Worcester Regional Transit Authority

Invitation for Bids (IFB) # 2025-07

FOR

WRTA Hub Lobby Renovation

Filed Sub-Bids Due:
August 19, 2025 – 2:00 p.m.

General Contractor Bids Due:
September 2, 2025 – 2:00 p.m.

Joshua Rickman, Administrator
Worcester Regional Transit Authority
60 Foster Street
Worcester, MA 01608

CONTACT:
Dinusha Perera, Manager of Grants and Procurement
(508) 453-3414
dperera@therta.com

Issued: July 18, 2025

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SECTION 1. GENERAL INFORMATION

The Worcester Regional Transit Authority, herein referred to as "WRTA" is a political subdivision of the Commonwealth of Massachusetts. It is responsible for public transit services in thirty-seven (37) communities within the Central Massachusetts region, and is funded with Federal, State and local subsidies, as well as farebox revenue. The WRTA was created pursuant to Massachusetts General Laws, Chapter 161B.

The WRTA is an Equal Opportunity Employer. Disadvantaged Business Enterprises are encouraged to submit bids and no Bidder will be subject to discrimination based on race, color, religion, ancestry, national origin, age, gender, disability, sexual orientation, veteran status, or other protected class, as identified by law, in consideration of an award of contract.

The purpose of this Invitation for Bid (IFB) is to solicit bids for the renovation of the WRTA's Lobby located at its Hub in Worcester, MA. The project work includes relocating restrooms, curtain wall modification, modification of the lobby mechanical, electrical, plumbing, fire protection, and painting. The lobby will be closed to the public during the renovation.

The WRTA is required to comply with the mandates of the Americans with Disabilities Act (ADA), as are the entities with which it contracts for transit. For the purposes of this contract and project, the WRTA must also comply with funding rules and regulations of the Federal Transit Administration (FTA) and the Massachusetts Department of Transportation (MassDOT), as well as other federal and state funding sources.

SECTION 2. INSTRUCTIONS TO BIDDERS

2.1 Preparation of IFB

Bidders shall submit the completed Invitation for Bid (IFB) with appropriate attachments / exhibits. All attachments / exhibits shall be identified with the Bidder's name and IFB number. IFB responses must be completed in Word / electronically processed. No oral, telephone, fax, or photocopied responses will be accepted.

2.2 IFB Documents

The following, in addition to this IFB, constitute the IFB documents:

- Attachment A - Specifications for Hub Lobby Renovation
- Attachment B - Main Lobby Renovation 100% Construction Drawings

2.3 IFB Process Schedule

The following is an anticipated IFB engagement schedule. The WRTA may change the estimated dates and process as deemed necessary.

The proposed schedule for submittal reviews and notification is as follows:

Activity	Date
Release and Advertise IFB	July 18, 2025
Pre-Bid Meeting and Site Visit	July 31, 2025
Deadline for Written Questions	August 7, 2025
Deadline for Issuance of Addendum (if necessary)	August 15, 2025
Deadline for Filed Sub-Bids	August 19, 2025
Deadline for General Contract Bids	September 2, 2025
Approximate Award Date	September 5, 2025

2.4 Submission of Bid to IFB

Bidders shall follow instuctions outlined in ATTACHMENT A - Specifications for Hub Lobby Renovation.

In addition, as described in the Supplementary Condtions included in ATTACHMENT A, the following certifications shall be signed and included with each bid submission:

- Attachment A, Exhibit A – Buy America Certification Non-Collusion Declaration
- Attachment A, Exhibit B – Government-Wide Debarment / Suspension
- Attachment A, Exhibit C – Non-Collusion Declaration
- Attachment A, Exhibit H – Lobbying Certification

Submsions to the IFB must be sealed and clearly marked on the outside as follows: **"WRTA Hub Lobby Renovation - IFB #2025-07"** and addressed to:

Dinusha Perera, Manager of Grants and Procurement
Worcester Regional Transit Authority
60 Foster Street
Worcester, MA 01608

Bidders shall be solely responsible for any and all costs incurred in the preparation or submittal of the bid. No portion of these costs shall in anyway be incurred by the WRTA.

2.5 Pre-Bid Site Visit

The Pre-bid meeting and site visit will be held at **60 Foster Street, Worcester, MA 01608 at 10:00 AM on July 31, 2025.** It is recommended that all prospective bidders have a representative in attendance.

2.6 Public Opening of IFB

There will be two public openings for this IFB:

Filed Sub-Bids	**August 19, 2025, at 2:00 p.m. EST**
General Contractor Bids	**September 2, 2025, at 2:00 p.m. EST**

Public openings will occur at the WRTA office at 60 Foster Street, Worcester, MA 01608. Bidders and their representatives are welcome to attend.

2.7 Multiple Bids

Only one IFB will be accepted from any one person, partnership, corporation or other entity.

2.8 Updates and Addenda

No one is authorized to amend any of these documents in any respect by an oral statement or to make any representation or interpretation in conflict with their provisions. Any changes to these documents will be issued in writing via Addendum by Dinusha Perera or designee.

Bidders shall be responsible for continually checking the WRTA's website at www.therta.com for the most current information regarding this IFB. Current information may be in the form of an update or formal addendum. In addition to being transmitted to known bidders, updates and / or addenda will be posted on the above-mentioned website by **August 15, 2025 at 11:59 p.m. EST**.

2.9 Late Bids

All bids to the IFB must be delivered in person or received by mail no later than dates and times shown in **Section 2.6 Public Opening of IFB** above . Bidders shall be responsible for the timely delivery of their IFB's. Bids received after the deadline will not be considered.

2.10 Bid Bond

Proposers shall furnish a bid guaranty in the form of a bid bond, or certified treasurer's or cashier's check issued by a responsible financial institution, be issued by a fully qualified surety company acceptable to the WRTA and made payable to the WRTA. The amount of such guaranty shall be equal to five percent (5%) of the bid price. The bid guarantee is an assurance that the proposer will, upon acceptance of the proposal, execute such contractual documents as may be required within the time specified.

In submitting this bid, it is understood and agreed by proposer that the WRTA reserves the right is to reject any and all bids, or part of any bid, and it is agreed that the proposal may not be withdrawn for a period of sixty (60) days subsequent to the opening of bids, without the written consent of Recipient.

It is also understood and agreed that if the undersigned proposer should withdraw any part or all of its proposal within sixty (60) days after the proposal opening without the written consent of the WRTA, or refuse or be unable to enter into this contract, the proposer shall forfeit its bid guaranty to the extent of WRTA's damages occasioned by such withdrawal, or refusal, or inability to enter into an agreement, or provide adequate security thereof.

It is further understood and agreed that to the extent the defaulting proposer's bid guaranty shall prove inadequate to fully recompense WRTA for the damages occasioned by default, then the undersigned proposer agrees to indemnify the WRTA and pay over to the WRTA the difference between the bid guaranty and WRTA's total damages, so as to make the WRTA whole.

2.11 Performance and Payment Bond

A performance and payment bond each in the amount of one hundred percent (100%) of the contract value and each by a surety company qualified to do business under the laws of the Commonwealth of Massachusetts and acceptable to the WRTA. The attorney-in-fact who signs the bond on behalf of the surety , must affix to each bond a certified and current copy of

the power of attorney. The Performance and Payment Bonds shall be written in a form satisfactory to the WRTA and shall remain in full force for the term of the contract. The WRTA may require additional bond protection when a contract price is increased. The increase in protection shall generally equal 100 percent of the increase in contract price. The WRTA may secure additional protection by directing the Contractor to increase the penal amount of the existing bond or to obtain an additional bond.

2.12 Point of Contact

All correspondence regarding this IFB shall be directed in writing to Dinusha Perera who may be reached by email at dperera@therta.com. No other individual has the authority to respond to any questions submitted unless specifically authorized by Dinusha Perera. Failure to adhere to this process may disqualify the Bidder.

2.13 Non-Collusion Declaration

Bidder shall execute a Non-Collusion Declaration on the form furnished by the WRTA (located in **ATTACHMENT A, EXHIBIT C**). This declaration must be submitted with the bid and will become part of all resulting contracts.

2.14 Buy America Certification

Bidder shall execute a Buy America Certification on the form furnished by the WRTA (located in **ATTACHMENT A, EXHIBIT A)**. This certification must be submitted with the bid and will become part of all resulting contracts.

2.15 Government-Wide Debarment and Suspension Certification

Bidder shall execute a Government-Wide Debarment and Suspension Certification on the form furnished by the WRTA (located in **ATTACHMENT A, EXHIBIT B).** This certification must be submitted with bid and will become part of all resulting contracts.

2.16 Lobbying Certification

Bidder shall executea Lobbying Certification on the form furnished by the WRTA (located in **ATTACHMENT A, EXHIBIT H)**. This certification must be submitted with the bid and will become part of all resulting contracts.

2.17 IFB Evaluation Criteria

If an award is made, it will be made to the responsive and responsible bidder offering the lowest total price for all services required. In addition to total price, other factors including prior performance may be considered.

2.18 Reservations

The WRTA reserves the right to do the following at any time and for its own convenience, at its sole discretion:

- To reject any and all bids, without indicating any reason for such rejection
- Waive or correct any minor or inadvertent defect, irregularity or technical error in any IFB or procedure, as part of the IFB or any subsequent negotiation process
- Terminate this IFB and issue a new Invitation for Bid anytime thereafter

- Procure any materials or services specified in the IFB by other means
- Extend any or all deadlines specified in the IFB, including deadlines for accepting IFBs by issuance of an Addendum at any time prior to the deadline for receipt of bids to the IFB
- Disqualify any Bidder on the basis of any real or perceived conflict of interest or evidence of collusion that is disclosed by the bid or other data available to the WRTA. Such disqualification is at the sole discretion of the WRTA
- Reject any Bidder that is in breach of or in default under any other agreement with the WRTA
- Reject any Bidder deemed by the WRTA to be non-responsive, unreliable, unqualified, or non-responsible

2.19 Notification of Withdrawals of Bids to IFBs

Bids may be modified or withdrawn prior to the date and time specified for IFB submission by an authorized representative of the Bidder or by formal written notice. All bids not withdrawn prior to the bid due date will become property of the WRTA.

2.20 Interpretation

Should any discrepancies or omissions be found in the IFB specifications / requirements, or doubt as to their meaning, the Bidder shall notify the WRTA in writing at once (email is acceptable). The WRTA will post updates or addenda on its website (www.therta.com). The WRTA shall not be responsible for oral interpretations. Questions must be received by August 7, 2025. All addenda issued shall be incorporated in the Contract.

2.21 Notice of Intent to Award

Notice of Intent to Award may be issued upon receipt of all required documents.

2.22 Execution of Agreement

Upon successful reference checks, evaluation and receipt of all required documents, an agreement (located in **ATTATCHMENT A**) or Purchase Order must be executed by both parties.

2.23 Proprietary Information

All information appearing within the bid is subject to public inspection. Any proprietary information must be clearly marked as such and submitted in a separate sealed envelope, provided, however, that this process shall not impede the obligation of the WRTA to respond to any public records request as required by Applicable Law. Reference sealed envelope within the body of the bid.

2.24 Exceptions and / or Deviations

No exceptions to or deviations from this specification will be considered, unless each exception or deviation is specifically stated by the Bidder as an exception and accompanied by a detailed statement completely defining the exception and / or deviation. The manufacturer's name, product name or trade name, and catalog or part number must be shown on the IFB in the designated places; however, that information is not sufficient evidence that the Bidder is making an exception. If no exception or deviation is shown, the Bidder will be required to

furnish the equipment exactly as specified herein. The burden of proof of compliance with this specification will be the responsibility of the Bidder. The WRTA reserves the right to reject, as unresponsive, any bid not containing all information requested by the WRTA.

SECTION 3. SPECIFICATIONS AND REQUIREMENTS

3.1 General Description

Please refer to **Attachment A**, Hub Lobby Renovation for a general introduction and specifications for this project

3.2 Construction Drawings

Please refer to **Attachment B**, Main Lobby Renovation 100% Construction Drawings for this project

SECTION 4. STANDARD TERMS AND CONDITIONS

4.1 Invoicing

The WRTA will only pay by original invoice. The WRTA will not authorize and does not participate in funding payments to a contractor prior to the incurrence of costs.

- Invoices must clearly indicate the date, location, and a description of the work that was completed

4.2 Controlling Law

The Contract shall be governed by, construed and enforced in accordance with the laws of the Commonwealth of Massachusetts and proper venue for legal action regarding the Contract shall be WRTA.

4.3 Taxes, Charges and Extras

The WRTA is exempt from all federal excise taxes, including tax on transportation and Massachusetts's sales tax. Price(s) quoted to the WRTA shall not include said taxes. Upon request the WRTA will furnish the Contractor with a tax exemption certificate.
No charge for delivery, drayage, express, parcel post, packing, cartage, insurance, license fees, permits, cost of bonds, or for any other purpose will be paid by the WRTA unless expressly included and itemized in the bid.

4.4 Award

Unless the prospective Bidder specifies otherwise in his / her bid, or the Invitation for Bid states otherwise, the WRTA may accept any item or group of items of any bid.

The WRTA reserves the right to reject any or all bids and to waive informalities and minor irregularities in bids received.

A written Contract mailed, or otherwise furnished, to the awarded Bidder within the time for acceptance specified, results in a binding contract without further action by either party. The contract shall be interpreted, construed and given in all respects according to the laws of the Commonwealth of Massachusetts.

4.5 Alteration or Variation of Terms

It is mutually understood and agreed that no alteration or variation of the terms of this IFB or subsequent contract shall be valid unless made or confirmed in writing and signed by the parties hereto, and that no oral understanding or agreements not incorporated herein, and no alterations or variations of the terms hereof unless made or confirmed in writing between the parties hereto shall be binding on any of the parties hereto.

4.6 Assignability

A contract is not assignable by the Bidder either in whole or in part.

4.7 Compliance with Statute

The Bidder hereby warrants that all applicable Federal and State statutes and regulations or local ordinances will be complied with in connection with the sale and delivery of the property furnished.

4.8 Insurance Requirements

By signing its proposal, Offeror acknowledges that it has read and understands the insurance requirement for this proposal as described in section 11.1.5 of **ATTACHMENT A SUPPLEMENTARY CONDITIONS.** Offeror also understands that the evidence of required insurance, naming the WRTA as an additional insured, must be submitted upon contract signing; otherwise, the WRTA may rescind its acceptance of the Offerors proposal.

4.9 Warranty

The Bidder warrants to WRTA that the goods and / or services covered by this order will conform to the drawings, specifications, samples, descriptions and time provisions furnished by WRTA and will be of first-class material and workmanship and free from defects; and WRTA reserves the right to cancel the unfilled portion of this order without liability to the Bidder for breach of this warranty. Goods will be received subject to inspection and acceptance at destination by WRTA; risk of loss before acceptance shall be on the Bidder. Defective goods rejected by WRTA may without prejudice to any other legal remedy be held at the Bidder's risk and returned to the Bidder at the Bidder's expense. Defects are not waived by acceptance of goods nor by failure to notify the Bidder thereof.

4.10 Federal Contract Clauses

The goods and / or services covered by this IFB are being funded in part with funds from the U.S. Department of Transportation, Federal Transit Administration, and the Massachusetts Department of Transportation. The Federal Contract Clauses included **(EXHIBIT E** of **ATTACHMENT A, SPECIFICATIONS)** apply to this procurement and will become a part of all resulting contracts. The Required Certifications (**EXHIBIT A**, **EXHIBIT B**, **EXHIBIT C**, and **EXHIBIT H** of **ATTACHMENT A**) must be submitted with the bid and will become part of all resulting contracts.

4.11 Davis-Bacon

The goods and / or services outlined in this IFB must comply with the Davis Bacon Act and related regulations. Please refer to **EXHIBIT D** of **ATTACHMENT A** for the applicable Davis Bacon Act Wages and **EXHIBIT E, Section 16** of **ATTACHMENT A** for the

applicable law.

4.12 Rights and Remedies of WRTA for Default

In the event any item furnished by the Bidder in the performance of the contract or purchase order should fail to conform to specifications therefore, or to the sample submitted by the Bidder with his / her bid, the WRTA may reject the same, and it shall thereupon become the duty of the Bidder to reclaim and remove the same, without expense to the WRTA, and immediately to replace all such rejected items with others conforming to such specifications or samples; providing that should the Bidder fail, neglect or refuse so to do the WRTA shall have the right to purchase on the open market, in lieu thereof, a corresponding quantity of any such items and to deduct from any moneys due or that may thereafter become due to the Bidder the difference between the prices named in the contract or purchase order and make the actual cost thereof to the WRTA. In the event the Bidder shall fail to make prompt delivery as specified of any item, the same conditions as to the rights of the WRTA to purchase in the open market and to reimbursement set forth above shall apply, except when delivery is delayed by fire, strike, freight embargo, or Act of God or the government.

Cost of delivery of an item which does not meet specifications, will be the responsibility of the Bidder.

The rights and remedies of the WRTA provided above shall not be exclusive and are in addition to any other rights and remedies provided by the law or under the contract.

4.13 Severability

Should any part of the Contract or Purchase Order be held to be invalid, illegal, or unenforceable in any respect, such invalidity, illegality, or unenforceability shall not affect the validity of the remainder of the Contract or Purchase Order which shall continue in full force and effect; provided that the remainder of the Contract or Purchase Order can, absent the excised portion, be reasonably interpreted to give the effect to the intentions of the parties.

4.14 Bid Results

Bid results will be made available for inspection electronically by contacting Dinusha Perera at dperera@therta.com.

4.15 DBE Objective / Policy Statement

The Worcester Regional Transit Authority (WRTA) has established a Disadvantaged Business Enterprise (DBE) Program in accordance with regulations of the U.S. Department of Transportation (DOT), 49 CFR § 26. The WRTA has received Federal financial assistance from the DOT and as a condition of receiving this assistance, the WRTA has signed an assurance that it will comply with 49 CFR § 26.

It is the policy of the WRTA to ensure that all contracts and procurements will be administered without discrimination on the basis of race, color, national origin, or sex. The WRTA ensures that Disadvantaged Business Enterprises (DBEs) shall have an equal opportunity to compete for and participate in DOT-assisted contracts. It is also our policy to:

1. To create a level playing field on which DBEs can compete fairly for DOT-assisted contracts;
2. To ensure that the DBE program is narrowly tailored in accordance with applicable law;
3. To ensure that only firms that fully meet 49 CFR § 26 eligibility standards are permitted to participate as DBEs;
4. To help remove barriers to the participation of DBEs in DOT-assisted contracts;
5. To assist the development of firms that can compete successfully in the marketplace outside the DBE program.

The Grants and Procurement Manager has been designated as the DBE Liaison Officer (DBELO). The DBELO has direct, independent access to the Chief Executive Officer (Administrator) concerning DBE program matters. The DBELO is responsible for implementing all aspects of the WRTA DBE program. The WRTA has adequate staff, (including procurement, finance, etc.), to administer the program in compliance with 49 CFR § 26.

WRTA has circulated this policy statement to the Advisory Board, throughout our organization and to the DBE and non-DBE business communities that perform work on our DOT-assisted contracts. Distribution has been accomplished via our website www.therta.com, inclusion with procurement documents and through outreach to community organizations.

ATTACHMENT A

DESIGN SPECIFICATIONS

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SPECIFICATIONS FOR

WORCESTER REGIONAL TRANSIT AUTHORITY

HUB LOBBRY RENOVATION WORCESTER, MA

STV Incorporated
One Financial Center, 3rd Floor, Boston, MA 02111

Based on the DCAMM Standard Specifications Rev 8 DBB
MGL Chapter 149 - Design-Bid-Build - Filed Sub-Bids

ARCHITECTURE

STRUCTURAL

CIVIL

MECHANICAL

PLUMBING / FIRE PROTECTION

ELECTRICAL

END OF PROFESSIONAL SEALS

WORCESTER REGIONAL TRANSIT AUTHORITY

HUB LOBBY RENOVATION

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Section 004000 Sub Bid Form
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Section 006100 Payment and Performance Bonds
Section 007000 General Conditions
Section 007000A AIA A210 – General Conditions
Section 007100 Supplementary Conditions

EXHIBIT A Buy America Certification – must be signed by the submitter
EXHIBIT B Debarment and Suspension Certification – must be signed by the submitter
EXHIBIT C Non-Collusion Declaration – must be signed by the submitter
EXHIBIT D Davis Bacon Wage Rates for Building Construction in Worcester County
EXHIBIT E Federally Required and Other Model Contract Clauses for Construction Over $2,000
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EXHIBIT G DBE Objective Policy Statement – for informational purposes
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DOCUMENT 001113

ADVERTISEMENT FOR BIDS

1.1 PROJECT INFORMATION

A. Notice to Bidders: Qualified bidders may submit bids for project as described in this Document. Submit bids according to the Instructions to Bidders.

1. Regulatory Requirements: M.G.L. c. 149 shall govern submittal, opening, and award of bids.

B. Project Identification: WRTA Hub Lobby Renovation

1. Project Locations:
   a. 60 Foster Street, Worcester, MA, 01608 (WRTA Hub)

C. Owner: Worcester Regional Transit Authority

1. Owner's Representative: Anjanette Kelso, Skanska
2. Procurement Officer: Dinusha Perera, WRTA

D. Architect: STV Incorporated

E. Project Description: Project consists of the renovation of the WRTA's Lobby located at their Hub. The project is limit of work includes relocating restrooms, curtain wall modification, modification to the lobby mechanical, electrical, plumbing and fire protection, and painting. The lobby will be closed to the public during the renovation.

F. Construction Contract: Bids will be received for the following Work:

1. General Contract

2. Filed Sub Bids
   a. Electrical
   b. Plumbing
   c. Fire Protection Sprinkler Systems
   d. HVAC
   e. Painting
   f. Waterproofing, Dampproofing, and Caulking

1.2 BID SUBMITTAL AND OPENING

A. Owner will receive sealed lump sum bids until the bid time and date at the location given below. Owner will consider bids prepared in compliance with the Instructions to Bidders issued by Owner, and delivered as follows:

1. Filed Sub Bids:
   a. Bid Date: August 19th, 2025.

b. Bid Time: 2:00 pm, local time.
c. Location: 60 Foster St, Worcester, MA 01608.

2. General Contract Bid:
   a. Bid Date: September 2, 2025.
   b. Bid Time: 2:00 pm, local time.
   c. Location: 60 Foster St, Worcester, MA 01608..

B. Bids will be thereafter, on August 19th, 2025 and September 2, 2025 will be publicly opened and read aloud.

C. Bidder Questions must be received by email on or before August 7th, 2025 to Dinusha Perera, WRTA, dperera@therta.com.

1.3 PREBID MEETING

A. Prebid Meeting: A Prebid meeting for all bidders will be held on Thursday, July 31th, 2025, 10:00am at:
   1. Project Location
      a. 60 Foster Street, Worcester, MA, 01608 (WRTA Hub)

   2. Prospective bidders are requested to attend.

1.4 BID SECURITY

A. Bid security in the form of a bid bond, cash, certified check, treasurer's or cashier's check payable to the Owner shall be submitted with each bid in the amount of 5 percent of the bid amount. No bids may be withdrawn for a period of 60 days after opening of bids. Owner reserves the right to reject any and all bids and to waive informalities and irregularities.

1.5 DOCUMENTS

A. Online Procurement and Contracting Documents: Obtain access after 7/18/25 by visiting WRTA's Business Opportunities website.

1.6 TIME OF COMPLETION

A. Successful bidder shall begin the Work on receipt of the Notice to Proceed and shall complete the Work within the Contract Time of 270 days. All work shall be substantially complete in 240 days from Notice to Proceed.

1.7 PERMITS

A. Each bidder shall include in their proposal all costs for permits as may be required for their portion of the work. The Building Permit will be obtained and paid for by the General Contractor.

1.8 BIDDER'S QUALIFICATIONS

A. Bidders must submit a Division of Capital Asset Management approved Certificate of Eligibility and Update Statement pursuant to the requirements of G.L. c.149, §44D

B. Bidders must be properly licensed under the laws governing their respective trades and be able to obtain insurance and bonds required for the Work.

C. A Performance Bond, separate Labor and Material Payment Bond in the amount at least equal to one hundred percent (100%), and Insurance in a form acceptable to Owner will be required of the successful Bidder.

D. All bids for this project are subject to applicable bidding laws of Massachusetts, including General Laws Chapter 149 as amended. The project will require filed sub-bids.

E. Davis-Bacon Wage Rates as determined by U.S. Department of Labor, Wage and Hour Division for building in Worcester County Massachusetts, as amended, apply to this project.

F. File Sub Bidders and General Contract Bidders must submit the "Federal Certifications" in the Exhibits located in these project specifications, at the time bids are submitted.

1.9 NOTIFICATION

A. This Advertisement for Bids document is issued by Worcester Regional Transit Authority.

B. The contract will be awarded to the bidder deemed by the awarding authority to be the lowest responsible and eligible bidder.

C. The Owner reserves the right to waive any informalities, to accept or reject, in whole or in part any or all bids, or take whatever other action may be deemed to be in the best interest of the Owner.

1.10 DISADVANTAGED BUSINESS ENTERPRISES (DBE)

A. This contract is subject to the requirements of Title 49, Code of Federal Regulations, Part 26, Participation by Disadvantaged Business Enterprises in Department of Transportation Financial Assistance Programs. The Disadvantaged Business Enterprises (DBE) goal set for the entire project is .66%.
   1. Interested bidders are encouraged to search for MassDOT UCP Certified DBE businesses by accessing the Massachusetts Supplier Diversity Office (SDO) at https:// www.diversitycertification.mass.gov/BusinessDirectory/BusinessDirectorySearch.aspx
      a. Search the Directory of Certified Businesses by filtering the Certification Type: DBE and the Certification Agency: UCP-MassDOT Office

END OF DOCUMENT 001113

AIA® Document A701™ – 2018

Instructions to Bidders

for the following Project:
(Name, location, and detailed description)

WRTA Hub Lobby Renovation
60 Foster Street, Worcester, MA 01608

THE OWNER:
(Name, legal status, address, and other information)

Worcester Regional Transit Authority
60 Foster Street, Worcester, MA 01608

THE ARCHITECT:
(Name, legal status, address, and other information)

STV Incorporated
One Financial Center
Boston, MA 02210

TABLE OF ARTICLES

1 DEFINITIONS

2 BIDDER'S REPRESENTATIONS

3 BIDDING DOCUMENTS

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5 CONSIDERATION OF BIDS

6 POST-BID INFORMATION

7 PERFORMANCE BOND AND PAYMENT BOND

8 ENUMERATION OF THE PROPOSED CONTRACT DOCUMENTS

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

FEDERAL, STATE, AND LOCAL LAWS MAY IMPOSE REQUIREMENTS ON PUBLIC PROCUREMENT CONTRACTS. CONSULT LOCAL AUTHORITIES OR AN ATTORNEY TO VERIFY REQUIREMENTS APPLICABLE TO THIS PROCUREMENT BEFORE COMPLETING THIS FORM.

It is intended that AIA Document G612™–2017, Owner's Instructions to the Architect, Parts A and B will be completed prior to using this document.

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ARTICLE 1 DEFINITIONS

§ 1.1 Bidding Documents include the Bidding Requirements and the Proposed Contract Documents. The Bidding Requirements consist of the advertisement or invitation to bid, Instructions to Bidders, supplementary instructions to bidders, the bid form, and any other bidding forms. The Proposed Contract Documents consist of the unexecuted form of Agreement between the Owner and Contractor and that Agreement's Exhibits, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, all Addenda, and all other documents enumerated in Article 8 of these Instructions.

§ 1.2 Definitions set forth in the General Conditions of the Contract for Construction, or in other Proposed Contract Documents apply to the Bidding Documents.

§ 1.3 Addenda are written or graphic instruments issued by the Architect, which, by additions, deletions, clarifications, or corrections, modify or interpret the Bidding Documents.

§ 1.4 A Bid is a complete and properly executed proposal to do the Work for the sums stipulated therein, submitted in accordance with the Bidding Documents.

§ 1.5 The Base Bid is the sum stated in the Bid for which the Bidder offers to perform the Work described in the Bidding Documents, to which Work may be added or deleted by sums stated in Alternate Bids.

§ 1.6 An Alternate Bid (or Alternate) is an amount stated in the Bid to be added to or deducted from, or that does not change, the Base Bid if the corresponding change in the Work, as described in the Bidding Documents, is accepted.

§ 1.7 A Unit Price is an amount stated in the Bid as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, as described in the Bidding Documents.

§ 1.8 A Bidder is a person or entity who submits a Bid and who meets the requirements set forth in the Bidding Documents.

§ 1.9 A Sub-bidder is a person or entity who submits a bid to a Bidder for materials, equipment, or labor for a portion of the Work.

ARTICLE 2 BIDDER'S REPRESENTATIONS

§ 2.1 By submitting a Bid, the Bidder represents that:

- **.1** the Bidder has read and understands the Bidding Documents;
- **.2** the Bidder understands how the Bidding Documents relate to other portions of the Project, if any, being bid concurrently or presently under construction;
- **.3** the Bid complies with the Bidding Documents;
- **.4** the Bidder has visited the site, become familiar with local conditions under which the Work is to be performed, and has correlated the Bidder's observations with the requirements of the Proposed Contract Documents;
- **.5** the Bid is based upon the materials, equipment, and systems required by the Bidding Documents without exception; and
- **.6** the Bidder has read and understands the provisions for liquidated damages, if any, set forth in the form of Agreement between the Owner and Contractor.

ARTICLE 3 BIDDING DOCUMENTS

§ 3.1 Distribution

§ 3.1.1 Bidders shall obtain complete Bidding Documents, as indicated below, from the issuing office designated in the advertisement or invitation to bid, for the deposit sum, if any, stated therein.

See 001113 – Advertisement for Bids

§ 3.1.2 Any required deposit shall be refunded to Bidders who submit a bona fide Bid and return the paper Bidding Documents in good condition within ten days after receipt of Bids. The cost to replace missing or damaged paper documents will be deducted from the deposit. A Bidder receiving a Contract award may retain the paper Bidding Documents, and the Bidder's deposit will be refunded.

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§ 3.1.3 Bidding Documents will not be issued directly to Sub-bidders unless specifically offered in the advertisement or invitation to bid, or in supplementary instructions to bidders.

§ 3.1.4 Bidders shall use complete Bidding Documents in preparing Bids. Neither the Owner nor Architect assumes responsibility for errors or misinterpretations resulting from the use of incomplete Bidding Documents.

§ 3.1.5 The Bidding Documents will be available for the sole purpose of obtaining Bids on the Work. No license or grant of use is conferred by distribution of the Bidding Documents.

§ 3.2 Modification or Interpretation of Bidding Documents

§ 3.2.1 The Bidder shall carefully study the Bidding Documents, shall examine the site and local conditions, and shall notify the Architect of errors, inconsistencies, or ambiguities discovered and request clarification or interpretation pursuant to Section 3.2.2.

§ 3.2.2 Requests for clarification or interpretation of the Bidding Documents shall be submitted by the Bidder in writing and shall be received by the Architect at least seven days prior to the date for receipt of Bids.
(Indicate how, such as by email, website, host site/platform, paper copy, or other method Bidders shall submit requests for clarification and interpretation.)

« » Submit by Email to dperera@therta.com.com.

§ 3.2.3 Modifications and interpretations of the Bidding Documents shall be made by Addendum. Modifications and interpretations of the Bidding Documents made in any other manner shall not be binding, and Bidders shall not rely upon them.

§ 3.3 Substitutions

§ 3.3.1 The materials, products, and equipment described in the Bidding Documents establish a standard of required function, dimension, appearance, and quality to be met by any proposed substitution.

§ 3.3.2 Substitution Process

§ 3.3.2.1 Written requests for substitutions shall be received by the Architect at least ten days prior to the date for receipt of Bids. Requests shall be submitted in the same manner as that established for submitting clarifications and interpretations in Section 3.2.2.

§ 3.3.2.2 Bidders shall submit substitution requests on a Substitution Request Form if one is provided in the Bidding Documents.

§ 3.3.2.3 If a Substitution Request Form is not provided, requests shall include (1) the name of the material or equipment specified in the Bidding Documents; (2) the reason for the requested substitution; (3) a complete description of the proposed substitution including the name of the material or equipment proposed as the substitute, performance and test data, and relevant drawings; and (4) any other information necessary for an evaluation. The request shall include a statement setting forth changes in other materials, equipment, or other portions of the Work, including changes in the work of other contracts or the impact on any Project Certifications (such as LEED), that will result from incorporation of the proposed substitution.

§ 3.3.3 The burden of proof of the merit of the proposed substitution is upon the proposer. The Architect's decision of approval or disapproval of a proposed substitution shall be final.

§ 3.3.4 If the Architect approves a proposed substitution prior to receipt of Bids, such approval shall be set forth in an Addendum. Approvals made in any other manner shall not be binding, and Bidders shall not rely upon them.

§ 3.3.5 No substitutions will be considered after the Contract award unless specifically provided for in the Contract Documents.

§ 3.4 Addenda

§ 3.4.1 Addenda will be transmitted to Bidders known by the issuing office to have received complete Bidding Documents.

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By Email and posted on the WRTA website.

§ 3.4.2 Addenda will be available where Bidding Documents are on file.

§ 3.4.3 Addenda will be issued no later than four days prior to the date for receipt of Bids, except an Addendum withdrawing the request for Bids or one which includes postponement of the date for receipt of Bids.

§ 3.4.4 Prior to submitting a Bid, each Bidder shall ascertain that the Bidder has received all Addenda issued, and the Bidder shall acknowledge their receipt in the Bid.

ARTICLE 4 BIDDING PROCEDURES

§ 4.1 Preparation of Bids

§ 4.1.1 Bids shall be submitted on the forms included with or identified in the Bidding Documents.

§ 4.1.2 All blanks on the bid form shall be legibly executed. Paper bid forms shall be executed in a non-erasable medium.

§ 4.1.3 Sums shall be expressed in both words and numbers, unless noted otherwise on the bid form. In case of discrepancy, the amount entered in words shall govern.

§ 4.1.4 Edits to entries made on paper bid forms must be initialed by the signer of the Bid.

§ 4.1.5 All requested Alternates shall be bid. If no change in the Base Bid is required, enter "No Change" or as required by the bid form.

§ 4.1.6 Where two or more Bids for designated portions of the Work have been requested, the Bidder may, without forfeiture of the bid security, state the Bidder's refusal to accept award of less than the combination of Bids stipulated by the Bidder. The Bidder shall neither make additional stipulations on the bid form nor qualify the Bid in any other manner.

§ 4.1.7 Each copy of the Bid shall state the legal name and legal status of the Bidder. As part of the documentation submitted with the Bid, the Bidder shall provide evidence of its legal authority to perform the Work in the jurisdiction where the Project is located. Each copy of the Bid shall be signed by the person or persons legally authorized to bind the Bidder to a contract. A Bid by a corporation shall further name the state of incorporation and have the corporate seal affixed. A Bid submitted by an agent shall have a current power of attorney attached, certifying the agent's authority to bind the Bidder.

§ 4.1.8 A Bidder shall incur all costs associated with the preparation of its Bid.

§ 4.2 Bid Security

§ 4.2.1 Each Bid shall be accompanied by the following bid security:

See 001113 – Advertisement for Bids

§ 4.2.2 The Bidder pledges to enter into a Contract with the Owner on the terms stated in the Bid and shall, if required, furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder. Should the Bidder refuse to enter into such Contract or fail to furnish such bonds if required, the amount of the bid security shall be forfeited to the Owner as liquidated damages, not as a penalty. In the event the Owner fails to comply with Section 6.2, the amount of the bid security shall not be forfeited to the Owner.

§ 4.2.3 If a surety bond is required as bid security, it shall be written on AIA Document A310™, Bid Bond, unless otherwise provided in the Bidding Documents. The attorney-in-fact who executes the bond on behalf of the surety shall affix to the bond a certified and current copy of an acceptable power of attorney. The Bidder shall provide surety bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 4.2.4 The Owner will have the right to retain the bid security of Bidders to whom an award is being considered until (a) the Contract has been executed and bonds, if required, have been furnished; (b) the specified time has elapsed so that

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Bids may be withdrawn; or (c) all Bids have been rejected. However, if no Contract has been awarded or a Bidder has not been notified of the acceptance of its Bid, a Bidder may, beginning 60 days after the opening of Bids, withdraw its Bid and request the return of its bid security.

§ 4.3 Submission of Bids

§ 4.3.1 A Bidder shall submit its Bid as indicated below:

(Indicate how, such as by website, host site/platform, paper copy, or other method Bidders shall submit their Bid.)

See 001113 – Advertisement for Bids

§ 4.3.2 Paper copies of the Bid, the bid security, and any other documents required to be submitted with the Bid shall be enclosed in a sealed opaque envelope. The envelope shall be addressed to the party receiving the Bids and shall be identified with the Project name, the Bidder's name and address, and, if applicable, the designated portion of the Work for which the Bid is submitted. If the Bid is sent by mail, the sealed envelope shall be enclosed in a separate mailing envelope with the notation "SEALED BID ENCLOSED" on the face thereof.

§ 4.3.3 Bids shall be submitted by the date and time and at the place indicated in the invitation to bid. Bids submitted after the date and time for receipt of Bids, or at an incorrect place, will not be accepted.

§ 4.3.4 The Bidder shall assume full responsibility for timely delivery at the location designated for receipt of Bids.

§ 4.3.5 A Bid submitted by any method other than as provided in this Section 4.3 will not be accepted.

§ 4.4 Modification or Withdrawal of Bid

§ 4.4.1 Prior to the date and time designated for receipt of Bids, a Bidder may submit a new Bid to replace a Bid previously submitted, or withdraw its Bid entirely, by notice to the party designated to receive the Bids. Such notice shall be received and duly recorded by the receiving party on or before the date and time set for receipt of Bids. The receiving party shall verify that replaced or withdrawn Bids are removed from the other submitted Bids and not considered. Notice of submission of a replacement Bid or withdrawal of a Bid shall be worded so as not to reveal the amount of the original Bid.

§ 4.4.2 Withdrawn Bids may be resubmitted up to the date and time designated for the receipt of Bids in the same format as that established in Section 4.3, provided they fully conform with these Instructions to Bidders. Bid security shall be in an amount sufficient for the Bid as resubmitted.

§ 4.4.3 After the date and time designated for receipt of Bids, a Bidder who discovers that it made a clerical error in its Bid shall notify the Architect of such error within two days, or pursuant to a timeframe specified by the law of the jurisdiction where the Project is located, requesting withdrawal of its Bid. Upon providing evidence of such error to the reasonable satisfaction of the Architect, the Bid shall be withdrawn and not resubmitted.

ARTICLE 5 CONSIDERATION OF BIDS

§ 5.1 Opening of Bids

If stipulated in an advertisement or invitation to bid, or when otherwise required by law, Bids properly identified and received within the specified time limits will be publicly opened and read aloud. A summary of the Bids may be made available to Bidders.

§ 5.2 Rejection of Bids

Unless otherwise prohibited by law, the Owner shall have the right to reject any or all Bids.

§ 5.3 Acceptance of Bid (Award)

§ 5.3.1 It is the intent of the Owner to award a Contract to the lowest responsive and responsible Bidder, provided the Bid has been submitted in accordance with the requirements of the Bidding Documents. Unless otherwise prohibited by law, the Owner shall have the right to waive informalities and irregularities in a Bid received and to accept the Bid which, in the Owner's judgment, is in the Owner's best interests.

§ 5.3.2 Unless otherwise prohibited by law, the Owner shall have the right to accept Alternates in any order or combination, unless otherwise specifically provided in the Bidding Documents, and to determine the lowest responsive and responsible Bidder on the basis of the sum of the Base Bid and Alternates accepted.

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ARTICLE 6 POST-BID INFORMATION

§ 6.1 Contractor's Qualification Statement

Bidders to whom award of a Contract is under consideration shall submit to the Architect, upon request and within the timeframe specified by the Architect, a properly executed AIA Document A305™, Contractor's Qualification Statement, unless such a Statement has been previously required and submitted for this Bid.

§ 6.2 Owner's Financial Capability

A Bidder to whom award of a Contract is under consideration may request in writing, fourteen days prior to the expiration of the time for withdrawal of Bids, that the Owner furnish to the Bidder reasonable evidence that financial arrangements have been made to fulfill the Owner's obligations under the Contract. The Owner shall then furnish such reasonable evidence to the Bidder no later than seven days prior to the expiration of the time for withdrawal of Bids. Unless such reasonable evidence is furnished within the allotted time, the Bidder will not be required to execute the Agreement between the Owner and Contractor.

§ 6.3 Submittals

§ 6.3.1 After notification of selection for the award of the Contract, the Bidder shall, as soon as practicable or as stipulated in the Bidding Documents, submit in writing to the Owner through the Architect:

- **.1** a designation of the Work to be performed with the Bidder's own forces;
- **.2** names of the principal products and systems proposed for the Work and the manufacturers and suppliers of each; and
- **.3** names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for the principal portions of the Work.

§ 6.3.2 The Bidder will be required to establish to the satisfaction of the Architect and Owner the reliability and responsibility of the persons or entities proposed to furnish and perform the Work described in the Bidding Documents.

§ 6.3.3 Prior to the execution of the Contract, the Architect will notify the Bidder if either the Owner or Architect, after due investigation, has reasonable objection to a person or entity proposed by the Bidder. If the Owner or Architect has reasonable objection to a proposed person or entity, the Bidder may, at the Bidder's option, withdraw the Bid or submit an acceptable substitute person or entity. The Bidder may also submit any required adjustment in the Base Bid or Alternate Bid to account for the difference in cost occasioned by such substitution. The Owner may accept the adjusted bid price or disqualify the Bidder. In the event of either withdrawal or disqualification, bid security will not be forfeited.

§ 6.3.4 Persons and entities proposed by the Bidder and to whom the Owner and Architect have made no reasonable objection must be used on the Work for which they were proposed and shall not be changed except with the written consent of the Owner and Architect.

ARTICLE 7 PERFORMANCE BOND AND PAYMENT BOND

§ 7.1 Bond Requirements

§ 7.1.1 If stipulated in the Bidding Documents, the Bidder shall furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder.

§ 7.1.2 If the furnishing of such bonds is stipulated in the Bidding Documents, the cost shall be included in the Bid. If the furnishing of such bonds is required after receipt of bids and before execution of the Contract, the cost of such bonds shall be added to the Bid in determining the Contract Sum.

§ 7.1.3 The Bidder shall provide surety bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 7.1.4 Unless otherwise indicated below, the Penal Sum of the Payment and Performance Bonds shall be the amount of the Contract Sum.

§ 7.2 Time of Delivery and Form of Bonds

§ 7.2.1 The Bidder shall deliver the required bonds to the Owner not later than three days following the date of execution of the Contract. If the Work is to commence sooner in response to a letter of intent, the Bidder shall, prior to commencement of the Work, submit evidence satisfactory to the Owner that such bonds will be furnished and delivered in accordance with this Section 7.2.1.

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§ 7.2.2 Unless otherwise provided, the bonds shall be written on AIA Document A312, Performance Bond and Payment Bond.

§ 7.2.3 The bonds shall be dated on or after the date of the Contract.

§ 7.2.4 The Bidder shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix to the bond a certified and current copy of the power of attorney.

ARTICLE 8 ENUMERATION OF THE PROPOSED CONTRACT DOCUMENTS

§ 8.1 Copies of the proposed Contract Documents have been made available to the Bidder.

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DOCUMENT 002113

INSTRUCTIONS TO BIDDERS

1.1 INSTRUCTIONS TO BIDDERS

A. AIA Document A701, "Instructions to Bidders," is hereby incorporated into the Procurement and Contracting Requirements. A copy of AIA Document A701, "Instructions to Bidders," is bound herein and immediately follows this page.

B. Contractors must sign the Exhibits identified in the Table of Contents.

END OF DOCUMENT 002113

DOCUMENT 002213

SUPPLEMENTARY INSTRUCTIONS TO BIDDERS

1.1 INSTRUCTIONS TO BIDDERS

A. Instructions to Bidders for Project consist of the following:

1. AIA Document A701, "Instructions to Bidders" a copy of which is bound in this Project Manual.
2. The following Supplementary Instructions to Bidders that modify and add to the requirements of the Instructions to Bidders.

1.2 SUPPLEMENTARY INSTRUCTIONS TO BIDDERS, GENERAL

A. The following supplements modify AIA Document A701, "Instructions to Bidders." Where a portion of the Instructions to Bidders is modified or deleted by these Supplementary Instructions to Bidders, unaltered portions of the Instructions to Bidders shall remain in effect.

1.3 ARTICLE 2 - BIDDER'S REPRESENTATIONS

A. Add Section 2.1.3.1:

1. 2.1.3.1 - The Bidder has investigated all required fees, permits, and regulatory requirements of authorities having jurisdiction and has properly included in the submitted bid the cost of such fees, permits, and requirements not otherwise indicated as provided by Owner.

B. Add Section 2.1.5:

1. 2.1.5 - The Bidder is a properly licensed Contractor according to the laws and regulations of the Commonwealth of Massachusetts and meets qualifications indicated in the Procurement and Contracting Documents.

C. Add Section 2.1.6:

1. 2.1.6 - The Bidder has incorporated into the Bid adequate sums for work performed by installers whose qualifications meet those indicated in the Procurement and Contracting Documents.

1.4 ARTICLE 3 - BIDDING DOCUMENTS

A. 3.1 – Copies

1. Delete Section 3.1.1 and insert the following:

a. Qualified Bidders may obtain complete electronic sets of the Bidding Documents from WRTA's Business Opportunities website: www.therta.com

2. Delete Section 3.1.2.

B. 3.2 - Interpretation or Correction of Procurement and Contracting Documents:

1. Add Section 3.2.2.1:

a. 3.2.2.1 - Submit Bidder's Requests for Interpretation using form bound in the Project Manual.
b. Delete Section 3.2.2 and insert the following:

1) Bidders and Sub-bidders requiring clarification or interpretation of the Bidding Documents shall make a written request which shall reach WRTA's Procurement Director at dperera@therta.com by, August 7, 2025 at 5:00pm.

C. 3.4 - Addenda:

1. Delete Section 3.4.3 and replace with the following:

a. 3.4.3 - Addenda will be issued on or before August 7, 2025 except an Addendum withdrawing the request for Bids or one which includes postponement of the date for receipt of Bids.

2. Add Section 3.4.4.1:

a. 3.4.4.1 - Owner may elect to waive the requirement for acknowledging receipt of 3.4.4 Addenda as follows:

1) 3.4.4.1.1 - Information received as part of the Bid indicates that the Bid, as submitted, reflects modifications to the Procurement and Contracting Documents included in an unacknowledged Addendum.
2) 3.4.4.1.2 - Modifications to the Procurement and Contracting Documents in an unacknowledged Addendum do not, in the opinion of Owner, affect the Contract Sum or Contract Time.

1.5 ARTICLE 4 - BIDDING PROCEDURES

A. 4.1 - Preparation of Bids:

1. Add Section 4.1.1.1:

a. 4.1.1.1 - Printable electronic Bid Forms and related documents are available from the WRTA.

2. Add Section 4.1.8:

a. 4.1.8 - The Bid shall include unit prices when called for by the Procurement and Contracting Documents. Owner may elect to consider unit prices in the determination of award. Unit prices will be incorporated into the Contract.

3. Add Section 4.1.9:

a. 4.1.9 - Owner may elect to disqualify a bid due to failure to submit a bid in the form requested, failure to bid requested alternates or unit prices, failure to complete entries in all blanks in the Bid Form, or inclusion by the Bidder of any alternates, conditions, limitations or provisions not called for.

B. 4.3 - Submission of Bids:

1. Add Section 4.3.1.2:

a. 4.3.1.2 - Include Bidder's Contractor License Number applicable in Project jurisdiction on the face of the sealed bid envelope.

C. 4.4 - Modification or Withdrawal of Bids:

1. Add the following sections to 4.4.2:

a. 4.4.2.1 - Such modifications to or withdrawal of a bid may only be made by persons authorized to act on behalf of the Bidder. Authorized persons are those so identified in the Bidder's corporate bylaws, specifically empowered by the Bidder's charter or similar legally binding document acceptable to Owner, or by a power of attorney, signed and dated, describing the scope and limitations of the power of attorney. Make such documentation available to Owner at the time of seeking modifications or withdrawal of the Bid.

b. 4.4.2.2 - Owner will consider modifications to a bid written on the sealed bid envelope by authorized persons when such modifications comply with the following: the modification is indicated by a percent or stated amount to be added to or deducted from the Bid; the amount of the Bid itself is not made known by the modification; a signature of the authorized person, along with the time and date of the modification, accompanies the modification. Completion of an unsealed bid form, awaiting final figures from the Bidder, does not require power of attorney due to the evidenced authorization of the Bidder implied by the circumstance of the completion and delivery of the Bid.

1.6 ARTICLE 6 - POSTBID INFORMATION

A. 6.1 - Contractor's Qualification Statement:

1. Delete Section 6.1.1:

B. 6.3 - Submittals:

1. Add Section 6.3.1.4:

a. 6.3.1.4 - Submit information requested in Sections 6.3.1.1, 6.3.1.2, and 6.3.1.3 no later than **two** business days following Architect's request.

1.7 ARTICLE 7 - PERFORMANCE BOND AND PAYMENT BOND

A. 7.1 - Bond Requirements:

1. Add Section 7.1.1.1:

a. 7.1.1.1 - Both a Performance Bond and a Payment Bond will be required, each in an amount equal to 100 percent of the Contract Sum.

B. 7.2 - Time of Delivery and Form of Bonds:

1. Delete the first sentence of Section 7.2.1 and insert the following:

a. The Bidder shall deliver the required bonds to Owner no later than **5** days after the date of Notice of Intent to Award and no later than the date of execution of the Contract, whichever occurs first. Owner may deem the failure of the Bidder to deliver required bonds within the period of time allowed a default.

2. Delete Section 7.2.3 and insert the following:

a. 7.2.3 - Bonds shall be executed and be in force on the date of the execution of the Contract.

1.8 ARTICLE 8 - FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

A. A101-2017 edited as bound in this Project Manual.

1.9 ARTICLE 9 - EXECUTION OF THE CONTRACT

A. Add Article 9:

1. 9.1.1 - Subsequent to the Notice of Intent to Award, and within **5** days after the prescribed Form of Agreement is presented to the Awardee for signature, the Awardee shall execute and deliver the Agreement to Owner.
2. 9.1.2 - Owner may deem as a default the failure of the Awardee to execute the Contract and to supply the required bonds when the Agreement is presented for signature within the period of time allowed.
3. 9.1.3 - Unless otherwise indicated in the Procurement and Contracting Documents or the executed Agreement, the date of commencement of the Work shall be the date of the executed Agreement **or the date that the Bidder is obligated to deliver the executed Agreement and required bonds to Owner**.
4. 9.1.4 - In the event of a default, Owner may declare the amount of the Bid security forfeited and elect to either award the Contract to the next responsible bidder or re-advertise for bids.

1.10 ARTICLE 10 TIME FOR COMPLETION

A. Add Article 10:

1. Substantial Completion: The date for Substantial Completion shall be 240 calendar days from Notice to Proceed.
2. Final Completion: The date for Final Completion shall be 270 calendar days after the date of Substantial Completion.

END OF DOCUMENT 002213

DOCUMENT 002600

PROCUREMENT SUBSTITUTION PROCEDURES

1.1 DEFINITIONS

A. Procurement Substitution Requests: Requests for changes in products, materials, equipment, and methods of construction from those indicated in the Procurement and Contracting Documents, submitted prior to receipt of bids.

B. Substitution Requests: Requests for changes in products, materials, equipment, and methods of construction from those indicated in the Contract Documents, submitted following Contract award.

1.2 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.3 PROCUREMENT SUBSTITUTIONS

A. Procurement Substitutions, General: By submitting a bid, the Bidder represents that its bid is based on materials and equipment described in the Procurement and Contracting Documents, including Addenda. Bidders are encouraged to request approval of qualifying substitute materials and equipment when the Specifications Sections list materials and equipment by product or manufacturer name.

B. Procurement Substitution Requests will be received and considered by Owner when the following conditions are satisfied, as determined by Architect; otherwise requests will be returned without action:

1. Extensive revisions to the Contract Documents are not required.
2. Proposed changes are in keeping with the general intent of the Contract Documents, including the level of quality of the Work represented by the requirements therein.
3. The request is fully documented and properly submitted.

1.4 SUBMITTALS

A. Procurement Substitution Request: Submit to Architect. Procurement Substitution Request must be made in writing in compliance with the following requirements:

1. Requests for substitution of materials and equipment will be considered if received no later than **10** days prior to date of bid opening.
2. Submittal Format: Submit three copies of each written Procurement Substitution Request, using form immediately following this section.

B. Architect's Action:

1. Architect may request additional information or documentation necessary for evaluation of the Procurement Substitution Request. Architect will notify all bidders of acceptance of the proposed substitute by means of an Addendum to the Procurement and Contracting Documents.

C. Architect's approval of a substitute during bidding does not relieve Contractor of the responsibility to submit required shop drawings and to comply with all other requirements of the Contract Documents.

END OF DOCUMENT 002600

SUBSTITUTION REQUEST FORM

PROJECT: WRTA Hub Lobby Renovation

OWNER: Worcester Regional Transit Authority

☐ TO	Architect/Engineer	☐ FROM	Contractor

Steven Packard
STV Incorporated

Steven.packard@stvinc.com

CONTRACTOR'S REQUEST, WITH SUPPORTING DATA

1. Specification Sections to which this request applies: ☐

☐ Product data for proposed substitution is attached (description product, reference standards, performance and test data).

☐ Sample is attached ☐ Sample will be sent if required by Architect

2. Itemized comparison of proposed substitution with product specified.

	SPECIFIED PRODUCT	PROPOSED SUBSTITUTION
Name, brand		
Catalog No.		
Manufacturer:		
Significant Variations		

3. Proposed change in Contract Time:

☐ Reduce/Increase Contract Time by _____ days. ☐ No change.

4. Proposed Change in Contract Sum:

   Credit to Owner $_____ Addition Cost to Owner $_____.

5. Effect of the proposed substitution on other parts of the Work, or on other contracts.

   _____

   _____

CONTRACTOR'S STATEMENT OF CONFORMANCE OF PROPOSED SUBSTITUTION TO CONTRACT REQUIREMENTS

We have investigated the proposed equivalent material and we:

1. believe that it is equal or superior in all respects to the originally specified product, except as stated in 2. above;
2. will provide the same warranty as required in Division 1 Section "Warranties";
3. will provide the same special warranty or guaranty as specified;
4. will pay redesign and special inspection costs caused by the use of this product;
5. will pay additional costs to other contractors caused by the substitution;
6. will coordinate the incorporation of the proposed substitution in the Work;
7. will modify other parts of the Work as may be needed, to make all parts of the Work complete and functioning;
8. waive future claims for added cost to Contractor caused by the proposed substitution;
9. confirm that this product is compliant with the Buy America Requirements as specified; and

Contractor Signature (s) _____ Date _____

_____

ARCHITECT'S REVIEW AND ACTION

☐ Provide more information in the following categories. Resubmit.

☐ Sign Contractor's Statement of Conformance. Resubmit.

☐ The proposed substitution is approved, with the following conditions

_____

_____

Addition/Deduction from the Contract Time: _____ days.

Addition/Deduction from the Contract Amount: _____ dollars.

☐ The proposed Substitution is rejected for the following reason (s):

_____

_____

DOCUMENT 004000

BID FORM – FILE SUB-BID

TO ALL GENERAL BIDDERS EXCEPT THOSE EXCLUDED:

FROM: _____(Name of Filed Sub-Bidder)

_____(Address of Filed Sub-Bidder)

_____

A. The undersigned proposes to finish all labor and materials required for completing, in accordance with the hereinafter described Drawings, specifications, and addenda, all the work specified in Section(s) No. _____
of the specifications and on the Drawings prepared by STV Incorporated for the WRTA Lobby Renovation Project in Worcester, Massachusetts for the contract sum of:

_____ _____Dollars ($_____ _____)

B. This Sub-Bid includes addenda numbered:

Addendum No. _____ Date: _____ Addendum No. _____ Date: _____

Addendum No. _____ Date: _____ Addendum No. _____ Date: _____

Addendum No. _____ Date: _____ Addendum No. _____ Date: _____

C. This Sub-Bid

□ may be used by any general bidder except:
_____

_____

□ may be used by the following general bidders:
_____

_____

[To exclude general bidders insert "X" in one box only and fill in blank following that box. Do not answer C if no general bidders are excluded.]

D. The undersigned agrees that, if he is selected as a Sub-Bidder, he will, within five (5) days, Saturdays, Sundays and legal holidays excluded, after presentation of a sub-contract by the General Bidder selected as the General Contractor, execute with such General Bidder a sub-contract in accordance with the terms of this Sub-Bid, contingent upon the execution of the general contract, and, if requested to do so in the General Bid by such General Bidder, who shall pay the premiums

therefor, furnish a Performance and Payment Bond of a surety company qualified to do business under the laws of the Commonwealth and satisfactory to the Authority, in the full sum of the sub-contract price.

E. The names of all persons, firms, and corporations furnishing to the undersigned labor or labor and materials for the class or classes or part thereof the work for which the provisions of the Section of the specifications fort this sub-trade require a listing in this paragraph, including the undersigned if customarily furnished by persons on his own payroll and in the absence of a contrary provision in the specifications, the name if each class or part thereof and the bid price for each such class of work or part thereof are:

Name	Class of Work	Bid Price
_____		
_____		
_____		
_____		
_____		
_____		

(Do not give bid price for any class or part thereof furnished by the undersigned.)

F. The undersigned agrees that the above list of bids to the undersigned represents bona fide bids based on the hereinbefore describe Drawings, specifications, and addenda and that, if the undersigned is awarded the contract, they will be used for the work indicated at the amounts stated, if satisfactory to the Authority.

G. The undersigned agrees to be bound to the General Contractor by the terms of the hereinbefore described Drawings, specifications, (including all General and Supplementary Conditions stated therein), and addenda, and to assume toward him all the obligations and responsibilities that he, by those documents, assumes toward the Authority

H. The undersigned offers the following information as evidence of his qualifications to perform the work as bid upon according to all the requirements of the Drawings and specifications:

1. Have been in business under present business name _____ years.
2. Ever failed to complete any work awarded? _____
3. List one or more recent projects with the names of General Contractor and Architect/Engineer on which you served as Sub-Contractor for work of similar character as required for the above named project.

Project	Architect/Engineer	General Contractor	Amount of Contract
(a) _____			
(b) _____			

(c) _____

4. Bank of reference _____

I. The undersigned hereby certifies that he is able to furnish labor that can work in harmony with other elements of labor employed or to be employed on the work and that he will comply fully with all laws and regulations applicable to awards of subcontracts subject to section forty-four F of Chapter 149, Massachusetts General Laws.

The undersigned further certifies under penalties of perjury that this sub-bid is in all respects bona fide, fair and made without collusion or fraud with any other person. As used in this subsection the word "person" shall mean any natural person, joint venture, partnership, corporation or other business legal entity. The undersigned further certifies under penalty of perjury that the said undersigned is not presently debarred from doing public construction work in the Commonwealth under the provisions of section twenty-nine, or any other applicable debarment provisions of any other chapter of the General Laws of any rule or regulation promulgated thereunder.

Name of Sub-Bidder:

_____

By: _____
(Signature) (Printed Name/Title)

_____
(Business Address)

(CORPORATE SEAL) _____ (City and State)

Date: _____

The Federal Security Identification Number of the Bidder (the number used on Employer's Quarterly Federal Tax Return, U.S. Treasury Department Form, 941) is:

_____

If the Bidder is a Foreign Corporation, also state the following:

(a) The Power of Attorney required by General Laws, C. 181, s 3 was filed on:

_____

(b) The certificate and copy of its Charter, Articles, or certificate of Incorporation required by General Laws, C. 181, s.5 were filed on:

_____

Subcontractor Qualification Statement

1. Number of years in business: _____

2. Changes in name or business form and date of changes:

   a. _____

   b. _____

   c. _____

3. Names of projects with subcontracts having dollar value in amount of current project or greater in last 5 years, names of Architect/Engineer and general contractor:

PROJECT NAME AND LOCATION	DOLLAR VALUE	ARCHITECT/ ENGINEER	GENERAL CONTRACTOR
a.			
b.			
c.			
d.			
e.			

4. List all construction projects your firm has in process on this date, regardless of when work commenced.

PROJECT TITLE	LOCATION	SUBCONTRACT AMOUNT	% COMPLETE	START AND END DATES	ON SCHEDULE?

5. Provide the following information concerning each project listed in item 4 above.

PROJECT TITLE	COMPANY NAME	CONTACT PERSON	CONTACT TELEPHONE
	OWNER	( )	
	DESIGNER	( )	
	GC	( )	
	OWNER	( )	
	DESIGNER	( )	
	GC	( )	
	OWNER	( )	
	DESIGNER	( )	
	GC	( )	
	OWNER	( )	
	DESIGNER	( )	
	GC	( )	
	OWNER	( )	
	DESIGNER	( )	
	GC	( )	
	OWNER	( )	
	DESIGNER	( )	
	GC	( )	

6. State the total contract amount left to complete on all contracts currently in progress:
$ _____

7. List each project which your firm has failed to complete in the last five years and describe the circumstances leading to the project failure.

PROJECT TITLE	CONTRACT AMOUNT	CIRCUMSTANCES

8. List the names of all supervisory personnel, including project managers and superintendents, who will be assigned to the project if your organization is selected to perform the work. Attach the resumes of these personnel.

_____

_____

_____

_____

9. Describe in detail any significant changes to your firm's business organization, financial condition of bonding references that have taken place in the last five years.

_____

_____

_____

_____

_____

_____

_____

10. In the table below:

    (a) List each judicial or administrative proceeding relating to the procurement of performance of any public or private construction contract instituted or concluded adversely against your firm or a principal of your firm in the past three years.

    (b) List each criminal la proceeding relating to graft, embezzlement, forgery, bribery, falsification or destruction of records, receipt of stolen property or environmental offenses brought against or concluded adversely against your firm or a principal of your firm in the past three years.

    (c) List each debarment proceeding concluded adversely against your firm or a principal of your firm in the past three years.

Judicial or administrative, criminal law and debarment proceedings:

TITLE OF ACTION	COURT/AGENCY	CASE NUMBER	NATURE OF ACTION	CURRENT STATUS

SUB-CONTRACTOR'S AFFIDAVIT

I swear under the pains and penalties of perjury that the information provided in the Subcontractor's Qualification Statement is true, accurate and complete, and that the accompanying bid is in all respects bona fide, fair and made without collusion or fraud with any other person.

_____ _____
Bid Date Print Name of Sub-Bidder

_____ _____
Project Number Business Address

_____ _____
Awarding Authority Telephone Number

_____
Signature of Sub-Bidder

END OF BID FORM

DOCUMENT 004100 - BID FORM – GENERAL CONTRACT

Bid of _____ (hereinafter called "Bidder")*

(____) a corporation, organized and existing under the laws of the state of _____

(____) a partnership

(____) a joint venture

(____) an individual

doing business as _____

To the Worcester Regional Transit Authority (hereinafter called "Owner").

A) The undersigned Bidder, in compliance with your invitation for bids for the project known as _____, having examined the plans and specifications and related documents and the site of the proposed work, having had the opportunity to visit the site, and being familiar with all of the conditions surrounding the construction of the proposed project including the availability of materials and labor, hereby proposes to furnish all labor, materials, and supplies, and to construct the project in accordance with the contract documents and the plans and specifications within the time set forth below, and at the prices stated below. These prices are to cover all expenses incurred in performing the work required under the contract documents, of which this bid is a part.

The Bidder hereby agrees to commence work on or before the date to be specified in written "Notice to Proceed" of the Owner, and to substantially complete the project within 240 consecutive calendar days thereafter.

_____

*Specify corporation, partnership or individual as applicable.

B) Bidder acknowledges receipt of and this bid includes the following addenda:

No. _____ Dated:

No. _____ Dated:

No. _____ Dated:

No. _____ Dated:

C) The Bidder agrees to perform the work described in the specifications and shown on the plans for the following contract price:

SCHEDULE OF BID PRICES

THE SCHEDULE OF THE BASE ESTIMATED CONTRACT BID PRICES IS AS FOLLOWS:

Item No.	Description	Quantity and Unit	Bid Price In Words	Bid Price In Numbers
a	Electrical Work Filed Sub-Bid	1 Lump Sum		
b	Plumbing Filed Sub-Bid	1 Lump Sum		
c	Fire Protection Sprinkler Systems Filed Sub-Bid	1 Lump Sum		
d	HVAC Filed Sub-Bid	1 Lump Sum		
e	Painting Filed Sub-Bid	1 Lump Sum		
f	Waterproofing, Dampproofing and Caulking Filed Sub-Bid	1 Lump Sum		
g	Acoustical Tile	1 Lump Sum		
h	Metal Windows	1 Lump Sum		
i	Glass and Glazing	1 Lump Sum		
	Total Bid Including Filed Sub-Bids	1 Lump Sum		

LIST OF FILED SUB-BIDDERS

	Category of Work	Company Name
a	Electrical	
b	Plumbing	
c	Fire Protection Sprinkler Systems	
d	HVAC	
e	Painting	
f	Waterproofing, Dampproofing and Caulking	
g	Acoustical Tile	
h	Metal Windows	
i	Glass and Glazing	

The Bidder shall list the names and addresses of their selected Filed Sub-Bidders in the following table.

The undersigned hereby certifies that he is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the work; that all employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least 10 hours in duration at the time the employee begins work and who shall furnish documentation of successful completion of said course with the first certified payroll report for each employee; and that he will comply fully with all laws and regulations applicable to awards made subject to section 44A.

The undersigned further certifies under the penalties of perjury that this bid is in all respects bona fide, fair and made without collusion or fraud with any other person. As used in this subsection the word "person" shall mean any natural person, joint venture, partnership, corporation or other business or legal entity. The undersigned further certifies under penalty of perjury that the said undersigned is not presently

debarred from doing public construction work in the commonwealth under the provisions of section twenty-nine F of chapter twenty-nine, or any other applicable debarment provisions of any other chapter of the General Laws or any rule or regulation promulgated thereunder.

The Bidder understands that the Owner reserves the right to reject any or all bids and to waive any informalities in the bidding.

The Bidder agrees that this bid shall be good and may not be withdrawn for a period of 30 days, Saturdays, Sundays and legal holidays excluded, after the opening of bids.

Bid security is attached in the sum of five percent (5%) of the total bid in accordance with the conditions of Section 002113 INSTRUCTIONS TO BIDDERS. The bid security may become the property of the Owner in the event the contract and bonds are not executed within the time set forth above.

The undersigned offers the following information as evidence of his qualifications to perform the work as bid upon according to all the requirements of the plans and specifications.

1. Have been in business under present name for ____ years.

2. The names and addresses of all persons interested in the bid (if made by a partnership or corporation) as principals, are as follows:

_____

_____

_____

_____

_____

_____

(attach supplementary list if necessary)

3. The bidder is requested to state below what work of a similar character to that included in the proposed contract he has done, and give references that will enable the Owner to judge his experience, skill and business standing (add supplementary page if necessary).

Completion Date	Project Name	Contract Amount	Design Architect	Reference Name	Telephone No.

Pursuant to M.G.L. C. 62C, Sec. 49A, I certify hereby in writing, under penalties of perjury, that the within named Bidder/Contractor has complied with all laws of the commonwealth relating to taxes, reporting of employees and contractors, and withholding and remitting of child support.

The undersigned bidder hereby certifies, under pains and penalties of perjury, that the foregoing bid is based upon the payment to laborers to be employed on the project of wages in an amount no less that the applicable prevailing wage rates established for the project by the Massachusetts Department of Labor and Workforce Development. The undersigned bidder agrees to indemnify the Awarding Authority for, from and against any loss, expense, damages, actions or claims, including any expense incurred in connection with any delay or stoppage of the project work arising out of or as a result of (1) the failure of the said bid to be based upon the payment of the said applicable prevailing wage rates or (2) the failure of the bidder, if selected as the contractor, to pay laborers employed on the project the said applicable prevailing wage rates.

DRAFT

AIA® Document A101™ – 2017

Standard Form of Agreement Between Owner and Contractor

where the basis of payment is a Stipulated Sum

AGREEMENT made as of the « » day of « » in the year « »
(In words, indicate day, month and year.)

BETWEEN the Owner:
(Name, legal status, address and other information)

« »« »
« »
« »
« »

and the Contractor:
(Name, legal status, address and other information)

« »« »
« »
« »
« »

for the following Project:
(Name, location and detailed description)

« »
« »
« »

The Architect:
(Name, legal status, address and other information)

« »« »
« »
« »
« »

The Owner and Contractor agree as follows.

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

The parties should complete A101™–2017, Exhibit A, Insurance and Bonds, contemporaneously with this Agreement. AIA Document A201™–2017, General Conditions of the Contract for Construction, is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

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User Notes: (3B9ADA18)

TABLE OF ARTICLES

1 THE CONTRACT DOCUMENTS

2 THE WORK OF THIS CONTRACT

3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

4 CONTRACT SUM

5 PAYMENTS

6 DISPUTE RESOLUTION

7 TERMINATION OR SUSPENSION

8 MISCELLANEOUS PROVISIONS

9 ENUMERATION OF CONTRACT DOCUMENTS

EXHIBIT A INSURANCE AND BONDS

ARTICLE 1 THE CONTRACT DOCUMENTS

The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, Addenda issued prior to execution of this Agreement, other documents listed in this Agreement, and Modifications issued after execution of this Agreement, all of which form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. An enumeration of the Contract Documents, other than a Modification, appears in Article 9.

ARTICLE 2 THE WORK OF THIS CONTRACT

The Contractor shall fully execute the Work described in and reasonably inferable from the Contract Documents, except as specifically indicated in the Contract Documents to be the responsibility of others.

ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be:
(Check one of the following boxes.)

[« »] The date of this Agreement.

[« X »] A date set forth in a notice to proceed issued by the Owner.

[« »] Established as follows:
(Insert a date or a means to determine the date of commencement of the Work.)

« »

If a date of commencement of the Work is not selected, then the date of commencement shall be the date of this Agreement.

§ 3.2 The Contract Time shall be measured from the date of commencement of the Work.

§ 3.3 Substantial Completion

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User Notes: (3B9ADA18)

§ 3.3.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, and subject to the phased completion requirements noted below, the Contractor shall achieve Substantial Completion of the entire Work:
(Check one of the following boxes and complete the necessary information.)

[« »] Not later than « » (« ») calendar days from the date of commencement of the Work.

[« »] By the following date: « »

§ 3.3.2 Subject to adjustments of the Contract Time as provided in the Contract Documents, if portions of the Work are to be completed prior to Substantial Completion of the entire Work, the Contractor shall achieve Substantial Completion of such portions by the following dates:

Portion of Work	Substantial Completion Date
« PHASE 1 » PHASE 2 PHASE 3	

§ 3.3.3 If the Contractor fails to achieve Substantial Completion of any Phase or of the entire Work as provided in this Section 3.3, liquidated damages, if any, shall be assessed as set forth in Section 4.5.

ARTICLE 4 CONTRACT SUM

§ 4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be « » ($ « »), subject to additions and deductions as provided in the Contract Documents.

§ 4.2 Alternates

§ 4.2.1 Alternates, if any, included in the Contract Sum:

Item	Price
« »	

§ 4.2.2 Subject to the conditions noted below, the following alternates may be accepted by the Owner following execution of this Agreement. Upon acceptance, the Owner shall issue a Modification to this Agreement.
(Insert below each alternate and the conditions that must be met for the Owner to accept the alternate.)

Item	Price	Conditions for Acceptance
« »		

§ 4.3 Unit prices, if any:

Unit Prices are set forth in the Unit Price Form submitted with the Contractor's bid. Refer to the Project Manual and General Conditions for Unit Price Forms and Conditions.

Item	Units and Limitations	Price per Unit ($0.00)
« »		

§ 4.5 Liquidated damages, if any:

One Thousand Five Hundred Dollars ($1,500.00) per day in accordance with the provisions of*the General* Conditions

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§ 4.6 Other:
(Insert provisions for bonus or other incentives, if any, that might result in a change to the Contract Sum.)

ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments

§ 5.1.1 Based upon Applications for Payment submitted to the Architect by the Contractor and Certificates for Payment issued by the Architect and approved by the Owner, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided below and elsewhere in the Contract Documents. This Article 5 is subject to the provisions of M.G.L. c. 149.

§ 5.1.2 The period covered by each Application for Payment shall be one calendar month ending on the last day of the month, or as follows:

« »

§ 5.1.3 Provided that an Application for Payment in the required form is received by the Architect not later than the «last » day of a month, the Owner shall make payment of the amount certified to the Contractor not later than the «15th » day of the «following » month. If an Application for Payment is received by the Architect after the application date fixed above, payment of the amount certified shall be made by the Owner not later than «fifteen » («15 ») days after the Architect receives the Application for Payment.
(Federal, state or local laws may require payment within a certain period of time.)

§ 5.1.4 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. The schedule of values shall be prepared in such form, and supported by such data to substantiate its accuracy, as the Architect and Owner may require. This schedule of values shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 5.1.5 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment.

§ 5.1.6 In accordance with and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.6.1 The amount of each progress payment shall first include:

- **.1** That portion of the Contract Sum properly allocable to completed Work;
- **.2** That portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction, or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing; and
- **.3** That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified.

§ 5.1.6.2 The amount of each progress payment shall then be reduced by:

- **.1** The aggregate of any amounts previously paid by the Owner;
- **.2** The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment;
- **.3** Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;
- **.4** For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided by law or in the Contract Documents; and
- **.5** Retainage withheld pursuant to Section 5.1.7.

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§ 5.1.7 Retainage

§ 5.1.7.1 For each progress payment made prior to Substantial Completion of the Work, the Owner may withhold the following amount, as retainage, from the payment otherwise due:

(Insert a percentage or amount to be withheld as retainage from each Application for Payment. The amount of retainage may be limited by governing law.)

«5%»

« »

§ 5.1.7.2 Reduction or limitation of retainage, if any, shall be as set forth in Section 9.6 of the General Conditions and in accordance with M.G.L Ch. 149.

(If the retainage established in Section 5.1.7.1 is to be modified prior to Substantial Completion of the entire Work, including modifications for Substantial Completion of portions of the Work as provided in Section 3.3.2, insert provisions for such modifications.)

« »

§ 5.1.7.3 Except as set forth in this Section 5.1.7.3, upon Substantial Completion of the Work, the Contractor may submit an Application for Payment that includes the retainage withheld from prior Applications for Payment pursuant to this Section 5.1.7. The Application for Payment submitted at Substantial Completion shall not include payment for incomplete Work and Punch List items.

(Insert any other conditions for release of retainage upon Substantial Completion.)

« per M.G.L. c. 149. applicable »

§ 5.1.8 If final completion of the Work is materially delayed through no fault of the Contractor, the Owner shall pay the Contractor any additional amounts in accordance with the Contract Documents.

§ 5.1.9 Except with the Owner's prior approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

§ 5.2 Final Payment

§ 5.2.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when

.1 the Contractor has fully performed the Contract and has satisfied all conditions for final payment set forth in the Contract Documents except for the Contractor's responsibility to correct Work as provided in Article 12 of the General Conditions, and to satisfy other requirements, if any, which extend beyond final payment; and

.2 a final Certificate for Payment has been issued by the Architect.

§ 5.2.2 The Owner's final payment to the Contractor shall be made in accordance with Section 9.10 of the General Conditions and M.G.L. Ch 149.

« »

§ 5.3 Interest

Payments due and unpaid under the Contract shall bear interest in accordance with M.G.L. Ch 149.

(Insert rate of interest agreed upon, if any.)

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«»

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Decision Maker

The Architect will serve as the decision maker pursuant to Article 15 of the General Conditions

(If the parties mutually agree, insert the name, address and other contact information of the Initial Decision Maker, if other than the Architect.)

« »
« »
« »
« »

§ 6.2 Binding Dispute Resolution

For any Claim subject to, but not resolved by, mediation, the method of binding dispute resolution shall be as follows:

(Check the appropriate box.)

[« »] Arbitration pursuant to Section 15.4 of AIA Document A201–2017

[«X»] Litigation in a court of competent jurisdiction

[« »] Other *(Specify)*

« »

If the Owner and Contractor do not select a method of binding dispute resolution, or do not subsequently agree in writing to a binding dispute resolution method other than litigation, Claims will be resolved by litigation in a court of competent jurisdiction.

ARTICLE 7 TERMINATION OR SUSPENSION

§ 7.1 Subject to the provisions of M.G.L. c. 149, the Contract may be terminated by the Owner or the Contractor as provided in the Contract Documents and/or as permitted by the provisions of M.G.L. c. 149.

« »

§ 7.2 The Work may be suspended by the Owner as provided in the Contract Documents and/or as permitted by the provisions of M.G.L. c. 149.

ARTICLE 8 MISCELLANEOUS PROVISIONS

§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A201–2017 or another provision of the Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

§ 8.2 The Owner's representative:

(Name, address, email address, and other information)

« »
« »
« »
« »

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« »
« »

§ 8.3 The Contractor's representative:
(Name, address, email address, and other information)

« »
« »
« »
« »
« »
« »

§ 8.4 Neither the Owner's nor the Contractor's representative shall be changed without ten days' prior notice to the other party.

§ 8.5 Insurance and Bonds
§ 8.5.1 The Owner and the Contractor shall purchase and maintain insurance as set forth in the Contract Documents.

§ 8.5.2 The Contractor shall provide bonds as set forth in the Contract Documents.

§ 8.6 Notice in electronic format, pursuant to Article 1 of AIA Document A201–2017, may be given in accordance with AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, if completed, or as otherwise set forth below:
(If other than in accordance with AIA Document E203–2013, insert requirements for delivering notice in electronic format such as name, title, and email address of the recipient and whether and how the system will be required to generate a read receipt for the transmission.)

« »

§ 8.7 Other provisions:

« »

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

.1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor
.2 AIA Document A101™–2017, Exhibit A, Insurance and Bonds
.3 AIA Document A201™–2017, General Conditions of the Contract for Construction
.4 AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:
(Insert the date of the E203-2013 incorporated into this Agreement.)

« »

.5 Drawings

Number	Title	Date
« »		

.6 Specifications

Section	Title	Date	Pages
« »			

.7 Addenda, if any:

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Number	Date	Pages
« »		

Portions of Addenda relating to bidding or proposal requirements and all bidding requirements are part of the Contract Documents.

.8 Other Exhibits:
(Check all boxes that apply and include appropriate information identifying the exhibit where required.)

[« »] AIA Document E204™–2017, Sustainable Projects Exhibit, dated as indicated below:
(Insert the date of the E204-2017 incorporated into this Agreement.)

« »

[« »] The Sustainability Plan:

Title	Date	Pages
« »		

[« »] Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages
« »			

.9 Other documents, if any, listed below:
(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A201™–2017 provides that the advertisement or invitation to bid, Instructions to Bidders, sample forms, the Contractor's bid or proposal, portions of Addenda relating to bidding or proposal requirements, and other information furnished by the Owner in anticipation of receiving bids or proposals, are not part of the Contract Documents unless enumerated in this Agreement. Any such documents should be listed here only if intended to be part of the Contract Documents.)

«Contractor's performance and payment bonds »

This Agreement entered into as of the day and year first written above.

« »	« »
OWNER *(Signature)*	**CONTRACTOR** *(Signature)*
« »« »	« »« »
(Printed name and title)	*(Printed name and title)*

Certificate of Appropriation

I hereby certify that an appropriation in the amount of this contract is available therefor and that the _____ (authorized signatory) has been authorized to execute said contract on behalf of the Owner and approve all requisitions and change orders.

_____
Deputy Administrator, Chief Financial Officer

_____
Date

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DRAFT

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Respectfully submitted:

Date: _____ By: _____
(Signature)

_____
(Type Name of Bidder)

_____
(Title)

_____
(Business Address)

_____
(City and State)

_____
(Telephone Number)

END OF DOCUMENT 004100

DOCUMENT 006100

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS: That we _____
(Name of Contractor)

a _____ hereinafter called "Principal" and
(Corporation, Partnership, Joint Venture or Individual)

_____of _____, State of _____
(Surety) (City & State)

_____ hereinafter called the "Surety" and licensed by the State Division of Insurance to do business under the laws of the Commonwealth of Massachusetts, are held and firmly bound to _____, hereinafter called "Owner", in the penal sum of _____ Dollars ($_____) in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that Whereas, the Principal entered into a certain contract with the Owner, dated the _____ day of _____, 20___ (the "Construction Contract"), for the construction described as follows: _____
_____.

NOW, THEREFORE, if the Principal shall well, truly and faithfully perform its duties, all the undertakings, covenants, terms, conditions, and agreements of the Construction Contract during the original term thereof, and any extensions thereof which may be granted by the Owner, with or without notice to the Surety, and if he shall satisfy all claims and demands incurred under the Construction Contract, and shall fully indemnify and save harmless the Owner from all costs and damages which it may suffer by reason of failure to do so, and shall reimburse and repay the Owner all outlay and expense which the Owner may incur in making good any default, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the Surety's obligation under this Bond shall arise after (1) the Owner has declared the Principal in default of the Construction Contract or any provision thereof or (2) has declared that the Principal has failed, or is otherwise unable or unwilling, to execute the work consistent with, and in conformance to, the Construction Contract (collectively referred to as a "Contractor Default"). The determination of a Contractor Default shall be made solely by the Owner. The Owner need not terminate the Construction Contract to declare a Contractor Default or to invoke its rights under this Bond.

When the Surety's obligation under this Bond arises, the Surety, at its sole expense and at the consent and election of the Owner, shall promptly take one of the following steps: (1) arrange for the Principal to perform and complete the work of the Construction Contract: (2) arrange for a contractor other than the Principal to perform and complete the work of the Construction Contract; (3) reimburse the Owner, in a manner and at such time as the Owner shall decide, for all costs and expenses incurred by the Owner in performing and completing the work of the Construction Contract. Surety will keep Owner reasonably informed of the progress, status and results of any investigation of any claim of the Owner.

If the Surety does not proceed as provided in this Bond with due diligence and all deliberate speed, the Surety shall be deemed to be in default of this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner.

After the Surety's obligation under this Bond arises, the Surety is obligated, to the limit of the amounts of this Bond, for (1) the correction of defective work and completion of the Construction Contract; (2) additional design, professional services, and legal costs, including attorneys' fees, resulting from the Contractor Default or from the default of the Surety under this Bond; (3) any additional work beyond the Construction Contract made necessary by the Contractor Default or default of the Surety under this Bond; (4) indemnification obligation of the Principal, if any, as provided in the Construction Contract; and (5) liquidated damages as provided in the Construction Contract, or if none are so specified, actual and foreseeable consequential damages resulting from the Contractor Default or default of the Surety under this Bond.

Any proceeding, legal or equitable, under this Bond shall be instituted in any court of competent jurisdiction in the Commonwealth of Massachusetts.

The Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Construction Contract or to the work to be performed thereunder or the specifications accompanying the same shall in any way affect its obligation on this Bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Construction Contract or to the work or to the specifications.

IN WITNESS WHEREOF, this instrument is executed in _____ ( ) counterparts, each one of which shall be deemed an original, this the _____ day of _____, 20___.

ATTEST:

_____
Principal

_____ By _____
(Principal Secretary)

_____

_____

_____
(Address-Zip Code)

_____ (SEAL)
Witness as to Principal

_____

_____
(Address-Zip Code)

ATTEST:

_____
Surety

_____ By _____
(Attorney-in-Fact)

_____

_____
(Address-Zip Code)

_____ (SEAL)
Witness as to Surety

_____

_____
(Address-Zip Code)

NOTE: Date of Bond must not be prior to date of Contract. If Contractor is a Partnership, all partners should execute Bond.

PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS: That we _____

_____ a_____ _____
(Name of Contractor) (Corporation, Partnership, Joint Venture or Individual)

hereinafter called "Principal" and _____ of _____,
(Surety)

State of _____ hereinafter called the "Surety" and licensed by the State
(City and State)

Division of Insurance to do business under the laws of the Commonwealth of Massachusetts, are held and firmly bound to _____, hereinafter called "Owner", in the penal sum of _____ Dollars ($_____) in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that Whereas, the Principal entered into a certain contract with the Owner, dated the _____ day of _____, 20___, for the construction described as follows:

NOW, THEREFORE, if the Principal shall promptly make payment to all persons, firms, subcontractors, and corporations furnishing materials for or performing labor in the prosecution of the work provided for in such contract, and any authorized extension or modification thereof, including all amounts due for materials, lubricants, oil, gasoline, coal and coke, repairs on machinery, equipment and tools, consumed or used in connection with the construction of such work, and all insurance premiums on said work, and for all labor, performed in such work whether by subcontractor or otherwise, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the said Surety, for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or to the work to be performed thereunder or the specifications accompanying the same shall in any way affect its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of this contract or to the work or to the specifications.

PROVIDED, FURTHER, that no final settlement between the Owner and the Contractor shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed in ____ ( ) counterparts, each one of which shall be deemed an original, this the _____ day of _____, 20__.

ATTEST:

_____
Surety

_____ By _____
(Attorney-in-Fact)

_____

_____
(Address-Zip Code)

_____ (SEAL)
Witness as to Surety

_____

_____
(Address-Zip Code)

NOTE: Date of Bond must not be prior to date of Contract. If Contractor is a Partnership, all partners should execute Bond.

DOCUMENT 007000

GENERAL CONDITIONS

1.1 GENERAL CONDITIONS

A. AIA Document A201, "General Conditions of the Contract for Construction," and “Supplementary Conditions” are hereby incorporated into the Procurement and Contracting Requirements. A copy of AIA Document A201, " General Conditions of the Contract for Construction” and “Supplementary Conditions” are bound herein immediately following this page.

END OF DOCUMENT 007000

AIA® Document A201® – 2017

General Conditions of the Contract for Construction

for the following PROJECT:
(Name and location or address)
WRTA Hub Lobby Renovation
60 Foster Street, Worcester, MA 01608

THE OWNER:
(Name, legal status and address)

Worcester Regional Transit Authority
60 Foster Street, Worcester, MA 01608

THE ARCHITECT:
(Name, legal status and address)

STV Incorporated
One Financial Center
Boston, MA 02210

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ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

For guidance in modifying this document to include supplementary conditions, see AIA Document A503™, Guide for Supplementary Conditions.

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ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement, and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive, or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of Addenda relating to bidding or proposal requirements.

§ 1.1.2 The Contract

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect's consultants, or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

§ 1.1.3 The Work

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment, and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

§ 1.1.4 The Project

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner and by Separate Contractors.

§ 1.1.5 The Drawings

The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.

§ 1.1.6 The Specifications

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.7 Instruments of Service

Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.8 Initial Decision Maker

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith.

§ 1.2 Correlation and Intent of the Contract Documents

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

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§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.3 Capitalization

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles, or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 Interpretation

In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 Ownership and Use of Drawings, Specifications, and Other Instruments of Service

§ 1.5.1 The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and retain all common law, statutory, and other reserved rights in their Instruments of Service, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7 and 1.8, solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants.

§ 1.6 Notice

§ 1.6.1 Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to whom the notice is addressed and shall be deemed to have been duly served if delivered in person, by mail, by courier, or by electronic transmission if a method for electronic transmission is set forth in the Agreement.

§ 1.6.2 Notice of Claims as provided in Section 15.1.3 shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery.

§ 1.7 Digital Data Use and Transmission

The parties shall agree upon protocols governing the transmission and use of Instruments of Service or any other information or documentation in digital form. The parties will use AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, to establish the protocols for the development, use, transmission, and exchange of digital data.

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set forth in AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document G202™–2013, Project Building Information Modeling Protocol Form, shall be at the using or

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relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

ARTICLE 2 OWNER

§ 2.1 General

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

§ 2.1.2 The Owner shall furnish to the Contractor, within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of, or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein.

§ 2.2 Evidence of the Owner's Financial Arrangements

§ 2.2.1 Prior to commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. The Contractor shall have no obligation to commence the Work until the Owner provides such evidence. If commencement of the Work is delayed under this Section 2.2.1, the Contract Time shall be extended appropriately.

§ 2.2.2 Following commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract only if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due; or (3) a change in the Work materially changes the Contract Sum. If the Owner fails to provide such evidence, as required, within fourteen days of the Contractor's request, the Contractor may immediately stop the Work and, in that event, shall notify the Owner that the Work has stopped. However, if the request is made because a change in the Work materially changes the Contract Sum under (3) above, the Contractor may immediately stop only that portion of the Work affected by the change until reasonable evidence is provided. If the Work is stopped under this Section 2.2.2, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided in the Contract Documents.

§ 2.2.3 After the Owner furnishes evidence of financial arrangements under this Section 2.2, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.4 Where the Owner has designated information furnished under this Section 2.2 as "confidential," the Contractor shall keep the information confidential and shall not disclose it to any other person. However, the Contractor may disclose "confidential" information, after seven (7) days' notice to the Owner, where disclosure is required by law, including a subpoena or other form of compulsory legal process issued by a court or governmental entity, or by court or arbitrator(s) order. The Contractor may also disclose "confidential" information to its employees, consultants, sureties, Subcontractors and their employees, Sub-subcontractors, and others who need to know the content of such information solely and exclusively for the Project and who agree to maintain the confidentiality of such information.

§ 2.3 Information and Services Required of the Owner

§ 2.3.1 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

§ 2.3.2 The Owner shall retain an architect lawfully licensed to practice architecture, or an entity lawfully practicing architecture, in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

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§ 2.3.3 If the employment of the Architect terminates, the Owner shall employ a successor to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect.

§ 2.3.4 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

§ 2.3.5 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

§ 2.3.6 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.

§ 2.4 Owner's Right to Stop the Work

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3.

§ 2.5 Owner's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such default or neglect. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect and the Architect may, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

ARTICLE 3 CONTRACTOR

§ 3.1 General

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 3.1.3 The Contractor shall not be relieved of its obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed, and correlated personal observations with requirements of the Contract Documents.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as

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the information furnished by the Owner pursuant to Section 2.3.4, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall submit Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner, subject to Section 15.1.7, as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.3 Supervision and Construction Procedures

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely notice to the Owner and Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. Unless the Architect objects to the Contractor's proposed alternative, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences, or procedures.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

§ 3.4 Labor and Materials

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

§ 3.4.2 Except in the case of minor changes in the Work approved by the Architect in accordance with Section 3.12.8 or ordered by the Architect in accordance with Section 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive.

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

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§ 3.5 Warranty

§ 3.5.1 The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.5.2 All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 9.8.4.

§ 3.6 Taxes

The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

§ 3.7 Permits, Fees, Notices and Compliance with Laws

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.7.4 Concealed or Unknown Conditions

If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 14 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may submit a Claim as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

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§ 3.8 Allowances

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents,

- **.1** allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;
- **.2** Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and
- **.3** whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

§ 3.9 Superintendent

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Architect may notify the Contractor, stating whether the Owner or the Architect (1) has reasonable objection to the proposed superintendent or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed.

§ 3.10 Contractor's Construction and Submittal Schedules

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to completion and shall not exceed time limits current under the Contract Documents. The schedule shall be revised at appropriate intervals as required by the conditions of the Work and Project.

§ 3.10.2 The Contractor, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, shall submit a submittal schedule for the Architect's approval. The Architect's approval shall not be unreasonably delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, or fails to provide submittals in accordance with the approved submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect.

§ 3.11 Documents and Samples at the Site

The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and

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similar required submittals. These shall be in electronic form or paper copy, available to the Architect and Owner, and delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.12 Shop Drawings, Product Data and Samples

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules, and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier, or distributor to illustrate some portion of the Work.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment, or workmanship, and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples, and similar submittals are not Contract Documents. Their purpose is to demonstrate how the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Architect, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of Separate Contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples, or similar submittals, until the respective submittal has been approved by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from the requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples, or similar submittals, unless the Contractor has specifically notified the Architect of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals, by the Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples, or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such notice, the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures. The Contractor shall not be required to provide professional services in violation of applicable law.

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will

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specify all performance and design criteria that such services must satisfy. The Contractor shall be entitled to rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop Drawings, and other submittals related to the Work, designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy and accuracy of the services, certifications, and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor the performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review and approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.

§ 3.12.10.2 If the Contract Documents require the Contractor's design professional to certify that the Work has been performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Architect at the time and in the form specified by the Architect.

§ 3.13 Use of Site

The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, lawful orders of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 3.14 Cutting and Patching

§ 3.14.1 The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting, or patching shall be restored to the condition existing prior to the cutting, fitting, or patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or Separate Contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter construction by the Owner or a Separate Contractor except with written consent of the Owner and of the Separate Contractor. Consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold, from the Owner or a Separate Contractor, its consent to cutting or otherwise altering the Work.

§ 3.15 Cleaning Up

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials and rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials from and about the Project.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the Owner shall be entitled to reimbursement from the Contractor.

§ 3.16 Access to Work

The Contractor shall provide the Owner and Architect with access to the Work in preparation and progress wherever located.

§ 3.17 Royalties, Patents and Copyrights

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for defense or loss when a particular design, process, or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications, or other documents prepared by the Owner or Architect. However, if an infringement of a copyright or patent is discovered by, or made known to, the Contractor, the Contractor shall be responsible for the loss unless the information is promptly furnished to the Architect.

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§ 3.18 Indemnification

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation, or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

ARTICLE 4 ARCHITECT

§ 4.1 General

§ 4.1.1 The Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement.

§ 4.1.2 Duties, responsibilities, and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified, or extended without written consent of the Owner, Contractor, and Architect. Consent shall not be unreasonably withheld.

§ 4.2 Administration of the Contract

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until the date the Architect issues the final Certificate for Payment. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents.

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner (1) known deviations from the Contract Documents, (2) known deviations from the most recent construction schedule submitted by the Contractor, and (3) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of, and will not be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 Communications

The Owner and Contractor shall include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities. The Owner shall promptly notify the Architect of the substance of any direct communications between the Owner and the Contractor otherwise relating to the Project. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

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§ 4.2.5 Based on the Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, whether or not the Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may order minor changes in the Work as provided in Section 7.4. The Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10.

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more Project representatives to assist in carrying out the Architect's responsibilities at the site. The Owner shall notify the Contractor of any change in the duties, responsibilities and limitations of authority of the Project representatives.

§ 4.2.11 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.12 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either, and will not be liable for results of interpretations or decisions rendered in good faith.

§ 4.2.13 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in

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number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a Separate Contractor or the subcontractors of a Separate Contractor.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 Award of Subcontracts and Other Contracts for Portions of the Work

§ 5.2.1 Unless otherwise stated in the Contract Documents, the Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the persons or entities proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design. Within 14 days of receipt of the information, the Architect may notify the Contractor whether the Owner or the Architect (1) has reasonable objection to any such proposed person or entity or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person, or entity for one previously selected if the Owner or Architect makes reasonable objection to such substitution.

§ 5.3 Subcontractual Relations

By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work that the Contractor, by these Contract Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies, and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.4 Contingent Assignment of Subcontracts

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

.1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and

.2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

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When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract.

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension.

§ 5.4.3 Upon assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 Owner's Right to Perform Construction and to Award Separate Contracts

§ 6.1.1 The term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate agreements. The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance and waiver of subrogation.

§ 6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each Separate Contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with any Separate Contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to its construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, Separate Contractors, and the Owner until subsequently revised.

§ 6.1.4 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces or with Separate Contractors, the Owner or its Separate Contractors shall have the same obligations and rights that the Contractor has under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6, and Articles 10, 11, and 12.

§ 6.2 Mutual Responsibility

§ 6.2.1 The Contractor shall afford the Owner and Separate Contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a Separate Contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Architect of apparent discrepancies or defects prior to proceeding with the Work shall constitute an acknowledgment that the Owner's or Separate Contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractor that are not apparent.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a Separate Contractor because of the Contractor's delays, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of a Separate Contractor's delays, improperly timed activities, damage to the Work or defective construction.

§ 6.2.4 The Contractor shall promptly remedy damage that the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or Separate Contractor as provided in Section 10.2.5.

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§ 6.2.5 The Owner and each Separate Contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.3 Owner's Right to Clean Up

If a dispute arises among the Contractor, Separate Contractors, and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Architect will allocate the cost among those responsible.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor, and Architect. A Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor. An order for a minor change in the Work may be issued by the Architect alone.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents. The Contractor shall proceed promptly with changes in the Work, unless otherwise provided in the Change Order, Construction Change Directive, or order for a minor change in the Work.

§ 7.2 Change Orders

§ 7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor, and Architect stating their agreement upon all of the following:

.1 The change in the Work;
.2 The amount of the adjustment, if any, in the Contract Sum; and
.3 The extent of the adjustment, if any, in the Contract Time.

§ 7.3 Construction Change Directives

§ 7.3.1 A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

.1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
.2 Unit prices stated in the Contract Documents or subsequently agreed upon;
.3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
.4 As provided in Section 7.3.4.

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to the following:

.1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect;

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.2 Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;

.3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;

.4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and

.5 Costs of supervision and field office personnel directly attributable to the change.

§ 7.3.5 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15.

§ 7.3.6 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.3.7 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.4 Minor Changes in the Work

The Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Architect and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Architect that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

ARTICLE 8 TIME

§ 8.1 Definitions

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

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§ 8.2 Progress and Completion

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, commence the Work prior to the effective date of insurance required to be furnished by the Contractor and Owner.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.3 Delays and Extensions of Time

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner or Architect, of an employee of either, or of a Separate Contractor; (2) by changes ordered in the Work; (3) by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner pending mediation and binding dispute resolution; or (5) by other causes that the Contractor asserts, and the Architect determines, justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§ 8.3.3 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

§ 9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.1.2 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed so that application of such unit prices to the actual quantities causes substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 9.2 Schedule of Values

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit a schedule of values to the Architect before the first Application for Payment, allocating the entire Contract Sum to the various portions of the Work. The schedule of values shall be prepared in the form, and supported by the data to substantiate its accuracy, required by the Architect. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. Any changes to the schedule of values shall be submitted to the Architect and supported by such data to substantiate its accuracy as the Architect may require, and unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment.

§ 9.3 Applications for Payment

§ 9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner or Architect require, such as copies of requisitions, and releases and waivers of liens from Subcontractors and suppliers, and shall reflect retainage if provided for in the Contract Documents.

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or supplier, unless such Work has been performed by others whom the Contractor intends to pay.

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§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage, and transportation to the site, for such materials and equipment stored off the site.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information, and belief, be free and clear of liens, claims, security interests, or encumbrances, in favor of the Contractor, Subcontractors, suppliers, or other persons or entities that provided labor, materials, and equipment relating to the Work.

§ 9.4 Certificates for Payment

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data in the Application for Payment, that, to the best of the Architect's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is entitled to payment in the amount certified. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion, and to specific qualifications expressed by the Architect. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work; (2) reviewed construction means, methods, techniques, sequences, or procedures; (3) reviewed copies of requisitions received from Subcontractors and suppliers and other data requested by the Owner to substantiate the Contractor's right to payment; or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 Decisions to Withhold Certification

§ 9.5.1 The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of

- **.1** defective Work not remedied;
- **.2** third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;
- **.3** failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;
- **.4** reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- **.5** damage to the Owner or a Separate Contractor;
- **.6** reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or

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.7 repeated failure to carry out the Work in accordance with the Contract Documents.

§ 9.5.2 When either party disputes the Architect's decision regarding a Certificate for Payment under Section 9.5.1, in whole or in part, that party may submit a Claim in accordance with Article 15.

§ 9.5.3 When the reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.4 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or supplier to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Contractor shall reflect such payment on its next Application for Payment.

§ 9.6 Progress Payments

§ 9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect.

§ 9.6.2 The Contractor shall pay each Subcontractor, no later than seven days after receipt of payment from the Owner, the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

§ 9.6.3 The Architect will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors and suppliers to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay, or to see to the payment of money to, a Subcontractor or supplier, except as may otherwise be required by law.

§ 9.6.5 The Contractor's payments to suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors or provided by suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, create any fiduciary liability or tort liability on the part of the Contractor for breach of trust, or entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.6.8 Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend and indemnify the Owner from all loss, liability, damage or expense, including reasonable attorney's fees and litigation expenses, arising out of any lien claim or other claim for payment by any Subcontractor or supplier of any tier. Upon receipt of notice of a lien claim or other claim for payment, the Owner shall notify the Contractor. If approved by the applicable court, when required, the Contractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.

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§ 9.7 Failure of Payment

If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents, the amount certified by the Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents.

§ 9.8 Substantial Completion

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate. Upon such acceptance, and consent of surety if any, the Owner shall make payment of retainage applying to the Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

§ 9.9 Partial Occupancy or Use

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Contractor, and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

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§ 9.10 Final Completion and Final Payment

§ 9.10.1 Upon receipt of the Contractor's notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment, (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6) if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed, corrected, and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of the surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from

- **.1** liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled;
- **.2** failure of the Work to comply with the requirements of the Contract Documents;
- **.3** terms of special warranties required by the Contract Documents; or
- **.4** audits performed by the Owner, if permitted by the Contract Documents, after final payment.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor, or a supplier, shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract.

§ 10.2 Safety of Persons and Property

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury, or loss to

- **.1** employees on the Work and other persons who may be affected thereby;

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.2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor; and

.3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

§ 10.2.2 The Contractor shall comply with, and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities, bearing on safety of persons or property or their protection from damage, injury, or loss.

§ 10.2.3 The Contractor shall implement, erect, and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards; promulgating safety regulations; and notifying the owners and users of adjacent sites and utilities of the safeguards.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment, or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3. The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 Injury or Damage to Person or Property

If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.3 Hazardous Materials and Substances

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and notify the Owner and Architect of the condition.

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed

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by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss, or expense is due to the fault or negligence of the party seeking indemnity.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for hazardous materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for hazardous materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

§ 10.3.5 The Contractor shall reimburse the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall reimburse the Contractor for all cost and expense thereby incurred.

§ 10.4 Emergencies

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury, or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

§ 11.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Owner, Architect, and Architect's consultants shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents.

§ 11.1.2 The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 11.1.3 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the

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procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance

§ 11.2.1 The Owner shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Owner shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located.

§ 11.2.2 Failure to Purchase Required Property Insurance. If the Owner fails to purchase and maintain the required property insurance, with all of the coverages and in the amounts described in the Agreement or elsewhere in the Contract Documents, the Owner shall inform the Contractor in writing prior to commencement of the Work. Upon receipt of notice from the Owner, the Contractor may delay commencement of the Work and may obtain insurance that will protect the interests of the Contractor, Subcontractors, and Sub-Subcontractors in the Work. When the failure to provide coverage has been cured or resolved, the Contract Sum and Contract Time shall be equitably adjusted. In the event the Owner fails to procure coverage, the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent the loss to the Owner would have been covered by the insurance to have been procured by the Owner. The cost of the insurance shall be charged to the Owner by a Change Order. If the Owner does not provide written notice, and the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain the required insurance, the Owner shall reimburse the Contractor for all reasonable costs and damages attributable thereto.

§ 11.2.3 Notice of Cancellation or Expiration of Owner's Required Property Insurance. Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any property insurance required by the Contract Documents, the Owner shall provide notice to the Contractor of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Contractor: (1) the Contractor, upon receipt of notice from the Owner, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Owner or the Contractor; (2) the Contract Time and Contract Sum shall be equitably adjusted; and (3) the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent any loss to the Owner would have been covered by the insurance had it not expired or been cancelled. If the Contractor purchases replacement coverage, the cost of the insurance shall be charged to the Owner by an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.

§ 11.3 Waivers of Subrogation

§ 11.3.1 The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents, and employees, each of the other; (2) the Architect and Architect's consultants; and (3) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance. The Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Architect, Architect's consultants, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

§ 11.3.2 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, to the extent permissible by such policies, the Owner waives all rights in accordance with the terms of Section 11.3.1 for damages caused by fire or other causes of loss covered by this separate property insurance.

§ 11.4 Loss of Use, Business Interruption, and Delay in Completion Insurance

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The Owner, at the Owner's option, may purchase and maintain insurance that will protect the Owner against loss of use of the Owner's property, or the inability to conduct normal operations, due to fire or other causes of loss. The Owner waives all rights of action against the Contractor and Architect for loss of use of the Owner's property, due to fire or other hazards however caused.

§11.5 Adjustment and Settlement of Insured Loss

§ 11.5.1 A loss insured under the property insurance required by the Agreement shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.5.2. The Owner shall pay the Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner.

§ 11.5.2 Prior to settlement of an insured loss, the Owner shall notify the Contractor of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Contractor shall have 14 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. If the Contractor does not object, the Owner shall settle the loss and the Contractor shall be bound by the settlement and allocation. Upon receipt, the Owner shall deposit the insurance proceeds in a separate account and make the appropriate distributions. Thereafter, if no other agreement is made or the Owner does not terminate the Contract for convenience, the Owner and Contractor shall execute a Change Order for reconstruction of the damaged or destroyed Work in the amount allocated for that purpose. If the Contractor timely objects to either the terms of the proposed settlement or the allocation of the proceeds, the Owner may proceed to settle the insured loss, and any dispute between the Owner and Contractor arising out of the settlement or allocation of the proceeds shall be resolved pursuant to Article 15. Pending resolution of any dispute, the Owner may issue a Construction Change Directive for the reconstruction of the damaged or destroyed Work.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

§ 12.1.1 If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.5.

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§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.2.3 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction of the Owner or Separate Contractors, whether completed or partially completed, caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 Acceptance of Nonconforming Work

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the law of the place where the Project is located, excluding that jurisdiction's choice of law rules. If the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate the assignment.

§ 13.3 Rights and Remedies

§ 13.3.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

§ 13.3.2 No action or failure to act by the Owner, Architect, or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed upon in writing.

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Architect

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timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

§ 13.4.2 If the Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Architect's services and expenses, shall be at the Contractor's expense.

§ 13.4.4 Required certificates of testing, inspection, or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.

§ 13.4.5 If the Architect is to observe tests, inspections, or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.4.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.5 Interest

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at the rate the parties agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

§ 13.6 Disadvantaged Business Enterprise (DBE)

§ 13.6.1 This contract is subject to the requirements of Title 49, Code of Federal Regulations, Part 26, Participation by Disadvantaged Business Enterprises in Department of Transportation Financial Assistance Programs. The goal for participation of Disadvantaged Business Enterprises (DBE) is 3%.

§ 13.6.2 The contractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of this contract. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the PVTA deems appropriate. Each subcontract the contractor signs with a subcontractor must include the assurance in this paragraph (see 49 CFR 26.13(b)).

The successful bidder/offeror will be required to report its DBE participation obtained through race-neutral means throughout the period of performance.

§ 13.6.3 The contractor is required to pay its subcontractors performing work related to this contract for satisfactory performance of that work no later than 30 days after the contractor's receipt of payment for that work from the PVTA. In addition, the contractor is required to return any retainage payments to those subcontractors within 30 days after the subcontractor's work related to this contract is satisfactorily completed.

§ 13.6.4 The contractor must promptly notify the PVTA, whenever a DBE subcontractor performing work related to this contract is terminated or fails to complete its work, and must make good faith efforts to engage another DBE subcontractor to perform at least the same amount of work. The contractor may not terminate any DBE subcontractor and perform that work through its own forces or those of an affiliate without prior written consent of the PVTA.

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ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, for any of the following reasons:

.1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;

.2 An act of government, such as a declaration of national emergency, that requires all Work to be stopped;

.3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or

.4 The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, repeated suspensions, delays, or interruptions of the entire Work by the Owner as described in Section 14.3, constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such termination.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees or any other persons or entities performing portions of the Work because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

.1 repeatedly refuses or fails to supply enough properly skilled workers or proper materials;

.2 fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;

.3 repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or

.4 otherwise is guilty of substantial breach of a provision of the Contract Documents.

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, and upon certification by the Architect that sufficient cause exists to justify such action, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

.1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;

.2 Accept assignment of subcontracts pursuant to Section 5.4; and

.3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not

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expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

§ 14.3 Suspension by the Owner for Convenience

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work, in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay, or interruption under Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent

.1 that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or

.2 that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 Termination by the Owner for Convenience

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 14.4.2 Upon receipt of notice from the Owner of such termination for the Owner's convenience, the Contractor shall

.1 cease operations as directed by the Owner in the notice;

.2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and

.3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work properly executed; costs incurred by reason of the termination, including costs attributable to termination of Subcontracts; and the termination fee, if any, set forth in the Agreement.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

§ 15.1.2 Time Limits on Claims

The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all Claims and causes of action not commenced in accordance with this Section 15.1.2.

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party under this Section 15.1.3.1 shall be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

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§ 15.1.3.2 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required.

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

§ 15.1.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the Initial Decision Maker's decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.

§ 15.1.5 Claims for Additional Cost

If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

§ 15.1.6.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated, and had an adverse effect on the scheduled construction.

§ 15.1.7 Waiver of Claims for Consequential Damages

The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

- **.1** damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and
- **.2** damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit, except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 Initial Decision

§ 15.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and binding dispute resolution without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the

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Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of the request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished, or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

§ 15.2.6 Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

§ 15.2.6.1 Either party may, within 30 days from the date of receipt of an initial decision, demand in writing that the other party file for mediation. If such a demand is made and the party receiving the demand fails to file for mediation within 30 days after receipt thereof, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 15.3 Mediation

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract, except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.7, shall be subject to mediation as a condition precedent to binding dispute resolution.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.

§ 15.3.3 Either party may, within 30 days from the date that mediation has been concluded without resolution of the dispute or 60 days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for binding dispute resolution. If such a demand is made and the party receiving the demand fails to file for binding dispute resolution within 60 days after receipt thereof, then both parties waive their rights to binding dispute resolution proceedings with respect to the initial decision.

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WORCESTER REGIONAL TRANSIT AUTHORITY
HUB LOBBY RENOVATION

SUPPLEMENTARY CONDITIONS

Amending the General Conditions of the Contract for Construction
AIA Document A201 (2017 edition)

I. SUPPLEMENTARY CONDITIONS

The following addendum supplements, modifies, deletes and/or adds to the General Conditions. Where any Article, Paragraph or subparagraph in the General Conditions is supplemented by one of the following paragraphs, the provisions of such Article, Paragraph, or Subparagraph shall remain in effect and the supplemental provisions shall be considered as added thereto. Where any Article, Paragraph, or subparagraph in the General Conditions is amended, voided or superseded by any of the following paragraphs, the provisions of such Article, Paragraph or subparagraph not so amended, voided, or superseded shall remain in effect.

II. MODIFICATIONS TO VARIOUS ARTICLES OF THE AIA CONDITIONS

ARTICLE 1 GENERAL PROVISIONS

1.1.1 In the first sentence, delete "are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and" after "The Contract Documents".

Insert "between the Owner and Contractor (hereinafter the Agreement)" after "consist of the Agreement".

In the last sentence:

Delete "Unless specifically enumerated in the Agreement".

Delete "not" after "Contract Documents do".

Delete "other" after "sample forms,".

Delete "or" after "or proposal," and insert "and".

Delete "bidding or proposal requirements" after "relating to" and insert "those documents."

1.1.8 Delete “Claims” and insert “claims”.

Delete “and shall not be liable for results of interpretations or decision rendered in good faith.”.

1.2.1.2 Add to the end of the sub-section:

All Work mentioned or indicated in the Contract Documents shall be performed by the Contractor as part of this Contract unless it is specifically indicated in the Contract Documents that such Work is to be done by others. Should the Drawings or the Specifications disagree in themselves or with each other, the Contractor shall provide the better quality or greater quantity of Work unless otherwise directed by written addendum to the Contract.

1.2.1 Add to the end of the sentence:

, except that the performance of filed sub-trade work shall comply with the provisions of chapter 149 of the General Laws of the Commonwealth of Massachusetts. The Contractor and all Subcontractors shall refer to all of the Drawings, including those showing primarily the Work of the mechanical, electrical and other specialized trades, and to all of the Sections of the Specifications, and shall perform all Work reasonably inferable therefrom as being necessary to produce the indicated results.

1.2.4 Add the following new sub-sections 1.2.4 to 1.2.11 as follows:
-1.2.11

§ 1.2.4 All indications or notations which apply to one of a number of similar situations, materials or processes shall be deemed to apply to all such situations, materials or processes wherever they appear in the Work, except where a contrary result is clearly indicated by the Contract Documents.

§ 1.2.5 Where codes, standards, requirements and publications of public and private bodies are referred to in the Specifications, references shall be understood to be to the latest revision prior to the date of receiving bids, except where otherwise indicated.

§ 1.2.6 Where no explicit quality or standards for materials or workmanship are established for Work, such Work is to be of good quality for the intended use and consistent with the quality of the surrounding Work and of the construction of the Project generally.

§ 1.2.7 All manufactured articles, materials, and equipment shall be applied, installed, connected, erected, used, cleaned, and conditioned in

accordance with the manufacturer's written or printed directions and instructions unless otherwise indicated in the Contract Documents.

§ 1.2.8 The Mechanical, Electrical and Fire Protection Drawings are diagrammatic only, and are not intended to show the alignment, physical locations or configurations of such Work. Such Work shall be installed without additional cost to the Owner to clear all obstructions, permit proper clearances for the Work of other trades, and present an orderly appearance where exposed. Prior to beginning such Work, the Contractor shall prepare coordination drawings showing the exact alignment, physical location and configuration of the Mechanical, Electrical and Fire Protection installations and demonstrating to the Contractor's satisfaction that the installations will comply with the preceding sentence. A copy of the drawings shall be submitted to the Architect, and the Contractor shall revise and resubmit the drawings if so directed by the Architect.

§ 1.2.9 Exact locations of fixtures and outlets shall be obtained from the Architect as provided in subparagraph 3.2.5 before the Work is roughed in; Work installed without such information from the Architect shall be relocated at the Contractor's expense.

§ 1.2.10 Test boring or soil test information included with the Contract Documents or otherwise made available to the Contractor was obtained by the Owner for use by the Architects in the design of the Project or Work. The Owner does not hold out such information to the Contractor as a completely accurate indication of subsurface conditions, and no claim for extra cost or extension of time resulting from a reliance by the Contractor on such information shall be allowed except as provided in subparagraph 3.7.4.

§ 1.2.11 Where the Work is to fit with existing conditions or work to be performed by others, the Contractor shall fully and completely join the Work with such conditions or work, unless otherwise specified. Owner provided drawings showing existing conditions or construction are based on available documents and are not guaranteed to show actual existing conditions.

1.5.1 Delete 1.5.1 and replace as follows:

§ 1.5.1 All Drawings, Specifications and copies thereof furnished by the Owner are and shall remain the Owner's property. They are to be used only with respect to this Project and are not to be used on any other project without the prior written consent of the Owner. With the exception of one contract set for each party to the Contract, such documents are to be returned or suitably accounted for to the Owner at the completion of the Work. Submission or distribution to meet official regulatory requirements

or for other purposes in connection with the Project is not to be construed as publication in derogation of any reserved rights.

1.8 Delete "using or relying party's" in Section 1.8 and replace with "Contractor's"

ARTICLE 2 OWNER

2.1.2 Delete sub-section 2.1.2.

2.2.1 - 2.2.4 Delete subsections 2.2.1 through 2.2.4

2.3.5 Delete the last sentence.

2.3.6 Add to the end of the sub-section as follows:

All additional copies will be furnished upon request at the cost of reproduction.

2.4 Delete from the last sentence ", except to the extent required by Section 6.1.3" and add as follows:

The Contractor shall resume the Work after such stoppage promptly upon written notice to do so from the Owner. The Contractor shall remain responsible for maintaining the progress of the Work and shall not be entitled to any increase in the Contract Sum or Contract Time. The Contractor shall be responsible for all costs incurred by the Owner attributable to such an order to stop the Work.

2.5 Add to the end of the section as follows:

The rights of the Owner hereunder are in addition to any other rights set forth in the Contract Documents or available at law or in equity.

ARTICLE 3 CONTRACTOR

3.2.1 Delete "generally" after "the site, become".

Add to the end of the sub-section as follows:

The Contractor shall not be entitled to any change in the Contract Time or Contract Sum on account of its failure, or that of any Subcontractor, to comply with the foregoing requirements.

3.2.2 Delete the beginning of the second sentence as follows:

These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however,

Delete the last sentence and replace as follows:

If the Contractor performs any construction activity that it knows or should know involves a recognized error, inconsistency or omission in the Contract Documents without such notice to the Architect, the Contractor shall assume appropriate responsibility for such performance and shall bear responsibility for the costs of any required correction.

3.2.3 Delete "not" after "Contractor is".

Delete ", but" after "public authorities" and create new sentence beginning with "The Contractor shall promptly".

3.2.4 Delete "claims" after "the Contractor shall submit" and insert "a claim".

Delete the last sentence.

3.2.5 Add new sub-section 3.2.5 as follows:

§ 3.2.5 Any claim by the Contractor or Subcontractors that, in submitting their respective bids, they did not include all items as shown in the Contract Documents will be given no consideration for an adjustment of any kind. If any item is specified in a Section which would not normally furnish this item it shall be the responsibility of the Contractor to coordinate the situation with the Subcontractor, and if the item under consideration is not to be provided by the Subcontractor it shall be the responsibility of the Contractor to provide the work in question, without any additional cost to the Owner.

3.3.1 Add to the end of the first sentence as follows:

which shall not be less than such state of skill and attention generally rendered by the contracting profession for projects similar to the Project in scope, difficulty and location. The Contractor shall adequately staff the Project to properly and thoroughly manage, schedule and supervise all construction activities.

3.3.2 Add the last sentence as follows:

This obligation shall also extend to the presence on the Site of suppliers of materials or equipment, their employees, contractors, and agents engaged in the Work.

3.4.3 Add to the end of the second sentence as follows:

, and the Contractor shall ensure that all workers to be employed on the Project have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration (OSHA) of at least 10 hours. The Contractor shall be responsible for maintaining all safety precautions at and around the Project site. On the Owner's request, the Contractor shall permanently remove from the Project site any employee of the Contractor or any Subcontractor who fails to comply with the requirements of the Contract Documents or whose presence or behavior is deemed by the Owner to be adverse to the success of the Project or the Owner's interests.

3.5 Add to the end of the first sentence as follows:

and, promptly after written notification of non-conformance, shall be repaired or replaced by the Contractor with Work conforming to such requirements.

Delete the second to last sentence.

3.5.3 Add new sub-sections 3.5.3 to 3.5.9 as follows:
-3.5.9

§ 3.5.3 The Contractor shall be responsible for determining that all materials furnished for the Work meet all requirements of the Contract Documents. The Architect may require the Contractor to produce reasonable evidence that a material meets such requirements, such as certified reports of past tests by qualified testing laboratories, reports of studies by qualified experts, or other evidence which, in the opinion of the Architect, would lead to a reasonable certainty that any material used, or proposed to be used, in the Work meets the requirements of the Contract Documents. All such data shall be furnished at the Contractor's expense. This provision shall not require the Contractor to pay for periodic testing of different batches of the same material, unless such testing is specifically required by the Contract Documents to be performed at the Contractor's expense.

§ 3.5.4 If the Contractor proposes to use a material which, while suitable for the intended use, deviates in any way from the detailed requirements of the Contract Documents, the Contractor shall inform the Architect in writing of the nature of such deviations at the time the material is submitted for approval and request approval of the deviation.

The Architect shall judge the design and appearance of proposed substitutes, an may refuse to approve any substitute which, in the Architect's opinion, would be out of character or otherwise inconsistent with the character or quality of design of the Project.

§ 3.5.5 In informing the Architect of deviations or substitutions, the Contractor shall provide, upon request, evidence leading to a reasonable certainty that the proposed substitution or deviation will provide a quality of result at least equal to that otherwise attainable in accordance with the Contract Documents. If, in the opinion of the Architect, the evidence presented by the Contractor does not provide a sufficient basis for such reasonable certainty, the Architect may reject such substitution or deviation without further investigation.

§ 3.5.6 Any additional cost, or any loss or damage arising from the substitution of any material or any method for those originally specified shall be borne by the Contractor, notwithstanding approval or acceptance of such substitution by the Owner or the Architect, unless such substitution was made at the written request or direction of the Owner or the Architect.

§ 3.5.7 The warranty provided in this paragraph 3.5 shall be in addition to and not in limitation of any other warranty required by the Contract Documents or otherwise prescribed by law.

§ 3.5.8 The Contractor shall procure and deliver to the Architect, no later than the date claimed by the Contractor as the date of Substantial Completion, all special warranties required by the Contract Documents. Delivery by the Contractor shall constitute the Contractor's guarantee to the Owner that the warranty will be performed in accordance with its terms and conditions.

§3.5.9 The Contractor shall guarantee all Work for a period of one year after Date of Substantial Completion, or by the terms of any special guarantee required by the Contract Documents. The Contractor shall, upon written notice from the Owner, promptly correct defective Work or Work not in accordance with the Contract Documents.

3.6.1 Add new sub-section 3.6.1 as follows:

§ 3.6.1 The project is exempt from the Massachusetts Sales Tax to the extent permitted by G.L. c.64H, §6(f). The exemption number will be provided by the Awarding Authority to the Contractor.

3.7.2 Add to the end of the sub-section as follows:

If any of the Work is required to be inspected or approved by any public authority, the Contractor shall cause such inspection or approval to be performed and shall comply with any instructions or corrections ordered by the public authority.

3.7.3 Delete "knowing it" after "performs Work" and replace with "it knows or should know".

3.7.4 Delete sub-section 3.7.4 and replace as follows:

§ 3.7.4 Concealed or Unknown Conditions. Claims for concealed or unknown conditions shall be governed by Chapter 30, Section 39N of the General Laws of the Commonwealth of Massachusetts, as amended.

3.7.5 Delete second and last sentences.

3.8 Delete section 3.8 in its entirety.

3.9.1 In the first sentence:

Insert ", in accordance with the Contract Documents," after "shall employ".

Insert "at all times" after "the Project site".

3.9.4 Add new sub-sections 3.9.4 and 3.9.5 as follows:
-3.9.5

§ 3.9.4 The Contractor shall coordinate and supervise the Work performed by Subcontractors to the end that the Work is carried out without conflict between trades and so that no trade, at any time, causes delay to the general progress of the Work. The Contractor and all Subcontractors shall at all times afford each trade, any separate contractor, or the Owner, every reasonable opportunity for the installation of Work and the storage of materials.

§ 3.9.5 The Contractor shall arrange for and attend job meetings with the Architect and such other persons as the Architect may from time to time wish to have present. The Contractor shall be represented by a principal, project manager, general superintendent or other authorized main office representative, as well as by the Contractor's own superintendent. An authorized representative of any Subcontractor or Sub-subcontractor shall attend such meetings if the representative's presence is requested by the Architect. Such representatives shall be empowered to make binding commitments on all matters to be discussed at such meetings, including costs, payments, change orders, time schedules and manpower. Any notices required under the Contract may be served on such representatives.

3.10.1 In the first sentence delete “promptly” after “The Contractor” and replace with “within twenty (20) days”.

In the second sentence, insert “or as requested by the Architect” after “conditions of the Work and Project”.

Add to the end of the sub-section as follows:

> The construction schedule shall be in such form and contain such information as the Architect and Owner require. The construction schedule shall be resource loaded for the Contractor and all subcontractors, with each resource identified by name, description, unit of measure, and calendar assignment. For each class of work included in the Contractor’s schedule of values, the construction schedule shall show the percentage of completion to be obtained and the total dollar value of the work to be completed as of the first of each month until Substantial Completion. All calculations shall be on the basis of work in place, but not including the value of materials delivered but not in place.

3.10.3 Add to the end of the sub-section as follows:

> The Contractor’s compliance with the construction schedule is a material obligation of the Contract.

3.10.4 Add new sub-sections 3.10.4, 3.10.5, and 3.10.6 as follows:
-3.10.6

> § 3.10.4 The Contractor shall monitor the progress of the Work for conformance with the requirements of the construction schedule and shall promptly advise the Owner of any delays or potential delays. The construction schedule shall be updated every month (or more frequently if requested by the Owner) to reflect actual conditions (such updates are sometimes referred to in these General Conditions as "progress reports"). In the event any progress report indicates delays in achievement of any milestone date set forth in such schedule, the Contractor shall propose in written form an affirmative plan (the "Recovery Schedule") to correct the delay, including overtime and/or additional labor, if necessary, which Recovery Schedule shall indicate the date by which the progress of the Work will comply with the construction schedule, and shall be subject to the approval of the Owner and the Architect. In no event shall any progress report or Recovery Schedule constitute an adjustment in the construction schedule, Contract Time or any milestone date unless any such adjustment is agreed to by the Owner and authorized pursuant to a Change Order.

§ 3.10.5 In the event (i) that the performance of the Work, as of a milestone date, has not progressed or reached the level of completion required by the construction schedule, and (ii) the progress of the Work is not brought back into compliance with the construction schedule on the date proposed by the Recovery Schedule, or the Contractor otherwise fails to comply with the Recovery Schedule, the Owner shall have the right to order the Contractor to take corrective measures to expedite the progress of the Work, including, without limitation, (1) supplying additional manpower, equipment, and facilities, (2) working additional shifts or overtime, (3) working additional days, and (4) other similar measures (hereinafter referred to collectively as "Corrective Measures"). Such Corrective Measures shall continue until the progress of the Work complies with the stage of completion required by the Contract Documents.

§ 3.10.6 The Contractor shall not be entitled to an adjustment in the Contract Sum in connection with Corrective Measures required by the Owner under or pursuant to Section 3.10.5. The Owner may exercise the rights furnished the Owner under or pursuant to Section 3.10.5 as frequently as reasonably necessary to ensure that the Contractor's performance of the Work complies with the milestone dates set forth in the construction schedule.

3.12.6 Add to the end of the sub-section as follows:

By approving and submitting Shop Drawings, Product Data, Samples, and similar submittals the Contractor thereby represents that the Contractor has determined and verified all dimensions, quantities, field dimensions, relations to existing work, coordination with work to be installed later, coordination with information on previously accepted Shop Drawings, Product Data, Samples, or similar submittals and verification of compliance with all the requirements of the Contract Documents. The accuracy of all such information is the responsibility of the Contractor. In reviewing Shop Drawings, Product Data, Samples, and similar submittals the Architect shall be entitled to rely upon the Contractor's representation that such information is correct and accurate.

3.12.10 Add to the end of the last sentence as follows:

, except as provided in Section 3.2.

3.12.10.2 Add to the end of subsection 3.12.10.2 the following:

When professional certification of materials, systems or equipment is required by the Contract Documents, the Owner shall be entitled to rely upon such certifications, and neither the Owner nor the Architect shall be

expected to make an independent examination with respect to the performance of such materials, systems or equipment.

3.13 Add to the end of the section as follows:

The right of possession of the premises and the improvements made thereon by the Contractor shall remain at all times with the Owner. The Contractor's right to entry and use thereof arises solely from the permission granted by the Owner under the Contract Documents. The Owner shall not be liable to the Contractor, the Subcontractors, their employees, or anyone else with respect to the conditions of the premises, except only for a condition caused directly and solely by the negligence of the Owner.

3.15.1 Add "site" to the end of the second sentence.

3.15.2 Add to the end of the sentence as follows:

, and may deduct all costs thereof from any payment due the Contractor.

3.16 Insert ", Owner's representatives" after "provide the Owner".

3.18.1 Delete the first sentence and replace as follows:

To the fullest extent permitted by law the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, including claims, damage, loss or expense attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property, including the Work, caused in whole or in part by the negligent or wrongful acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations, including those of indemnity, which would otherwise exist as to a party or person described in this section.

ARTICLE 4 ARCHITECT

4.1.2 In the first sentence delete ", Contractor" after "consent of the Owner".

In the second sentence insert "of the Owner" after "Consent".

4.1.3 Delete sub-section 4.1.3.

4.2.3 In the first sentence delete “reasonably” after “will keep the Owner”.

4.2.4 Delete the second sentence.

4.2.10 Delete sub-section 4.2.10.

4.2.11 Add to the end of the sub-section as follows:

> The parties agree that the Architect’s duties under this subparagraph shall be governed by Chapter 30, Section 39P of the General Laws of the Commonwealth of Massachusetts, as amended.

4.2.12 Delete the second sentence.

ARTICLE 5 SUBCONTRACTORS

5.2.1 Delete the last sentence.

5.2.2 In the second sentence insert “and legally permissible” after “has made reasonable”.

5.2.3 Delete the last two sentences and replace as follows:

> No increase in the Contract Sum or Contract Time shall be allowed for such change.

5.2.4 Add to the end of the sub-section as follows:

> The applicable provisions of Chapter 149, Section 44F of the General Laws of the Commonwealth of Massachusetts shall apply to filed sub-bid subcontractors.

5.4.1 In sub-heading .1 delete “Section 14.2” and replace with “Article 14”.

Add new sub-heading .3 as follows:

> .3 The Owner may further assign the subcontract to a successor contractor or other entity.

Delete last sentence of sub-section.

5.4.2 Delete sub-sections 5.4.2 and 5.4.3.
-5.4.3

ARTICLE 6 CONSTRUCTION BY OWNER OR SEPARATE CONTRACTORS

6.1.1 At the end of the second sentence delete "including those provisions of the Conditions under the Contract related to insurance and waiver of subrogation".

6.1.4 Delete sub-section 6.1.4 and replace as follows:

> § 6.1.4 The Owner reserves the right to enter any part of the Project site at any time to inspect the Work or to perform other work with its own forces or separate contractors, or to address any emergency situation. Such access is not to be construed to mean partial occupancy by the Owner and no claim for increase in the Contract Time or Sum will be considered unless such Owner's contractors have delayed or damaged the Contractor's Work. The Contractor shall permit the Owner to place and install as much furniture, equipment and other material during the progress of the Work as is possible before completion of the various parts of the Work and agrees that such placing and installation of equipment shall not in any way evidence the completion or acceptance of the Work or any portion of it.

6.2.2 Delete the last sentence.

6.2.3 Delete the last sentence.

6.2.5 Delete sub-section 6.2.5.

ARTICLE 7 CHANGES IN THE WORK

7.2.2 Add new sub-section 7.2.2 as follows:

> § 7.2.2 Upon request of the Owner or the Architect, the Contractor shall without cost to the Owner submit to the Architect, in such form as the Architect may require, an accurate written estimate of the cost of any proposed extra Work or change. The estimate shall indicate the quantity and unit cost of each item of material, and the number of hours of work and hourly rate for each class of labor, as well as a description and the amounts of all other costs chargeable under the terms of this Article. Unit labor costs for the installation of each item of material shall be shown if required by the Architect. The Contractor shall promptly revise and resubmit each estimate if the Architect determines that it is not in compliance with the requirements of this Article, or that it contains errors of fact or mathematical errors. If required by the Architect, in order to establish the exact cost of new Work added or of previously required Work omitted, the Contractor shall obtain and furnish to the Architect

bona fide proposals from recognized suppliers for furnishing any material included in such Work. Such estimates shall be furnished promptly so as to occasion no delay in the Work, and shall be furnished at the Contractor's expense. The Contractor shall state in the estimate any extension of time required for the completion of the Work if the change or extra work is ordered.

7.3.3 Delete the first sentence of the sub-section and replace as follows:

If the Construction Change Directive provides for an adjustment to the Contract Sum, and if the Contract Documents include a unit price for the work that is the subject of such directive, such unit price shall be the basis of the adjustment to the Contract Sum, unless the Owner, in its sole discretion, chooses another method. If, however, the Contract Documents do not include a unit price for such work, the adjustment shall be based on one of the following methods, as selected by the Owner:

In sub-heading .2 delete "stated in the Contract Documents or" after "Unit prices".

7.3.4 Delete first sentence and replace as follows:

If the proposed method of adjustment in the Contract Sum is based on unit prices that are stated in the Contract Documents, such unit prices shall be the basis of any adjustment to the Contract Sum, unless the Owner has chosen another method pursuant to subparagraph 7.3.3. If the proposed method of adjustment is not based on such unit prices and the Contractor objects to the proposed method of adjustment, the Contractor must notify the Architect of such objection in writing within five (5) calendar days from Contractor's receipt of the Construction Change Directive. Failure to so object will irrevocably waive any such objections and claims on account of such method of adjustment, and the Construction Change Directive shall be deemed and shall constitute a Change Order. If the Contractor does so object, the adjustment to the Contract Sum shall be determined by the Architect on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, a reasonable allowance for overhead and profit.

In sub-heading .4 insert "and" after "and insurance," and delete ", and sales, use or similar taxes related to the Work" after "permit fees".

Delete sub-heading .5 and replaces as follows:

.5 A reasonable allowance for overhead and profit.

7.3.6 In the first sentence add after "the Work involved and" as follows:

> , within five (5) calendar days from receipt of the Construction Change Directive,"

Insert "by written notice" after "advise the Architect".

Add to the end of the sub-section as follows:

> Failure to so advise the Architect within such 5-day period (1) shall be interpreted as Contractor's agreement with the proposed method of adjustment; (2) shall constitute an irrevocable waiver of any right of the Contractor to submit a claim on account of the method of adjustment; and (3) shall cause the Construction Change Directive to be deemed and constitute a Change Order.

7.3.7 In the second sentence delete "recorded as" after "immediately shall be" and replace with "deemed and shall constitute".

7.3.9 Delete the end of the first sentence starting after "Directive to the Owner," and replace as follows:

> amounts for such changes in the Work shall not be included in Applications for Payment. Such amounts shall only be included in an Application for Payment after the adjustment for the Construction Change Directive has been included in a Change Order signed by the Owner and the Contractor.

ARTICLE 8 TIME

8.2.2 In the first sentence delete ", except by agreement or instruction of the Owner"

8.2.4 Add new sub-sections 8.2.4 and 8.2.5 as follows:
-8.2.5

> § 8.2.4 Unless specifically required by law, no payment under this Contract shall be due until the construction schedule, required by Section 3.10, and conforming to the requirements of the General Requirements has been accepted by the Architect.
>
> § 8.2.5 If the Architect in reviewing any Application for Payment determines that the amount of completed Work in place as certified by the Architect is less than 90% of the Work in place required by the Contractor's construction schedule or schedule of values provided for in Section 9.2, or that there have been delays to critical paths and the Contract completion date will not be met, or that, in the Owner's sole discretion, there is reasonable concern that the Work will not be

Substantially Complete by the date required in the Contract Documents, the Contractor shall be required to submit a recovery schedule with a written description of the steps the Contractor intends to take to put the Project back on schedule. At the Owner's option, the Contractor shall take some or all of the following actions at no additional cost to the Owner:

.1 Increase the number of workers on the site, in such quantities and trades as will substantially eliminate the backlog of work;

.2 Increase the number of working hours per shift, shifts per day, working days per week, amount of construction equipment, or any combination of the foregoing, sufficiently to substantially eliminate backlog of work; or

.3 Reschedule activities so that the completion dates initially scheduled will be met.

8.3.1 Insert "(except weather)" after "casualties" and delete "adverse weather conditions documented in accordance with Section 15.1.6.2"

Delete "pending mediation and binding dispute resolution" after "delay authorized by Owner".

Add to the end of the sub-section as follows:

, and this shall be the Contractor's sole remedy for such delay. Under no circumstances will the Contractor be entitled to an increase in the Contract Sum, or to any other damages, on account of or in connection with any delay, regardless of the cause of such delay, and Contractor agrees not to make any claim for such damages, including, but not limited, claims for damages on account of having to perform out-of-sequence work, claims for damages on account of loss of production, and claims for damages on account of hindrances or interference with the work.

8.3.3 Delete sub-section 8.3.3.

8.3.4 Add new sections 8.3.4 and 8.3.5 as follows:
-8.3.5

§ 8.3.4 No extension of time shall be granted because of seasonal or abnormal variations in temperature, humidity or precipitation, which conditions shall be wholly at the risk of the Contractor, whether occurring within the time originally scheduled for completion or within the period of any extension granted. There shall be no increase in the Contract Sum on account of any additional costs of operations or conditions resulting therefrom.

§ 8.3.5 The Contractor hereby agrees that the Contractor shall have no claim for damages of any kind against the Owner or the Architect on account of any delay in the commencement of the Work and/or any

hindrance, delay or suspension of any portion of the Work, whether such delay is caused by the Owner, the Architect, or otherwise, except as and to the extent expressly provided in G.L. c. 30, §39N. The Contractor acknowledges that the Contractor's sole remedy for any such delay and/or suspension will be an extension of time as provided in this Article.

8.4 Add new section 8.4 as follows:

§ 8.4 LIQUIDATED DAMAGES

§ 8.4.1 It is expressly understood and agreed, by and between the Contractor and Owner, that the time for the completion of the Work described herein is a reasonable time for the completion of same, taking into consideration the average climatic range and usual industrial and/or residential conditions prevailing in this locality. If the said Contractor shall neglect, fail or refuse to complete the Work within the times herein specified, or any proper extension thereof granted by the Owner, then the Contractor does hereby agree, as a part consideration for the awarding of this Contract, to pay to the Owner $1,500.00, not as a penalty but as liquidated damages for such breach of contract, for each and every calendar day that the Contractor shall be in default after the time stipulated for completing the Work. The said amount is fixed and agreed upon by and between the Contractor and the Owner because of the impracticability and difficulty of fixing and ascertaining the actual damages the Owner would in such event sustain, and said amount is agreed to be the amount of damages which the Owner would sustain and said amount shall be deducted by the Owner from periodic payments.

ARTICLE 9 Payments and Completion

9.1.2 Delete subsection 9.1.2 and replace with the following:

§9.1.2 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed in a proposed Change Order or Construction Change Directive so that, in the opinion of the Architect, application of such unit prices to quantities of Work proposed will cause substantial inequity to the Owner, the applicable unit prices shall be equitably adjusted.

9.2 Add to the end of the section as follows:

, and shall be revised if later found by the Architect to be inaccurate. In addition, the Contractor shall submit to the Architect, at least 14 days before the first Application for Payment, a Cash Flow Schedule that shows the percentage completion to be obtained and the total dollar value of Work to be completed as of the first of each month until Substantial

Completion. All calculations in the Cash Flow Schedule shall be on the basis of Work in place and shall exclude the value of materials delivered but not in place.

9.2.1 Add new sub-section 9.2.1 as follows:

§ 9.2.1 The Cash Flow Schedule shall be based on an orderly progression of the Work allowing adequate time for each operation (including adequate time for submission and review of submittals) and leading to a reasonable certainty of Substantial Completion by the date established in the Agreement. The Cash Flow Schedule will be reviewed by the Architect for compliance with the requirements of the Contract Documents. Unless specifically required by law, no payment under this Contract shall be due until the Cash Flow Schedule has been reviewed and approved by the Architect. The Architect's review of the Cash Flow Schedule shall not impose any duty on the Architect or the Owner with respect to the timing, planning, scheduling or execution of the Work. In particular if the Contractor proposes a Cash Flow Schedule indicating a date of Substantial Completion which is earlier than the Contract Time the Contractor shall not be entitled to additional payment or compensation of any kind if for any reason the full Contract Time is required to achieve Substantial Completion of the Work.

9.3.1.1 Delete sub-section 9.3.1.1.

9.3.2 Add to the end of the sub-section as follows:

The Owner may deduct the amount of such costs from payments due the Contractor.

9.4.1 Insert at the beginning of the first sentence as follows:

Subject to the Contractor's compliance with Section 9.3 and the provisions of Section 9.6,

9.5.1 Add new sub-headings .8, .9, .10, .11, and .12 as follows:

.8 failure of the Contractor or mechanical or electrical trade subcontractors to comply with requirements of the General Requirements for maintaining record drawings. The Contractor shall check record drawings each month. Written confirmation that the record drawings are current will be required by the Architect before approval of the Contractor's monthly payment requisition;
.9 failure of the Contractor to provide required warranties under Section 9.3, claims for direct payment, or reasonable evidence indicating probable filing of such claims;

.10 costs incurred by the Owner under Section 10.2.5;
.11 failure of the Contractor to submit prerequisite documentation required by the General Requirements; or
.12 liquidated damages due the Owner pursuant to Section 8.4.

9.5.2 Delete "Claim" and replace with "claim".

9.5.3 Delete sub-section 9.5.3.

9.6.4 Delete "If the Contractor fails to furnish such evidence within seven days," from the beginning of the second sentence.

9.6.5 Delete sub-section 9.6.5.

9.6.7 Delete sub-section 9.6.7.

9.6.9 Add new sub-section 9.6.9 as follows:

§ 9.6.8 Notwithstanding the provisions of Section 9.6 all progress payments shall be made in accordance with Chapter 30, Sections 39F, 39G and 39K (as appropriate) of the General Laws of the Commonwealth of Massachusetts, as amended.

9.7 Delete section 9.7.

9.8.1 Add to the end of the sub-section as follows:

In addition, Substantial Completion for the entire Project shall be achieved only when: (1) the Owner has beneficial occupancy and use of the entire Project for all its intended uses; (2) all Project systems included in the Work are operational and acceptable to the Owner; (3) all governmental inspections for the Project have been successfully completed, all governmental approvals and related paperwork have been delivered to the Owner, and final and unconditional certificates of occupancy for the entire Project have been delivered to the Owner, (4) the only remaining Work to be performed is minor in nature and the remaining Work may reasonably be performed without having a material adverse effect on or materially interfering with the Owner's occupancy and use of the Project and (5) all prerequisites to Substantial Completion defined in the Contract Documents have been completed.

9.8.2 Add to the end of the first sentence as follows:

together with the estimated value of completing or correcting such items (the "Punchlist") and (2) the permits and certificates referenced in Section

13.5. The Architect shall have the right to modify and supplement the Punchlist, including the estimated value of completion or correction.

9.8.5 Delete sub-section 9.8.5 and replace as follows:

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor by the Architect. The certificate shall state the date of substantial completion, shall state any consequent responsibilities of the Contractor and the Owner in accordance with the Contract Documents. The Contractor shall complete and correct any incomplete and defective work within forty-five (45) calendar days from the date of Substantial Completion

9.8.6 Add new sub-section 9.8.6 as follows:

§ 9.8.6 Services provided by the Architect to conduct more than three (3) inspections of completed Work and any inspections beyond sixty (60) days after the date of substantial completion of any portion of the Work as stated in the Agreement shall be paid by the Contractor to the Owner. The Owner may deduct the cost of such services and inspections from payments due the Contractor.

9.9.1 Delete the end of the first sentence starting after "Work at any stage".

Delete the second sentence and replace as follows:

Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner has accepted in writing the responsibilities assigned to it and the Contractor for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance.

Delete the second to last sentence.

9.10.1 Add to the end of the sub-section as follows:

By Final Completion, the Contractor shall have completed its performance of all Punchlist items, completed all balancing of mechanical and other applicable systems and all seasonal system adjustments that are reasonably necessary to proper functioning of the completed Project, delivered to the Owner all operations and maintenance manuals and completed related training for such manuals, and delivered to the Owner all required warranties and guarantees.

9.10.3 Delete sub-sections 9.10.3 and 9.10.4.
-9.10.4

9.10.5 Insert “for payment for Work performed and of all other claims of which the payee knew or should have known at the time of final payment,” after “claims by that payee”

9.10.6 Add new sub-section 9.10.6 as follows:

§ 9.10.6 Notwithstanding anything in the Contract Documents to the contrary, final payment shall be made in accordance with the requirements of G.L.c.30, §39K (building projects) or §39G (public works projects), as amended.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

10.2.1 Add new sub-heading .4 as follows:

.4 work or property of the Owner, its tenants, or other parties at or near the Project site with the Owner's permission.

10.2.5 At the beginning and end of the first sentence:

Delete “and” after “10.2.1.2”.

Insert “and 10.2.1.4” after “10.2.1.3”.

Delete the second sentence in its entirety.

10.2.9 Add new sub-sections 10.2.9, 10.2.10, 10.2.11, 10.2.12, and 10.2.13 as follows: -10.2.13

§ 10.2.9 The Contractor shall provide and maintain in good operating condition suitable and adequate fire protection equipment and services, and shall comply with all reasonable recommendations regarding fire protection made by the representatives of the fire insurance company carrying insurance on the Work or by the local fire chief or fire marshal. The area within the site limits shall be kept orderly and clean, and all combustible rubbish shall be promptly removed from the site.

§ 10.2.10 The Contractor shall at all times protect excavations, trenches, buildings and materials from rain water, groundwater, backup or leakage of sewers, drains and other piping, and from water of any other origin and shall remove promptly any accumulation of water. The Contractor shall provide and operate all pumps, piping and other equipment necessary to this end.

§ 10.2.11 The Contractor shall remove snow and ice which might result in damage or delay.

§ 10.2.12 During the progress of the Work and at all times prior to the date of Substantial Completion or occupancy of the Work by the Owner, whichever is earlier, the Contractor shall provide temporary heat, ventilation, and enclosure, adequate to permit the Work to proceed in a timely fashion, and to prevent damage to completed Work or Work in progress, or to materials stored on the premises. The use of the permanent heating and/or ventilation systems for temporary heat and/or ventilation shall be subject to the prior written approval of the Owner and Architect.

§ 10.2.13 [G.L. c.149, §44F(1)] The Contractor shall install weather protection and furnish adequate heat in the protected area from November 1 to March 31.

10.3.1 Delete the second sentence and replace as follows:

The Contractor shall not cause or permit any introduction onto, under, or near the Owner's property of any hazardous materials or substances as defined by any applicable law, and shall not cause of permit any release, discharge, transportation, storage, or disposal of such materials or substances onto, under, or near the Owner's property or areas near the Owner's property. If the Contractor encounters or recognizes on the site any material known or reasonably believed to be hazardous, including but not limited to asbestos or polychlorinated biphenyl (PCB), the Contractor shall immediately stop Work in the area affected and report the condition to the Owner and Architect in writing. The Contractor and the Owner shall cooperate in implementing measures to remove or contain said material and the Contractor shall comply with all directions of the Architect in the implementation of such removal or containment.

10.3.2 Delete sub-sections 10.3.2, 10.3.3, and 10.3.4.

10.3.5 Delete the remainder of the sentence starting after "obligations under" and replace as follows:

Article 10 or for any violation of applicable law related to the Contractor's noncompliance with the provisions of this Article 10.

10.3.6 Delete sub-section 10.3.6.

10.3.7 Add new sub-section 10.3.7 as follows:

§ 10.3.7 The parties anticipate that certain hazardous substances and/or materials may be discovered at the site. When such conditions are set forth in the Contract Documents, the Contractor acknowledges that such conditions have been considered in establishing the Contract Time and

Contract Sum. No extension of the Contract Time or increase in the Contract Sum shall be claimed or allowed with respect to any hazardous substances or materials located at the site which were disclosed in the Contract Documents. The Contractor shall strictly comply with all laws, regulations, rules, orders, ordinances and the like related to the excavation, storage, removal and disposal of any such hazardous substances or materials.

ARTICLE 11 INSURANCE AND BONDS

11.1.1 In the last sentence insert "the Owner's Project Manager," after "The Owner,".

Add the following new paragraphs to the end of Section 11.1.1:

The insurance required by this Agreement shall include all major divisions of coverage, and shall be on a comprehensive general basis including Premises and Operations (including X-C-U), Owner's and Contractor's Protective, Products and Completed Operations, and Owned, Non-owned, and Hired Motor Vehicles. Such insurance shall be written for not less than any limits of liability required by law or those set forth in the Contract Documents, whichever is greater.

All insurance shall be written on an occurrence basis, unless the Owner approves in writing coverage on a claims-made basis. Coverages, whether written on an occurrence or claims-made basis, shall be maintained without interruption from date of commencement of the Work until date of final payment and any further period during which coverage is required to be maintained after final payment by the Contract Documents. The Owner shall be named an Additional Insured on all policies.

Coverage for such liability insurance shall be provided by a company or companies reasonably acceptable to the Owner and authorized to do business in Massachusetts. Contractor shall furnish to Owner written confirmation as to the insurance carrier's most current financial ratings prior to commencing work.

11.1.2 Delete subsection 11.1.2 and replace with the following:

§11.1.2 Contractor shall provide Performance and Payment Bonds, each in the amount of 100% of the Contract Price, and each by a surety company qualified to do business under the laws of the Commonwealth of Massachusetts and acceptable to the Owner. The attorney-in-fact who signs the bonds on behalf of the surety, must affix to each bond a certified and current copy of the power of attorney. The Performance and Payment Bonds shall be written in a form satisfactory to the Owner.

11.1.5 Add new sub-section 11.1.5:

§ 11.1.5 In no case shall the limits of liability be less than the following:

Contractor's Commercial General Liability

Bodily Injury & Property Damage	$1,000,000.00 each occurrence $2,000,000.00 general aggregate, per project

This policy shall include coverage relating to explosion, collapse, and underground property damage if blasting operations constitute part of the Work to be performed under this Contract.

Vehicle Liability

The Contractor shall provide the following minimum coverage with respect to the operations of any employee, including coverage for owned, non-owned, and hired vehicles:

Combined Single Limit: $2,000,000.00

Worker's Compensation

The Contractor shall provide the following coverage in accordance with M.G.L. c. 149, sec. 34A and M.G.L. c. 152 as amended, unless a higher coverage is specified below:

Part One	Provide Statutory Minimum
Employer's Liability	$1,000,000.00 each accident
Part Two	$1,000,000.00 disease per employee
	$1,000,000.00 disease policy aggregate

Umbrella Liability Coverage $5,000,000 All Limits

11.1.3.1 The Contractor shall be responsible for having acceptable insurance coverage provided by or on behalf of all Subcontractors, with such insurance to be similar to that required of the Contractor under the Agreement and these General Conditions. The Contractor shall not allow any Subcontractor to commence Work on the Project prior to the Contractor's receipt of certificates of insurance that are acceptable in form and limits to the Owner; the Owner shall have no obligation to pay the Contractor for any Work performed by a Subcontractor who has not supplied acceptable insurance certificates prior to starting its Work. The Owner shall be named an additional insured on all such certificates.

11.1.3.2 All insurance policies shall contain provisions or endorsements necessary to assure coverage of claims by one insured against another. All

required insurance policies are to be endorsed to state that the Contractor's policies shall be primary to all other insurance available to the Owner and other specified additional insureds for liability arising out of or resulting from the Contractor's operations under the Contract, whether such operations be by the Contractor or by a Subcontractor or by anyone directly or indirectly employed by any of them or by anyone for whose acts any of them may be liable.

11.2 Delete section 11.2 and replace as follows:

§ 11.2 OWNER'S LIABILITY INSURANCE
The Contractor shall procure and pay for an Owner's policy of Owner's protective liability insurance insuring the Owner and its officers, employees and agents against claims which may arise from operations under the Contract or relating thereto.

11.2.1 Delete sub-section 11.2.1 and replace as follows:

§ 11.2.1 The Contractor shall purchase and maintain property insurance upon the entire Work at the site to the full insurable value thereof. Coverage for such liability insurance shall be provided by a company or companies reasonably acceptable to the Owner. Contractor shall furnish to Owner written confirmation as to the insurance carrier's most current financial ratings prior to commencing work. Such insurance shall include the interests of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the work and shall insure against the perils of fire and extended coverage and shall include "all risks" insurance for physical loss or damage including without duplication, theft, vandalism and malicious mischief. This insurance shall also cover portions of the Work stored off the site or in transit. If this insurance is written with stipulated amounts deductible, the Owner shall not be responsible for any difference between the payments made by the insurance carrier and the claim. The policy shall contain a provision that coverages afforded under policies will not be canceled or allowed to expire until at least 30 days' written notice has been given to the Owner. The Owner shall be named insured within the policy.

11.2.3 Delete sub-section 11.2.3.

11.3 - Delete Section 11.3 and replace as follows:

Contractor waives all rights against (1) the Owner; (2) the Architect and Architect's consultants; and (3) the Owner's Project Manager and Owner's Project Manager's consultants for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project. The Contractor shall require similar written

waivers in favor of the individuals and entities identified above from the Contractor's subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this section 11.3 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

11.4 – Delete Section 11.4 in its entirety

11.5.1 Delete the first sentence.

11.5.2 Delete sub-section 11.5.2

11.6.11 Add new sub-section 11.6.1 as follows:

§ 11.6.11 The Owner shall have the power to adjust and settle with its insurers any loss for which it has obtained insurance.

Upon the occurrence of an insured loss, the Owner and the Contractor shall cooperate with each other and with each other's insurer in the submission of claims and related information and the distribution of any insurance proceeds. If after such a loss no other special agreement is made, replacement of damaged work shall be covered by an appropriate change order.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

12.2.1 Add to the end of the sub-section as follows:

The Contractor shall bear the cost of any loss or damages to the Owner resulting from such failure or defect.

12.2.2.1 Delete the third sentence.

Add to the end of the sub-section as follows:

If the correction or repair of any of the Work is required to avoid impacts to the maintenance, operation or safety of any portion of the Project site or the Owner's property, the Owner reserves the right to undertake the repairs prior to notifying the Contractor or without waiting for the

Contractor to respond, without waiving the Owner's rights under the warranties and the Owner's right to correct work under Section 2.4.

ARTICLE 13 MISCELLANEOUS PROVISIONS

13.1 Delete the words "by the law of", and insert the words "Commonwealth of Massachusetts" at the end of the sentence as revised.

Delete the second sentence.

13.2.1 In the second sentence delete "Except as provided in Section 13.2.2".

13.2.2 Delete sub-section 13.2.2.

13.4.4 Delete sub-section 13.5.4 and replace as follows:

§ 13.5.4 The Contractor shall obtain and deliver promptly to the Architect any occupancy permit and any certificates of final inspection of any part of the Contractor's work and operating permits for any mechanical apparatus, such as elevators, escalators, boilers, air compressors, etc., which may be required by law to permit full use and occupancy of the premises by the Owner. Receipt of such permits or certificates by the Architect shall be a condition precedent to Substantial Completion of the Work.

13.7.1 Add new sub-section 13.7.1 as follows:

§ 13.7.1 It is expressly agreed that the obligations of the Contractor hereunder arise out of contractual duties, and that the failure of the Contractor to comply with the requirements of the Contract Documents shall constitute a breach of contract, not a tort, for the purpose of applicable statutes of limitation and repose. Any cause of action which the Owner may have on account of such failure shall be deemed to accrue only when the Owner has obtained actual knowledge of such failure, not before.

13.8 Add new section 13.8 as follows:

§ 13.8 LIMITATION OF LIABILITY

§ 13.8.1 The Owner shall be liable, if ever, only to the extent of its interest in the Project; and no officer, director, partner, agent or employee of the Owner shall ever be personally or individually liable with respect to this Contract or the Work. Each Subcontract shall include the foregoing limitation, which shall be effective if the Owner ever succeeds to the Contractor's rights and obligations under a Subcontract.

13.9 Add new section 13.9 as follows:

§ 13.9 DEFENSE OF SUITS

§ 13.9.1 The Contractor shall be responsible for, shall defend and pay all costs, attorneys' fees and liabilities both direct and indirect as a result of suits arising out of this Contract.

§ 13.9.2 Neither final acceptance nor occupation of the premises by the Owner shall relieve the Contractor of responsibility for all claims for labor, materials, and equipment arising out of this Contract.

§ 13.9.3 The Contractor shall indemnify and hold harmless the Owner and the Architect and their agents and employees from and against all claims, damages, losses, and expenses including attorneys' fees arising out of or resulting from the performance of the work.

ACTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

14.1.1 Insert in the beginning of the first sentence as follows:

Provided that the Contractor is not in breach of any of its obligations under the Contract,

Delete sub-headings .1, .2, and .4.

14.1.2 Delete sub-section 14.1.2.

14.1.3 Delete sub-section 14.1.3 and replace as follows:

§ 14.1.3 If one of the above reasons exists, the Contractor may, upon seven days written notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work properly executed and for all materials or equipment not incorporated in the Work, but delivered and suitably stored at the site. The payment for materials or equipment stored at the site shall be conditioned upon submission by the Contractor of bills of sale or such other evidence as is satisfactory to the Owner to establish the Owner's title to such material or equipment or otherwise protect the Owner's interest.

14.1.4 Delete sub-section 14.1.4.

14.2.1 Delete “repeatedly” from the beginning of sub-headings .1 and .3.

Insert new sub-headings .4 and .5 after sub-heading .3 as follows:

.4 becomes the subject of a voluntary petition in bankruptcy or any voluntary proceeding related to insolvency, receivership, liquidation or comparable proceeding or any assignment for the benefit of creditors or becomes the subject of an involuntary petition in bankruptcy or any involuntary proceeding related to insolvency, receivership, liquidation or comparable proceeding or any assignment for the benefit of creditors.

.5 submits three successive Applications for Payment, each of which indicate that the actual Work completed is less than 90 percent of the values estimated in the construction schedule (submitted by the Contractor pursuant to Section 3.10.1) to be completed by the respective dates.

14.2.2 In the first sentence delete ", and upon certification by the Architect that sufficient cause exists to justify such action,".

Delete the second sentence of sub-heading .3.

14.2.4 In the first sentence:

Insert "all costs and losses incurred by the Owner on account of the Contractor's failure to comply with the Contract Documents and" after "the Work, including".

Insert "and Owner's Project Manager's" after "for the Architect's".

Delete the last sentence of the sub-section and replace as follows:

The Owner shall be entitled to hold all amounts due the Contractor at the date of termination until all of the Owner's damages have been established, and to apply such amounts to such damages.

14.3.2 Insert ", subject to compliance with the conditions of Section 8.3." at the end of the first sentence.

Delete the second sentence.

14.4.2 In sub-heading .3 delete "and" after "all existing contracts" and replace with "except for subcontracts, if any, that Owner elects to assume, terminate all"

14.4.3 Delete sub-section 14.4.3 and replace as follows:

§ 14.4.3 In the event that the Contract is terminated for the Owner's convenience, the Contractor shall be reimbursed in accordance with the Contract Documents for all Work properly performed up to the termination date, and for all materials or equipment not incorporated in the

Work, but delivered and suitably stored at the site. Payment for materials or equipment stored at the site shall be conditioned upon submission by the Contractor of bills of sale or such other evidence as is satisfactory to the Owner to establish the Owner's title to such material or equipment or otherwise protect the Owner's interest. The Contractor shall not be entitled to payment for overhead and profit on the Work not executed.

ARTICLE 15 CLAIMS AND DISPUTES

15.1.1 Delete sub-section 15.1.1 and replace as follows:

§ 15.1.1 DEFINITION
The word "Claim" shall mean a written demand by the Contractor for an increase in the Contract Time or the Contract Sum. The Contractor is responsible for substantiating its Claims. The word "Claim" shall not include claims by the Owner. The Owner may withhold from the Contractor the value of any claims against the Contractor in accordance with Massachusetts General Laws, including, but not limited to, Sections 39G and 39K of Chapter 30.

15.1.2 Delete subsection 15.1.2

15.1.3 Delete sub-section 15.1.3 and replace as follows:

§ 15.1.3 NOTICE OF CLAIMS
Contractor must initiate Claims within fourteen (14) calendar days after occurrence of the event giving rise to such Claim by written notice to the Architect and the Owner. Such written notice must (1) be signed by the Contractor; (2) conspicuously identify on its face that the notice serves as a notice of claim; (3) explain in sufficient detail the basis of the Claim; (4) identify the date of the event giving rise to such Claim; and (5) state the exact dollar amount of the increase in the Contract Sum being requested, if any, and the number of days extension to the Contract Time sought, if any.

15.1.3.2 Delete subsection 15.1.3.2

15.1.4 Delete "Section 9.7 and" after "as provided in".

15.1.4.2 Delete subsection 15.1.4.2

15.1.6.1 In the second sentence delete "of cost and" after "include an estimate".

15.1.6.2 Delete sub-section 15.1.5.2.

15.1.7 Delete sub-section 15.1.7.

15.2.1 Delete the capitalized word, “Claim,” and replace with lower-case word, “claim,” in the first and fourth sentences.

In the third sentence:

Delete “mediation” after “condition precedent to” and replace with “litigation”.

15.2.2 Delete sub-section 15.2.2 and replace as follows:

§ 15.2.2 The Initial Decision Maker will review Claims and within 30 days of the receipt of the Claim take one or more of the following actions: (1) request additional supporting data from the Contractor; (2) notify the Contractor that the Initial Decision Maker requires additional time to resolve the Claim; and/or (3) reject the Claim in whole or in part.

15.2.3 Delete the last sentence.

15.2.4 Delete sub-section 15.2.4 and replace as follows:

§ 15.2.4 If the Architect requests the Contractor to furnish additional supporting data in connection with a Claim, the Contractor shall provide such data within ten (10) calendar days of such request. If the Contractor is of the opinion that it is impossible to provide such data within such time, the Contractor shall notify the Architect of such opinion in writing within such ten-day period. If the Architect determines that it is impossible for such data to be provided within such ten-day period through no fault of the Contractor, the Contractor shall provide such data within 30 calendar days of the Architect’s request, unless the Architect fixes another date, in which case the data must be submitted by the date so fixed. Failure of the Contractor to provide such data within the time prescribed herein shall result in the irrevocable waiver of the Claim.

15.2.5 Delete the last sentence and replace as follows:

The rejection of a claim by the Architect and any decisions of the Owner with respect to the same, and the interpretations by the Architect of the plans, drawings and specifications, shall be final and binding on the Contractor in accordance with Section 39J of Chapter 30 of the Massachusetts General Laws.

15.2.6 Delete sub-section 15.2.6 in its entirety.

15.2.7 Delete the capitalized word, “Claim,” and replace with lower-case word, “claim,” in the first and second sentences.

15.2.8 Delete sub-section 15.2.8.

15.3 Delete sections 15.3 and 15.4 in their entirety.
-15.4

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§ 15.3.4 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

§ 15.4 Arbitration

§ 15.4.1 If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. The Arbitration shall be conducted in the place where the Project is located, unless another location is mutually agreed upon. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

§ 15.4.1.1 A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.

§ 15.4.2 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement, shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

§ 15.4.4 Consolidation or Joinder

§ 15.4.4.1 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).

§ 15.4.4.2 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.

§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as those of the Owner and Contractor under this Agreement.

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Exhibit A

Buy America Certification
(Must be signed by the submitter)

WORCESTER REGIONAL TRANSIT AUTHORITY

60 Foster Street, Worcester, MA 01608
Phone: (508) 791-2389 Fax: (508) 752-1676

BUY AMERICA REQUIREMENTS

Applies to Contracts >$150,000
49 U.S.C. 5323(j)
49 C.F.R. part 661

Buy America

The contractor agrees to comply with 49 U.S.C. 5323(j) and 49 C.F.R. part 661, which provide that Federal funds may not be obligated unless all steel, iron, and manufactured products used in FTA funded projects are produced in the United States, unless a waiver has been granted by FTA or the product is subject to a general waiver. General waivers are listed in 49 C.F.R. § 661.7. Separate requirements for rolling stock are set out at 49 U.S.C. 5323(j)(2)(C) and 49 C.F.R. § 661.11.

The [bidder or offeror] must submit to [WRTA] the appropriate Buy America certification below with its [bid or offer]. Bids or offers that are not accompanied by a completed Buy America certification will be rejected as nonresponsive.

In accordance with 49 C.F.R. § 661.6, for the procurement of steel, iron or manufactured products, use the certifications below.

Certificate of Compliance with Buy America Requirements

The bidder or offeror hereby certifies that it will comply with the requirements of 49 U.S.C. 5323(j)(1), and the applicable regulations in 49 C.F.R. part 661.

_____ Date

_____ Signature

_____ Company

_____ Name

_____ Title

Certificate of Non-Compliance with Buy America Requirements

The bidder or offeror hereby certifies that it cannot comply with the requirements of 49 U.S.C. 5323(j), but it may qualify for an exception to the requirement pursuant to 49 U.S.C. 5323(j)(2), as amended, and the applicable regulations in 49 C.F.R. § 661.7.

_____ Date

_____ Signature

_____ Company

_____ Name

_____ Title

WORCESTER REGIONAL TRANSIT AUTHORITY

60 Foster Street, Worcester, MA 01608
Phone: (508) 791-2389 Fax: (508) 752-1676

BUY AMERICA REQUIREMENTS

Applies to Contracts >$150,000

49 U.S.C. 5323(j)

49 C.F.R. part 661

In accordance with 49 C.F.R. § 661.12, for the procurement of rolling stock (including train control, communication, and traction power equipment) use the following certifications :

Certificate of Compliance with Buy America Rolling Stock Requirements

The bidder or offeror hereby certifies that it will comply with the requirements of 49 U.S.C. 5323(j), and the applicable regulations of 49 C.F.R. § 661.11.

_____ Date

_____ Signature

_____ Company

_____ Name

_____ Title

Certificate of Non-Compliance with Buy America Rolling Stock Requirements

The bidder or offeror hereby certifies that it cannot comply with the requirements of 49 U.S.C. 5323(j), but may qualify for an exception to the requirement consistent with 49 U.S.C. 5323(j)(2)(C), and the applicable regulations in 49 C.F.R. § 661.7.

_____ Date

_____ Signature

_____ Company

_____ Name

_____ Title

Exhibit B

Debarment and Suspension Certification
(Must be signed by the submitter)

WORCESTER REGIONAL TRANSIT AUTHORITY

60 Foster Street, Worcester, MA 01608
Phone: (508) 791-2389 Fax: (508) 752-1676

GOVERNMENT-WIDE DEBARMENT AND SUSPENSION

Applies to All Contracts >$25,000

2 C.F.R. part 180
2 C.F.R part 1200
2 C.F.R. § 200.213
2 C.F.R. part 200 Appendix II (I)
Executive Order 12549
Executive Order 12689

Debarment, Suspension, Ineligibility and Voluntary Exclusion

The Contractor shall comply and facilitate compliance with U.S. DOT regulations, "Nonprocurement Suspension and Debarment," 2 C.F.R. part 1200, which adopts and supplements the U.S. Office of Management and Budget (U.S. OMB) "Guidelines to Agencies on Governmentwide Debarment and Suspension (Nonprocurement)," 2 C.F.R. part 180. These provisions apply to each contract at any tier of $25,000 or more, and to each contract at any tier for a federally required audit (irrespective of the contract amount), and to each contract at any tier that must be approved by an FTA official irrespective of the contract amount. As such, the Contractor shall verify that its principals, affiliates, and subcontractors are eligible to participate in this federally funded contract and are not presently declared by any Federal department or agency to be:

a) Debarred from participation in any federally assisted Award;
b) Suspended from participation in any federally assisted Award;
c) Proposed for debarment from participation in any federally assisted Award;
d) Declared ineligible to participate in any federally assisted Award;
e) Voluntarily excluded from participation in any federally assisted Award; or
f) Disqualified from participation in ay federally assisted Award.

By signing and submitting its bid or proposal, the bidder or proposer certifies as follows:

The certification in this clause is a material representation of fact relied upon by the WRTA. If it is later determined by the WRTA that the bidder or proposer knowingly rendered an erroneous certification, in addition to remedies available to the WRTA, the Federal Government may pursue available remedies, including but not limited to suspension and/or debarment. The bidder or proposer agrees to comply with the requirements of 2 C.F.R. part 180, subpart C, as supplemented by 2 C.F.R. part 1200, while this offer is valid and throughout the period of any contract that may arise from this offer. The bidder or proposer further agrees to include a provision requiring such compliance in its lower tier covered transactions.

_____ Signature of Contractor's Authorized Official

_____ Name and Title of Contractor's Authorized Official

_____ Date

Exhibit C

Non-Collusion Declaration
(Must be signed by the submitter)

NON-COLLUSION DECLARATION

TO BE EXECUTED BY PROPOSER AND SUBMITTED WITH RFP

I, _____, am the

_____ of _____,
(Position / Title) (Company)

the party making the foregoing RFP that the RFP is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation; that the RFP is genuine and not collusive or sham; that the Proposer has not directly or indirectly induced or solicited any other Proposer to put in a false or sham RFP; and has not directly or indirectly colluded, conspired, connived, or agreed with any Proposer or anyone else to put in a sham RFP, or that anyone shall refrain from bidding; that the Proposer has not in any manner directly or indirectly, sought by agreement, communication, or conference with anyone to fix the bid price of the Proposer or any other Proposer, or to fix any overhead, profit, or cost element of the bid price, or of that of any other Proposer, or to secure any advantage against the public body awarding the contract of anyone interested in the proposed contract; that all statements contained in the RFP are true; and, further, that the Proposer has not, directly or indirectly, submitted his or her bid price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, or paid, and will not pay, any fee to any corporation, partnership, company association, organization, bid depository, or to any member or agent thereof to effectuate a collusive or sham bid.

I declare under penalty of perjury under the laws of the Commonwealth of Massachusetts that the foregoing is true and correct:

_____ _____
(Date) (Signature)

"General Decision Number: MA20250013 07/11/2025

Superseded General Decision Number: MA20240013

State: Massachusetts

Construction Type: Building

County: Worcester County in Massachusetts.

BUILDING CONSTRUCTION PROJECTS (does not include single family homes or apartments up to and including 4 stories).

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(1).

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:	. Executive Order 14026 generally applies to the contract. . The contractor must pay all covered workers at least $17.75 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2025.
If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:	. Executive Order 13658 generally applies to the contract. . The contractor must pay all covered workers at least $13.30 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2025.

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at http://www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/03/2025
1	03/07/2025
2	03/14/2025
3	03/21/2025
4	04/04/2025
5	07/11/2025

ASBE0006-013 09/01/2024

	Rates	Fringes
ASBESTOS WORKER/HEAT & FROST INSULATOR (Duct, Pipe, & Mechanical System Insulation)	$ 49.10	36.63

BRMA0003-004 08/01/2024

	Rates	Fringes
TILE FINISHER	$ 49.32	35.26
TILE SETTER	$ 64.52	37.51

BRMA0003-005 08/01/2024

	Rates	Fringes
BRICKLAYER (Includes Pointing, Caulking, Cleaning, and Waterproofing)	$ 62.36	36.80

CARP0336-001 03/01/2025

	Rates	Fringes
CARPENTER (Includes Acoustical Ceiling installation, Batt Insulation, Drywall Hanging, Form Work, Metal Building-Metal Siding/Wall Panels, Metal Stud Installation, Scaffold Building, Fireproofer, Window and Curtain Wall Installation)	$ 49.10	31.20

ELEC0096-003 09/03/2023

	Rates	Fringes
ELECTRICIAN		
Includes HVAC/Temperature Controls Installation	$ 45.59	30.92
Low Voltage Wiring	$ 34.49	31.44

ELEV0041-005 01/01/2025

	Rates	Fringes
ELEVATOR MECHANIC	$ 66.41	38.435+a+b

FOOTNOTE:

a.Vacation: 6%/under 5 years based on regular hourly rate for all hours worked. 8%/over 5 years based on regular hourly rate for all hours worked.
b. PAID HOLIDAYS: New Year's Day; Memorial Day; Independence Day; Labor Day; Veterans' Day; Thanksgiving Day; the Friday after Thanksgiving Day; and Christmas Day.

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* ENGI0004-012 06/01/2025

	Rates	Fringes
POWER EQUIPMENT OPERATOR		
GROUP 1: Backhoe/Excavator/Trackhoe, Loader	$ 57.83	33.70
GROUP 2: Bulldozer	$ 57.18	33.70

FOOTNOTE:
A. Paid Holidays: New Year's Day, Washington's Birthday, Memorial Day, Independence Day, Patriot's Day, Columbus Day, Labor Day, Vetersns Day; Thanksgiving Day and Christmas Day.

IRON0007-018 03/16/2024

	Rates	Fringes
IRONWORKER (Ornamental, Reinforcing, and Structural)	$ 54.38	36.48

LABR0721-002 12/01/2024

	Rates	Fringes
LABORER (Mason Tender-Brick)	$ 38.95	29.81

PAIN0035-018 07/01/2024

	Rates	Fringes
PAINTER (Brush/Roller, Including Drywall Finisher/Taper)	$ 46.26	36.00

PLUM0004-004 03/01/2025

	Rates	Fringes
PLUMBER/PIPEFITTER (Includes HVAC Pipe and Unit Installation)	$ 55.00	30.17

ROOF0033-005 02/01/2025

	Rates	Fringes
ROOFER	$ 52.03	35.69

SHEE0063-006 07/01/2024

	Rates	Fringes
SHEET METAL WORKER (Includes HVAC Duct and Unit Installation)	$ 40.98	34.59

SUMA2014-002 04/04/2016

	Rates	Fringes
LABORER: Common or General	$ 39.84	12.04

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at https://www.dol.gov/agencies/whd/government-contracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (iii)).

The body of each wage determination lists the classifications and wage rates that have been found to be prevailing for the type(s) of construction and geographic area covered by the wage determination. The classifications are listed in alphabetical order under rate identifiers indicating whether the particular rate is a union rate (current union negotiated rate), a survey rate, a weighted union average rate, a state adopted rate, or a supplemental classification rate.

Union Rate Identifiers

A four-letter identifier beginning with characters other than ""SU"", ""UAVG"", ?SA?, or ?SC? denotes that a union rate was prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2024. PLUM is an identifier of the union whose collectively bargained rate prevailed in the survey for this classification, which in this example would be Plumbers.

0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2024 in the example, is the effective date of the most current negotiated rate.

Union prevailing wage rates are updated to reflect all changes over time that are reported to WHD in the rates in the collective bargaining agreement (CBA) governing the classification.

Union Average Rate Identifiers

The UAVG identifier indicates that no single rate prevailed for those classifications, but that 100% of the data reported for the classifications reflected union rates. EXAMPLE: UAVG-OH-0010 01/01/2024. UAVG indicates that the rate is a weighted union average rate. OH indicates the State of Ohio. The next number, 0010 in the example, is an internal number used in producing the wage determination. The date, 01/01/2024 in the example, indicates the date the wage determination was updated to reflect the most current union average rate.

A UAVG rate will be updated once a year, usually in January, to reflect a weighted average of the current rates in the collective bargaining agreements on which the rate is based.

Survey Rate Identifiers

The ""SU"" identifier indicates that either a single non-union rate prevailed (as defined in 29 CFR 1.2) for this classification in the survey or that the rate was derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As a weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SUFL2022-007 6/27/2024. SU indicates the rate is a single non-union prevailing rate or a weighted average of survey data for that classification. FL indicates the State of Florida. 2022 is the year of the survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 6/27/2024 in the example, indicates the survey completion date for the classifications and rates under that identifier.

?SU? wage rates typically remain in effect until a new survey is conducted. However, the Wage and Hour Division (WHD) has the discretion to update such rates under 29 CFR 1.6(c)(1).

State Adopted Rate Identifiers

The ""SA"" identifier indicates that the classifications and prevailing wage rates set by a state (or local) government were adopted under 29 C.F.R 1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 01/03/2024 in the example, reflects the date on which the classifications and rates under the ?SA? identifier took

effect under state law in the state from which the rates were adopted.

WAGE DETERMINATION APPEALS PROCESS

1) Has there been an initial decision in the matter? This can be:

a) a survey underlying a wage determination
b) an existing published wage determination
c) an initial WHD letter setting forth a position on a wage determination matter
d) an initial conformance (additional classification and rate) determination

On survey related matters, initial contact, including requests for summaries of surveys, should be directed to the WHD Branch of Wage Surveys. Requests can be submitted via email to davisbaconinfo@dol.gov or by mail to:

Branch of Wage Surveys
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

Regarding any other wage determination matter such as conformance decisions, requests for initial decisions should be directed to the WHD Branch of Construction Wage Determinations. Requests can be submitted via email to BCWD-Office@dol.gov or by mail to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2) If an initial decision has been issued, then any interested party (those affected by the action) that disagrees with the decision can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Requests for review and reconsideration can be submitted via email to dba.reconsideration@dol.gov or by mail to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board

U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210.

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END OF GENERAL DECISION"

Exhibit D

Davis Bacon Wage Rates for Building Construction in Worcester County

Exhibit E

Federally Required Contract Clauses

Federally Required and Other Model Contract Clauses
Applicability of Third-Party Contract Clauses – Construction Procurements more than $2,000
(Excluding micro-purchases, and exceptions as noted within each clause)

1. NO GOVERNMENT OBLIGATIONS TO THIRD PARTIES

2. PROGRAM FRAUD AND FALSE OR FRAUDULENT STATEMENTS AND RELATED ACTS

3. ACCESS TO RECORDS AND REPORTS

4. CHANGES TO FEDERAL REQUIREMENTS

5. CIVIL RIGHTS LAWS AND REGULATIONS

5.5 SPECIAL DOL / EEO CLAUSE

6. INCORPORATION OF FTA TERMS

7. ENERGY CONSERVATION

8. TERMINATION

9. GOVERNMENT-WIDE DEBARMENT AND SUSPENSION

10. BUY AMERICA REQUIREMENTS

11. VIOLATION AND BREACH OF CONTRACT

12. LOBBYING RESTRICTIONS

13. CLEAN AIR ACT AND FEDERAL WATER POLLUTION CONTROL ACT

14. CARGO PREFERENCE REQUIREMENTS

15. FLY AMERICA

16. DAVIS-BACON AND COPELAND ANTI-KICKBACK ACTS

17. DISADVANTAGED BUSINESS ENTERPRISE (DBE)

17D. PROMPT PAYMENT

18. RECYCLED PRODUCTS

19. AMERICANS WITH DISABILITIES (ADA) ACCESS

20. PROHIBITION ON CERTAIN TELECOMMUNICATIONS AND VIDEO SURVEILLANCE SERVICES OR EQUIPMENT

21. NOTICE TO FTA AND U.S. DOT INSPECTOR GENERAL OF INFORMATION RELATED TO FRAUD, WASTE, ABUSE, OR OTHER LEGAL MATTERS

22. SAFE OPERATION OF MOTOR VEHICLES

23. VETERANS HIRING PREFERENCE

24. CONTRACT WORK HOURS AND SAFETY STANDARDS ACT

25. BONDING

26. SEISMIC SAFETY

1. NO GOVERNMENT OBLIGATION TO THIRD PARTIES - *Applies to All Contracts*

The WRTA and Contractor acknowledge and agree that, notwithstanding any concurrence by the Federal Government in or approval of the solicitation or award of the underlying Contract, absent the express written consent by the Federal Government, the Federal Government is not a party to this Contract and shall not be subject to any obligations or liabilities to the WRTA, Contractor or any other party (whether or not a party to that contract) pertaining to any matter resulting from the underlying Contract. The Contractor agrees to include the above clause in each subcontract financed in whole or in part with Federal assistance provided by the FTA. It is further agreed that the clause shall not be modified, except to identify the subcontractor who will be subject to its provisions.

2. PROGRAM FRAUD AND FALSE OR FRAUDULENT STATEMENTS AND RELATED ACTS

Applies to All Procurements
49 U.S.C. § 5323(l) (1)
31 U.S.C. §§ 3801-3812
18 U.S.C. § 1001
49 C.F.R. part 31

The Contractor acknowledges that the provisions of the Program Fraud Civil Remedies Act of 1986, as amended, 31 U.S.C. § 3801 et seq. and U.S. DOT regulations, "Program Fraud Civil Remedies," 49 C.F.R. part 31, apply to its actions pertaining to this Project. Upon execution of the underlying contract, the Contractor certifies or affirms the truthfulness and accuracy of any statement it has made, it makes, it may make, or causes to be made, pertaining to the underlying contract or the FTA assisted project for which this contract work is being performed. In addition to other penalties that may be applicable, the Contractor further acknowledges that if it makes, or causes to be made, a false, fictitious, or fraudulent claim, statement, submission, or certification, the Federal Government reserves the right to impose the penalties of the Program Fraud Civil Remedies Act of 1986 on the Contractor to the extent the Federal Government deems appropriate.

The Contractor also acknowledges that if it makes, or causes to be made, a false, fictitious, or fraudulent claim, statement, submission, or certification to the Federal Government under a contract connected with a project that is financed in whole or in part with Federal assistance originally awarded by FTA under the authority of 49 U.S.C. chapter 53, the Government reserves the right to impose the penalties of 18 U.S.C. § 1001 and 49 U.S.C. § 5323(l) on the Contractor, to the extent the Federal Government deems appropriate.

The Contractor agrees to include the above two clauses in each subcontract financed in whole or in part with Federal assistance provided by FTA. It is further agreed that the clauses shall not be modified, except to identify the subcontractor who will be subject to the provisions.

3. ACCESS TO RECORDS AND REPORTS - *Applies to All Procurement Types*

49 U.S.C. § 5325(g)
2 C.F.R. § 200.333
49 C.F.R. part 633

a. Record Retention. The Contractor will retain, and will require its subcontractors of all tiers to retain, complete and readily accessible records related in whole or in part to the contract, including, but not limited to, data, documents, reports, statistics, sub-agreements, leases, subcontracts, arrangements, other third party agreements of any type, and supporting materials related to those records.

b. Retention Period. The Contractor agrees to comply with the record retention requirements in accordance with 2 C.F.R. § 200.333. The Contractor shall maintain all books, records, accounts and reports required under this Contract for a period of at not less than three (3) years after the date of termination or expiration of this Contract, except in the event of litigation or settlement of claims arising from the performance of this Contract, in which case records shall be maintained until the disposition of all such litigation, appeals, claims or exceptions related thereto.

c. Access to Records. The Contractor agrees to provide sufficient access to FTA and its contractors to inspect and audit records and information related to performance of this contract as reasonably may be required.

d. Access to the Sites of Performance. The Contractor agrees to permit FTA and its contractors' access to the sites of performance under this contract as reasonably may be required.

4. FEDERAL CHANGES – *Applies to all Contracts*

49 CFR Part 18

Federal Changes - Contractor shall at all times comply with all applicable FTA regulations, policies, procedures and directives, including without limitation those listed directly or by reference in the Master Agreement between Purchaser and FTA, as they may be amended or promulgated from time to time during the term of this contract. Contractor's failure to so comply shall constitute a material breach of this contract.

5. CIVIL RIGHTS LAWS AND REGULATIONS – *Applies to All Procurement Types*

Civil Rights and Equal Opportunity – The WRTA is an Equal Opportunity Employer. As such, the WRTA agrees to comply with all applicable Federal civil rights laws and implementing regulations. Apart from inconsistent requirements imposed by Federal laws or regulations, the WRTA agrees to comply with the requirements of 49 U.S.C. § 5323(h) (3) by not using any Federal assistance awarded by FTA to support procurements using exclusionary or discriminatory specifications.

Under this Agreement, the Contractor shall at all times comply with the following requirements and shall include these requirements in each subcontract entered into as part thereof.

1. **Nondiscrimination**. In accordance with Federal transit law at 49 U.S.C. § 5332, the Contractor agrees that it will not discriminate against any employee or applicant for employment because of race, color, religion, national origin, sex, disability, or age. In addition, the Contractor agrees to comply with applicable Federal implementing regulations and other implementing requirements FTA may issue.

2. **Race, Color, Religion, National Origin, Sex.** In accordance with Title VII of the Civil Rights Act, as amended, 42 U.S.C. § 2000e et seq., and Federal transit laws at 49 U.S.C. § 5332, the Contractor agrees to comply with all applicable equal employment opportunity requirements of U.S. Department of Labor (U.S. DOL) regulations, "Office of Federal Contract Compliance Programs, Equal Employment Opportunity, Department of Labor," 41 C.F.R. chapter 60, and Executive Order No. 11246, "Equal Employment Opportunity in Federal Employment," September 24, 1965, 42 U.S.C. § 2000e note, as amended by any later Executive Order that amends or supersedes it, referenced in 42 U.S.C. § 2000e note. The Contractor agrees to take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, national origin, or sex (including sexual orientation and gender identity). Such action shall include,

but not be limited to, the following: employment, promotion, demotion or transfer, recruitment or recruitment advertising, layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. In addition, the Contractor agrees to comply with any implementing requirements FTA may issue.

3. **Age**. In accordance with the Age Discrimination in Employment Act, 29 U.S.C. §§ 621- 634, U.S. Equal Employment Opportunity Commission (U.S. EEOC) regulations, "Age Discrimination in Employment Act," 29 C.F.R. part 1625, the Age Discrimination Act of 1975, as amended, 42 U.S.C. § 6101 et seq., U.S. Health and Human Services regulations, "Nondiscrimination on the Basis of Age in Programs or Activities Receiving Federal Financial Assistance," 45 C.F.R. part 90, and Federal transit law at 49 U.S.C. § 5332, the Contractor agrees to refrain from discrimination against present and prospective employees for reason of age. In addition, the Contractor agrees to comply with any implementing requirements FTA may issue.

4. **Disabilities**. In accordance with section 504 of the Rehabilitation Act of 1973, as amended, 29 U.S.C. § 794, the Americans with Disabilities Act of 1990, as amended, 42 U.S.C. § 12101 et seq., the Architectural Barriers Act of 1968, as amended, 42 U.S.C. § 4151 et seq., and Federal transit law at 49 U.S.C. § 5332, the Contractor agrees that it will not discriminate against individuals on the basis of disability. In addition, the Contractor agrees to comply with any implementing requirements FTA may issue.

5. **Special DOL EEO Clause** – *Applies to construction contracts > $10,000;*

This contractor and subcontractor shall abide by the requirements of 41 CFR 60-1.4(a), 60-300.5(a) and 60-741.5(a). These regulations prohibit discrimination against qualified individuals based on their status as protected veterans or individuals with disabilities, and prohibit discrimination against all individuals based on their race, color, religion, sex, sexual orientation, gender identity or national origin. Moreover, these regulations require that covered prime contractors and subcontractors take affirmative action to employ and advance in employment individuals without regard to race, color, religion, sex, sexual orientation, gender identity, national origin, disability or veteran status.

6. INCORPORATION OF FEDERAL TRANSIT ADMINISTRATION (FTA) TERMS – *Applies to all Contracts*

The preceding provisions include, in part, certain Standard Terms and Conditions required by DOT, whether or not expressly set forth in the preceding contract provisions. All contractual provisions required by DOT, as set forth in FTA Circular 4220.1F are hereby incorporated by reference. Anything to the contrary herein notwithstanding, all FTA mandated terms shall be deemed to control in the event of a conflict with other provisions contained in this Agreement. The Contractor shall not perform any act, fail to perform any act, or refuse to comply with any the WRTA requests which would cause the WRTA to be in violation of the FTA terms and conditions.

7. ENERGY CONSERVATION – *Applies to All Procurements*

42 U.S.C. 6321 et seq.
49 C.F.R. part 622, subpart C

The contractor agrees to comply with mandatory standards and policies relating to energy efficiency, which are contained in the state energy conservation plan issued in compliance with the Energy Policy and Conservation Act.

8. TERMINATION – *Applies to all contracts >$10,000 if 49 CFR part 18 applies*
2 C.F.R. § 200.339

2 C.F.R. part 200, Appendix II (B)

Termination for Convenience (General Provision)

The WRTA may terminate this contract, in whole or in part, at any time by written notice to the Contractor when it is in the WRTA's best interest. The Contractor shall be paid its costs, including contract close-out costs, and profit on work performed up to the time of termination. The Contractor shall promptly submit its termination claim to WRTA to be paid the Contractor. If the Contractor has any property in its possession belonging to WRTA, the Contractor will account for the same, and dispose of it in the manner WRTA directs.

Termination for Default [Breach or Cause] (General Provision)

If the Contractor does not deliver supplies in accordance with the contract delivery schedule, or if the contract is for services, the Contractor fails to perform in the manner called for in the contract, or if the Contractor fails to comply with any other provisions of the contract, the WRTA may terminate this contract for default. Termination shall be effected by serving a Notice of Termination on the Contractor setting forth the manner in which the Contractor is in default. The Contractor will be paid only the contract price for supplies delivered and accepted, or services performed in accordance with the manner of performance set forth in the contract.

If it is later determined by the WRTA that the Contractor had an excusable reason for not performing, such as a strike, fire, or flood, events which are not the fault of or are beyond the control of the Contractor, the WRTA, after setting up a new delivery of performance schedule, may allow the Contractor to continue work, or treat the termination as a Termination for Convenience.

Opportunity to Cure (General Provision)

The WRTA, in its sole discretion may, in the case of a termination for breach or default, allow the Contractor [an appropriately short period of time] in which to cure the defect. In such case, the Notice of Termination will state the time period in which cure is permitted and other appropriate conditions

If Contractor fails to remedy to WRTA's satisfaction the breach or default of any of the terms, covenants, or conditions of this Contract within [10 days] after receipt by Contractor of written notice from WRTA setting forth the nature of said breach or default, WRTA shall have the right to terminate the contract without any further obligation to Contractor. Any such termination for default shall not in any way operate to preclude WRTA from also pursuing all available remedies against Contractor and its sureties for said breach or default.

Waiver of Remedies for any Breach

In the event that WRTA elects to waive its remedies for any breach by Contractor of any covenant, term or condition of this contract, such waiver by WRTA shall not limit WRTA's remedies for any succeeding breach of that or of any other covenant, term, or condition of this contract.

Termination for Convenience (Professional or Transit Service Contracts)

The WRTA, by written notice, may terminate this contract, in whole or in part, when it is in the WRTA's interest. If this contract is terminated, the WRTA shall be liable only for payment under the payment provisions of this contract for services rendered before the effective date of termination.

Termination for Default (Supplies and Service)

If the Contractor fails to deliver supplies or to perform the services within the time specified in this contract or any extension, or if the Contractor fails to comply with any other provisions of this contract, the WRTA may

terminate this contract for default. The WRTA shall terminate by delivering to the Contractor a Notice of Termination specifying the nature of the default. The Contractor will only be paid the contract price for supplies delivered and accepted, or services performed in accordance with the manner or performance set forth in this contract.

If, after termination for failure to fulfill contract obligations, it is determined that the Contractor was not in default, the rights and obligations of the parties shall be the same as if the termination had been issued for the convenience of the WRTA.

Termination for Default (Transportation Services)

If the Contractor fails to pick up the commodities or to perform the services, including delivery services, within the time specified in this contract or any extension, or if the Contractor fails to comply with any other provisions of this contract, the WRTA may terminate this contract for default. The WRTA shall terminate by delivering to the Contractor a Notice of Termination specifying the nature of default. The Contractor will only be paid the contract price for services performed in accordance with the manner of performance set forth in this contract.

If this contract is terminated while the Contractor has possession of WRTA goods, the Contractor shall, upon direction of the WRTA, protect and preserve the goods until surrendered to the WRTA or its agent. The Contractor and WRTA shall agree on payment for the preservation and protection of goods. Failure to agree on an amount will be resolved under the Dispute clause.

If, after termination for failure to fulfill contract obligations, it is determined that the Contractor was not in default, the rights and obligations of the parties shall be the same as if the termination had been issued for the convenience of the WRTA.

Termination for Default (Construction)

If the Contractor refuses or fails to prosecute the work or any separable part, with the diligence that will ensure its completion within the time specified in this contract or any extension or fails to complete the work within this time, or if the Contractor fails to comply with any other provision of this contract, WRTA may terminate this contract for default. The WRTA shall terminate by delivering to the Contractor a Notice of Termination specifying the nature of the default. In this event, the WRTA may take over the work and compete it by contract or otherwise, and may take possession of and use any materials, appliances, and plant on the work site necessary for completing the work. The Contractor and its sureties shall be liable for any damage to the WRTA resulting from the Contractor's refusal or failure to complete the work within specified time, whether or not the Contractor's right to proceed with the work is terminated. This liability includes any increased costs incurred by the WRTA in completing the work.

The Contractor's right to proceed shall not be terminated nor shall the Contractor be charged with damages under this clause if:

1. The delay in completing the work arises from unforeseeable causes beyond the control and without the fault or negligence of the Contractor. Examples of such causes include: acts of God, acts of WRTA, acts of another contractor in the performance of a contract with WRTA, epidemics, quarantine restrictions, strikes, freight embargoes; and

2. The Contractor, within [10] days from the beginning of any delay, notifies WRTA in writing of the causes of delay. If, in the judgment of WRTA, the delay is excusable, the time for completing the work shall be extended. The judgment of WRTA shall be final and conclusive for the parties, but subject to appeal under the Disputes clause(s) of this contract.

If, after termination of the Contractor's right to proceed, it is determined that the Contractor was not in default, or that the delay was excusable, the rights and obligations of the parties will be the same as if the termination had been issued for the convenience of WRTA.

Termination for Convenience or Default (Architect and Engineering)

The WRTA may terminate this contract in whole or in part, for the WRTA's convenience or because of the failure of the Contractor to fulfill the contract obligations. The WRTA shall terminate by delivering to the Contractor a Notice of Termination specifying the nature, extent, and effective date of the termination. Upon receipt of the notice, the Contractor shall (1) immediately discontinue all services affected (unless the notice directs otherwise), and (2) deliver to the WRTA 's Contracting Officer all data, drawings, specifications, reports, estimates, summaries, and other information and materials accumulated in performing this contract, whether completed or in process. WRTA has a royalty-free, nonexclusive, and irrevocable license to reproduce, publish or otherwise use, all such data, drawings, specifications, reports, estimates, summaries, and other information and materials.

If the termination is for the convenience of the WRTA, the WRTA's Contracting Officer shall make an equitable adjustment in the contract price but shall allow no anticipated profit on unperformed services.

If the termination is for failure of the Contractor to fulfill the contract obligations, the WRTA may complete the work by contact or otherwise and the Contractor shall be liable for any additional cost incurred by the WRTA.

If, after termination for failure to fulfill contract obligations, it is determined that the Contractor was not in default, the rights and obligations of the parties shall be the same as if the termination had been issued for the convenience of WRTA.

Termination for Convenience or Default (Cost-Type Contracts)

The WRTA may terminate this contract, or any portion of it, by serving a Notice of Termination on the Contractor. The notice shall state whether the termination is for convenience of WRTA or for the default of the Contractor. If the termination is for default, the notice shall state the manner in which the Contractor has failed to perform the requirements of the contract. The Contractor shall account for any property in its possession paid for from funds received from the WRTA, or property supplied to the Contractor by the WRTA. If the termination is for default, the WRTA may fix the fee, if the contract provides for a fee, to be paid the Contractor in proportion to the value, if any, of work performed up to the time of termination. The Contractor shall promptly submit its termination claim to the WRTA and the parties shall negotiate the termination settlement to be paid the Contractor.

If the termination is for the convenience of WRTA, the Contractor shall be paid its contract close-out costs, and a fee, if the contract provided for payment of a fee, in proportion to the work performed up to the time of termination.

If, after serving a Notice of Termination for Default, the WRTA determines that the Contractor has an excusable reason for not performing, the WRTA, after setting up a new work schedule, may allow the Contractor to continue work, or treat the termination as a Termination for Convenience.

9. GOVERNMENT-WIDE DEBARMENT AND SUSPENSION – *Applies to All Contracts >$25,000*

2 C.F.R. part 180
2 C.F.R part 1200
2 C.F.R. § 200.213
2 C.F.R. part 200 Appendix II (I)
Executive Order 12549

Executive Order 12689

Debarment, Suspension, Ineligibility and Voluntary Exclusion

The Contractor shall comply and facilitate compliance with U.S. DOT regulations, "Nonprocurement Suspension and Debarment," 2 C.F.R. part 1200, which adopts and supplements the U.S. Office of Management and Budget (U.S. OMB) "Guidelines to Agencies on Governmentwide Debarment and Suspension (Nonprocurement)," 2 C.F.R. part 180. These provisions apply to each contract at any tier of $25,000 or more, and to each contract at any tier for a federally required audit (irrespective of the contract amount), and to each contract at any tier that must be approved by an FTA official irrespective of the contract amount. As such, the Contractor shall verify that its principals, affiliates, and subcontractors are eligible to participate in this federally funded contract and are not presently declared by any Federal department or WRTA to be:

a) Debarred from participation in any federally assisted Award;

b) Suspended from participation in any federally assisted Award;

c) Proposed for debarment from participation in any federally assisted Award;

d) Declared ineligible to participate in any federally assisted Award;

e) Voluntarily excluded from participation in any federally assisted Award; or

f) Disqualified from participation in ay federally assisted Award.

By signing and submitting its bid or proposal, the bidder or proposer certifies as follows:

The certification in this clause is a material representation of fact relied upon by the WRTA. If it is later determined by the WRTA that the bidder or proposer knowingly rendered an erroneous certification, in addition to remedies available to the WRTA, the Federal Government may pursue available remedies, including but not limited to suspension and/or debarment. The bidder or proposer agrees to comply with the requirements of 2 C.F.R. part 180, subpart C, as supplemented by 2 C.F.R. part 1200, while this offer is valid and throughout the period of any contract that may arise from this offer. The bidder or proposer further agrees to include a provision requiring such compliance in its lower tier covered transactions.

10. BUY AMERICA REQUIREMENTS – *Applies to Contracts >$150,000*

49 U.S.C. 5323(j)
49 C.F.R. part 661

Buy America

The Contractor agrees to comply with 49 U.S.C. 5323(j) and 49 C.F.R. part 661, which provide that Federal funds may not be obligated unless all steel, iron, and manufactured products used in FTA funded projects are produced in the United States, unless a waiver has been granted by FTA or the product is subject to a general waiver. General waivers are listed in 49 C.F.R. § 661.7. Separate requirements for rolling stock are set out at 49 U.S.C. 5323(j)(2)(C) and 49 C.F.R. § 661.11.

The [bidder or offeror] must submit to WRTA the appropriate Buy America certification below with its [bid or offer]. Bids or offers that are not accompanied by a completed Buy America certification will be rejected as nonresponsive.

In accordance with 49 C.F.R. § 661.6, for the procurement of steel, iron, or manufactured products, use the certifications below.

Certificate of Compliance with Buy America Requirements

Certificate of Non-Compliance with Buy America Requirements

Certificate of Compliance with Buy America Rolling Stock Requirements

Certificate of Non-Compliance with Buy America Rolling Stock Requirements

11. VIOLATION AND BREACH OF CONTRACT – *Applies to all Contracts >$250,000*

2 C.F.R. § 200.326
2 C.F.R. part 200, Appendix II (A)

Rights and Remedies of the WRTA The WRTA shall have the following rights in the event that the WRTA deems the Contractor guilty of a breach of any term under the Contract.

1. The right to take over and complete the work or any part thereof as WRTA for and at the expense of the Contractor, either directly or through other contractors;

2. The right to cancel this Contract as to any or all of the work yet to be performed;

3. The right to specific performance, an injunction or any other appropriate equitable remedy; and

4. The right to money damages.

Rights and Remedies of Contractor Inasmuch as the Contractor can be adequately compensated by money damages for any breach of this Contract, which may be committed by the WRTA, the Contractor expressly agrees that no default, act or omission of the WRTA shall constitute a material breach of this Contract, entitling Contractor to cancel or rescind the Contract (unless the WRTA directs Contractor to do so) or to suspend or abandon performance.

Remedies Substantial failure of the Contractor to complete the Project in accordance with the terms of this Agreement will be a default of this Agreement. In the event of a default, the WRTA will have all remedies in law and equity, including the right to specific performance, without further assistance, and the rights to termination or suspension as provided herein. The Contractor recognizes that in the event of a breach of this Agreement by the Contractor before the WRTA takes action contemplated herein, the WRTA will provide the Contractor with sixty (60) days written notice that the WRTA considers that such a breach has occurred and will provide the Contractor a reasonable period of time to respond and to take necessary corrective action.

Disputes - Disputes arising in the performance of this Contract that are not resolved by agreement of the parties shall be decided in writing by the authorized representative of WRTA's Administrator. This decision shall be final and conclusive unless within [10] days from the date of receipt of its copy, the Contractor mails or otherwise furnishes a written appeal to the Administrator. In connection with any such appeal, the Contractor shall be afforded an opportunity to be heard and to offer evidence in support of its position. The decision of the Administrator shall be binding upon the Contractor and the Contractor shall abide be the decision.

In the event that a resolution of the dispute is not mutually agreed upon, the parties can agree to mediate the dispute or proceed with litigation. Notwithstanding any provision of this section, or any other provision of this Contract, it is expressly agreed and understood that any court proceeding arising out of a dispute under the

Contract shall be heard by a Court de novo and the court shall not be limited in such proceeding to the issue of whether the Authority acted in an arbitrary, capricious or grossly erroneous manner.

Pending final settlement of any dispute, the parties shall proceed diligently with the performance of the Contract, and in accordance with the WRTA's direction or decisions made thereof.

Performance during Dispute Unless otherwise directed by WRTA, Contractor shall continue performance under this Contract while matters in dispute are being resolved.

Claims for Damages Should either party to the Contract suffer injury or damage to person or property because of any act or omission of the party or of any of its employees, agents or others for whose acts it is legally liable, a claim for damages therefor shall be made in writing to such other party within a reasonable time after the first observance of such injury or damage.

Remedies Unless this Contract provides otherwise, all claims, counterclaims, disputes and other matters in question between the WRTA and the Contractor arising out of or relating to this agreement or its breach will be decided by arbitration if the parties mutually agree, or in a court of competent jurisdiction within the State in which the WRTA is located.

Rights and Remedies The duties and obligations imposed by the Contract documents and the rights and remedies available thereunder shall be in addition to and not a limitation of any duties, obligations, rights and remedies otherwise imposed or available by law. No action or failure to act by the WRTA or Contractor shall constitute a waiver of any right or duty afforded any of them under the Contract, nor shall any such action or failure to act constitute an approval of or acquiescence in any breach thereunder, except as may be specifically agreed in writing.

12. LOBBYING RESTRICTIONS – *Applies to All Contracts >$100,000*

31 U.S.C. § 1352
2 C.F.R. § 200.450
2 C.F.R. part 200 appendix II (J)
49 C.F.R. part 20

The undersigned certifies, to the best of his or her knowledge and belief, that:

1. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of an WRTA, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

2. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any WRTA, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

3. The undersigned shall require that the language of this certification be included in the award documents for all sub-awards at all tiers (including subcontracts, sub-grants, and contracts under grants, loans, and cooperative agreements) and that all subWRTAs shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

13. CLEAN AIR ACT AND FEDERAL WATER POLLUTION CONTROL ACT – *Applies to All Procurement Types >$150,000*

42 U.S.C. §§ 7401 – 7671q
33 U.S.C. §§ 1251-1387
2 C.F.R. part 200, Appendix II (G)

The Contractor agrees:

1) It will not use any violating facilities;

2) It will report the use of facilities placed on or likely to be placed on the U.S. EPA "List of Violating Facilities;"

3) It will report violations of use of prohibited facilities to FTA; and

4) It will comply with the inspection and other requirements of the Clean Air Act, as amended, (42 U.S.C. §§ 7401 – 7671q); and the Federal Water Pollution Control Act as amended, (33 U.S.C. §§ 1251-1387).

14. CARGO PREFERENCE REQUIREMENTS – *Applies to Rolling Stock, Construction, Material & Supplies that may be transported by ocean vessel.*

46 U.S.C. § 55305
46 C.F.R. part 381

Cargo Preference - Use of United States-Flag Vessels

The contractor agrees:

a. to use privately owned United States-Flag commercial vessels to ship at least 50 percent of the gross tonnage (computed separately for dry bulk carriers, dry cargo liners, and tankers) involved, whenever shipping any equipment, material, or commodities pursuant to the underlying contract to the extent such vessels are available at fair and reasonable rates for United States-Flag commercial vessels;

b. to furnish within 20 working days following the date of loading for shipments originating within the United States or within 30 working days following the date of loading for shipments originating outside the United States, a legible copy of a rated, "on-board" commercial ocean bill-of-lading in English for each shipment of cargo described in the preceding paragraph to the Division of National Cargo, Office of Market Development, Maritime Administration, Washington, DC 20590 and to the WRTA (through the contractor in the case of a subcontractor's bill-of-lading.); and

c. to include these requirements in all subcontracts issued pursuant to this contract when the subcontract may involve the transport of equipment, material, or commodities by ocean vessel.

15. FLY AMERICA – *Applies to All Procurements involving foreign transport or travel by air*

49 U.S.C. § 40118
41 C.F.R. part 301-10
48 C.F.R. part 47.4

Fly America Requirements

a) Definitions. As used in this clause—

> "International air transportation" means transportation by air between a place in the United States and a place outside the United States or between two places both of which are outside the United States.
> "United States" means the 50 States, the District of Columbia, and outlying areas.
> "U.S.-flag air carrier" means an air carrier holding a certificate under 49 U.S.C. Chapter 411.

b) When Federal funds are used to fund travel, Section 5 of the International Air Transportation Fair Competitive Practices Act of 1974 (49 U.S.C. 40118) (Fly America Act) requires contractors, WRTAs, and others use U.S.-flag air carriers for U.S. Government-financed international air transportation of personnel (and their personal effects) or property, to the extent that service by those carriers is available. It requires the Comptroller General of the United States, in the absence of satisfactory proof of the necessity for foreign-flag air transportation, to disallow expenditures from funds, appropriated or otherwise established for the account of the United States, for international air transportation secured aboard a foreign-flag air carrier if a U.S.-flag air carrier is available to provide such services.

c) If available, the Contractor, in performing work under this contract, shall use U.S.-flag carriers for international air transportation of personnel (and their personal effects) or property.

d) In the event that the Contractor selects a carrier other than a U.S.-flag air carrier for international air transportation, the Contractor shall include a statement on vouchers involving such transportation essentially as follows:

Statement of Unavailability of U.S.-Flag Air Carriers

International air transportation of persons (and their personal effects) or property by U.S.-flag air carrier was not available or it was necessary to use foreign-flag air carrier service for the following reasons. See FAR § 47.403. [State reasons]: _____ *(End of statement)*

e) The Contractor shall include the substance of this clause, including this paragraph (e), in each subcontract or purchase under this contract that may involve international air transportation. *(End of Clause)*

16. DAVIS-BACON AND COPELAND ANTI-KICKBACK ACTS – *Applies to Construction Contracts Valued over $2,000*

(1) **Minimum wages** - (i) All laborers and mechanics employed or working upon the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the

particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR Part 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classifications and wage rates conformed under paragraph (1)(ii) of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

(ii)(A) The contracting officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(1) Except with respect to helpers as defined as 29 CFR 5.2(n)(4), the work to be performed by the classification requested is not performed by a classification in the wage determination; and

(2) The classification is utilized in the area by the construction industry; and

(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination; and

(4) With respect to helpers as defined in 29 CFR 5.2(n)(4), such a classification prevails in the area in which the work is performed.

(B) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(C) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(D) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs (a)(1)(ii) (B) or (C) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account asset for the meeting of obligations under the plan or program.

(v)(A) The contracting officer shall require that any class of laborers or mechanics which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefor only when the following criteria have been met:

(1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(2) The classification is utilized in the area by the construction industry; and

(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(B) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(C) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination with 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(D) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs (a)(1)(v) (B) or (C) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(2) **Withholding** - The Worcester Regional Transit Authority shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so

much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), all or part of the wages required by the contract, the Worcester Regional Transit Authority may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

(3) **Payrolls and basic records** - (i) Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work (or under the United States Housing Act of 1937, or under the Housing Act of 1949, in the construction or development of the project). Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(ii)(A) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the Worcester Regional Transit Authority for transmission to the Federal Transit Administration. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under section 5.5(a)(3)(i) of Regulations, 29 CFR part 5. This information may be submitted in any form desired. Optional Form WH-347 is available for this purpose and may be purchased from the Superintendent of Documents (Federal Stock Number 029-005-00014-1), U.S. Government Printing Office, Washington, DC 20402. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors.

(B) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(1) That the payroll for the payroll period contains the information required to be maintained under section 5.5(a)(3)(i) of Regulations, 29 CFR part 5 and that such information is correct and complete;

(2) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;

(3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(C) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph (a)(3)(ii)(B) of this section.

(D) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

(iii) The contractor or subcontractor shall make the records required under paragraph (a)(3)(i) of this section available for inspection, copying, or transcription by authorized representatives of the Federal Transit Administration or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the Federal agency may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

(4) **Apprentices and trainees** - (i) Apprentices - Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Bureau of Apprenticeship and Training, or with a State Apprenticeship Agency recognized by the Bureau, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Bureau of Apprenticeship and Training or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator of the Wage and Hour Division of the U.S. Department of Labor determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Bureau of Apprenticeship and Training, or a State Apprenticeship Agency recognized by the Bureau, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) Trainees - Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) Equal employment opportunity - The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

(5) **Compliance with Copeland Act requirements** - The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

(6) **Subcontracts** - The contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR 5.5(a)(1) through (10) and such other clauses as the Federal Transit Administration may by appropriate instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

(7) **Contract termination: debarment** - A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

(8) **Compliance with Davis-Bacon and Related Act requirements** - All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

(9) **Disputes concerning labor standards** - Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

(10) **Certification of eligibility** - (i) By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

17. DISADVANTAGED BUSINESS ENTERPRISE (DBE) – *Applies to All Procurement Types*
49 C.F.R. part 26

The following contract clause is required in all DOT-assisted prime and subcontracts:

a. This contract is subject to the requirements of Title 49, Code of Federal Regulations, Part 26, *Participation by Disadvantaged Business Enterprises in Department of Transportation Financial Assistance Programs.* The WRTA's overall goal for DBE participation is 0.66%**.**

b. The contractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of this DOT-assisted contract. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the WRTA deems appropriate, which may include, but is not limited to:

(1) Withholding monthly progress payments;
(2) Assessing sanctions;
(3) Liquidated damages; and/or
(4) Disqualifying the contractor from future bidding as non-responsible. 49 C.F.R. § 26.13(b).

Each subcontract the contractor signs with a subcontractor must include the assurance in this paragraph (see 49 CFR 26.13(b)).

c. The successful bidder/offeror will be required to report its DBE participation obtained through race-neutral means throughout the period of performance.

d. PROMPT PAYMENT - The contractor is required to pay its subcontractors performing work related to this contract for satisfactory performance of that work no later than 30 days after the contractor's receipt of payment for that work from the WRTA**.** In addition, the contractor is required to return any retainage payments to those subcontractors within 30 days after the subcontractor's work related to this contract is satisfactorily completed.

e. The contractor must promptly notify the WRTA, whenever a DBE subcontractor performing work related to this contract is terminated or fails to complete its work, and must make good faith efforts to engage another DBE subcontractor to perform at least the same amount of work. The contractor may not terminate any DBE subcontractor and perform that work through its own forces or those of an affiliate without prior written consent of the WRTA**.**

18. RECYCLED PRODUCTS – *Applies to Operations/Management/Subrecipients; Rolling Stock; Construction Procurements - EPA Selected Items >$10,000 Annually*

42 U.S.C. § 6962
40 C.F.R. part 247
2 C.F.R. part § 200.322

Recovered Materials The Contractor agrees to provide a preference for those products and services that conserve natural resources, protect the environment, and are energy efficient by complying with and facilitating compliance with Section 6002 of the Resource Conservation and Recovery Act, as amended, 42 U.S.C. § 6962, and U.S. Environmental Protection WRTA (U.S. EPA), "Comprehensive Procurement Guideline for Products Containing Recovered Materials," 40 C.F.R. part 247.

19. AMERICANS WITH DISABILITIES ACT (ADA) – *Applies to all A&E, Operations/Management/Subrecipients; Rolling Stock; Construction Contracts*

ADA Access - This requirement applies to contracts for Architectural and Engineering Services. The contractor agrees to comply with the requirements of 49 U.S.C. § 5301 (d), which states the Federal policy that the elderly and persons with disabilities have the same right as other persons to use mass transportation service and facilities, and that special efforts shall be made in planning and designing those services and facilities to implement that policy. The contractor also agrees to comply with all applicable requirements of section 504 of the Rehabilitation Act of 1973, as amended, 29 U.S.C. § 794, which prohibits discrimination on the basis of handicaps, with the Americans with Disabilities Act of 1990 (ADA), as amended, 42 U.S.C. §§ 12101 et seq., which requires that accessible facilities and services be made available to persons with disabilities, including any subsequent amendments to that Act, and with the Architectural Barriers act of 1968, as amended, 42 U.S.C. §§ 4151 et seq., which requires that buildings and public accommodations be accessible to persons with disabilities, including any subsequent amendments to that Act. In addition, the contractor agrees to comply with any and all applicable requirements issued by the FTA, DOT, DOJ, U.S. GSA, U.S. EEOC, U.S. FCC, any subsequent amendments thereto and any other nondiscrimination statute(s) that may apply to the Project.

20. PROHIBITION ON CERTAIN TELECOMMUNICATIONS AND VIDEO SURVEILLANCE SERVICES OR EQUIPMENT – *Applies to All Procurements*

2 CFR 200.216

The contractor is prohibited from obligating or expending Federal funds to:

1. Procure or obtain

2. Extend or renew a contract to procure or obtain; or

3. Enter into a contract (or extend or renew a contract) to procure or obtain equipment, services, or systems that use covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system. As described in Public Law 115-232, section 889, "covered telecommunications equipment or services" is:

   a. Telecommunications equipment provided by Huawei Technologies Company or ZTE Corporation (or any subsidiary or affiliate of such entities)

   b. For the purpose of public safety, security of government facilities, physical security surveillance of critical infrastructure, and other national security purposes, video surveillance and telecommunications equipment produced by Hytera Communications Corporation, Hangzhou Hikvision Digital Technology Company, or Dahua Technology Company (or any subsidiary or affiliate of such entities).

   c. Telecommunications or video surveillance services provided by such entities or using such equipment.

   d. Telecommunications or video surveillance equipment or services produced or provided by an entity that the Secretary of Defense, in consultation with the Director of National Intelligence or

the Director of the Federal Bureau of Investigation, reasonably believes to be an entity owned or controlled by, or otherwise connected to, the government of a covered foreign country.

The contractor shall not provide covered telecommunications equipment or services in the performance of this contract.

21. NOTICE TO FTA AND U.S. DOT INSPECTOR GENERAL OF INFORMATION RELATED TO FRAUD, WASTE, ABUSE, OR OTHER LEGAL MATTERS – *Applies to All Contracts in excess of $25,000*

FTA Master Agreement §39(b)

If a current or prospective legal matter that may affect the Federal Government emerges, the Contractor must promptly notify the Worcester Regional Transit Authority (WRTA), which will promptly notify the FTA Chief Counsel and FTA Regional Counsel for the Region in which the WRTA is located. The Contractor must include an equivalent provision in its sub-agreements at every tier, for any agreement that is a "covered transaction" according to 2 C.F.R. §§ 180.220 and 1200.220.

- The types of legal matters that require notification include, but are not limited to, a major dispute, breach, default, litigation, or naming the Federal Government as a party to litigation or a legal disagreement in any forum for any reason.

- Matters that may affect the Federal Government include, but are not limited to, the Federal Government's interests in the Award, the accompanying Underlying Agreement between the FTA and the WRTA, and any Amendments thereto, or the Federal Government's administration or enforcement of federal laws, regulations, and requirements.

Additional Notice to U.S. DOT Inspector General. The Contractor must promptly notify the WRTA, which will promptly notify the U.S. DOT Inspector General in addition to the FTA Chief Counsel or Regional Counsel for the Region in which the WRTA is located, if the Contractor has knowledge of potential fraud, waste, or abuse occurring on a Project receiving assistance from FTA. The notification provision applies if a person has or may have submitted a false claim under the False Claims Act, 31 U.S.C. § 3729, et seq., or has or may have committed a criminal or civil violation of law pertaining to such matters as fraud, conflict of interest, bid rigging, misappropriation or embezzlement, bribery, gratuity, or similar misconduct involving federal assistance. This responsibility occurs whether the Project is subject to this Agreement or another agreement with the WRTA involving a principal, officer, employee, agent, or Third Party Participant of the Contractor. It also applies to subcontractors at any tier. Knowledge, as used in this paragraph, includes, but is not limited to, knowledge of a criminal or civil investigation by a Federal, state, or local law enforcement or other investigative agency, a criminal indictment or civil complaint, or probable cause that could support a criminal indictment, or any other credible information in the possession of the Contractor. In this paragraph, "promptly" means to refer information without delay and without change. This notification provision applies to all divisions of the Contractor, including divisions tasked with law enforcement or investigatory functions.

22. SAFE OPERATION OF MOTOR VEHICLES – *Applies to All Procurements*

23 U.S.C. part 402
Executive Order No. 13043
Executive Order No. 13513
U.S. DOT Order No. 3902.10
Seat Belt Use

Seat Belt Use: The Contractor is encouraged to adopt and promote on-the-job seat belt use policies and programs for its employees and other personnel that operate company-owned vehicles, company- A-60 rented vehicles, or personally operated vehicles. The terms "company-owned" and "company-leased" refer to vehicles owned or leased either by the Contractor or WRTA.

Distracted Driving: The Contractor agrees to adopt and enforce workplace safety policies to decrease crashes caused by distracted drivers, including policies to ban text messaging while using an electronic device supplied by an employer, and driving a vehicle the driver owns or rents, a vehicle Contactor owns, leases, or rents, or a privately-owned vehicle when on official business in connection with the work performed under this agreement.

23. VETERANS HIRING PREFERENCE – *Applies to Construction Procurements >$150,000*
49 U.S.C. 5325(k) et seq.

Veterans Employment - WRTAs and sub-WRTAs of Federal financial assistance under this chapter shall ensure that contractors working on a capital project funded using such assistance give a hiring preference, to the extent practicable, to veterans (as defined in section 2108 of title 5) who have the requisite skills and abilities to perform the construction work required under the contract. This subsection shall not be understood, construed or enforced in any manner that would require an employer to give a preference to any veteran over any equally qualified applicant who is a member of any racial or ethnic minority, female, an individual with a disability, or a former employee.

24. CONTRACT WORK HOURS AND SAFETY STANDARDS ACT –*Applies to Contracts >$250,000*

1. Overtime requirements - No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

2. Violation; liability for unpaid wages; liquidated damages - In the event of any violation of the clause set forth in paragraph (1) of this section the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (1) of this section, in the sum of $10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (1) of this section.

3. Withholding for unpaid wages and liquidated damages - The Worcester Regional Transit Authority shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (2) of this section.

4. Subcontracts - The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraphs (1) through (4) of this section and also a clause requiring the subcontractors to include these clauses in

any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (1) through (4) of this section.

25. BONDING REQUIREMENTS - *Applies to Construction Procurements > $250,000*

2 C.F.R. § 200.325
31 C.F.R. part 223
Bond Requirements

Bid Guarantee Bidders shall furnish a bid guaranty in the form of a bid bond, or certified treasurer's or cashier's check issued by a responsible bank or trust company, made payable to the Worcester Regional Transit Authority (WRTA). The amount of such guaranty shall be equal to **5%** of the total bid price.

In submitting this bid, it is understood and agreed by bidder that the WRTA reserves the right to reject any and all bids, or part of any bid, and it is agreed that the Bid may not be withdrawn for a period of [90] days subsequent to the opening of bids, without the written consent of the WRTA.

It is also understood and agreed that if the undersigned bidder should withdraw any part or all of his bid within [90] days after the bid opening without the written consent of the WRTA, or refuse or be unable to enter into this Contract as provided above, or refuse or be unable to furnish adequate and acceptable Performance and Payment Bonds, or refuse or be unable to furnish adequate and acceptable insurance, as provided above, it shall forfeit its bid guaranty to the extent WRTA'S damages occasioned by such withdrawal, or refusal, or inability to enter into an agreement, or provide adequate security thereof.

It is further understood and agreed that to the extent the defaulting bidder's bid guaranty shall prove inadequate to fully recompense WRTA for the damages occasioned by default, then the undersigned bidder agrees to indemnify WRTA and pay over to WRTA the difference between the bid guarantee and WRTA'S total damages so as to make WRTA whole.

The undersigned understands that any material alteration of any of the above or any of the material contained herein, other than that requested will render the bid unresponsive.

Performance Guarantee A Performance Guarantee in the amount of 100% of the Contract value is required by the WRTA to ensure faithful performance of the Contract. Either a Performance Bond or an Irrevocable Stand-By Letter of Credit shall be provided by the Contractor and shall remain in full force for the term of the Agreement. The successful Bidder shall certify that it will provide the requisite Performance Guarantee to the WRTA within ten (10) business days from Contract execution. The WRTA requires all Performance Bonds to be provided by a fully qualified surety company acceptable to the WRTA and listed as a company currently authorized under 31 C.F.R. part 22 as possessing a Certificate of Authority as described hereunder. WRTA may require additional performance bond protection when the contract price is increased. The increase in protection shall generally equal 100 percent of the increase in contract price. The WRTA may secure additional protection by directing the Contractor to increase the amount of the existing bond or to obtain an additional bond.

If the Bidder chooses to provide a Letter of Credit as its Performance Guarantee, the Bidder shall furnish with its bid, certification that an Irrevocable Stand-By Letter of Credit will be furnished should the Bidder become the successful Contractor. The Bidder shall also provide a statement from the banking institution certifying that an Irrevocable Stand-By Letter of Credit for the action will be provided if the Contract is awarded to the Bidder. The Irrevocable Stand-By Letter of Credit will only be accepted by the WRTA if:

1. A bank in good standing issues it. The WRTA will not accept a Letter of Credit from an entity other than a bank.

2. It is in writing and signed by the issuing bank.

3. It conspicuously states that it is an irrevocable, non-transferable, "standby" Letter of Credit.

4. The WRTA is identified as the Beneficiary.

5. It is in an amount equal to 100% of the Contract value. This amount must be in U.S. dollars.

6. The effective date of the Letter of Credit is the same as the effective date of the Contract

7. The expiration date of the Letter of Credit coincides with the term of this Agreement.

8. It indicates that it is being issued in order to support the obligation of the Contractor to perform under the Contract. It must specifically reference the Contract between the WRTA and the Contractor the work stipulated herein.

The issuing bank's obligation to pay will arise upon the presentation of the original Letter of Credit and a certificate and draft (similar to the attached forms contained in Sections X and Y) to the issuing bank's representative at a location and time to be determined by the parties. This documentation will indicate that the Contractor is in default under the Contract.

Payment Bonds A Labor and Materials Payment Bond equal to the full value of the contract must be furnished by the contractor to WRTA as security for payment by the Contractor and subcontractors for labor, materials, and rental of equipment. The bond may be issued by a fully qualified surety company acceptable to (WRTA) and listed as a company currently authorized under 31 C.F.R. part 223 as possessing a Certificate of Authority as described thereunder.

Sample Bond Certifications

Performance Guarantee Certification

The undersigned hereby certifies that the Bidder shall provide a Performance Guarantee in accordance with the Specifications.

Designate below which form of Performance Guarantee shall be provided:

_____Performance Bond

_____Irrevocable Stand-By-Letter of Credit

BIDDER'S NAME:_____

AUTHORIZED SIGNATURE: _____

TITLE: _____

DATE: _____

Performance Bond

KNOW ALL MEN BY THESE PRESENTS: that _____
(Insert full name and address and legal title of Contractor) as Principal, hereinafter called Contractor,
_____and (Insert full name and address or legal title of Surety) as Surety, hereinafter called Surety, are held and firmly bound unto WRTA as Obligee, hereinafter called Authority, in the amount of Dollars _____ ($) for the payment whereof Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, Contractor has by written agreement dated , 20____, entered into a contract with the WRTA for Contract No._____, which contract is by reference made a part hereof, and is hereinafter referred to as the Contract.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if Contractor shall promptly and faithfully perform said Contract, then this obligation shall be null and void; otherwise it shall remain in full force and effect.

The Surety hereby waives notice of any alteration or extension of time made by the WRTA.

Whenever Contractor shall be, and is declared by the WRTA to be in default under the Contract, the WRTA having performed WRTA'S obligations thereunder, the Surety may promptly remedy the default, or shall promptly

1. Complete the Contract in accordance with its terms and conditions, or

2. Obtain a bid or bids for completing the Contract in accordance with its terms and conditions, and upon determination by Surety of the lowest responsible bidder, or, if the WRTA elects, upon determination by the WRTA and the Surety jointly of the lowest responsible bidder, arrange for a contract between such bidder and the Authority, and make available as Work progresses (even though there should be a default or a succession of defaults under the contract or contracts of completion arranged under this paragraph) sufficient funds to pay the cost of completion less the balance of the contract price; but not exceeding, the amount set forth in the first paragraph hereof. The term "balance of the contract price," as used in this paragraph, shall mean the total amount payable by the WRTA to Contractor under the Contract and any amendments thereto, less the amount properly paid by the WRTA to Contractor.

Any suit under this bond must be instituted before the expiration of two (2) years from the date on which final payment under the Contract falls due.

No right of action shall accrue on this bond to or for the use of any person or corporation other than the WRTA or the heirs, executors, administrators or successors of the WRTA.

Signed and sealed this _____day of_____, 20____.

WITNESS PRINCIPAL

_____ (SEAL)

_____ (Title)

WITNESS SURETY

_____ (SEAL)

_____ (Title)

Attach hereto proof of authority of officers or agents to sign bond.

Irrevocable Stand-By Letter Of Credit Certificate

The undersigned states that he/she is of the_____ of the

(Title)

_____(The "Beneficiary") and hereby

(Name of Beneficiary)

Certifies on behalf of the Beneficiary to _____(the "Bank), with

(Name of Issuing Bank)

Reference to Irrevocable Standby Letter of Credit No._____ Issued by the Bank (the "Letter of Credit"), that:

1. The undersigned is duly authorized to execute and deliver this certificate on behalf of the Beneficiary.

2. The Beneficiary is making a drawing under the Letter of Credit.

3. An Event of Default has occurred under Contract No. _____.

4. The amount of the draft presented with this certificate does not exceed the total maximum amount drawable today under the Letter of Credit as provided therein.

, this certificate is executed this day of_____, 20____.

(NAME OF BENEFICIARY)

By:_____

Its:_____

Bank Draft

FOR VALUE RECEIVED

Pay on presentment to _____ the sum of _____

(Name of Beneficiary) Dollars ($)

Charge the Account of _____ Irrevocably Standby Letter of

(Name of Issuing Bank)

Credit No. _____Dated: 20_____ .

To _____

(Name of Issuing Bank)

NAME OF BENEFICIARY

By _____

Its_____

26. SEISMIC SAFETY - Professional Services - A&E & Construction for new buildings & additions

42 U.S.C. 7701 et seq.
49 C.F.R. part 41
Executive Order (E.O.) 12699

The contractor agrees that any new building or addition to an existing building will be designed and constructed in accordance with the standards for Seismic Safety required in Department of Transportation (DOT) Seismic Safety Regulations 49 C.F.R. part 41 and will certify to compliance to the extent required by the regulation. The contractor also agrees to ensure that all work performed under this contract, including work performed by a subcontractor, is in compliance with the standards required by the Seismic Safety regulations and the certification of compliance issued on the project.

Exhibit F

WRTA Bid Protest Procedures

PROTEST PROCEDURES

The following Bid Protest Procedures apply to Federal Transit Administration (FTA) assisted procurements that are competitively solicited. Interested parties must adhere to the following procedures. A protest will be processed in the time frames and structure specified below.

A. PRIOR TO OFFER OPENING

1. Protests concerning a procurement (by a prime contractor or an adversely affected subcontractor) must be in writing and received by WRTA not less than five (5) working days before offer opening unless a different deadline is established in the procurement documents.

2. Upon receipt of that protest, the Administrator will determine if the offer opening should be postponed. If offer opening is postponed, WRTA will notify all prime contractors and subcontractors who have been furnished a copy of the specifications that a protest has been filed and that offer opening is postponed until WRTA has issued its decision. Appropriate addenda will be issued re-scheduling offer opening.

3. Any protest to WRTA may be withdrawn at any time before WRTA has issued its decision.

4. WRTA will respond within three (3) working days of receiving the protest, at least generally, to each material issue raised in the Protest. If the matter requires further evaluation, the Administrator will notify the protesting party in writing (by facsimile and U.S. Mail) of the extended review period. The Administrator's decision on any protest will be in writing and is final.

B. AFTER OFFER OPENING

1. Protests received after an offer opening will be considered only if it concerns an issue, procedure, or other matter that could not have been protested by an offeror prior to the opening. The protest must be in writing and be received by WRTA at least three (3) working days before the conditional award of a contract by the WRTA.

2. Upon receipt of the protest, the Administrator will immediately determine if the award of the contract should be postponed. If it is postponed, WRTA will notify all offerors that a protest has been filed and that award of the contract is postponed until WRTA has issued its decision.

3. A protest to WRTA may be withdrawn at any time before WRTA has issued its decision.
4. WRTA will respond within three (3) working days of receiving the protest, at least generally, to each material issue raised in the Protest. If the matter requires

further evaluation, the Administrator will notify the protesting party in writing (by facsimile and U.S. Mail) of the extended review period. The Administrator's decision on any protest will be in writing and is final.

C. AFTER AWARD

1. Protests received after an award has been made will be considered only if it concerns an issue, procedure or other matter that could not have been protested by an offeror after the opening. The protest must be in writing and received by the WRTA three (3) working days before the execution of the resulting contract.

2. Upon receipt of the protest, the Administrator will immediately determine if the execution of the contract should be postponed. If it is postponed, WRTA will notify all offerors that a protest has been filed and that execution of the contract is postponed until WRTA has issued its decision.

3. A protest to WRTA may be withdrawn at any time before WRTA has issued its decision.

4. WRTA will respond within three (3) working days of receiving the protest, at least generally, to each material issue raised in the Protest. If the matter requires further evaluation, the Administrator will notify the protesting party in writing (by facsimile and U.S. Mail) of the extended review period. The Administrator's decision on any protest will be in writing and is final.

D. APPEALS

1. Except as provided above, there are no further administrative appeals available. In certain circumstances judicial remedies may be available to aggrieved parties.

The WRTA will consider all written protests made within the timelines stated in this policy. Protest submissions should be concise, logically arranged, clearly state the grounds for the protest, and must include at least the following information:

- Name, address, and telephone number of protester.
- Solicitation or contract name and/or number.
- A detailed statement of the legal and factual grounds for the protest, including copies of all relevant documents or information.
- A statement of relief requested.

Protests are to be filed by certified mail, return receipt requested or by personal deliver by 4:30 pm on or before the due date at:

Administrator
Worcester Regional Transit Authority

60 Foster Street
Worcester, MA 01608

If protests are filed by personal delivery, the protestor must obtain a time-stamped copy of the protest from the WRTA's Administration Office as proof of the date and time of the filing of the protest. It is the Protester's sole responsibility to provide said copy at the time of filing.

Exhibit G

DBE Objective Policy Statement

WORCESTER REGIONAL TRANSIT AUTHORITY
DISADVANTAGED BUSINESS ENTERPRISE (DBE) PROGRAM
In compliance with U.S. DOT 49 CFR § 26 FINAL RULE

WRTA DBE Objective / Policy Statement - § 26.1, 26.23

The Worcester Regional Transit Authority (WRTA) has established a Disadvantaged Business Enterprise (DBE) Program in accordance with regulations of the U.S. Department of Transportation (DOT), 49 CFR § 26. The WRTA has received Federal financial assistance from the DOT and as a condition of receiving this assistance, the WRTA has signed an assurance that it will comply with 49 CFR § 26.

It is the policy of the WRTA to ensure that all contracts and procurements will be administered without discrimination on the basis of race, color, national origin, or sex. The WRTA ensures that Disadvantaged Business Enterprises (DBEs) shall have an equal opportunity to compete for and participate in DOT-assisted contracts. It is also our policy to:

1. To create a level playing field on which DBEs can compete fairly for DOT-assisted contracts;
2. To ensure that the DBE program is narrowly tailored in accordance with applicable law;
3. To ensure that only firms that fully meet 49 CFR § 26 eligibility standards are permitted to participate as DBEs;
4. To help remove barriers to the participation of DBEs in DOT-assisted contracts;
5. To assist the development of firms that can compete successfully in the marketplace outside the DBE program.

The Grants and Procurement Manager has been designated as the DBE Liaison Officer (DBELO). The DBELO has direct, independent access to the Chief Executive Officer (Administrator) concerning DBE program matters. The DBELO is responsible for implementing all aspects of the WRTA DBE Program. The WRTA has adequate staff, (including procurement, finance, etc.), to administer the program in compliance with 49 CFR § 26.

WRTA has circulated this Policy Statement to its Advisory Board, throughout our organization, and to the DBE and non-DBE business communities that perform work on our DOT-assisted contracts. Distribution has been accomplished via our website www.therta.com, inclusion with procurement documents, and through outreach to community organizations.

Passed and adopted by the Worcester Regional Transit Authority this 25th day of February, 2025.

Joshua Rickman

Joshua Rickman, Administrator, Worcester Regional Transit Authority

Exhibit H

Lobbying Restrictions Certification
(Must be signed by the submitter)

WORCESTER REGIONAL TRANSIT AUTHORITY

60 Foster Street, Worcester, MA 01608
Phone: (508) 791-2389 Fax: (508) 752-1676

LOBBYING RESTRICTIONS

Applies to All Contracts >$100,000

31 U.S.C. § 1352
2 C.F.R. § 200.450
2 C.F.R. part 200 appendix II (J)
49 C.F.R. part 20

Lobbying Restrictions

The undersigned certifies, to the best of his or her knowledge and belief, that:

1. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

2. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of WRTA, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

3. The undersigned shall require that the language of this certification be included in the award documents for all sub-awards at all tiers (including subcontracts, sub-grants, and contracts under grants, loans, and cooperative agreements) and that all subWRTAs shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

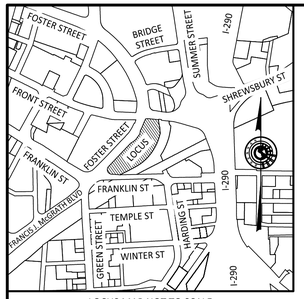
_____ Signature of Contractor's Authorized Official

_____ Name and Title of Contractor's Authorized Official

_____ Date

Exhibit I

Contractor Laydown Areas



LOCUS MAP NOT TO SCALE

NOTES:

1. THE TOPOGRAPHY, SURFACE IMPROVEMENTS, AND SITE DETAIL DEPICTED HEREON WERE OBTAINED FROM AN ON-THE-GROUND INSTRUMENT SURVEY CONDUCTED BY BRENNAN CONSULTING, INC. BETWEEN NOVEMBER 18, 2024 AND DECEMBER 5, 2024.
2. THE HORIZONTAL DATUM IS BASED ON THE MASSACHUSETTS COORDINATE SYSTEM, NAD83, MAINLAND ZONE AS DERIVED FROM GPS OBSERVATIONS.
3. THE VERTICAL DATUM IS BASED ON THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88) AS DERIVED FROM GPS OBSERVATIONS.
4. CONTOUR INTERVAL EQUALS ONE (1) FOOT.
5. ALL PROPERTY LINES AS SHOWN HEREON ARE PER MassGIS AND SHOULD NOT BE CONSIDERED A BOUNDARY LINE DETERMINATION.
6. PROPERTY LIES WITHIN: ZONE X (UNSHADED): AREA OF MINIMAL FLOOD HAZARD PER FIRM 25027C0618E, EFFECTIVE 07/04/2011.
7. BENCH MARK INFORMATION:

   TBM-1: X-CUT SET ON HYDRANT, LEFT BOLT OVER MAIN OUTLET, AT INTERSECTION OF GREEN STREET AND FOSTER STREET. ELEVATION = 474.47
   TBM-2: X-CUT SET ON HYDRANT, LEFT BOLT OVER MAIN OUTLET, AS SHOWN HEREON. ELEVATION = 473.28
   TBM-3: X-CUT SET ON HYDRANT, LEFT BOLT OVER MAIN OUTLET, AS SHOWN HEREON. ELEVATION = 471.32
   TBM-4: PUNCHMARK SET ON CORNER OF CONCRETE RAMP, AS SHOWN HEREON. ELEVATION = 466.76
8. ALL UNDERGROUND UTILITY INFORMATION DEPICTED HEREON WAS COMPILED FROM PLANS OF RECORD AND VISUAL FIELD EVIDENCE. THE LOCATIONS OF UNDERGROUND PIPES AND CONDUITS HAVE BEEN DETERMINED FROM THE AFOREMENTIONED RECORD PLANS AND ARE APPROXIMATE ONLY. BRENNAN CONSULTING, INC. CANNOT ASSUME RESPONSIBILITY FOR DAMAGES INCURRED AS A RESULT OF UTILITIES THAT ARE OMITTED OR INACCURATELY SHOWN ON SAID RECORD PLANS SINCE SUBSURFACE UTILITIES CANNOT BE VISIBLY VERIFIED. BEFORE PLANNING FUTURE CONNECTIONS, THE PROPER UTILITY ENGINEERING DEPARTMENT SHOULD BE CONSULTED AND THE ACTUAL LOCATION OF SUBSURFACE STRUCTURES SHOULD BE DETERMINED IN THE FIELD. CALL, TOLL-FREE, THE DIG-SAFE CALL CENTER AT 1-888-344-7233 SEVENTY-TWO HOURS PRIOR TO EXCAVATION.
9. RECORD PLANS RECEIVED FROM NATIONAL GRID AND CROWN CASTLE WERE SCHEMATIC IN NATURE AND UTILITY LINES SHOWN HEREON ARE APPROXIMATE. RECORD PLANS RECEIVED FROM EVERSOURCE GAS WERE SCHEMATIC IN NATURE AND UNABLE TO BE ACCURATELY PLOTTED HEREON.
10. THIS DOCUMENT IS AN INSTRUMENT OF SERVICE OF BRENNAN CONSULTING, INC. AND ISSUED TO OUR CLIENT FOR PURPOSES RELATED DIRECTLY AND SOLELY TO BRENNAN CONSULTING, INC. AND OUR SCOPE OF SERVICES UNDER CONTRACT TO OUR CLIENT FOR THIS PROJECT. ANY USE OR REUSE OF THIS DOCUMENT FOR ANY REASON BY ANY PARTY FOR PURPOSES UNRELATED DIRECTLY AND SOLELY TO SAID CONTRACT SHALL BE AT THE USER'S SOLE AND EXCLUSIVE RISK AND LIABILITY, INCLUDING LIABILITY FOR VIOLATION OF COPYRIGHT LAWS, UNLESS WRITTEN CONSENT IS PROVIDED BY BRENNAN CONSULTING, INC.

OWNER OF RECORD:

WORCESTER REDEVELOPMENT AUTHORITY
DEED BOOK 4960, PAGE 201
PLAN BOOK 328, PAGE 51
DEED BOOK 48445, PAGE 157
PLAN BOOK 891, PAGE 112
PLAN BOOK 305, PAGE 120
PARCEL 02-015-0000C
60 FOSTER STREET

LEGEND

SMH (S)	SEWER MANHOLE
DMH (D)	DRAIN MANHOLE
EMH (E)	ELECTRIC MANHOLE
WMH (W)	WATER MANHOLE
CB	CATCH BASIN
CO	CLEAN OUT
RD	ROOF DRAIN
ICV	IRRIGATION CONTROL VALVE
	HYDRANT
	WATER SHUT OFF/WATER GATE
	STAND PIPE/SIAMESE CONNECTION
	GAS SHUT OFF/GAS GATE
GM	GAS METER
	SECURITY CAMERA
	DOUBLE LIGHT STANDARD
	FLOOD LIGHT
	LIGHT POLE
	GROUND LIGHT
HH	ELECTRIC HANDHOLE
	TRANSFORMER
EM	ELECTRIC METER
E	ELECTRIC CONDUIT OR CONTROL BOX
	RECORD ELECTRIC STRUCTURE NOT FOUND DURING SURVEY
	BOLLARD
	CONCRETE BARRIER
	SIGN
FP	FLAG POLE
TR	TRASH RECEPTACLE
	STEEL COLUMN ON CONCRETE FOOTING
GP	GATE POST
	DECIDUOUS TREE
	SHRUB
BC	BOTTOM OF CURB
BCP	BITUMINOUS CONCRETE PATCH
BFA	BUILDING FOOTPRINT AREA
BIT	BITUMINOUS
BW	BOTTOM OF WALL
CAB.	CABINET
CC	CONCRETE CURB
CLF	CHAIN LINK FENCE
CONC	CONCRETE
CRW	CONCRETE RETAINING WALL
DDP	DETECTABLE DIRECTIONAL PANEL
DWP	DETECTABLE WARNING PAD
ENT	ENTRANCE
EXIST.	EXISTING
FFE	FINISH FLOOR ELEVATION
FGC	FLUSH GRANITE CURB
GEN	GENERATOR
HR	HAND RAIL
I=	INVERT ELEVATION
INACC.	INACCESSIBLE
LS	LANDSCAPED
NTS	NOT TO SCALE
NVP	NO VISIBLE PIPES
OH	OVERHANG
R=	RADIUS OR RIM ELEVATION
RET	RETAINING
SQ. FT.	SQUARE FEET
TBM	TEMPORARY BENCH MARK
TC	TOP OF CURB
TH	THRESHOLD OR TOP OF HOOD
TOD	TOP OF DEBRIS
TOW	TOP OF WATER
TW	TOP OF WALL
TYP	TYPICAL
VGC	VERTICAL GRANITE CURB
WIF	WROUGHT IRON FENCE
E	ELECTRIC
G	GAS
FO	FIBER OPTIC
SL	STREET LIGHTING
W	WATER
12" CI	PIPE SIZE AND MATERIAL
CI	CAST IRON
PVC	POLYVINYL CHLORIDE
X	METAL FENCE
	WROUGHT IRON FENCE
DSE	DIGSAFE ELECTRIC

BRENNAN
MASSACHUSETTS COORDINATE SYSTEM
NAD 83, MAINLAND ZONE

Now or Formerly
MC ROSELAND WORCESTER LLC
PARCEL 02-23B-000JK
BOOK 53544, PAGE 115
PLAN BK. 900, PAGE 116
145 FRONT STREET

FRONT STREET

PROPERTY LINE PER MassGIS

OWNER:
WORCESTER REDEVELOPMENT AUTHORITY
PARCEL 02-015-0000C
DEED BOOK 4960, PAGE 201
DEED BOOK 48445, PAGE 157
PLAN BOOK 305, PAGE 120
PLAN BOOK 328, PAGE 51
PLAN BOOK 891, PAGE 112
60 FOSTER STREET

FOSTER STREET

CONTRACTOR LAYDOWN AREA

POTENTIAL AREA FOR TEMP TICKETING OFFICE

EXISTING 3 STORY BRICK AND STONE BUILDING "WORCESTER REGIONAL TRANSIT AUTHORITY" 60 FOSTER STREET BFA = 4,700 S.F. ±

POTENTIAL AREA FOR TEMP TICKETING OFFICE

TBM BREN-1

TBM BREN-2

TBM BREN-3

TBM BREN-4

SOLAR POWER CAB

SOLAR PANEL CANOPY

MASONRY STONE BLOCK WALL

FACE STEEL RAILROAD BRIDGE OVER STREET

PROPERTY LINE PER MassGIS

Now or Formerly
PROVIDENCE AND WORCESTER RAILROAD COMPANY
PARCEL 04-047-M0012
NO DEED REF.

Now or Formerly
BOSTON & MAINE CORPORATION
PARCEL RR-ROW-000ST
NO DEED REF.

FRANKLIN STREET

SCALE: 1"=20'
20' 0 10' 20' 40' 80'

I HEREBY CERTIFY THAT THIS PLAN IS BASED ON AN ACTUAL FIELD SURVEY.

PROFESSIONAL LAND SURVEYOR — 02/14/2025 DATE

COMMONWEALTH OF MASSACHUSETTS
PHJE BROWN OWENS
No. 57494
REGISTERED
PROFESSIONAL LAND SURVEYOR

REVISIONS

NO.	DATE	DESCRIPTION	BY	CHK'D

EXISTING CONDITIONS SURVEY
60 FOSTER STREET
WORCESTER, MASSACHUSETTS
(WORCESTER COUNTY)

PREPARED FOR
STV INCORPORATED

SCALE: 1" =20'
DATE: JANUARY 23, 2025

Brennan·Consulting
ENGINEERING TRANSPORTATION SURVEYING
24 RAY AVENUE, BURLINGTON, MA
PHONE: (781) 273-3434 WWW.BRENNANCONSULTS.COM

FIELD CHIEF: JT/ST	APPROVED: PBO	PM: PBO	SHEET NO. 1 OF 1
RESEARCH: PBO	COMP: PBO	CADD: JT/PBO	JOB NO. 24485

P:\24485 WRTA, 60 Foster St, Worcester, STV\Survey\Dwg\Plans_Worksheets\24485 2024-1209-JT.dwg

SECTION 011000

SUMMARY

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

B. Equality of material, article, assembly or system other than those named or described in this Section shall be determined in accordance with the provisions of Article V of the GENERAL CONDITIONS OF THE CONTRACT.

1.2 REQUIREMENTS INCLUDED

A. This Section includes requirements for the following:

1. Work under this Contract.
2. Work Sequence.
3. Examination of Site and Documents.
4. Contractor Qualifications.
5. Contract Method.
6. Supervision of Work.
7. Use of Premises.
8. Coordination.
9. Field Engineering.
10. Reference Standards.
11. Preconstruction Conference.
12. Project Meetings.
13. Permits, Inspection, and Testing Required by Governing Authorities.
14. Cutting, Coring, Patching, Unless Otherwise Indicated.
15. Debris Removal.
16. Field Measurements.
17. Safety Regulations.
18. OSHA Safety and Health Course Documentation.
19. Damage Responsibility.
20. Owner Furnished Products.
21. User Agency Occupancy.
22. Asbestos and Hazardous Materials Discovery.
23. Special Requirements.
24. List of Drawings.

1.3 WORK UNDER THIS CONTRACT

A. The project work consists of a lobby renovation. The building shall be constructed so as to meet all requirements of the Contract Documents, including, but not limited to, the plans and specifications for WRTA Hub Lobby Renovation at 60 Foster St Worcester, MA.

B. General Project Information : Project consists of the renovation of the WRTA's Lobby located at their Hub. The project is limit of work includes relocating restrooms, curtain wall modification, modification to the lobby mechanical, electrical, plumbing and fire protection, and painting. The lobby will be closed to the public during the renovation. The contractor must maintain public access to the WRTA Bus Loop on the property and provide a temporary enclosed ticketing office at the bus loop for the public. Ticketing office must be heated and cooled, with adequate lighting and power to the office. Location of the temporary office shall be proposed to the architect and WRTA for approval.

C. The work will include all operations necessary to deliver the building(s) and ancillary on and off site amenities in a fully installed and operable condition including all utility and site work and obtaining all necessary licenses, permits, and certificates. Where utilities exist within and adjacent to the building(s) and ancillary parking lots, and are known by the Owner, they have been shown on the site plan(s) appearing in, but not restricted to, the exhibits. Connections to these existing utility lines will be the responsibility of the Contractor.

D. The scope of work, without limiting the generality thereof, includes all labor, materials, equipment and services required to perform the work described fully in the Drawings and Specifications and includes, but is not limited to the following major work:

1. Construction of a renovation including, but not limited to:
    a. Metal framing.
    b. Sheathing and air barrier.
    c. Exterior façade.
    d. Concrete work.
    e. Demolition.
    f. Carpentry, waterproofing, dampproofing, caulking.
    g. Roofing.
    h. Doors and windows.
    i. Interior finishes.
    j. Mechanical and electrical.
    k. Sitework.

E. Construction shall be classified as reovation.

F. Reference To Drawings: The work to be done under this Contract is shown on the Drawings listed at the end of this Section.

G. The Contractor shall provide a schedule for completion of the project to WRTA within the construction period set forth in the Contract.

H. The Massachusetts Standard Labor Wage rates contained in the Contract Documents, as updated on an annual basis, will be used throughout the construction of this project.

1.4 WORK SEQUENCE

A. The Work will be conducted in the following sequence of demolition/construction:

1. Temporary ticking office construction, contractor mobilization
2. Demolition
3. New Construction

1.5 EXAMINATION OF SITE AND DOCUMENTS

A. For information related to a pre-bid conference, if any, refer to the Bid Instructions for Bidders as amended.

B. Bidders interested in visiting the site to visually inspect the location of the work and existing conditions that may affect new work may only visit the site on a non-holiday weekday pre-arranged and agreed to by and with the User Agency and Architect.

C. The bidders are expected to examine and to be thoroughly familiar with all contract documents and with the conditions under which the work is to be carried out. The WRTA will not be responsible for errors, omissions, and/or charges for extra work arising from the Contractors or Subcontractors failure to familiarize themselves with the contract documents. The Contractor and Subcontractor acknowledge that they are familiar with the conditions and requirements of the contract documents where they require, in any part of the work a given result to be produced, and that the contract documents are adequate and will produce the required results

1.6 CONTRACTOR QUALIFICATION

A. The Contractor must be currently certified by the Division of Capital Asset Management and Maintenance (DCAMM) for General Building Construction

B. It is the firm’s responsibility to obtain the necessary forms from DCAMM and make application to DCAMM not less than three weeks prior to advertised bid opening for DCAMM to evaluate the application and issue the required Certificate of Eligibility.

1.7 CONTRACT METHOD

A. Work under this contract shall be lump sum price, for the scopes of work as described in these specifications and shown on the Drawings.

1.8 SUPERVISION OF WORK

A. The Contractor shall be held directly responsible for the correct installation of all work performed under this Contract. The Contractor must make good repair, without expense to the Commonwealth, of any part of the new work, or existing work to remain, which may become inoperative on account of leaving the work unprotected or unsupervised during construction of the system or which may break or give out in any manner by reason of poor workmanship, defective materials or any lack of space to allow for expansion and contraction of the work

during the Contractor's warranty period, from the date of final acceptance of the work by WRTA.

1.9 USE OF PREMISES

A. Use of the Site: Limit use of the premises to work in areas indicated within the construction fence shown on the site drawings. Coordinate work of all trades required outside the construction fence boundary shown on the site drawings. Confine operations to areas within contract limits indicated. Do not disturb portions of the site beyond the areas in which the Work is indicated.

1. Owner Occupancy: Allow for Owner occupancy and use by the public.
2. Driveways and Entrances: Keep driveways and entrances serving the premises clear and available to the Owner, the Owner’s employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

B. Schedule and perform work to afford minimum of interruption to normal and continuous operation of utility systems. The Contractor shall submit to WRTA and the Designer for approval, proposed schedule for performing work; including construction of new utilities, re-routing of existing utilities and final connection of new work to existing work. Schedule shall indicate shutdown time required for each operation.

1. Work includes checking all safety devices to verify that they have come back on-line after interruption. This requirement will not be waived.

C. The Contractor shall notify the WRTA and Operating Agency in writing, 72 hours in advance of the proposed time for shutting down or interrupting any utilities, services or facilities which may affect the operation of other buildings, services or facilities of the Operating Agency.

D. Coordinate with WRTA and the Architect, work in connection with adjacent driveways, walks, or other facilities which would prevent access thereto or interrupt, restrict, or otherwise infringe upon the Operating Agency’s use thereof.

E. The Contractor shall be aware of the sensitivity of the neighborhood organizations to noise, dust, debris, vibration, and site maintenance and take appropriate precautions to avoid conflict.

F. Contractor, Subcontractors shall protect existing structures, surfaces, equipment and furnishing, and the like, and installed work to avoid any damage. Damage to existing work, if caused by the Contractor’s operations under this Contract, shall be repaired at no cost to WRTA.

1. An existing conditions survey shall be conducted, with the Designer, the DCAMM Project Manager, and User Agency representatives, at which existing conditions will be videotaped by the Contractor. A copy of the videotape will be provided to the WRTA.

G. Trenching and other work outside construction limits shall be expedited to fullest extent and carried out with minimum of inconvenience to normal operation of the Operating Agency and public traffic. Walks, paved or landscaped areas over which temporary driveways cross, shall upon completion of the work, be restored to their original condition. Temporary roadways shall be bridged over trenched areas.

H. The Contractor can gain access to the premises during the hours specified below. In addition the Contractor and his personnel will limit themselves only within the working premises during working hours. If work needs to be scheduled during times other than those listed below, Contractor shall inform the WRTA and Architect one week prior to work.

1. Deliveries: 6:30 am to 8:00 am and after 1:00 pm.
2. General Access: 6:30 am to 10:00 pm.

I. Confine operations at the site to areas permitted by:

1. Laws
2. Ordinances
3. Permits
4. Contract Documents
5. WRTA.

J. Contractor shall supervise the use of the site related to construction and be responsible for correcting any damage identified by the WRTA or Architect to the WRTA's.

1. An existing conditions survey shall be conducted, with the Architect, The Project Manage, and User Agency representatives, at which existing conditions will be videotaped by the Contractor. A copy of the videotape will be provided to the Project Manager.

K. All available existing utilities adjacent to the construction site will be available for use during construction unless indicated otherwise. Temporary connections to these utilities, all metering, transformers, removal, usage, and their associated costs will be the responsibility of the appropriate Subcontractor.

1. Utilities Available for use During Construction:
   a. Power
   b. Water

L. The Contractor shall verify that Subcontractors have visited the site and included all costs associated with the location of the project, and any restriction or limitations the location of the project may pose.

M. The Contractor, Subcontractors shall at all times conduct their operations in a courteous, professional manner while on the project or in the vicinity of the project. Sexual or other harassment, offensive language or behavior will not be permitted on the site.

1.10 COORDINATION

A. The Contractor shall be responsible for the proper fitting of all the work and for the coordination of the operations of all trades, Subcontractors or material and persons engaged upon the work. The Contractor shall do, or cause his agents to do, all cutting, fitting, adjusting, and repair necessary in order to make the several parts of the work come together properly.

1. Examine Contract Documents in advance of start of construction and identify in writing questions, irregularities or interference to the Architect in writing. Failure to identify and

address such issues in advance becomes the sole responsibility of the Contractor. A conflict that would cause the reduction of the normal ceiling height of any occupied space is considered to be interference.

B. Execute the work in an orderly and careful manner with due regard to the occupants of the facility, the public, the employees, and the normal function of the facility.

C. The work sequence shall follow planning and schedule established by the Contractor as approved by the Architect and WRTA. The work upon the site of the project shall commence promptly and be executed with full simultaneous progress. Work operations which require the interruption of utilities, service, and access shall be scheduled so as to involve minimum disruption and inconvenience, and to be expedited so as to insure minimum duration of any periods of disruption or inconvenience.

D. The Contractor shall review the tolerances established in the specifications for each type of work and as established by trade organizations. The Contractor shall coordinate the various trades and resolve any conflicts that may exist between trade tolerances without additional cost to WRTA. The Contractor shall provide any chipping, leveling, shoring or surveys to ensure that the various materials align as detailed by the Designer and as necessary for smooth transitions not noticeable in the finished work.

1.11 FIELD ENGINEERING

A. Provide field engineering services; establish grades, lines and levels, by use of recognized engineering survey practices. All field engineering surveying shall be performed by a licensed Land Surveyor registered in the Commonwealth of Massachusetts.

B. The Contractor shall survey and submit exact dimensional layouts as required. Engage and pay for the services of a Massachusetts Registered Surveyor acceptable to the Architect to locate and protect control and reference points.

1.12 REFERENCE STANDARDS

A. For products specified by association or trade standards, comply with requirements for the standard, except where more rigid requirements are specified or are required by codes. Refer to Section 014200 - REFERENCES.

B. Where reference is made in the Contractual Documents to Publications and Standards issued by Associations or Societies, the intent shall be understood to specify the current edition of such Publications or Standards (including tentative revision) in effect on the date of the contract advertisement notwithstanding any reference to a particular date.

1.13 PRE-CONSTRUCTION CONFERENCE

A. In accordance with the Contract Documents, a pre- construction conference to review the work will be conducted by the WRTA and Architect prior to commencing construction on the site.

B. Representatives of the following shall be required to attend this conference:

1. WRTA
2. Architect
3. User Agency
4. Contractor
5. All Subcontractors

C. The Contractor shall have a responsible representative at the pre-construction conference to be called by the Architect following the award of the contract, as well as representatives of field or office forces and major Subcontractors. All such representatives shall have authority to act for their respective firms. The pre-construction conference is to be held within five days of Notice to Proceed, or as otherwise determined by WRTA.

1.14 PROJECT MEETINGS

A. Project meetings shall be held on a weekly basis and as required subject to the discretion of the WRTA.

B. As a prerequisite for monthly payments, ordering schedules, shop drawing submitted schedules, and coordination meeting schedules shall be prepared and maintained by the Contractor and shall be revised and updated on a monthly basis, and a copy shall be submitted to the WRTA and Architect.

C. In order to expedite construction progress on this project, the Contractor shall order all materials immediately after the approval of shop drawings and shall obtain a fixed date of delivery to the project site for all materials ordered which shall not impede or otherwise interfere with construction progress. The Contractor shall present a list and written proof of all materials and equipment ordered (through purchase orders). Such list shall be presented at the meetings and shall be continuously updated.

D. Scheduling shall be discussed with all concerned parties, and methods shall be presented by the Contractor, which shall reflect construction completion not being deferred or foreshortened. Identify critical long-lead items and other special scheduling requirements. The project schedule is to include time for submission of shop drawing submittals, time for review, and allowance for resubmittal and review.

E. Project meetings shall be chaired by the Owner’s Representative.

F. Minutes of the project meetings shall be prepared by the Owner’s Representative and shall be distributed to all present. The meeting minutes shall be the only official meeting record.

1.15 PERMITS, INSPECTION, AND TESTING REQUIRED BY GOVERNING AUTHORITIES

A. If the Contract Documents, laws, ordinances, rules, regulations or orders of any public authority having any jurisdiction require any portion of the Work to be inspected, tested, or approved, the Contractor shall give the Designer, the WRTA or his/her designated representative, and such Authority timely notice (5 business days minimum) of its readiness so the Designer may observe such inspecting, testing, or approval.

B. Prior to the start of construction, the Contractor shall complete application to the applicable Building Code enforcement authority for a Building Permit. Such Permit shall be displayed in a conspicuous location at the project site.

C. Unless otherwise specified under the Sections of the Specifications, the Contractor shall pay all fees required by public entities for the due and faithful performance of the work and which may arise incidental to the fulfilling of this Contract, including, but not limited to, fees associated with permits, inspections, and connectionsAs such, all fees, charges, and assessments in connection with the above shall be paid by the Contractor.

D. The Contractor shall maintain at the site, for the duration of construction operations, at least one (1) up-to-date copy of all relevant codes and standards listed in the Contract Documents or determined to be applicable to the work. One (1) copy of such codes shall be for the exclusive use of WRTA and the Designer and its Consultants, and shall be kept in the Contractor's site office.

E. The Contractor shall provide all information required by the building official(s) and shall secure the general building permit for the work promptly on award of the Contract. The Contractor shall conform to all conditions and requirements of the permit and code enforcement authority. The Contractor shall provide names and license numbers of its responsible representatives to complete the application for permit, and shall receive the permit and promptly distribute copies to WRTA and the Designer.

F. Contractor and specialized Subcontractors as applicable shall identify all permits (other than general building permit) required from Authorities having jurisdiction over the Project for the construction and occupancy of the work. The Contractor shall, working with specialized Subcontractors as applicable, prepare the necessary applications and submit required plans and documents to obtain such permits in a timely manner, and shall furnish the required information to the Building Official and obtain the required permits as early as practicable after award of the Contract.

1. The Contractor shall display all permit cards as required by the Authorities, and shall deliver legible photocopies of all permits to WRTA and the Architect promptly upon their receipt.
2. The Contractor shall arrange for all inspections, testing and approvals required for all permits, and shall notify the Architect and WRTA of such inspections at least three (3) business days in advance (longer if so required in the various Sections of the Specifications), so they may arrange to observe.
3. The Contractor shall comply with all conditions and provide all notices required by all permits.
4. The Contractor shall perform and/or arrange for and pay for all testing and inspections required by the Governing Codes and Authorities, other than those provided by WRTA, and shall notify the Architect and WRTA of such inspections at least three (3) business days in advance of all such testing or inspection, so they may arrange to observe.
5. Where Inspecting Authorities require corrective work for conformance with applicable Codes and Authorities, the Contractor shall notify WRTA and promptly comply with such requirements, except in cases where such requirements clearly exceed the requirements of the Contract Documents, in which case the Contractor shall proceed in accordance with the procedures for modifications or changes in the work established in the Contract Documents, as amended.

1.16 CUTTING, CORING, AND PATCHING, UNLESS OTHERWISE INDICATED

A. The Contractor shall coordinate all cutting, coring, fitting and patching of the work that may be required to make its several parts come together properly and fit it to receive or be received by work of the Subcontractors shown on the Drawings and Specifications. The Subcontractor shall perform all cutting, coring or patching as applicable to their Work.

B. The Contractor shall coordinate the work of the Subcontractors so as not to endanger any existing work by any cutting, coring, or excavating. No Subcontractor work shall endanger or alter the work of any other Subcontractor except with the written consent of the Designer.

C. The Contractor shall submit a written request to Designer well in advance of executing any cutting or alteration which affects:

1. Work of WRTA or separate Contractor.
2. Structural value or integrity of any element of the Project, including, but not limited to all building systems.
3. Integrity or effectiveness of weather-exposed or moisture-resistant elements or systems.
4. Efficiency, operational life, maintenance, or safety of operational elements.
5. Visual qualities of sight-exposed elements.
6. Request shall include:
    a. Identification of the Project.
    b. Description of affected work.
    c. The necessity for cutting, alteration, or excavation.
    d. Effect on other ongoing projects, facilities operations, or Project structure, weatherproof integrity or building systems.
    e. Description of proposed work:
    f. Alternatives to cutting and patching.
    g. Cost proposal, when applicable.
    h. Written permission of any separate subcontractor whose work will be affected.
7. Should conditions of Work or the schedule indicate a change of products from original installation, Contractor shall submit request for substitution.
8. Upon approval by WRTA for such cutting or coring, the Contractor shall provide written notice to Designer designating date and time the affected work will be performed a minimum of three business days in advance.

D. Performance:

1. Execute cutting and patching by methods which will prevent damage to other work, and will provide proper surfaces to receive installation of repairs.
    a. In general, where mechanical cutting is required, cut work with sawing and grinding tools, not with hammering and chopping tools. Core drill openings through concrete work.
    b. Prior to cutting and structural steel or concrete work, contact Designer and Project Structural Engineer in writing. Do not cut any structural steel and concrete work until approval has been granted by the Designer and the Project Structural Engineer.
2. Employ original installer or fabricator to perform cutting and patching for:
    a. Weather-exposed or moisture-resistant elements.
    b. Sight-exposed finished surfaces.

3. Execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances, and finishes.
4. Restore work which has been cut or removed; install new products matching existing to provide completed Work in accordance with requirements of Contract Documents.
5. Fit work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
6. Patch with seams which are durable and as invisible as possible. Flash and seal all penetration of exterior work. Comply with specified tolerances for the work.
7. Restore exposed finishes of patched areas; and, where necessary extend finish restoration onto retained work adjoining, in a manner which will eliminate evidence of patching.
    a. Where patch occurs in a smooth painted surface, extend final paint coat over the entire unbroken surface containing the patch.
8. Refinish entire surfaces as necessary to provide an even finish to match adjacent finishes:
    a. For continuous surfaces, refinish to nearest intersection.
    b. For an assembly, refinish entire unit.

E. Existing Utilities Services:

1. Interruptions to critical existing utility services is not permitted without prior notice and written approval by WRTA and others as may be required by DCAMM. Any such notifications must be submitted to WRTA no later than two (2) weeks prior to the proposed interruption.
    a. Sanitary sewer, storm drainage, and water changeovers as affecting existing services shall be done with no disruptions of existing services and scheduling of such work will require approval in writing by the User Agency.
    b. All relocation of existing electrical, telephone, and gas services that are utility company owned shall be performed by the respective utility company, and the cost of any charges for such work shall be paid by the Contractor. All utility installations and relocation shall be the responsibility of the Contractor. Coordination of all of the aforesaid work is the responsibility of the Contractor.
2. The Contractor shall locate and record on Drawings all existing utilities along the course of the work by such means as the Designer and the WRTA may approve, and shall preserve such marked locations until the work has progressed to the point where the encountered utility is fully exposed and protected as required. It shall be the Contractor's responsibility to notify the proper authorities and/or utility company before interfering with the existing utilities.
3. Existing utilities that are indicated on the Drawings or whose locations are made known to the Contractor prior to excavations, though accuracy and information as to grades and elevations may be lacking, shall be protected from damage during the excavation and backfilling operations and, if damaged by the Contractor, it shall be repaired by the Contractor at his/her own expense.
4. All exposed conduits, wires, and/or cables shall be provided with sufficient protection and support to prevent failure, fraying, or damage due to backfilling or other construction operations.
5. The Contractor shall not obstruct access to existing active utility system manholes and catch basins which continue to serve facilities other than the project construction site. The Contractor shall exercise measures as necessary to prevent the placement of impediments that limit continuous access by authorized utility company or User Agency maintenance personnel and shall be required to reimburse the utility company or User Agency for any expense incurred as a result of need to remove any such impediments to access.

F. Dig-Safe:

1. Within the Commonwealth, “Dig-Safe” (Dig Safe Systems, Inc.) is the name of the Utility Underground Plant Damage Prevention Authority. Dig-Safe can be contacted via www.digsafe.com or by calling 1-888-DIGSAFE (344-7233) or dialing 811. Contractors must notify “Dig-Safe” of contemplated excavation, demolition, or explosive work in public or private ways, and any utility company right- of-way easement. Notification must be made at least seventy-two (72) hours prior to the work, but not more than sixty (60) days before the contemplated work.
2. The Owner requires that notification to “Dig-Safe” as required by their website with confirmation of such notification to the Designer and the WRTA.
3. “Dig-Safe” is required to respond to the notice within seventy-two (72) hours from the time said notice is received by designating at the locus the location of pipes, mains, wires, or conduits.
4. Contractors shall not commence with work until “Dig-Safe” has responded as noted above.
5. Prior to the “Dig-Safe” notification, the Owner requires Contractors to provide their Superintendent with current “Dig-Safe” regulations, and a copy of Massachusetts General Laws, Chapter 82, Section 40

1.17 DEBRIS REMOVAL

A. The Contractor shall coordinate the removal of all demolition and construction waste by the Subcontractor from the job site on a daily basis. Waste shall be segregated for recycling. Comply with requirements of Section 017419 - CONSTRUCTION WASTE MANAGEMENT.

B. Debris shall be legally disposed of in a D.E.P. approved disposal site. The site to be used shall be submitted to and approved by WRTA prior to the start of construction. All required dumping permits shall be obtained prior to start of construction. Contractor shall submit receipts from the disposal site(s) as evidence of legal disposal. The responsible contracxtor shall pay the cost of any charges for debris removal.

C. The Contractor shall bear responsibility for maintaining the building and site clean and free of debris, leaving all work in clean and proper condition satisfactory to WRTA and the Designer. The Contractor shall ensure that each of the Subcontractors clean up during and immediately upon completion of their daily work. Clean up includes the following tasks:

1. Remove all rubbish, waste, tools, equipment, appurtenances caused by and used in the execution of work.
2. Clean up of surface in work area.

D. Prevent the accumulation of debris at the construction site, storage areas, parking areas, and along access roads and haul routes.

E. Provide containers for deposit of debris and schedule periodic collection and disposal of debris.

F. Prohibit overloading of trucks to prevent spillage on access and haul routes.

G. The Contractor shall be responsible for proper disposal of all construction debris leaving the site.

1.18 FIELD MEASUREMENTS

A. Although care has been taken to ensure their accuracy, the dimensions shown for existing items and structures are not guaranteed. It is the responsibility of the Contractor to verify these dimensions in the field before fabricating any construction component. No claims for extra payment due to incorrect dimensions will be considered by WRTA.

1.19 SAFETY REGULATIONS

A. This project is subject to compliance with Public Law 91 596 "Occupational Safety and Health Act" latest edition (OSHA 29 CFR 1926), with respect to all rules and regulations pertaining to construction, including Volume 36, numbers 75 and 105, of the Federal Register, as amended, and as published by the U.S. Department of Labor and all other applicable laws.

B. Submit the name of the Contractor's safety officer to the WRTA. Submit copies of safety reports to the WRTA.

C. All accident reports are to be transmitted to the WRTA within 24 hours of occurrence.

1.20 OSHA SAFETY AND HEALTH COURSE DOCUMENTATION

A. OSHA Safety and Health Course Documentation Records: M.G.L. 30 s 39S requires that everyone employed at the jobsite must complete a minimum 10-hour long course in construction safety and health approved by the U.S. Occupational Safety and Health Administration (OSHA) prior to working at the jobsite. Compliance is required of Contractors' and Subcontractors' on-site employees at all levels whether stationed in the trailer or working in the field.

B. Documentation records shall be initially compiled by the Contractor and Subcontractors as part of their certified payrolls, and the Contractor shall create and maintain a copy of the documentation on site at all times and the employer shall submit a copy with the certified payrolls to WRTA. On-site documentation shall be filed in alphabetical order and immediately available to WRTA and OSHA inspectors. Fines imposed for non-compliance shall be promptly paid by the Contractor at no additional expense to WRTA. Delays in the progress of the Work caused by such non-compliance will not be acceptable as the basis for an extension of contract time or change order request.

1.21 DAMAGE RESPONSIBILITY

A. The Contractor shall repair, at no cost to WRTA, any damage to building elements, site appurtenances, landscaping, utilities, etc. caused during demolition operation and work of this Contract.

1.22 OWNER FURNISHED PRODUCTS

A. Products indicated "N.I.C." (Not in Contract), or "E. O." (Equipment by Owner), or "O.F.O.I." (Owner Furnished Owner Installed), or other similar acronyms as defined in the contract

documents will be furnished and installed by the Owner. Coordination and provision of service lines for such products shall be included under these Construction Contract Documents, if indicated. Final connections from service lines to equipment will be by the Owner, unless otherwise indicated

1.23 USER AGENCY OCCUPANCY

A. Beneficial Use and Occupancy: Refer to requirements in Section 017700 - CONTRACT CLOSEOUT, Par. 1.7.

B. Use and Occupancy: When the project is Substantially Complete (with all work affecting health, safety, and function totally completed, and with less than one percent (<1%) of the contract value remaining) and ready for Use and Occupancy as determined by the Designer, the WRTA and the Operating Agency, then the User Agency will take control of their building area(s) and be responsible for operating costs and security.

1.24 ASBESTOS AND HAZARDOUS MATERIALS DISCOVERY

A. If unanticipated asbestos-containing materials or other Hazardous Materials not included in Contract are discovered at any time during the course of work, the Contractor shall cease work in the affected areas only and continue work in other areas, at the same time notify WRTA the Designer of such discovery. Do not proceed with work in such affected areas until written instructions are received. If removal is required, payment will be made in accordance with the contract unit prices bid for each respective material. In the absence of unit prices, costs shall be negotiated or otherwise established prior to commencement of removal, in accordance with provisions of the Contract.

1.25 SPECIAL REQUIREMENTS

A. The Contractor shall prepare a Health and Safety Plan that addresses protection of employee and public health and safety. The minimum contents of the Plan are specified in Section 013300 – SUBMITTAL REQUIREMENTS.

B. The Contractor shall be solely responsible for implementing the procedures specified in the Plan.

C. The Contractor shall make available complete sets of personal protective equipment and clothing to WRTA for use during site observations/inspections by WRTA and the Designer. These shall be supplied and maintained at no cost to WRTA and the Designer, and shall be returned to the Contractor upon the completion of work, except for disposable protective clothing.

1. The Contractor shall provide a repository for collection and disposal of health and safety materials. Collection and disposal of contaminated disposable supplies shall be at no additional cost.

1.26 LIST OF DRAWINGS

A.

G-000 COVER SHEET
G-001 CODE SUMMARY, NOTES AND SYMBOLS
G-002 ARCHITECTURAL ABBREVIATIONS

AD-101 DEMOLITION LEVEL 1 FLOOR PLAN
AD-111 DEMOLITION LEVEL 1 RCP
AD-401 DETAILS OF DEMOLITION
A-101 LEVEL1 FLOOR PLAN
A-111 LEVEL 1 RCP
A-201 INTERIOR ELEVATIONS @ WAITING AREA
A-202 ENLARGED VESTIBULE PLAN & ELEVATIONS
A-203 ENLARGED RESTROOM PLANS & ELEVATIONS
A-301 WALL SECTIONS AND ENLARGED ELEVATIONS
A-401 PARTITION TYPES & DETAILS
A-402 PLAN DETAILS
A-403 SECTION DETAILS - PART 1 OF 2
A-404 SECTION DETAILS - PART 2 OF 2
A-501 LEVEL 1 FLOOR FINISH PLAN & SCHEDULE
A-502 FURNITURE AND EQUIPMENT SCHEDULE
A-601 DOOR, WINDOW SCHEDULE AND DETAILS
A-701 ROOM FINISH SCHEDULE AND DETAILS
A-801 REFERENCE PHOTO

S-101 SLAB ON GRADE DEMO
S-102 CURTAIN WALL REPLACEMENT
S-103 ENTRY DOOR REPLACEMENT

M-001 MECHANICAL LEGEND
MD-100 LEVEL 1 DEMOLITION PLAN
MD-110 LEVEL 1 PIPING AND CONTROLS DEMOLITION PLAN
M-100 LEVEL 1 FLOOR PLAN
M-110 LEVEL 1 PIPING AND CONTROLS FLOOR PLAN
M-400 MECHANICAL DETAILS 1 OF 2
M-401 MECHANICAL DETAILS 2 OF 2
M-402 MECHANICAL CONTROLS
M-700 MECHANICAL SCHEDULES

E-001 LEGEND, NOTES, & ABBREVIATIONS
ED-101 DEMOLITION LEVEL 1 POWER & FIRE ALARM PLAN
ED-102 DEMO LEVEL 1 SECURITY, COMMS, & DATA PLAN
ED-201 DEMOLITION LEVEL 1 LIGHTING PLAN
ED-601 EXISTING SINGLE LINE DIAGRAM
ED-701 DEMOLITION FA & CAMERA ONE LINE & SCHEDULE
ED-901 EXISTING PANEL SCHEDULES (SHEET 1 OF 2)
ED-902 EXISTING PANEL SCHEDULES (SHEET 2 OF 2)
E-101 LEVEL 1 POWER & FIRE ALARM PLAN
E-102 LEVEL 1 SECURITY, COMMS, & DATA PLAN
E-201 LEVEL 1 LIGHTING PLAN

E-701 FIRE ALARM RISER & MATRIX
E-901 PANEL SCHEDULES (SHEET 1 OF 2)
E-902 PANEL SCHEDULES (SHEET 2 OF 2)
E-903 NEW SCHEDULES

P-001 PLUMBING LEGEND
PD-100 PLUMBING UNDERGROUND DEMOLITION PLAN
PD-101 PLUMBING FIRST FLOOR DEMOLITION PLAN
P-100 PLUMBING UNDERGROUND PLAN
P-101 PLUMBING FIRST FLOOR PLAN
P-401 PLUMBING SCHEDULES

FP-001 FIRE PROTECTION LEGEND
FPD-100 FIRE PROTECTION FIRST FLOOR DEMO PLAN
FP-100 FIRE PROTECTION FIRST FLOOR PLAN

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 013100

PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 SUMMARY

A. Without limitations, coordination will include Critical Path Method Scheduling (CPM), coordination of submittals, coordination of all elements of the Work, and coordination of contract closeout.

B. Description:

1. Coordinate scheduling, submittals, and work of the various trades and elements of the Work to assure efficient and orderly sequence of installation of construction elements, with provisions for accommodating items to be installed later.
2. Coordinate sequence of the Work to accommodate User Agency Partial (Beneficial) Occupancy.

C. Meetings:

1. In addition to progress meetings, hold coordination meetings and pre-installation conferences with personnel and Subcontractors to assure coordination of the Work. The coordination meetings are to be separate from the commissioning or commissioning meetings under Section 019100 – COMMISSIONING.

D. Coordination of Submittals:

1. Schedule and coordinate submittals.
2. Coordinate work of various trades having interdependent responsibilities for installing, connecting to, and placing in service such equipment.
3. Review and coordinate requests for substitutions and provide recommendation to Awarding Authority and Designer as to the suitability of the proposed substitution as compared to the specified product(s), to assure compatibility with space and operating elements, and to verify compatibility with work and equipment of other trades.

E. HVAC, Electrical, Plumbing and Fire Protection Coordination:

1. Provide a Mechanical/Electrical Coordinator (MEC) to the project to provide HVAC, electrical, plumbing and fire protection coordination. The name of the coordinator,

together with his/her qualifications, shall be submitted to the WRTA and the Designer for approval.

F. The MEC shall be an individual highly experienced in design and construction coordination of HVAC, electrical, plumbing and fire protection systems. The MEC shall be, in addition to the Contractor's Project Manager, Project Scheduler and Project Superintendent.

G. The MEC shall attend all construction meetings.

H. Coordinate all activities associated with commissioning activities and the work of the Test Technician.

I. Commissioning:

1. A systematic process of ensuring that all building systems perform interactively according to the Designer's design intent and the User Agency's operational needs. This is to be achieved through actual verification of systems performance during the construction period by the Owner's consultant under Section 019100 - COMMISSIONING.
2. The commissioning process does not take away from, or reduce the responsibility of the Contractor and installing Subcontractors to provide a finished and fully functioning product.
3. The MEC shall provide all necessary documents and coordination required for the CX process to the Owner's Commissioning Agent (CxA) to complete the commissioning process as outlined in Section 019100 - COMMISSIONING.

1.3 MECHANICAL AND ELECTRICAL COORDINATOR (MEC)

A. The purpose of the Contractor's coordinator shall be to prevent conflicts in the installation of all materials and equipment for the entire project, but not specifically relating to the HVAC, electrical, plumbing and fire protection trades. Although the General Conditions and General Requirements of the construction contract apply to the Contractor and all Subcontractors, respectively, with regards to the coordination of all trades, the Contractor shall employ a Mechanical/Electrical Coordinator (MEC), in addition to the Contractor's coordinator, who shall specifically ensure and be responsible for the total and complete coordination of all work of the fire protection, plumbing, HVAC and electrical trades as such work relates to the Contractor's work and all other sub-trades. The MEC shall be provided for the Project from initial project's Notice to Proceed until all building systems have been accepted by both the Designer and the DCAMM Project Manager. The MEC shall be on-site during the construction phases (a minimum of two days per week), but more frequently as needed for coordination of the work being performed.

B. The MEC shall have the following qualifications:

1. Extensive experience in building construction, security and tele/data systems, food service equipment, medical and research equipment, elevators, HVAC, hot water heating, chilled water, plumbing, fire protection, electrical, emergency power, fire alarm, life safety systems or similar complexity to those contained in these documents or impacted by the work.

2. Excellent working knowledge of complex environmental, fire alarm, and electric power control and facility management systems; be capable of understanding control vendors' operating system and control code, be capable of trouble-shooting control code and recommending necessary modifications.
3. Competency in systems design and intent.
4. Excellent communication and writing skills, be highly organized, and be able to work well with both management and Subcontractors.
5. Minimum Bachelor's degree in Mechanical Engineering with 10 years (minimum) experience in the design and field administration of building mechanical and electrical systems, and working knowledge of project scheduling.

C. The Contractor shall submit the MEC's resume and sample documents to the WRTA and Designer for approval; which shall include the following:
1. Education and technical training.
2. Relevant work experience:
a. Job name.
b. Position held.
c. Work history (include dates and positions held).
d. Examples of prior building commissioning projects performed by the proposed MEC.
e. List of projects similar in commissioning scope and complexity, including dates of project completions.

D. The MEC cannot currently be or recently been financially associated with any of the Division 01 through 31 Subcontractors or vendors to avoid potential conflicts of interest.

1.4 MECHANICAL AND ELECTRICAL COORDINATOR'S DUTIES

A. Coordinate the work of the Fire Protection, Plumbing, HVAC and Electrical Filed Sub-Bid Contractors:

1. For temporary utilities.
2. Among the work of the fire protection, plumbing, HVAC and Electrical trades.
3. Among the work of all other trades.

B. Coordinate the schedule of Fire Protection, Plumbing, HVAC and Electrical Filed Sub-Bid Contractors:

1. Verify timely deliveries of products for installation by other trades.
2. Verify that labor and materials are adequate to maintain schedules.

C. Conduct conferences among Fire Protection, Plumbing, HVAC and Electrical Filed Sub-Bid Contractors and other concerned parties, as necessary to:

1. Maintain coordination and schedules.
2. Resolve matters in dispute.

D. Participate in all project meetings:

1. Report progress of all fire protection, plumbing, HVAC and electrical work.

2. Recommend needed changes in schedules.
3. Transmit minutes of meetings to fire protection, plumbing, HVAC and electrical trades, as appropriate.
4. Commissioning meetings.

E. Temporary Utilities:

1. Coordinate installation, operation, and maintenance, to verify compliance with project requirements and with Contract Documents.

F. Shop Drawings, Product Data and Samples:

1. Prior to submittal, review for compliance with Contract Documents.
   a. Check field dimensions and clearance dimensions.
   b. Check relation to available space.
   c. Review the effect of any changes on the work of other contracts or other trades.
   d. Check anchor bolt settings.
   e. Check compatibility with equipment and work of other trades.
   f. Check motor voltages and control characteristics.
   g. Coordinate controls and interlocks:
      1) Voltages.
      2) Wiring of pneumatic and control diagrams.
   h. Coordinate wiring and control diagrams.

G. Coordination Drawings:

1. In addition to the coordination drawings submitted by the Fire Protection, Plumbing, HVAC and Electrical Filed Sub-Bid Contractors, prepare additional drawings as required to assure coordination of the work, or affected by, fire protection, plumbing, HVAC and electrical work, or to resolve conflicts.
2. Reproduce and distribute approved copies to all concerned parties.

H. Verify that Subcontractors maintain accurate Record Documents.

I. Substitutions and Changes:

1. Review proposals and requests.
   a. Check for compliance with Contract Documents.
   b. Review and coordinate the suitability of the proposed substitution as compared to the specified product(s), to assure compatibility with space and operating elements, and to verify compatibility with work and equipment of other trades.
2. Recommend action to Contractor.
3. Test materials, assemblies and/or fabrications that are submitted as substitutions, when necessary to assure that they meet contractual design standards.

J. Observe fire protection, plumbing, HVAC and electrical work for compliance with requirements of the Contract Documents:

1. Maintain list of observed deficiencies and discrepancies.
2. Promptly report deficiencies and discrepancies to Contractor.

K. Assemble and evaluate pertinent documentation related to claims or disputes involving fire protection, plumbing, HVAC and electrical trades.

L. Equipment Commissioning:

1. The MEC shall coordinate all commissioning activities with the Owner's commissioning agent.

M. Inspection and acceptance of equipment:

1. Prior to inspection by Designer, Owner's commissioning agent, public officials or others, check that equipment is clean, repainted as required, tested and operational.
2. Assist inspector; prepare list of items to be completed or corrected.
3. Should acceptance and operation of equipment constitute the beginning of the warranty period, prepare, and transmit written notice to the Contractor, for his/her transmittal to the Designer and the WRTA for concurrence.

N. Assemble As-built documents from Subcontractors, transfer Subcontractors' As-built documentation to electronic format, and transmit to Designer. All information shall be submitted on electronic media. Drawings should be on AutoDesk AutoCAD ver. 2000 or later, word documents in .pdf format, baseline and subsequently approved schedules in Primavera format, schedule of values in Excel format, and approved shop drawing submittals scanned in showing model numbers, capacities, and all relevant information.

1. As-built documents will be compiled in an electronic format acceptable to Awarding Authority and will include, without limitation, the following:
   a. All Drawings, including title sheet, code analysis, geotechnical, civil, structural, architectural, fire protection, plumbing, HVAC, electrical, security, data/telecommunications.
   b. All Specifications in .pdf format with addenda.
   c. Shop drawings and product cuts, scanned in; approved sheets only.
   d. Project schedules, baseline and all updates.

O. Oversee and ensure required training for the systems to be commissioned under Section 019100 – COMMISSIONING and as called fori n the specifications.

1. Verify that the User Agency's operating personnel are trained in each particular commissioned equipment's operation and maintenance.
2. Obtain a written sign-off, from the responsible User Agency's personnel, that certify they are capable to operate and maintain the particular commissioned equipment such that their health and safety are not compromised.
3. Verify that all training requirements meet the specified training within the particular specification divisions and the requirements of this specification section.
4. Verify that training is provided only from certified instructors. The instructors shall be certified and approved by the particular equipment manufacturer. In the absence of manufacturer's certification, the trainer shall have a minimum of ten years' experience in the installation, operation, and repair of the particular equipment.
5. Verify that all training is audio and visually recorded by a professional who is regularly employed in video photography.

P. Verify that O & M documentation is complete and approved by the Designer and the WRTA prior to transmittal to the User Agency.

1.5 MECHANICAL AND ELECTRICAL COORDINATOR'S COORDINATION DRAWINGS

A. The MEC shall cause to be prepared and submit to the Contractor, coordination drawings for site utilities and building(s), for Designer and the WRTA's review.

B. Sequence of Coordination Drawings preparation shall be as follows:

1. Coordination Drawings: The Contractor shall be fully responsible for coordinating all trades, coordinating construction sequences and schedules, and coordinating the actual installed location and interface of all work. Before materials are fabricated or the Work begun, the Contractor shall supervise and direct the creation of one (1) complete set of Coordination Drawings showing the complete coordination and integration of all Work of this Project including, but not limited to, structural, architectural, fire protection, plumbing, HVAC and electrical disciplines. Coordination Drawings are intended to assist the Contractor during construction and shall not be used for "shop drawings", "record drawings", or any other required submittal.
   a. Base Sheets: The Contractor shall prepare and provide one accurately scaled set of building coordination drawing "base sheets" in electronic format, or such other format as requested by the Awarding Authority, showing all architectural and structural work. Base sheets shall be at 1/4-inch scale, except congested areas and sections through vertical shafts shall be at 3/8-inch scale.
   b. HVAC: The Contractor shall circulate the coordination drawing base sheets to the HVAC Subcontractor and require the HVAC Subcontractor to accurately and neatly show the actual size and location of all HVAC equipment and work. Ductwork shall be drawn to scale with full dimensions indicated graphically. Single line diagrams are not acceptable. The HVAC Subcontractor shall note any apparent conflicts, suggest alternate solutions, and return the coordination drawings to the Contractor.
   c. Plumbing: The Contractor shall circulate the coordination drawings to the Plumbing Subcontractor and require the Plumbing Subcontractor to accurately and neatly show the actual size and location of all plumbing equipment and work. The Plumbing Subcontractor shall note any apparent conflicts, suggest alternate solutions, and return the coordination drawings to the Contractor. Sloped plumbing lines have right of way.
   d. Electrical: The Contractor shall circulate the coordination drawings to the Electrical Subcontractor and require the Electrical Subcontractor to accurately and neatly show the actual size and location of all electrical equipment and work. The Electrical Subcontractor shall note any apparent conflicts, suggest alternate solutions, and return the coordination drawings to the Contractor.
   e. Fire Protection: The Contractor shall circulate the coordination drawings to the Fire Protection Subcontractor and require the Fire Protection Subcontractor to accurately and neatly show the actual size and location of all electrical equipment and work. The Fire Protection Subcontractor shall note any apparent conflicts, suggest alternate solutions, and return the coordination drawings to the Contractor.
   f. Other Subcontractors: The Contractor shall circulate the coordination drawings to other Subcontractors and trades whose work might conflict with other work and require these Subcontractors to accurately and neatly show the actual size and

location of all their equipment and work. These Subcontractors shall note any apparent conflicts, suggest alternate solutions, and return the coordination drawings to the Contractor.

g. After each trade completes its drawings, a meeting will be held to resolve conflicts between the trades.
   1) Coordination drawings shall be prepared at not less than 1/4-inch scale, and electronic files of same in a format requested by the Awarding Authority.
   2) Submit drawings to the Contractor for Designer's review prior to starting any installations.
   3) Items of impossibility or request for variance shall be called to the Contractor's attention for the Designer's resolution.

h. Contractor Review and Submission: The Contractor shall carefully review, modify and approve coordination drawings in cooperation with the Subcontractors to assure that conflicts, if any, are resolved before work in the field is begun and to ensure that the location of work exposed to view is as indicated or as approved by the Designer and the WRTA.
   1) Prior to submittal of the coordination drawings, the Subcontractors shall affix their signatures to the drawings.
   2) Clearly indicate conflicts requiring modification to the general appearance or the function of the project for Designer and WRTA reviews, and approvals.
   3) The Contractor shall stamp, sign and submit the coordination drawing originals to the Designer for review and approval, with one (1) paper copy and one (1) additional electronic copy to the WRTA following the specified procedures and policies outlined in Section 013300 – SUBMITTAL REQUIREMENTS. In no case shall acceptance of coordination drawings be interpreted as a release of Contractor of responsibility to fulfill all of the requirements of the Contract Documents.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 013200

CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 REQUIREMENTS INCLUDED

A. Procedures and requirements for submission and review of progress schedules and reports.

B. Procedures and requirements for photographic documentation of the Work.

C. Related Work: The following items are not included in this Section and are specified under the designated Sections:

1. CONTRACT AND GENERAL CONDITIONS:
   a. Failure to complete the Work on time - liquidated damages.
2. Section 011000 – SUMMARY:
   a. Project meetings.
3. Section 013100 - PROJECT MANAGEMENT AND COORDINATION:
   a. Progress and coordination meetings.
4. Section 013300 - SUBMITTAL REQUIREMENTS:
   a. Project reports.
   b. Schedule of values.
   c. Shop drawings, product data, and samples.
5. Section 015000 - TEMPORARY FACILITIES AND CONTROLS:
   a. Computer equipment hardware, software, and ancillary supplies.

1.3 CONSTRUCTION SCHEDULE

A. General Contractor shall prepare and submit for Designer and WRTA's information, a Critical Path Method (CPM) Progress Schedule for the work of the project. Said schedule will be coordinated with the Designer's Work Plan to include sequencing of the project work (both design and construction). In addition, a Project Scheduler will be required for this project.

1. General Schedule Requirements
2. Critical Path Method (CPM) Schedule Requirements
3. Critical Path Submission Requirements
4. Critical Path Progress Reporting and Changes
5. Progress Payments to General Contractor

6. Adjustment of Critical Path Contract Completion Time

B. Critical Path Method Scheduler.

C. Design of Project.

1.4 CRITICAL PATH METHOD SCHEDULING

A. General Contractor's Schedule Requirements are contained herein, and are to be provided to WRTA by the General Contractor.

1. General Schedule Requirements
   a. Upon the finalization of the agreement, signified by issuance of the WRTA Notice to Proceed with Construction, the General Contractor shall develop a network plan to demonstrate complete fulfillment of all Working Documents and Construction contract requirements. The General Contractor shall keep the network plan up to date in accordance with the progress and logic update requirements stated herein, and shall utilize the network plan in planning, coordinating and performing the work of this project (including all activities of Designer, Subcontractors, equipment vendors and suppliers). General Contractor's monthly payments will be made in direct relation to the activity items scheduled and by the progress completion of those activities. Upon authorized commencement of the construction phase of the contract, as signified by the WRTA Notice to Proceed with Construction, the General Contractor shall provide the microcomputer, associated hardware and software required for the project site as defined under Section 015000 – TEMPORARY FACILITES AND CONTROLS, Par. Computers. Substitute software, approved in writing by WRTA, will be considered provided that the promised substitution is totally compatible with PRIMAVERA.
   b. Within 20 calendar days of receipt of the WRTA Notice to Proceed with Construction, the General Contractor shall submit to WRTA and the Designer, an expanded Time Scaled Critical Path Method (CPM) Network Diagram for the first 90 calendar days of the Construction phase of the project. This preliminary 90-day schedule need not be resource loaded.
   c. Within 60 calendar days after receipt of the WRTA Notice to Proceed with Construction, the General Contractor shall submit for review by WRTA and the Designer, a complete Time Scaled Critical Path Method (CPM) Network Diagram for the complete project, including all construction phases. All completion dates shall be within the period required by the contract for completion of the project. This complete duration project schedule must be fully resource loaded. The General Contractor shall provide a presentation where the schedule's activities and logic are fully explained.
   d. Within 15 calendar days after receipt of the complete Critical Path Method Network Diagram, WRTA and the General Contractor shall meet with the Designer and their consultant engineers and Subcontractors, and the Project Scheduler, for joint review(s), correction, or adjustment of the proposed plan and schedule(s). Within 10 calendar days after the joint review(s), the General Contractor shall revise the proposed CPM Network Diagram in accordance with agreements reached during the joint review(s) and shall furnish two copies of the Diagram as defined hereinafter (in Para. 1.5.3), to WRTA and one copy to the

Designer. This CPM Network Diagram, as revised at the joint review, is the Project Schedule (and shall be the Target Schedule to which all future changes are compared) until subsequently revised in accordance with the logic update requirements stated hereinafter (in Para. 1.5.4). All appropriate Subcontractors shall also be furnished copies of the Time Scaled Network Diagram.

e. Until the joint review(s) and subsequent issuance of the complete Project Schedule, as defined hereinbefore, the establishment of the PRIMAVERA database, all Payment Requisition Schedule of Values and General Contractor Payment Forms may be produced manually.

2. Critical Path Method (CPM) Scheduling Requirements

a. The Critical Path Method (CPM) schedule shall show the sequence and interdependence of activities required and shall reflect the manner in which actual work will be performed. The number of activities shown on the Critical Path schedule must be at least equal and related to the number of items listed in the Schedule of Values, however the General Contractor must submit a detailed explanation that identifies what each activity includes. In preparing the Critical Path schedule, the General Contractor shall break up the work into activities not exceeding two calendar months each, except as to non-construction activities (i.e., design, procurement of materials and delivery of equipment) and any other activities for which WRTA may approve the showing of longer duration. The schedule shall show not only the activities for actual design and construction work for each trade category of the project but also activities on which the work is dependent (i.e., such as the submittal of shop drawings, equipment schedules, samples, color submission, coordination drawings, templates, fabrication, material delivery times, Designer/WRTA review and approval of design documents and shop drawings, equipment schedules, samples and templates, and the delivery of Owner furnished equipment). In addition, the complete duration project schedule submission that is to be made 60 calendar days after receipt of the WRTA Notice to Proceed with Construction shall be resource loaded with costs, manpower (labor by craft or trade), and equipment for all on-site construction activities shown on the schedule. All activities shall be logically tied to one common end date. The number of construction activities shown on the Critical Path schedule shall be capable of being summarized to a level equivalent to the individual specification sections, for which any item of work is being performed (defined hereinafter in Para. 1.5.2.b). To the extent that the Critical Path schedule shows anything not jointly agreed upon, or fails to show anything jointly agreed upon, it shall not be deemed to have been accepted by WRTA. Failure to include any element of work required for the performance of the contract shall not excuse the General Contractor from completing all work required within any applicable completion date, notwithstanding WRTA acceptance of the Critical Path schedule.

b. The baseline data to be entered for each individual activity shall include the duration, activity type, activity codes, work breakdown structure, date constraints, cost, resources, custom data items, predecessor activity, and successor activity.

1) Critical Path Method (CPM) Scheduling shall be carried as a specific pay item on the Schedule of Values.

2) Each activity shall be assigned a Work Breakdown Structure (WBS) Code. The WBS is to be structured in levels of deliverable work elements beginning with the end result (Level 1), and then divided into identifiable deliverable work elements (Level 2, 3, 4, etc.). The WRTA Project Manager, Designer and General Contractor will meet to establish a WBS specific to the project.

3) Each activity shall be assigned Activity Codes. The Activity Codes shall identify specific groups such as responsibility, phase, system, location, CSI Division, specification section, and corresponding Schedule of Values ID. This is not a complete list. The WRTA, Designer and General Contractor will meet to establish Activity Codes specific to the project.

3. Critical Path Submission Requirements (CPM Network Diagram elements)
   a. As a minimum, the General Contractor shall furnish, monthly with each Critical Path Submission, and each revision thereof required in the logic update, three (3) copies of the following PRIMAVERA output reports (which shall show Early Start, Early Finish, Late Start, Late Finish and Total Float):
      1) Current Schedule Comparison to Target Schedule
      2) Network Logic: Detailed Precedence Analysis
      3) Activity Input Listing sorted by WBS or Activity Codes, per WRTA
      4) Schedule sort by Early Start and Total Float
      5) Actual Cash, Manpower and Equipment Flows (on schedule - Monthly; late schedule - Weekly)
   b. As a minimum, the following computer-produced PRIMAVERA graphic reports shall be supplied with each Critical Path Submission and revision thereto (which shall show Early Start, Early Finish, Late Start, Late Finish and Total Float):
      1) Gantt Chart sorted by Early Start date and WBS or Activity Codes, per WRTA.
      2) Bar Chart - Two Week Look Ahead sorted by WBS or Activity Codes, per WRTA (and narrative format if requested by the WRTA, at no additional cost). A two-week look ahead schedule, generated from the Project Schedule, shall be submitted for review and discussion at the weekly project meeting.
      3) Time Scaled Network Diagram (PERTVIEW) sorted by WBS or Activity Codes, per WRTA.
      4) Cash, Manpower and Equipment Flows (monthly and cumulative)
   c. Payment requisition Schedule of Values (CSI formatted) and General Contractor Payment form, to be produced monthly through custom software which uses the PRIMAVERA database percentage complete to calculate payment owed to General Contractor.
   d. PRIMAVERA Database: The complete PRIMAVERA database for the project shall be submitted monthly with each Critical Path Submission electronically or as otherwise requested by WRTA.
   e. Material/Supplies Schedule: As a minimum, a full list of all materials required for the project shall be listed. This list shall include coded sub-lists (per Para. 1.5.7) relating to the activity codes of the Critical Path Method schedule. The Material/Supplies Schedule sub-lists shall be required which list all materials required for critical activities, all items of long lead time nature (i.e., transformers, plantings, windows, doors and frames, electrical and mechanical equipment, etc.), all pre-purchase items and all Owner-furnished items. The schedule shall provide names, addresses, telephone numbers of suppliers, key suppliers' contact person, order placement data, order confirmation data, proposed arrival date, actual arrival date and all other pertinent information. This Critical Materials/Supplies Schedule and its associated sub-lists shall be updated as directed by the WRTA and as a minimum at each Logic Update period.
   f. Utilities Schedule: As a minimum, a full list of all utilities required for the project shall be listed. The list shall include codes that relate to the activity code of the

Critical Path schedule where appropriate. The list shall include type of utility, usage levels required, and timing of requirements.

g. Equipment Schedule: As a minimum, a full list of all equipment required for the project shall be listed. The list shall include codes that relate to the activity code of the Critical Path schedule where appropriate. The list shall include type of equipment, usage levels required, and timing of requirements.

4. Critical Path Progress Reporting and Changes (Progress and Logic Update)

a. The General Contractor shall provide a complete progress and logic update monthly. The progress and logic update shall include complete updating of the schedule progress per activity --- both amount paid and amount remaining. Actual cost amount paid and amount remaining shall agree with the payment requisition forms required hereinbefore (in sub-paragraph 1.5.3.c.). The requirements for schedule progress reporting are further specified hereinafter. A full Critical Path Submission will be required at each progress and logic update.

b. In addition to the progress and logic update requirements, the General Contractor shall prepare and submit to WRTA a revised Critical Path Submission showing all changes in network logic, including but not limited to changes in activity duration, and revised activity costs as a result of contract changes in activity sequence and any changes in contract completion dates which have been made pursuant to the provisions of the contract for adjustment of contract completion time, since the last revision of the critical path schedule. The contract completion date or dates shall be adjusted to reflect time extensions granted on the activities in accordance with the contract. The contract completion date or dates shall remain constant when data in regards to actual progress (activity start, activity completion, percent completed, etc.) are entered and delay shows a negative float/slack. Where WRTA has not yet made a final determination, as to the amount of time extension to be granted and the parties are unable to agree as to the amount of the extension to be reflected in the critical path schedule, the General Contractor shall reflect that amount of time extension in the critical path schedule as WRTA may determine in their best judgment, to be appropriate for such interim purpose. It is understood and agreed that any such interim determination by WRTA for the purposes of this paragraph shall not be binding upon either party for any other purpose and that, after WRTA has made final determination as to any time extension, the General Contractor will revise the critical path schedule prepared thereafter in accordance with the final decision, in accordance with the contract.

c. Prior to the date specified by WRTA for submission of the logic update (i.e., at each General Contractor pencil monthly payment requisition, one week prior to the approval of the General Contractor monthly payment requisition), the Project Scheduler, including input from General Contractor, Subcontractors and the Designer, shall update the computer-produced schedule and diagrams. The update shall show actual progress and percent completed of activities in progress, identify those activities started and those completed during the previous logic update period, show the estimated time required to complete each activity started but not yet completed, and reflect any changes in the critical path schedule approved in accordance with the Critical Path Scheduling Requirements and Progress and Logic Update paragraphs of this Section (Para. 1.5.2 and 1.5.4). Actual progress to-date shall be entered by inputting actual start date and remaining duration (or early finish) for each activity which has either started during the monthly update period or is ongoing. In addition to entering remaining duration, the percent complete shall be entered for that activity. However, percent complete calculation shall be set to manual using the project default screen. After completion of the

review and WRTA approval of all entries, the General Contractor shall submit an updated Critical Path Submission, in the detail specified in the Critical Path Submission Requirements of this Section (Para. 1.5.3), to WRTA, no later than the close of business on the date specified by WRTA for submission of edited General Contractor monthly payment requisition (normally one week after pencil monthly payment requisition review).

d. The General Contractor shall assume that the full duration of the contract will be required to complete the work of the contract. Positive float/slack belongs to the project and must be used in the best interest of completing the project on time in the event departure from the network occurs. If negative float/slack is indicated on the schedule, recovery schedules shall be prepared by the General Contractor at no additional cost to the Commonwealth, indicating how the work will be expedited to meet current contract completion dates. The General Contractor's construction schedule shall begin with the date of issuance of the WRTA Notice to Proceed and conclude with the contract date of Final Completion of the Project. Float or slack time within the construction schedule is not for the exclusive use or benefit of either the Commonwealth or the General Contractor, but is a jointly owned, expiring project resource available to both parties as needed to meet contract milestones and the contract completion date. Therefore, any existing float shall be used to the maximum extent possible to offset:
   1) Unexpected delays which occur in connection with the General Contractor's work; and
   2) Contract change actions initiated by the parties specified in the contract (i.e., Changes in the Work).

e. Where delays are incurred, the General Contractor shall provide through weekly and/or full logic CPM update how the work delay can be returned to the approved schedule. The General Contractor agrees that whenever it becomes apparent from the current weekly computer produced calendar-dated schedule that the contract completion date will not be met, he/she will take some or all of the following actions at no additional cost to the Commonwealth:
   1) Increase design review and/or construction manpower and/or equipment in such quantities and crafts as will substantially eliminate, in the judgment of the WRTA, the backlog of work and any impact on the construction activities.
   2) Increase the number of working hours per shift, shifts per working day, working days per week, or the amount of construction equipment, or any combination of the foregoing, sufficiently to substantially eliminate, in the judgment of WRTA, the backlog of work.
   3) Reschedule activities to achieve maximum practical concurrence of accomplishment of activities.

f. Float shall be used as it occurs (time extension granted or job delay). If a time extension and job delay occurs in the same logic update period (normally weekly), the delay will be entered in the network first.

g. In addition to the foregoing, the General Contractor shall submit a narrative report every other week (bi-weekly) and at the same time as the updated schedule required by the preceding paragraphs in a form agreed upon by WRTA. The narrative report shall include a description of problem areas, current and anticipated delaying factors and their estimated impact on performance of other activities and completion dates, and an explanation of corrective action taken or proposed.

h. WRTA shall have the right to require the General Contractor to furnish additional printouts of logic updated schedules and time scaled network diagrams, reflecting actual or estimated time changes resulting from unexpected delays, change orders, strikes, etc., at no additional cost to the Commonwealth.

5. Progress Payments to General Contractor
   a. The monthly Critical Path Submission shall be an integral part and basic element of the estimate upon which progress payments shall be made. The General Contractor shall be entitled to progress payment only upon approval of estimates as determined from the currently approved updated computer-produced Critical Path schedule. Payments will be made against activity items shown on the computer-produced schedule and as reflected on WRTA approved format payment forms which shall be used in conjunction with PRIMAVERA. The General Contractor shall produce the Schedule of Values and the Standard Payment forms by following the guidelines of WRTA staff. This shall include entering the Net Amount Paid to Subcontractors against the appropriate activities.
   b. Whereas every schedule activity is cost loaded, as well as manpower and equipment loaded (i.e., the schedule of payment values lists all schedule activities, at the end of every month the General Contractor's payment application is a listing of all schedule activities started and completed, the percentage of work accomplished, and a calculation of the value of the work performed), but the Commonwealth is required to pay for work performed within a mandated time frame, the submittal of the schedule update is not a "condition precedent" to monthly progress payments; however, in the event the General Contractor fails to submit a computer-produced calendar-dated schedule or the initial or revised time scaled network diagram on the date designated by WRTA, WRTA shall have the right, after giving written notice to the General Contractor, to have the computer-produced calendar-dated schedule or time scaled network diagram prepared or revised (as applicable) by separate computer contract award or otherwise and to deduct the cost thereof from the contract amount through the progress payment which becomes due upon completion thereof and upon approval of WRTA of the payment request. If, however, the General Contractor fails or refuses to furnish the information and data which, in the judgment of the WRTA, are necessary for preparation or revision of the computer-produced calendar-dated schedule or time scaled network diagram by separate contract or otherwise, after seven [7] calendar days written notice, the schedule requirement terms of the contract may be considered to have been breached by the General Contractor, and WRTA may take any or all of the following additional actions:
      1) Impose lack-of-schedule damages (separate and distinct from liquidated damages), at a cost of $ 300 per day for every day the schedule submittal is late.
      2) Terminate the contract with prejudice (per Article XVII of the Contract).

6. Adjustment of Critical Path Contract Completion Time
   a. The contract completion time or contract cost will and in general be adjusted only for change orders approved by WRTA as outlined in the contract. In the event the General Contractor requests an extension of any contract completion date or cost increase he/she shall furnish such justification and supporting evidence as WRTA may deem necessary for the determinations to whether the General Contractor is entitled to an extension of time or contract cost adjustment under the provisions of this contract. WRTA approval as to the total number of days extension and/or increase in contract value shall be based upon the currently accepted computer-produced Critical Path schedule and on all data relevant to the extension. A

request for an extension of time, associated with the change orders will not be considered unless it is clearly proven that the critical path has been negatively effected (such as, but not limited to, time impact analysis using resource loaded fragmentary networks to demonstrate the effect of delays on the overall project schedule). Such data shall be included as an activity linked to the activity which is being impacted and will appear in the next monthly schedule and logic update. All extensions for related manpower/equipment increases shall be applied to the appropriate existing activity items.

1) Contract time can only be extended by authorized approved change order.

b. Whereas time is of the essence in the performance of work under the contract, each request for change in any contract completion date shall be submitted by the General Contractor to WRTA at the time an alleged delay occurs. Failure to notify WRTA of any delay as provided in the contract shall preclude the General Contractor from subsequently claiming any damages due to said delay.

c. For purposes of scheduling, the project will be considered to be Substantially Complete when all work affecting health, safety and function is totally completed, and with less than one [1] percent of the base contract value remaining, and ready for complete Use and Occupancy as determined by the WRTA, the Operating Agencies (individually or collectively), and the Designer. Then the User Agencies (individually or collectively) will take control of their building area(s) and be responsible for operating costs and security. Final punch lists will be established and monetized at this time.

1) WRTA Certificate of Use and Occupancy must be issued for partial Use and Occupancy, contingent upon conditions set forth by the Building Official having jurisdiction. The Massachusetts Department of Public Safety Occupancy Certificate must be issued by the effective Substantial Completion date.

2) The General Contractor shall have the number of calendar days stated in the contract, from the date of the first WRTA Notice to Proceed, to complete all the work before Substantial Completion is achieved. If the General Contractor fails to complete the work within the contract completion time frame so stated, the General Contractor shall be subject to the assessment of liquidated damages.

7. Additional Requirements:

a. A list in EXCEL format and the associated database file, as prescribed by WRTA, of every submittal of shop drawings, product data, samples and other submittals required by the contract, General Conditions, Supplementary Conditions and/or technical specifications of the construction contract. This required list shall be set upon a template, based on the General Contractor's Work Breakdown Structure (WBS) to facilitate reporting, showing the following: Specification Section, Sub-Section Number, Item Number, Description, Shop Drawing Number, Submittal Review and Approval, Actual Order Date, Procurement and Fabrication, Schedule Delivery Date, Date Received, Scheduled Installation Date and Actual Installation Date.

b. A list in EXCEL format and the associated database file, as prescribed by WRTA, of every long lead item required by the contract, General Conditions, Supplementary Conditions and/or technical specifications of the construction contract. This required list shall be set upon a template, based on the General Contractor's Work Breakdown Structure (WBS) to facilitate reporting, showing the following: Specification Section, Sub-Section Number, Item Number, Description, Shop Drawing Number, Submittal Review and Approval, Actual

Order Date, Procurement and Fabrication, Schedule Delivery Date, Date Received, Scheduled Installation Date and Actual Installation Date.

c. A list in EXCEL format and the associated database file, as prescribed by WRTA, of every pre-purchase item required by the contract, General Conditions, Supplementary Conditions and/or technical specifications of the construction contract. This required list shall be set upon a template, based on the General Contractor's Work Breakdown Structure (WBS) to facilitate reporting, showing the following: Specification Section, Sub-Section Number, Item Number, Description, Shop Drawing Number, Submittal Review and Approval, Actual Order Date, Procurement and Fabrication, Schedule Delivery Date, Date Received, Scheduled Installation Date and Actual Installation Date.

d. A list in EXCEL format and the associated database file, as prescribed by WRTA, of every Owner-furnished item required by the contract, General Conditions, Supplementary Conditions and/or technical specifications of the construction contract. This required list shall be set upon a template, based on the General Contractor's Work Breakdown Structure (WBS) to facilitate reporting, showing the following: Specification Section, Sub-Section Number, Item Number, Description, Actual Order Date, Procurement and Fabrication, Schedule Delivery Date, Date Received, Scheduled Installation Date and Actual Installation Date. The list of Owner-furnished items shall correspond with the construction schedule so that the submissions relate to the time when the products and/or systems will actually be required on the site.

1) Deliveries of Owner-furnished equipment or materials shall be shown on the schedule with time windows to be provided by the Commonwealth.

2) Neither the Designer nor the Commonwealth will be responsible for acceptance of a list that calls for out-of-sequence delivery of Owner-furnished items.

1.5 CRITICAL PATH METHOD SCHEDULER

A. The General Contractor shall provide a full-time, independent, project-dedicated scheduler who shall attend all progress and logic update meetings to address project progress, alleged delays and cost or time impacts. The name of the Project Scheduler, together with his qualifications, shall be submitted to the Designer and WRTA for mutual approval. The Project Scheduler shall have a minimum of five [5] years of project CPM scheduling experience, three [3] years of which shall be on projects of similar scope and value to this project. References shall be provided from past projects that can attest to the capabilities of the Project Scheduler. A Project Scheduler who the WRTA deems unqualified, or who engages in "schedule gamesmanship" rather than consciously and accurately portraying progress of the work, will be replaced at no additional cost to the Commonwealth.

B. The General Conditions and General Requirements of the construction contract apply to the General Contractor with regards to responsibility for the scheduling of all trades. The Project Scheduler shall ensure the total and complete scheduling of all work of the project as such work relates to the General Contractor's work and all other sub-trades.

C. The purpose of the Project Scheduler shall be to accurately portray all relevant activities required to complete the work according to the contract documents, organized in a logical sequence and, generally, time scaled.

D. Preferential sequencing (i.e., whereby activities that could be performed concurrently and are established in the project schedule as sequential simply to consume float), and/or indicating artificial activity durations (i.e., inflating activities in the schedule to consume float and influence the critical path) are unacceptable. The Project Scheduler will provide monthly comparisons of the start and finish dates with field records of WRTA inspection staff, job photos, weekly meeting minutes, monthly progress reports, General Contractor weekly bar charts or two-week look ahead schedules, and accurately update the schedule to reflect actual job progress.

1. Pursuant to the float-sharing requirements of the contract documents, the use of float suppression techniques (a.k.a., sequestering float) such as preferential sequencing or logic, special lead/lag logic restraints, and extended activity times are prohibited, and the use of float time disclosed or implied by the use of alternate float suppression techniques shall be shared to the proportionate benefit of the WRTA and the General Contractor.
2. Sequestering of float shall be cause for rejection of the General Contractor's schedule submittal. In the event that float sequestering is identified the General Contractor, through the Project Scheduler, shall have the computer-produced calendar-dated schedule or time scaled network diagram revised appropriately, at no additional cost to the Commonwealth.

E. The General Contractor, through the Project Scheduler, shall require the Designer, all major Subcontractors (including, but not limited to, Site Work, Masonry, Structural Steel, Fireproofing, Roofing, Elevators, Mechanical, Plumbing, Electrical, and all other Subcontractors with a subcontract equal to or in excess of five [5] percent of the contract value) to participate in and sign off on the baseline schedule and all schedule updates. The General Contractor must submit an as-built construction schedule (certified by the General Contractor's Project Manager and the Project Scheduler as representing the way the project was actually constructed) as a condition precedent to Final Acceptance.

1.6 PHOTOGRAPHIC DOCUMENTATION

A. Construction Photographs: Take images that use the maximum range of depth of field, that are in focus, and that clearly show the Work. Provide digital photography as follows:

1. Preconstruction Photographs: Before starting construction, take photographs of the site and surrounding properties from different points of view, as selected by the Designer.
2. Periodic Construction Photographs: Take at least five project photographs monthly, coinciding with the cutoff date associated with each Application for Payment. The photographer shall select the vantage points for each shot to best show the status of construction and progress since the last photographs were taken. Comply also with the Designer's directions concerning desired vantage points and specific circumstances for shots.

3. Submittals: Submit digital images of each photograph to the WRTA and Designer within 24 hours. Retain digital images in the field office at the Project site. Identify each image with project name, date and vantage point.

a. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph. Indicate elevation or

story of construction. Include same label information as corresponding set of photographs.

4. Usage Rights: WRTA shall retain copyright usage rights for unlimited reproduction of photographic documentation.
5. Digital Images: Provide images in JPG format, produced by a digital camera with minimum sensor size of 8.0 megapixels, and at an image resolution of not less than 3200 by 2400 pixels and 400 dpi.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 013300

SUBMITTAL REQUIREMENTS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 REQUIREMENTS INCLUDED

A. Shop drawings, products data, samples, submittal logs (shop drawings and samples, RFI, NOI, PCO, CO and SK drawings), weather protection (if applicable), schedule of values, and schedule of submittals (within 20 days of NTP with construction).

1.3 SCHEDULE OF VALUES

A. Prior to the first request for payment, the Contractor shall submit to the Designer and the WRTA, a Schedule of Values of the various portions of the Work in sufficient detail to reflect various major components of each trade, including quantities when requested, aggregating the total contract sum, and divided so as to facilitate payments based upon the progress of the work among other things under each Section. The schedule shall be prepared in such form as specified or as the Designer or the WRTA may approve, and it shall include data to substantiate its accuracy. Each item in the Schedule of Values shall include its proper share of overhead and profit. This schedule, including breakdown and values, requires the approval of the Designer and the WRTA and shall be used only as a basis for the Contractor's request for payment.

1.4 SHOP DRAWINGS, PRODUCTS DATA, AND SAMPLES

A. General:

1. Review and submit to the Designer and where outlined below to the WRTA, shop drawings, project data and samples required by Specifications Sections in hard and electronic copies.
2. No submissions made by FAX will be accepted.
3. The Construction Manager, within the time frame stated in Section 013200 – CONSTRUCTION PROGRESS DOCUMENTATION after the Pre-Construction Meeting, shall prepare and submit for the Designer and the WRTA’s approval, a Schedule of Shop Drawings, Product Data and Samples required to be submitted for the Work. The schedule shall indicate, by trade, the date by which final approval of each item must be obtained, and shall be revised as required by conditions of the Work,

subject to the WRTA's approval. The Schedule of Shop Drawings, Product Data and Samples shall correspond with the construction schedule so that the submissions relate to the time when the products and/or systems will be required on the site. Neither the Designer nor the WRTA will approve a schedule that calls for out-of-sequence submittals.

B. Shop Drawings:

1. Original drawings shall be prepared by Contractor, Subcontractor, Supplier or Distributor, which illustrate some portion of the Work, showing fabrication, layout, setting, or erection of details.
   a. Shop drawings shall be prepared by a qualified detailer.
   b. Details shall be identified by reference to sheet and detail numbers indicated on Contract Drawings.
   c. Maximum sheet size shall be 30-inch by 42-inch.
2. Submit the information listed above in both hard and electronic format.

C. Product Data:

1. Manufacturers' catalog sheets, brochures, diagrams, schedules, performance charts, illustrations, and other standard descriptive data. Provide manufacturer's catalogue sheet, specification for each product and other pertinent data as required under the individual specification.
   a. Modify product data submittals to delete information which is not applicable to the project.
   b. Supplement standard information to provide additional information applicable to the project.
   c. Clearly mark each copy to identify pertinent materials, products, or models.
   d. Show dimensions and clearances required.
   e. Show performance characteristics and capacities.
   f. Show wiring diagrams and controls.
2. All such data shall be specific and identification of material or equipment submitted shall be clearly made in ink. Data of general nature will not be accepted.
3. Product Data shall be accompanied by transmittal notice. The Contractor's stamp of approval shall appear on the printed information itself.
4. Submit the information listed above in both hard and electronic format.

D. Samples: Provide samples of finishes at the project as required by individual Specification section. Install sample complete and finished.

1. Physical samples shall illustrate materials, equipment, or workmanship, and shall establish standards by which work is judged. After review and approval, samples may be used in construction of project if not retained for comparison
   a. Office samples of sufficient size and quantity shall clearly illustrate:
      1) Functional characteristics of product or material, with integrally related parts and attachment devices.
      2) Full range of color samples (including standard and premium ranges).
      3) After review and approval by Designer and the WRTA, samples may be used in construction of project if not retained for comparison.
   b. Field Samples and Mock-ups:
      1) Erect at project site at locations acceptable to the Designer and the WRTA.

2) Construct each sample of mock-up complete, including work of all trades required in finished work. Samples shall be incorporated into a larger mock-up with varied products and trades if required.

2. Unless otherwise specified in the individual Section, the Contractor shall submit two labeled specimens of each Sample.
3. Samples shall be of adequate size to permit proper evaluation of material. Where variations in color or in other characteristics are to be expected, samples shall show the maximum range of variation. Materials exceeding the variation of the approved samples will not be approved on the Work.
4. Samples which can be conveniently mailed shall be sent directly to the Designer, accompanied by transmittal notice. On the transmittal notice the Contractor shall stamp his approval of samples submitted.
5. All other samples shall be delivered at the field office of the WRTA with sample identification tag attached and properly filled in. Transmittal notice of samples so delivered with the Contractor's stamp of approval, shall be mailed concurrently to the Designer and the WRTA to confirm their receipt thereof.
6. If sample is rejected by the Designer, a new sample shall be resubmitted in a timely manner as specified above. This procedure shall be repeated until the sample is approved in writing by the Designer.
7. Samples will not be returned unless return is requested at the time of submission. The right is reserved to require submission of samples whether or not specified in the Specifications, at no additional cost to the Commonwealth

E. Mock-ups: Erect at project site at location acceptable to Designer and the WRTA, a mock-up complete, including work of all trades required in finished work as applicable to mock-up.

1.5 CONTRACTOR'S RESPONSIBILITIES:

A. Review shop drawings, product data and samples prior to submission. Verify:

1. Field measurements.
2. Field construction criteria.
3. Catalog numbers and similar data.
4. Conformance with the Specifications. Clearly identify deviations from conformance with the specifications. Identifying deviations does not constitute acceptance by the Designer or WRTA of such deviations, or their impact on cost or schedule. Deviations which impact cost or schedule must be submitted as a Change Order, clearly identifying the reason for the deviation and including a comparison with the specified products.
5. Integration with adjoining work.
6. Delivery schedule.

B. All shop drawings prepared by Subcontractors shall be processed through the Contractor. The Contractor shall check all the shop drawings for conformity with the Contract Documents and particularly for field measurements and proper fit with adjoining work prior to submitting same to the Designer for approval. Certification shall appear on each shop drawing stating that the Contractor has made its check. Format and content of the Contractor’s certification stamp shall be subject to approval by the WRTA and the Designer and shall include, but not be limited to:

1. The Term "By Others" shall not be used on shop drawings, the Contractor shall state by whom related items are to be furnished and/or installed.

2. The Designer reserves the right to reject and return to the Contractor, without examination, any shop drawings which have not been previously checked and certified as outlined above, which carry the term "by other" or such vague reference, which are difficult to read, or which in any way are obviously not in conformity with Contract Requirements.
3. Shop drawings shall show materials, design, dimensions, connections and other details necessary to ensure that they accurately interpret the Contract Documents and shall also show adjoining work in such detail as required to provide proper connection with same.
4. The Designer will check and approve shop drawings only for conformance with the design concept and for compliance with information given in the Contract Documents. Approval of shop drawings by the Designer will not release the Contractor from his responsibility for furnishing same of proper dimensions, size quantity and quality to effectively perform the work and carry out the requirements and intent of Contract Documents.
5. Such approval will not relieve the Contractor from responsibility for errors of any sort in the shop drawings, nor for the proper coordination of any submittal with all other work. If the shop drawings deviate, or are intended to deviate, from the Contract Documents, the Contractor shall so advise the Designer in writing at the time the shop drawings are submitted, stating the difference in value between the Contract requirements and that denoted by said shop drawings.
6. The Contractor shall assume full liability for delay attributed to insufficient time for delivery and/or installation of material or performance of the work when approval of pertinent shop drawing is withheld due to the failure of the Contractor to submit, revise, or resubmit shop drawings in adequate time to allow the Designer and the WRTA a reasonable time, not to exceed twenty-one (21) calendar days, for normal checking and processing of each submission or resubmission.

C. Coordinate each submittal with requirements of Contract Documents, including but not limited to, identifying specification section references.

D. Notify the Designer in writing at the time of submission, of deviations in submittals from requirements of Contract Documents or previous submissions.

E. Work that requires submittals shall not commence unless submitted with Designer’s stamp and initials or signature indicating review and approval, and WRTA’s initials or signature of concurrence indicate review and approval.

1. No work shall be started in the shop or on the job, or materials delivered to the site, until pertinent shop drawings have been approved by the Designer and the WRTA.

F. After aforesaid review and approval, distribute copies.

G. Maintain one (2) copies of each approved submittal at the project site. One for the Contractor and one for the WRTA .

1.6 SUBMISSION REQUIREMENTS:

A. General: All submittals shall be made to the Designer’s Office. The quantity and make-up of submittals shall be as established by the Designer; however, two (2) additional copies of all submittals shall be transmitted to the WRTA at the same time that such submittals are

transmitted to the Designer. The Designer will log and distribute submittals for review by his consultant engineers. The Contractor shall distribute all shop drawings directly to the Designer. All submittals shall be in hard and electronic versions.

B. Make submittals promptly in accordance with approved schedules, and in such sequence as to cause no delay in the work.

C. Submit number of samples specified in each Section of the Specifications.

D. Submittals shall include:

1. Date and revision dates.
2. Project title and number.
3. The names of:
    a. Designer;
    b. Contractor;
    c. Subcontractor;
    d. Supplier;
    e. Manufacturer;
    f. Separate detailer when pertinent.
4. Identification of product or material.
5. Location of work and relation to adjacent structure or materials.
6. Field dimensions clearly identified as such.
7. Specification Section number and specific paragraph under which item is specified.
8. Submission number.
9. Applicable standards, such as ASTM number.
10. A blank space, five-inch by four-inch, for the Designer’s stamp.
11. Contractor’s remarks. Identify exceptions or deviations from Contract Documents and reasons for them.
    a. If shop drawings submitted by the Contractor indicate a departure from the Contract and the Designer deems it to be minor adjustment in the interest of WRTA (subject to concurrence by the Contractor stating it does not involve a change in Contract Price or extension of time), the Designer may approve the submission, but the approval shall be subject to WRTA review and acceptance of the Designer’s recommendation.
    b. The approval of WRTA shall be inferred to contain in substance the following: The change is so ordered with the understanding that it does not involve any change in the Contract Price or Time, and that it is subject generally to all contract stipulations and covenants, and is without prejudice to any and all rights of WRTA under the Contract.
12. Contractor's stamp, initialed or signed certifying review and approval of submittal.
13. For each product include the following:
    a. Manufacturer’s Instructions
    b. Certificates of Compliance
    c. Warranties/Guarantees
    d. Any other items as required in the applicable Specification
14. Any other items as called for by the Designer, the WRTA or required by the manufacturers.
15. The Designer reserves the right to ask for shop drawings for any or all items on the project, whether or not requested in individual specification sections, at no additional cost to the Commonwealth.

E. Manufacturer's Instruction: When required in individual Specification Section, submit manufacturer's printed instructions for delivery, storage, assembly, installation, start-up, adjusting and finishing, in quantities specified for product data to the Designer, with one (1) copy submitted to the WRTA and one (1) copy to the WRTA . These copies are in addition to those materials required at Contract Closeout.

F. Certificates of Compliance: Submit certificates of compliance with the associated Shop Drawings, Product Data, and Samples required for the product in quantities specified for certificates of compliance to the Designer, with one (1) copy submitted to the WRTA and one (1) copy to the WRTA . These copies are in addition to those materials required at Contract Closeout.

G. Field Samples: Provide field samples of finishes at the project as required by individual Specification Section. Install sample complete and finished.

H. Patterns and Colors: Submit accurate color charts and pattern charts to the Designer for review and selection whenever a choice of color or pattern is available in a specified product, unless the exact color and pattern of a product are indicated in the Contract Documents. Color and Pattern charts shall represent the manufacturer's complete standard offerings, except where Specifications limit the offerings by defining a particular series or product type which is normally limited in color and pattern availability. Color and Pattern charts shall be submitted in quantities specified with two (2) additional copies submitted to the WRTA and one (1) copy to the WRTA .

1.7 RESUBMISSION REQUIREMENTS

A. Resubmission: Resubmission procedure shall follow the same procedures as the initial submittal with the following exceptions:

B. Shop Drawings:

1. Transmittal shall contain the same information as the first transmittal except that the submission number shall change sequentially. The drawing number/description shall be identical as the first transmittal but the date shall be the revised date for that submission.
2. No new material should be included on the same transmittal for the resubmission.
3. Indicate on drawings any changes which may have been made other than those requested by the Designer.

C. Product Data and Samples:

1. Submit any new data and samples as required from previous submittal.

1.8 THE DESIGNER'S REVIEWS AND DISTRIBUTION OF SUBMISSIONS

A. The review period, for the Designer will not exceed twenty-one (21) calendar days from the established date of each submission indicated on the Schedule of Shop Drawings, Product Data and Samples, plus the additional time, if any, for distribution by the Contractor and receipt of submissions by the Designer and with copies to WRTA. After the Designer's (and its consultant engineers) review, distribution shall be as stated herein.

1. If submittal is 'reviewed - no exceptions taken', or 'reviewed, make corrections noted', the WRTA shall compose a transmittal indicating the status. The Designer will then transmit the following:

((Edit below to reflect any WRTA authorized electronic submissions.))

   a. One (1) copy of the submittal to the Contractor;
   b. One (1) copy of the submittal together with the transmittal to WRTA;
   c. One (1) copy of the submittal together with the transmittal to WRTA ; and
   d. Retain one (1) copy for Designer's records
   e. The Contractor shall then distribute said submittals to appropriate Subcontractors.

2. If submittal is 'reviewed - revise and resubmit' or 'rejected', the Designer shall compose a transmittal indicating the status. The Designer will then transmit the following:

((Edit below to reflect any WRTA authorized electronic submissions.))

   a. One (1) copy of the submittal to the Contractor;
   b. One (1) copy of the submittal together with the transmittal to WRTA;
   c. One (1) copy of the submittal together with the transmittal to WRTA ; and
   d. Retain one (1) copy for Designer's records
   e. The Contractor shall then distribute said submittals to appropriate Subcontractors.

3. If a submittal is 'reviewed - no exceptions taken' or reviewed, make corrections noted' by the Designer, or approved as noted by the Designer, but the WRTA does not concur, a meeting between the Designer and the WRTA will immediately be established to resolve the impasse within the overall review period time frame (21 calendar days). The WRTA will have final authority as to the disposition of the submission. The Designer's position of approval (or disapproval) must be based on the contractual criteria of design intent, function, structure, and durability. The WRTA's contrary position must also be based on these criteria.

4. The Contractor is required to anticipate review time, including time for possible rejection and resubmission, in establishing Schedule dates.
   a. The aforementioned time provided the Designer for checking shop drawings is from the date of receipt of shop drawings by the Designer to the mailing date of shop drawings returned to the Contractor by the Designer.

5. The Designer will process the submission and indicate the appropriate action on the submission and the transmittal. Incomplete or erroneous transmittals will be returned without action.

6. The Designer will fill out transmittal in the following sequence:
   a. Date received from Contractor.
   b. Date returned to Contractor.
   c. Action taken on submission.
   d. Distribution, including number of copies distributed and type of material distributed (i.e., print, brochure or sample, etc.).
   e. Designer's remarks (note major deviations from the Contract Documents).

B. Designer's Review Procedure:

1. Stamped REVIEWED, "NO EXCEPTIONS TAKEN":
   a. No corrections or resubmissions required, fabrication may proceed.
2. Stamped REVIEWED, "MAKE CORRECTIONS NOTED":
   a. If Contractor complies with noted corrections, fabrication may proceed. Submit corrected print for final review.

b. If, for any reason, the Contractor cannot comply with the noted corrections, fabrication shall not proceed and Contractor shall resubmit, following procedures outlined in this Section.

3. Stamped REVIEWED, “REVISE AND RESUBMIT” OR “REJECTED”:
   a. Contractor shall revise and resubmit for review. Fabrication shall not proceed.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 014000

QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 REQUIREMENTS INCLUDED

A. General Contractor's Quality Assurance.

B. General Contractor's Testing Responsibilities.

C. WRTA's independent agencies.

D. Duties of the General Contractor's testing agencies.

E. Welding.

F. Field engineering.

G. Examination of substrate.

H. General Contractor's Quality Assurance and Quality Control Plan.

1.3 RELATED SECTIONS

A. Section 013100 – PROJECT MANAGEMENT AND COORDINATION:

1. General project management and coordination.

B. Section 013129 – BIM COORDINATION:

1. Coordination of BIM modeling.

C. Section 014325 – TESTING AGENCY SERVICES:

1. Testing to be performed by the Owner's Independent Testing Laboratory, exclusive of testing to be performed by the General Contractor.

1.4 GENERAL CONTRACTOR'S QUALITY ASSURANCE

A. Qualifications for Service Agencies: Engage inspection and testing services agencies, including independent testing laboratories, which are pre-qualified as complying with "Recommended Requirements for Independent Laboratory Qualification" by the American Council of Independent Laboratories, and which specialize in the types of inspections and tests to be performed.

B. Each independent inspection and testing agency engaged on the project shall be authorized by authorities having jurisdiction to operate in the Commonwealth of Massachusetts.

1.5 GENERAL CONTRACTOR'S TESTING RESPONSIBILITIES

A. The General Contractor shall provide inspections, tests and quality control services specified in individual specification Sections and required by governing authorities, except where they are specifically indicated to be solely the responsibility of a Subcontractor in the respective specification section or solely the responsibility of WRTA.

B. Engage and pay for the services of an independent agency acceptable to the WRTA to perform the specified inspections, testing, and quality control. Submit qualifications to the WRTA. General Contractor's testing agency/laboratory shall be licensed by the Commonwealth of Massachusetts Department of Public Safety.

C. Re-testing: The General Contractor is responsible for re-testing where results of required inspections, tests or similar services prove unsatisfactory and do not indicate compliance with Contract Documents requirements, regardless of whether the original test or service was the General Contractor's responsibility.

D. Substitutions, Suspicious Issues and Designer Initiated Testing: The General Contractor is responsible for inspections, tests and similar services for substitutions, suspicious issues identified by the General Contractor or WRTA, and testing initiated by the Designer.

E. Associated Services: The General Contractor shall cooperate with agencies performing required inspections, tests and similar services and provide reasonable auxiliary services as required. Notify the agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include but are not limited to:

1. Provide access to the work and furnish incidental labor and facilities necessary to facilitate inspections and tests.
2. Take adequate quantities or representative samples of materials that require testing or assist the agency in taking samples.
3. Provide facilities for storage and curing of test samples and delivery of samples to testing laboratories.
4. Provide the agency with a preliminary design mix proposed for use for material mixes that require control by the testing agency.
5. Provide security and protection of samples and test equipment at the project site.

F. The General Contractor shall prepare and submit to the WRTA for approval a Quality Assurance and Quality Control Plan within 30 days from Notice to Proceed. A Quality Assurance and Quality Control (QA/QC) Plan shall promote completion of all work in

accordance with the Contract Documents including Contract, Construction Drawings, Specifications, Project Procedures, Approved Submittals and Shop Drawings, Approved Changes, Applicable Codes and Regulations, Referenced Industry Standards, and similar items. The primary purpose of this quality plan is to ensure that all in place work by the General Contractor and all Subcontractors is performed correctly the first time and is turned over and represented as complete and defect free in accordance with the Contract Documents.

G. If required by the Contract, the General Contractor shall assign a dedicated Quality Assurance and Quality Control Manager for the duration of the project. If the Contract does not require a dedicated Quality Assurance and Quality Control Manager, the General Contractor shall prepare and submit to the WRTA their QA/QC Plan as discussed in Par. E above. In addition, if this Contract does not require a dedicated QA/AC Manager, the duties of the QA/AC Manager as delineated in Par. 1.5F6 shall be carried out by another qualified member of the General Contractor's onsite staff.

1. The purpose of a QA/QC Manager shall be to prepare and submit the Quality Assurance and Quality Control Plan for approval and to be responsible for and to manage adherence to the plan throughout the construction process. The QA/QC Manager shall be designated for the project from the initial notice to proceed through system acceptances by both the designer and WRTA. The QA/QC Manager shall at all times instill an expectation that all work will be completed correctly and in an expeditious manner and shall be responsible for enforcement of the Coontractor's staff and all Subcontractors to this plan.
2. Have extensive experience in building construction, project controls, and previous QA/QC training and practical knowledge.
3. Have excellent communication and writing skills, be highly organized and be able to work with both management and Subcontractors.
4. Have a working knowledge of project scheduling.
5. The General Contractor shall submit substantiating documentation attesting to the proposed QA/QC Manager's capabilities to the WRTA and the Designer for approval.
6. Duties of the QA/QC Manager:
    a. Prepare and submit QA/QC Plan for approval.
    b. Conduct and submit minutes for all requisite Quality Meetings.
    c. Coordinate and report on all daily quality activities.
    d. Verify accurate documentation by Subcontractors and Vendors.
    e. Work with WRTA Commissioning Agent.
    f. Oversee final project records pertaining to quality.
    g. Report, photograph and distribute evidence of deficient and/or defective construction conditions or materials that cannot be corrected within three work days of observation. When such conditions or materials are remedied report, photograph and distribute evidence of remedial work prior to concealing. Photographs shall be dated and defects and/or deficiencies shall be clearly labeled on the photographs.

1.6 WRTA'S INDEPENDENT TESTING AGENCIES

A. WRTA will engage an independent testing agency at its own expense to perform certain tests and similar services as set forth in Section 014325. Information provided by WRTA's Independent Testing Agency shall be for the sole use of WRTA's Project Manager, and shall not relieve the General Contractor of its responsibilities to provide its own quality control, to meet

all requirements of the Contract and to provide a completed project free from construction defects.

B. It is the General Contractor's responsibility to provide and pay for its own inspection and testing to assure quality control. General Contractor shall be responsible for coordinating its work with requirements of WRTA's testing agencies, and shall provide reasonable services in support of facilitating work of WRTA's testing agencies as required.

1.7 DUTIES OF THE GENERAL CONTRACTOR'S TESTING AGENCIES

A. The General Contractor's independent testing agency engaged to perform inspections, sampling and testing of materials and construction shall cooperate with the Designer and General Contractor in performing its duties, and shall provide qualified personnel to perform required inspections and tests.

B. The testing agency shall notify the Designer and General Contractor promptly of irregularities or deficiencies observed in the work during performance of its services.

C. The testing agency shall not perform any duties of the General Contractor.

D. The General Contractor is responsible for scheduling times for inspections, tests, taking samples and similar activities.

1.8 GENERAL CONTRACTOR'S QUALITY CONTROL REQUIREMENTS, GENERAL

A. Maintain quality control over suppliers, manufacturers, products, services, site conditions, and workmanship to produce work of the quality as specified.

B. Comply fully with manufacturer's instructions, including each step in sequence.

C. Comply with specified standards as a minimum quality for the Work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

D. Perform work by persons qualified to produce workmanship of specified quality.

E. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortions, or disfigurement. Anchorage devices shall be labeled to allow for visual inspection and verification of type of anchorage device.

1.9 WELDING

A. Certified Welders:

1. Structural welds shall be made only by operators who have been qualified by tests, as prescribed in the "Standard Qualification Procedure" of the American Welders Society, to perform the type of work required. Operators shall be certified welders; certification

must be shown to the and must be current. Provide a copy of certification(s) to the WRTA .

2. Pipe welds shall be made by operators who have been qualified by the National Certified Pipe Welding Bureau and each operator's qualification record shall be submitted to the Designer before any work is performed. Welders' certification card must be shown to the . . Provide a copy of certification(s) to the WRTA .
3. Shop welding shall be in accordance with the "Code for Welding in Building Construction."
4. Welders shall provide their own portable generating equipment for electric welding. Use of the Commonwealth's electrical system for welding will not be permitted.

B. Welding and Cutting:

1. Where electric or gas welding or cutting work is done above or within ten (10) feet of combustible material or above a space that may be occupied by persons, use interposed shields of incombustible material to protect against fire damage or injury due to sparks and hot metal.
2. Place tanks supplying gases for gas welding or cutting at no greater distance from the work than is necessary for safety, securely fastened and maintained in an upright position in accordance with applicable codes. Store such tanks in a locked enclosure remote from any combustible material and free from exposure to the rays of the sun or high temperatures.
3. Maintain suitable fire extinguishing equipment near all welding and cutting operations. When operations cease for the noon hour or at the end of the day, thoroughly wet down the surroundings adjacent to welding and cutting operations.
4. Station a workman equipped with suitable fire extinguishing equipment near welding and cutting operations to see that sparks do not lodge in floor cracks or pass through floor or wall openings or lodge in any combustible material. Keep the workman at the source of work which offers special hazards for thirty (30) minutes after the job is completed to make sure that smoldering fires have not been started.
5. Place a qualified electrician in charge of installing and maintaining electric and arc welding equipment. Remove damaged electric, arc or gas welding equipment from the site.

1.10 MANUFACTURER'S REPRESENTATIVES

A. If required by specific Specification Sections, manufacturer's representative shall be present at the job site for supervision of work during installation of materials. Such representative shall be present during all aspects of construction to ensure proper installation of all applicable items. Refer to other sections of these specifications for additional requirements.

1.11 FIELD ENGINEERING

A. Survey work through the course of all phases of construction shall conform to the following guidelines:

1. General Contractor shall employ a competent Civil Engineer or Land Surveyor, registered in the Commonwealth of Massachusetts, who will establish permanent

benchmarks. Maintain all established bounds and benchmarks and replace as directed any which are destroyed or disturbed.

2. Prior to the installation of permanent construction (foundations, slab-on-grade, utilities, etc.) General Contractor shall provide a certification signed by Engineer/Surveyor warranting the principal lines, levels, and overall dimensions are accurately established in accordance with the Contract Documents.
3. Establish all lines and grades for the work, and verify all locations, property lines, work lines and other dimensioned points indicated on the Drawings for the project site.
4. Submit to the Designer a written confirmation of locations of all lines, and any discrepancies between conditions and locations as they actually exist and those indicated on the Drawings. General Contractor shall not commence any excavation or construction work until verification has been received and approved by the Designer. Upon receipt of approval from the Designer, provide one (1) copy of that approval to the WRTA .
5. General Contractor shall be held responsible for any damage incurred thereby to WRTA, due to incorrect laying out of the work. In the event that errors or discrepancies are discovered on the Drawings, the General Contractor shall immediately notify the Designer and no further work shall be performed until the discrepancy has been corrected by the Designer.

1.12 EXAMINATION OF SUBSTRATE

A. Installers of materials, products or equipment shall:

1. Examine base surfaces upon which materials, products or equipment are to be installed.
2. Examine conditions upon which materials, products or equipment are to be installed.
3. Where there is any question as to the dryness of a surface, test with a modern moisture- indicating machine.
4. Notify the General Contractor, in writing, with a copy to the Designer, if conditions are detrimental to proper and timely construction and completion of the work.

B. Do not proceed with work until unsatisfactory substrate, or not acceptable conditions have been corrected. Commencement of installation constitutes acceptance of substrate or base surfaces, and the cost of any corrective work due shall be borne by the installer applying his/her materials, products or equipment thereon.

1.13 CONTRACTOR'S QUALITY ASSURANCE AND QUALITY CONTROL PLAN

A. The Contractor's Quality Assurance and Quality Control Plan shall instill an expectation that all work will be completed correctly and in an expeditious manner. In all instances the Contractor shall be responsible for the adherence to and enforcement of the Contractor's staff and all Subcontractors to this plan.

1. Submit the General Contractor's Quality Assurance and Quality Control Plan to the WRTA within 30 days from the Notice to Proceed. Submit in format acceptable to WRTA's Project Manager. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out quality-assurance and quality-control responsibilities. Coordinate with construction schedule.

B. The Plan shall include specific procedures for conducting formalized inspections of predetermined selected work items at the time the Contractor first starts new work. These inspections are performed by a designated QA/QC Inspection Team composed of authorized representatives from WRTA, the Contractor, A/E, Subcontractor(s) (whose work is being inspected) and others as may be required.

C. The Quality Assurance and Quality Control Plan shall be created as a Project Specific Quality Plan addressing at a minimum the following components:

1. Quality meetings.
    a. Pre-construction conference.
    b. Pre-installation review meetings.
    c. Coordination meetings.
2. Regular Daily Inspections.
3. Building Exterior Envelope Review.
4. First Delivery of Material / Equipment Inspections.
5. First Equipment in Place Inspections.
6. Mock-up Inspections.
7. Bench Mark Inspections.
8. Follow-Up Bench Mark Inspections.
9. Below Grade / In-Wall and Above Ceiling Inspections.
10. Utility Activation and Start-Up Inspection Procedures for Equipment/Systems Prior to Validation.

D. Quality Meetings:

1. Pre-construction Conference:
    a. A conference held to discuss all aspects of the construction project such as the schedule, payment procedures, change order procedures and much more. This meeting is held immediately after contract award.
    b. The WRTA, Designer, Design Consultants, Contractor and Subcontractors will attend these meetings.
2. Pre-Installation Review Meetings:
    a. A review meeting shall be held for certain kinds of work requiring special coordination efforts between the trades, a better understanding of how the work is to be performed by one or more trades, sequencing of work between the trades, or a review of special requirements pertaining to the work to be performed. This type of meeting is conducted just prior to starting the actual work. The meeting is scheduled and run by the Contractor on an as needed basis.
    b. The WRTA, Designer, Contractor and all applicable Subcontractors will attend these meetings.
    c. The Contractor’s staff and Subcontractor’s actual supervisory people who will be performing the work in the field are to attend these meetings.
    d. Safety precautions relating to the work to be performed are also to be discussed as part of this meeting.
3. Coordination Meetings:
    a. The Contractor shall conduct project Coordination Meetings at regular intervals. Project Coordination Meetings are in addition to specific meetings held for other purposes, such as regular progress meetings and special pre-installation meetings. An example would be regularly scheduled MEP coordination meetings to monitor the progress of the MEP coordination process.

b. Contractor shall request representation by every party currently involved in coordination or planning for the construction activities involved.
c. Contractor shall record meeting results and distribute copies to everyone in attendance and others affected by decisions or actions resulting from each meeting. The WRTA and the Designer are to be on the Distribution List.

E. Regular Daily Inspections:

1. The Contractor shall monitor the quality of the in-place construction work daily, to ensure that it complies with the requirements of the Contract Documents, Pre-Construction Meetings, Pre-Installation Meetings and Coordination Meetings.
2. The Contractor shall log, record and distribute daily record of quality monitoring as a component of daily reporting and provide notification on a regular basis during construction of currently observed items requiring corrective action
3. The QA/QC Inspection Team will inspect work periodically based on observations noted in Contractor's reporting to verify completion and compliance.

F. Building Exterior Envelope Review:

1. WRTA will engage and pay for an independent testing firm to perform a review of the exterior envelope building design.
2. The design review will be performed by an independent consulting firm experienced with this type of work.
3. The scope of services for the building exterior envelope review shall include a documented review of the exterior building envelope design details and specifications, review of proposed product and material submittals prior to material acquisition, and on-site quality control inspections as deemed appropriate by the Contractor and WRTA.
4. Physical inspections shall include on-site meetings with project personnel, including the WRTA, Designer, Contractor and Subcontractors at various stages of installation.
5. The scope of the building envelope inspection, or review, should include, but is not limited to exterior building materials, flashings, bracing, anchors, weep holes and other water removal systems from with-in cavity walls, roofing systems, caulking and other sealants, parapet wall cap details, mullion details at openings, waterproofing below grade, and other abutting materials or systems.
6. The Contractor shall coordinate with and support the exterior envelope review inspections to include coordination of first delivery inspections, mock-ups and benchmarks called for within envelope system or specific materials specifications to which the design review of this section may apply.

G. First Delivery of Material/Equipment Inspection:

1. The Contractor shall manage and keep current an anticipated delivery schedule for all materials and equipment to be delivered to the site and provide regular updates or upon request to the WRTA and QA/QC Inspection Team.
2. The Contractor shall log, record and distribute any account on the first delivery of each type of material or equipment as a component of daily reporting and provide notification on a regular basis during construction of currently observed items requiring corrective action
3. First deliveries will be verified against the requirements of the design documents and the approved submittals. Nonconforming materials and/or equipment will not be allowed to be set into place and will be removed from the site.

4. This inspection establishes the basis for judging all future deliveries of like material/equipment.

H. First Equipment In Place Inspection:

1. The Contractor shall manage and keep current an anticipated schedule for all materials and equipment to be inspected in place and provide regular updates or upon request to the WRTA and QA/QC Inspection Team.
2. The Contractor and QA/QC Inspection Team will inspect and document the first setting of equipment to verify it is in conformance with the requirements of the Contract Documents.
3. The installation and assembly will be verified against the requirements of the design documents and the approved shop drawings.
4. The Contractor shall log, record and distribute any account for each type of first in place equipment inspection as a component of daily reporting and provide notification on a regular basis during construction of currently observed items requiring corrective action or pending inspection.
5. Upon acceptance of the equipment in place, The Contractor can proceed with permanently anchoring it into place by the means prescribed in the Contract Documents.
6. This inspection establishes the basis for judging all future setting of like equipment.

I. Mock-Up Inspections:

1. The note all Mock-Ups required by the Contract Documents and include the activity in their construction schedule and submit for review and approval of the WRTA, the Designer and the QA/QC Inspection Team.
2. The Contractor shall log, record and distribute any account of Mock-Up(s) as a component of daily reporting and provide notification on a regular basis during construction of currently observed items in process, requiring corrective action, or follow up, and inspection.
3. The Contractor shall benchmark each work type within the Mock-Up for conformance with the requirements and review with the QA/QC Inspection Team.
4. The QA/QC Inspection Team shall review, comment that the work appears in conformance to the requirements. Comments are documented and distributed by the Contractor. Non-conforming work will be corrected at no additional cost to WRTA.
5. The approved Mock-Up establishes a basis for judgment for all later like construction.
6. The Mock-Up process and inspection(s) does not take away from the responsibility of the Contractor and installing Subcontractors to provide a finished and fully functioning product and to maintain the construction schedule.

J. Benchmark Inspections (In Sequence Work):

1. The Contractor in consultation with the WRTA, Designer and QA/QC Inspection Team will establish which work will be scheduled for benchmarking during the normal course of construction.
2. The Contractor shall log, record and distribute any account of Benchmark(s) as a component of daily reporting and provide notification on a regular basis during construction of currently observed items in process, requiring corrective action, or follow up, and that require inspection.

3. The Contractor shall note that the work to be inspected has been started and if found to be acceptable shall call for a benchmark inspection to be conducted by the QA/QC Inspection Team.
4. The QA/QC Inspection Team shall review, comment that the work appears in conformance to the requirements. Comments are documented and distributed by the Contractor. Non-conforming work shall be corrected at no additional cost to WRTA.
5. This inspection establishes the basis for judging all future work of a like type, none of which shall commence until the benchmark is approved.
6. The Benchmark process and inspection(s) does not take away from the responsibility of the Contractor and installing Subcontractors to provide a finished and fully functioning product and to maintain the construction schedule.

K. Follow-Up Benchmark Inspections:

1. The Contractor shall ensure that all subsequent work being built of the same type of work that was previously benchmarked shall be built in conformance to the Benchmarked work without deviation.
2. The Contractor and QA/QC Inspection Team will randomly inspect subsequent work being built of the same type of work that was previously benchmarked to ensure the work is being built in conformance with the benchmarked work.
3. The Contractor shall log, record and distribute any account of follow-up benchmark(s) as a component of daily reporting and provide notification on a regular basis during construction of currently observed items in process, requiring corrective action, or follow up, and that require inspection.

L. Below Grade / In Wall and Above Ceiling Inspections:

1. It is the intent of this section to mandate inspection of as much of the work that is to be enclosed before it has been covered over to avoid having to reopen closed spaces to complete or correct work therein.
2. The Contractor shall verify that all work is complete within the concealed space and is ready to be inspected before it is enclosed.
3. The Contractor and all Subcontractors who have work installed within the work area shall sign a closure form stating that their work has been completed and has been inspected by all applicable code officials. The Contractor shall be responsible for all costs to have the space reopened later to complete or correct any work within the space, and to have the space closed again, including all costs incurred for any schedule impacts due to this work.
4. Photographs of areas to be permanently enclosed shall be taken by The Contractor and retained as a part of the project record.
5. The Contractor shall log, record and distribute account of below grade, in wall or above ceiling inspections as a component of daily reporting and provide notification on a regular basis during construction of currently observed items in process, requiring corrective action, or follow up.
6. No closure or covering of work shall proceed until all requirements are met and approval given by the QA/QC Inspection Team where such inspections are to be conducted.

M. Utility Activation and Start-Up Inspection Procedures for Equipment/Systems Prior to Validation. Refer to Section 019100 - COMMISSIONING for additional requirements.

1. Activation Inspection:

a. The Activation Inspection is required when the Contractor has verified that system work meets the contract document requirements and has completed the static installation of equipment/systems, and is ready to place it into dynamic operation for the purposes of shakedown, debugging, check-out and similar activities.
b. The Contractor shall log, record and distribute any account of pending activations as a component of daily reporting and provide separate individual notification at a minimum of 48 hour notice prior to the scheduled time for placing specific equipment into dynamic operation.
c. The Contractor shall notify the QA/QC Inspection Team who will inspect the work, the surroundings and provide comment that the installation is safe and appears meets the requirements for operation.
d. Any deficiencies noted shall be corrected immediately
e. The Contractor shall then place the equipment/systems into operation for his use, shakedown, debugging, check-out, and similar activities.

2. Start-Up Inspection:
a. The Contractor shall coordinate with WRTA's Commissioning Agent to ensure that start-up procedures, O&M's, prefunctional checklists and testing, equipment manufacturer's representation are completed and/or in place according to the approved Commissioning Plan.
b. The Contractor shall log, record and distribute any account of pending startups as a component of daily reporting and provide separate individual notification at a minimum of 48 hour notice prior to the scheduled time for placing specific equipment into final operation.
c. The Contractor shall coordinate with the QA/QC Inspection Team and WRTA CA to ensure that the installation operates as required.
d. All non-conforming work shall be corrected immediately.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 014200

REFERENCES

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DEFINITIONS

A. General: Basic Contract definitions included in the General Conditions of the Contract are incorporated by reference.

B. "Reviewed": When used to convey Designer's action on General Contractor's submittals, applications, and requests, "reviewed" is limited to Designer's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": A command or instruction by Designer. Other terms including "requested," "authorized," "selected," "approved," "required," and "permitted" have the same meaning as "directed."

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, regulations, codes, decrees, requirements of governmental and quasi-governmental authorities, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work that Awarding Authority deems acceptable.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation by others, and similar operations.

G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. "Project Site": Space available for performing construction activities subject to WRTA and User Agency approval. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced in the Contract Documents. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents, unless otherwise indicated. In the event that the Contractor becomes aware of an update after the date of the Contract Documents which they believe may impact the Project, notify the WRTA and Designer in writing for resolution of such impact.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source, and have available on site for reference.

1.4 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale Research's "Encyclopedia of Associations" or in Columbia Books' "National Trade & Professional Associations of the U.S."

AA	Aluminum Association, Inc. (The)
AAMA	American Architectural Manufacturers Association
AASHTO	American Association of State Highway and Transportation Officials
ABAA	Air Barrier Association of America
ACI	ACI International (American Concrete Institute)
AGC	Associated General Contractors of America (The)
AIA	American Institute of Architects (The)
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
ALSC	American Lumber Standard Committee, Incorporated
AMCA	Air Movement and Control Association International, Inc.
ANSI	American National Standards Institute
APA	APA - The Engineered Wood Association
ARMA	Asphalt Roofing Manufacturers Association
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
ASME	ASME International (The American Society of Mechanical Engineers International)
ASTM	ASTM International (American Society for Testing and Materials International)
AWI	Architectural Woodwork Institute
AWPA	American Wood-Preservers' Association
AWS	American Welding Society
BHMA	Builders Hardware Manufacturers Association

BIA	Brick Industry Association (The)
CDA	Copper Development Association
CISCA	Ceilings & Interior Systems Construction Association
CRI	Carpet & Rug Institute (The)
CSI	Construction Specifications Institute (The)
DHI	Door and Hardware Institute
EPA	Environmental Protection Agency (United States)
FM	Factory Mutual
FMRC	Factory Mutual Research (Now FM Global)
FSC	Forest Stewardship Council
GA	Gypsum Association
GANA	Glass Association of North America
GS	Green Seal
HPVA	Hardwood Plywood & Veneer Association
ICRI	International Concrete Repair Institute, Inc.
IESNA	Illuminating Engineering Society of North America
ILI	Indiana Limestone Institute of America, Inc.
ISO	International Organization for Standardization
ISSFA	International Solid Surface Fabricators Association
ITS	Intertek Testing Service NA
LEED	Leadership in Energy & Environmental Design (USGBC)
MFMA	Maple Flooring Manufacturers Association, Inc.
NAAMM	National Association of Architectural Metal Manufacturers
NAIMA	North American Insulation Manufacturers Association
NBGQA	National Building Granite Quarries Association, Inc.
NCMA	National Concrete Masonry Association
NeLMA	Northeastern Lumber Manufacturers' Association
NEMA	National Electrical Manufacturers Association
NFPA	NFPA (National Fire Protection Association)
NFRC	National Fenestration Rating Council
NOFMA	NOFMA: The Wood Flooring Manufacturers Association (Formerly: National Oak Flooring Manufacturers Association)
NRCA	National Roofing Contractors Association
NSF	NSF International (National Sanitation Foundation International)
NTMA	National Terrazzo & Mosaic Association, Inc. (The)
NWWDA	National Wood Window and Door Association (Now WDMA)
SDI	Steel Deck Institute
SGCC	Safety Glazing Certification Council
SJI	Steel Joist Institute
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association
SSINA	Specialty Steel Industry of North America
SSPC	SSPC: The Society for Protective Coatings
TCA	Tile Council of America, Inc.
UL	Underwriters Laboratories Inc.
USGBC	U.S. Green Building Council
WCLIB	West Coast Lumber Inspection Bureau
WDMA	Window & Door Manufacturers Association

(Formerly: NWWDA - National Wood Window and Door Association)
WWPA Western Wood Products Association

B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of current edition of Codes in the Commonwealth of Massachusetts.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 015000

TEMPORARY FACILITES AND CONTROLS

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide temporary facilities and controls, including but not limited to the following:

1. Temporary Water.
2. Weather Protection.
3. Heating During Construction.
4. Temporary Power.
5. Hoisting Equipment and Machinery.
6. Staging.
7. Maintenance of Access.
8. Dust Control.
9. Noise Control.
10. Enclosures.
11. Cleaning During Construction.
12. Field Offices.
13. Telephone Service.
14. Sanitary Facilities.
15. Construction Barriers.
16. Parking.
17. Safety Protection.
18. Vehicle and Equipment Protection.
19. Fire Safety During Construction.
20. Shoring.
21. Construction Fence.
22. Project Identification Sign.

B. Related Work: The following items are not included in this Section and are specified under the designated Sections:

1. Section 017419 - CONSTRUCTION WASTE MANAGEMENT:
   a. Debris control and removal.
2. Section 018119 - CONSTRUCTION INDOOR AIR QUALITY MANAGEMENT:
   a. Smoking policies and other indoor air quality requirements.

1.3 TEMPORARY WATER

A. Water will be furnished by the Contractor up to the point indicated on the Drawings for the permanent connection to the water supply system.

B. Water shall be distributed by means of connections to the permanent service lines that are to be installed at the expense of the Plumbing Subcontractor.

C. Any temporary hoses and pipe lines and connections from the permanent service lines either outside or within the building, necessary for the use of the Contractor and his Subcontractors shall be installed, protected, and maintained at the expense of the Plumbing Subcontractor.

D. Temporary hoses and temporary pipe lines used for transporting water shall not be run unattended or unprotected across parking areas, parking area entrance, walkways, plazas, or steps. Temporary hoses and temporary pipelines shall not be permitted to be installed along, through or across corridor and occupied rooms or spaces.

E. The Contractor shall provide an adequate supply of drinking water from approved sources of acceptable quality, satisfactorily cooled, for his employees and those of his Subcontractors.

F. Use of the water may be discontinued by the Commonwealth if, in the opinion of the WRTA Project Manager, it is wastefully used.

1.4 WEATHER PROTECTION

A. It is the intent of these Specifications to require that the Contractor shall provide temporary enclosures and heat to permit construction work to be carried on during the months of November through March in compliance with M.G.L. Chapter 149, Section 44G(D). Under no circumstances shall the Contractor suspend any work during the months of November through March because of their reluctance to provide and pay for temporary weather protection. These Specifications are not to be construed as requiring enclosures or heat for operations that are not economically feasible to protect in the judgment of WRTA. Included in the preceding category, without limitation, are such items as site work, excavation, steel erection, erection of certain "exterior" wall panels, roofing, and similar operations.

B. "WEATHER PROTECTION" shall mean the temporary protection of that work adversely affected by moisture, wind, and cold, by covering, enclosing and/or heating. This protection shall provide adequate working areas during the months of November through March as determined by WRTA and consistent with the approved construction schedule to permit the continuous progress of all work necessary to maintain an orderly and efficient sequence of construction operations. The Contractor shall furnish and install all "weather protection" material and be responsible for all costs, including heating required to maintain a minimum temperature of 55 degrees F. at the working surface. This provision does not supersede any specific requirements for methods of construction, curing of materials or the applicable general conditions set forth in the Contract with added regard to performance obligations of the Contractor.

C. Within 30 calendar days after his award of contract, the Contractor shall submit in writing to the Designer for approval, three copies of his proposed methods for "Weather Protection."

D. Installation of weather protection and heating devices shall comply with all safety regulations including provisions for adequate ventilation and fire protection devices. Heating devices which may cause damage to finish surfaces shall not be used.

E. The Contractor shall furnish and install one accurate Fahrenheit thermometer at each work area as designated by the Designer. However, one additional accurate Fahrenheit thermometer shall be provided for every 2,000 square feet of floor space where the work areas exceed 2,000 square feet.

1.5 HEATING DURING CONSTRUCTION

A. Within 30 calendar days after the commencement of work under this Contract, the Contractor shall submit in writing to the Designer for approval, three copies of his method and time schedule for heating during construction which shall concur with his general progress schedule hereto before submitted as required under the CONTRACT AND GENERAL CONDITIONS.

B. After the building or portion thereof is completely enclosed by either permanent construction or substantial temporary materials having a comparable resistance as the specified permanent construction. The Contractor shall pay and provide heat therein of not less than 55 degrees F., nor more than 75 degrees F., which shall be continuously maintained in the enclosed area to the extent necessary to properly progress and protect the work until the project is accepted.

C. The Contractor shall furnish and install one accurate recording Fahrenheit thermometer at a place designated by the Designer, and one additional accurate thermometer for every 2,000 square feet of floor space, located as directed by the Designer in order to determine if the specified temperatures are maintained. The Contractor or his authorized agent shall furnish daily to the Resident Engineer three copies of a signed statement of temperatures recorded every three hours.

D. The Contractor, with the approval of the Designer and WRTA, may use the permanent heating system as specified for the project once it has been tested, flushed out and chemically treated, thoroughly cleaned of all construction dust and dirt, and is ready to operate. The Contractor shall pay all energy costs for heating during construction and provide meters if required. The Contractor and the HVAC and/or Electrical subcontractor shall coordinate their work so that the permanent heating system for the building will be available and ready to provide heat as soon as the building is closed in. In case the Contract includes more than one building, the heating shall be provided for each building in accordance with the above provision.

E. Operating labor shall be provided for continuous direct attendance, for frequent inspection of the system, emergency repairs, and keeping of temperature records. Continuous direct attendance shall mean direct attendance for twenty-four hours each day, seven days per week, Saturdays, Sundays and holidays included, throughout the progress of the work.

F. It shall be the sole responsibility of the Contractor to arrange for and pay the HVAC and/or Electrical subcontractor to operate and to put in first-class condition all portions of the permanent heating system used for heating during cconstruction. The Commonwealth will require the discharge of inexperienced or unsatisfactory operating labor.

G. If the system is electric heat, the foregoing requirements shall equally apply to all the comparable components thereof.

H. The installation and operation of heating devices shall comply with all safety regulations including provisions for adequate ventilation and fire protection. Heating devices which may cause damage to finish surfaces shall not be used

1.6 TEMPORARY POWER

A. The Contractor will coordinate with utility company and provide electrical energy required for temporary light and power. The Electrical Subcontractor is required under Section 260001 - ELECTRICAL WORK, to provide temporary feeders of sufficient capacity from the local utility company, or from the institution power lines, at the point designated on the drawings, to provide for the electric light and power requirements of the Project while under construction and until the permanent feeders have been installed and are in operation. It is not the intent of the above statement to relieve the Contractor of the responsibility of payment for energy consumed during construction, but rather to afford him use of permanent feeder, etc. for electric distribution during construction. Payment for energy consumed during construction shall be the responsibility of the Contractor until either Use and Occupancy or Final Acceptance has occurred.

B. The Contractor shall pay for the cost of electric energy consumed by itself and by all of its subcontractors. Any temporary wiring of a special nature, other than that specified in Section 260001 - ELECTRICAL WORK, shall be paid for by subcontractors requiring it, such as:

1. Special circuits required by electric welders, elevators, lifts or other special equipment requiring high-amperage and/or special voltage service, etc.
2. Exterior lighting circuits for protection against vandalism, public warning lights, lights for advertising, and similar items.

C. The Contractor and all subcontractors, individually, shall furnish all extension cords, sockets, motors, and accessories required for their work. They shall also pay for all temporary wiring of construction offices and buildings used by them. The Contractor shall pay for the offices of the Contractor and the Resident Engineer specified in the Contract Form.

D. All temporary wiring installed by the Electrical Filed Sub-Bid Contractor shall be removed after it has served its purpose. Use copper wire only.

E. All relocations of temporary service to meet construction and/or phasing requirements shall be performed at no additional cost to the Commonwealth.

1.7 HOISTING EQUIPMENT AND MACHINERY

A. All hoisting equipment and machinery required for the proper and expeditious prosecution and progress of the work shall be furnished, installed, operated and maintained in safe condition by the individual subcontractors as applicable to their trade. All costs for hoisting operating services shall be borne by the subcontractors unless specifically excepted in the Contract Documents.

1. A licensed equipment manufacturer’s representative shall be present at all times, to witness the erection and dismantling of all hoisting equipment and machinery, whenever

such equipment is being erected or dismantled. No such work will be performed without the presence of such representative.

2. Hoisting equipment and machinery erection and dismantling shall be performed only by trained, certified, and experienced riggers qualified to perform such work.
3. Copies of such licenses and/or certifications, clearly indicating qualifications, shall be provided to the WRTA Resident Engineer prior to commencement of such erecting and dismantling work.

B. Review Drawings for hoisting requirements and openness of traffic access routes to installed destinations of specified equipment and furnishings.

1.8 STAGING

A. All staging, planking and scaffolding, exterior and interior, required for the proper execution of the work and over eight feet in height, shall be furnished, installed, and maintained by the Contractor. Individual subcontactors shall be responsible for notifying the Contractor for moving staging, planking and scaffolding with sufficient notice to allow the Construction Manger's timely response. The Contractor will be responsible for all potential costs from subcontractors if timely response is not provided.

1. Erection and dismantling of staging shall be performed only by trained, certified, and experienced staging personnel qualified to perform such work.
2. Copies of such certifications, clearly indicating qualifications, shall be provided to the WRTA Resident Engineer prior to commencement of such erecting and dismantling work.

B. All staging up to eight feet in height shall be provided by the individual subcontractors as applicable to their work.

1.9 MAINTENANCE OF ACCESS

A. The Contractor shall provide and maintain for the duration of his contract, a means of access to, around and within the site, as indicated on the Contract Drawings, for vehicular traffic and authorized personnel. This means of access shall be construed to sustain the weight of equipment customarily engaged for use in construction projects of this type and magnitude. The Contractor shall, without additional compensation from the Commonwealth, furnish labor and materials as may be required from time to time to maintain this means of access in an acceptable condition as determined by the Designer and WRTA. Pedestrian access shall provide adequate protection against falling debris, slippage, adequate lighting, warning and directional signs, and protection against construction activities.

1.10 DUST CONTROL

A. The Contractor shall have all Subcontractors provide adequate means for the purpose of preventing dust caused by construction operations from creating a hazard, nuisance, and from entering adjacent occupied areas throughout the period of the construction contract.

B. This provision does not supersede any specific requirements for methods of construction or applicable general conditions set forth in the Contract Articles with added regard to performance obligations of the Contractor.

1.11 NOISE CONTROL

A. Comply with requirements of authorities having jurisdiction. Develop and maintain a noise-abatement program and enforce strict discipline over all personnel to keep noise to a minimum.

B. Execute construction work by methods and by use of equipment which will reduce excess noise.

1. Equip air compressors with silencers, and power equipment with mufflers.
2. Manage vehicular traffic and scheduling to reduce noise.
3. No heavy equipment may be started or idled before 7:00 A.M.

1.12 ENCLOSURES

A. Provide temporary, insulated, weather tight closures of openings in exterior surfaces for providing acceptable working conditions and protection for materials, allowing for heating during construction, and preventing entry of unauthorized persons. Provide doors with self-closing hardware and locks.

B. All utilities including electric ducts, conduits, telephone lines, sprinklers, and other utilities shall be protected against damage from construction activity. The Contractor shall be responsible for all damage to the utilities from construction and shall repair all such damage at no additional cost to WRTA.

1.13 CLEANING DURING CONSTRUCTION

A. Unless otherwise specified within the Specifications, the Contractor shall perform clean-up operations during construction as herein specified.

1. Refer to Section 017419 - CONSTRUCTION WASTE MANAGEMENT for additional requirements.

B. Control accumulation of waste materials and rubbish; periodically dispose of off-site in a legal manner. The Contractor shall bear all costs, including fees resulting from such disposal.

C. Clean interior areas prior to start of finish work and maintain areas free of dust and other contaminants during finish operations.

D. Conduct cleaning and disposal operations to comply with local ordinances and anti- pollution laws.

E. Maintain project in accordance with all local, Commonwealth of Massachusetts, and Federal Regulatory Requirements.

1. Store volatile wastes in covered metal containers, and remove from premises.

2. Prevent accumulation of wastes which create hazardous conditions.
3. Provide adequate ventilation during use of volatile or noxious substances.

F. Cleaning: Clean interior areas prior to start of finish work and maintain areas free of dust and other contaminants during finish operations.

1. Use only those materials which will not create hazards to health or property and which will not damage surfaces.
2. Use only those cleaning materials and methods recommended by manufacturer of surface materials to be cleaned.
3. Handle material in a controlled manner with as few handlings as possible. Do not drop or throw materials from heights.
4. Schedule cleaning operations so that dust and other contaminants resulting from cleaning process will not damage surrounding surfaces.

G. Execute cleaning to ensure that the buildings, the sites, and adjacent properties are maintained free from accumulations of waste materials and rubbish and windblown debris, resulting from construction operations.

H. Provide on-site containers for collection of waste materials, debris, and rubbish.

(Designer shall customize the following field office requirements with the WRTA Project Manager.)

1.14 FIELD OFFICES

A. The Contractor shall provide and maintain a temporary ticketing office for WRTA, to provide temporary communication and service during the lobby construction.

B. Provide desk, ramp and ticketing window compliant with the accessibility requirements of Code of Massachusetts Regulations Title 521 (521 CMR).

1.15 SANITARY FACILITIES

A. The Contractor shall provide suitable toilet facilities for its staff, the Resident Engineer and the Designer, and additional facilities for the workmen on the job, including personnel of Subcontractors.

B. Provide chemical toilets where work is in progress and in quantity required by OSHA Code.

C. Chemical toilets and their maintenance shall meet requirements of state and local health regulations and ordinances and shall be subject to the approval the Resident Engineer and Designer.

1.16 CONSTRUCTION BARRIERS

A. Proper construction barriers shall be provided around the contract work areas as defined by the Contract Drawings or as directed by the Resident Engineer.

B. Construction barriers shall consist of traffic cones, ribbons, tapes, secure fencing, trench covers, wood barriers, warning signs, directional signs, and other traffic materials to keep traffic and people from area of construction and maintain ongoing operations.

C. Barriers shall be erected at such approved locations as are necessary, sufficiently cross-braced and supported adequately from floors and ceilings as required.

1.17 PARKING

A. There will be No Contractor Parking on Site.

1.18 SAFETY PROTECTION

A. At no time shall the work be left unattended without proper safety protection and shall not be left unprotected to the weather and accessible to the public. It is the responsibility of the Contractor to maintain proper safety protection for the public while work is in progress or unattended.

1.19 VEHICLE AND EQUIPMENT PROTECTION

A. All construction activities shall be performed in such a manner so as not to dust, stain or damage any building elements, equipment, vehicles, etc. within general vicinity of the construction work area. Any damage to these items shall be cleaned and repaired at the expense of the Contractor.

1. All construction vehicles and equipment on site shall be effectively disabled and secured when not in use.

1.20 FIRE SAFETY DURING CONSTRUCTION

A. Fire-Safety Program: Comply with requirements of authorities having jurisdiction and NFPA 241 Standard for Safeguarding Construction, Alteration, and Demolition Operations.

1. Submit a copy of NFPA 241 Impairment Plan to local fire department. Indicate Contractor personnel responsible for management of fire-prevention program.

B. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.

1. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
2. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

1.21 SHORING

A. The subcontractors shall provide all temporary shoring and bracing as required for the proposed work. Comply with all applicable codes and standards.

1.22 CONSTRUCTION FENCE

A. Contractor shall provide a construction fence along the entire perimeter of the contract limit lines, and shall be kept in good repair at all times, and shall be arranged and modified to maintain ongoing operation's access and egress during project.

B. Construction fences shall be six feet high and of chain link, or approved equal, erected in a substantial manner, straight, plumb and true as approved by the Designer.

C. Gates shall be built into fence at such approved locations as are necessary, well cross-braced and hung on heavy strap hinges with proper post and hook for double gates. Provide heavy hasps and padlocks for each gate. Provide a set of three keys for each lock to WRTA Project Manager and Resident Engineer to facilitate emergency access.

D. Fencing shall be removed by the Contractor at no cost to WRTA at such time before final completion as the Designer directs. Restore site to acceptable condition after removing fence

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 016000

PRODUCT REQUIREMENTS

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 REQUIREMENTS INCLUDED

A. Products include material, equipment, and systems.

B. Comply with Specifications and referenced standards as minimum requirements.

C. Components required to be supplied in quantity within a Specification Section shall be the same, and shall be interchangeable.

D. Do not use materials and equipment removed from existing structures, except as specifically required, or allowed, by the Contract Documents.

E. In the case of an inconsistency between Drawings and the Project Manual, or within either document which is not clarified by addendum, the product of greater quality or greater quantity of work shall be provided in accordance with the Designer’s interpretation.

1.3 WORKMANSHIP

A. Comply with industry standards except when more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship.

B. Perform work by persons qualified to produce workmanship of specified quality.

C. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, and racking.

1.4 MANUFACTURERS' INSTRUCTIONS

A. When work is specified to comply with manufacturers' instructions, submit copies as specified in Section 013300 - SUBMITTAL REQUIREMENTS, distribute copies to persons involved, and maintain one set in field office.

B. Perform work in accordance with details of instructions and specified requirements.

1.5 TRANSPORTATION AND HANDLING

A. Refer to the Contract and General Conditions and Specifications Sections for requirements pertaining to transportation and handling of materials and equipment.

B. Transport products by methods to avoid product damage; deliver in undamaged condition in manufacturers' labeled and unopened containers or packaging, dry

C. Provide equipment and personnel to handle products by methods to prevent soiling or damage.

D. Promptly inspect shipments to assure that products comply with requirements, that quantities are correct, and products are undamaged.

1.6 STORAGE AND PROTECTION

A. Refer to the Contract and General Conditions and Specifications Sections for requirements pertaining to storage and protection of materials and equipment.

B. Store products in accordance with manufacturers' instruction, with seals and labels intact and legible. Store sensitive products in weather tight enclosures; maintain within temperature and humidity ranges required by manufacturers' instructions.

C. For exterior storage of fabricated products, place on sloped supports above ground. Cover products subject to deterioration with impervious sheet covering; provide ventilation to avoid condensation.

D. Store loose granular materials on solid surfaces in a well-drained area; prevent mixing with foreign matter.

E. Arrange storage to provide access for inspection. Periodically inspect to assure that products are undamaged, and are maintained under required conditions.

F. Protect masonry and stone products from damage and staining.

G. Protect finished materials, including window frames and doors, with protection acceptable to the WRTA.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 017419

CONSTRUCTION WASTE MANAGEMENT

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

1.2 SUMMARY

A. This Section includes requirements for the Contractor's implementation of waste management controls and systems for the duration of the Work.

1. LEED MRp2, Construction and Demolition Waste Management Planning: Develop a waste management plan, quantifying material diversion by either weight or volume to recycle and/or salvage non-hazardous construction and demolition debris.

a. Exclude excavated soil and land-clearing debris from calculations.
b. Diverted waste includes recycled, salvaged, reused, and donated materials.
c. Include materials destined for alternative daily cover (ADC) in the calculations as waste (not diversion).
d. Include wood waste converted to fuel (bio-fuel) in the calculations as diversion. Other types of waste-to-energy are not considered diversion for this credit.

2. LEED MRc5, Construction and Demolition Waste Management: Comply with one of the following paths, as directed by the LEED Checklist:

a. Option 1, Diversion:
1) Path 1: Divert at least 50 percent and three material streams of non-hazardous construction and demolition debris.
2) Path 2: Divert at least 75 percent and four material streams of non-hazardous construction and demolition debris.
b. Option 2, Reduction of Total Waste Material: Do not generate more than 2.5 pounds of construction waste per square foot (12.2 kilograms of waste per square meter) of the building’s floor area.

B. Related Work: The following items are not included in this Section and are specified under the designated Sections:

1. Section 013543 - ENVIRONMENTAL PROTECTION PROCEDURES:
a. Environmental-protection measures during construction.
2. Section 024100 - DEMOLITION:
a. Demolition, salvage, and reuse requirements.
3. Section 311000 - SITE CLEARING:
a. Site clearing, grubbing, and chipping activities.

1.3 INTENT

A. WRTA and the Designer have established that this Project shall generate the least amount of waste practical and that processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors shall be employed.

1. With regard to these goals the Contractor shall develop, for the Designer's review, a Waste Management Plan (WMP) for this Project.

a. Final Waste Management Plan shall be submitted for LEED certification.

2. Each Subcontractor shall be responsible for segregating their own waste into different dumpsters as directed by the Contractor.
3. Source Separation, Definition: Source separated construction waste materials that are sorted into separate bins on the project site (aka on-site).

a. This waste strategy often isolates waste materials targeted for reuse, donation, or recycling programs.
b. Typically, sorted materials on-site include metals, wood, ceiling tiles, furniture, and concrete.

B. The Contractor shall be responsible for ensuring that debris will be disposed of at appropriately designated licensed solid waste disposal facilities, as defined by local authorities having jurisdiction or Massachusetts General Laws (MGL) Chapter 111, Section 150A.

1.4 SUBMITTALS

A. Construction and Demolition Waste Management Plan (WMP): Submit within 21 calendar days after receipt of Notice to Proceed, in a format acceptable to the WRTA and in compliance with USGBC requirements. Demolition shall not begin until WMP has been approved.

1. Establish waste diversion goals for the project by identifying at least seven materials (both structural and nonstructural) targeted for diversion. Approximate a percentage of the overall project waste that each material represents.
2. Construction and Demolition Handling Facilities:

a. Indicate the name(s) of the facilities where construction and demolition waste will be delivered and the applicable tipping fees.
b. Furnish Contractor’s statement of verification that facilities proposed for use are licensed for types of waste to be delivered and have sufficient capacity to receive waste from this project.

3. Material Handling Procedures, at Construction and Demolition Handling Facilities:

a. Indicate annual recycling rates and material streams, as defined by local authorities having jurisdiction or MassDEP.
b. Specify which materials shall be source separated or commingled and describe the diversion strategies planned for the project. Describe where the materials will be taken and how the recycling facilities will process the materials.

4. Alternatives to Landfilling: A list of each material proposed to be salvaged or recycled during the course of the Project. Include the following and any additional items proposed:

a. Cardboard and paper products.
b. Clean dimensional wood. If means of diversion is Wood Derived Fuel (WDF) refer to submittal requirements below.
c. Beverage containers and employee food containers.
d. Concrete.
e. Slurry wall materials.
f. Bricks and masonry.
g. Asphalt.
h. Metals from framing, banding, stud trim, ductwork, piping, rebar, roofing, other trim, steel, iron, galvanized sheet steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.
i. Mechanical and electrical equipment.
j. Building components which can be removed relatively intact from existing construction.
k. Packaging materials, including cardboard, boxes, plastic sheet and film, polystyrene packaging, wood crates, and plastic pails.
l. Glass.
m. Scraps from new gypsum wall board (drywall).
n. Carpet and pad.
o. Acoustical ceiling panels.
p. Plastics, including plastic pails, polyethylene sheet, and bubble wrap.
q. Rigid foam.

5. Meetings: A description of the regular meetings to be held to address waste management.
6. Materials Handling Procedures, at Project Site: A description of the means by which any waste materials identified above will be protected from contamination, and a description of the means to be employed in recycling the above materials consistent with requirements for acceptance by designated facilities.

    a. Indicate which material streams shall be source separated and which shall be commingled.

7. Transportation: A description of the means of transportation of the recyclable materials (whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler and removed from the site) and destination of materials.

B. Waste Management Progress Reports: Concurrent with each Application for Payment, submit a written Waste Management Progress Report in the same format as required for Final Report.

1. Provide updated LEED v4 Construction and Demolition Waste Calculator with each progress report.

C. Waste Management Final Report: Prior to Substantial Completion, submit a written Waste Management Final Report summarizing the types and quantities of materials recycled and disposed of under the Waste Management Plan. Include the name and location of disposal facilities. Quantity may be measured by either weight or volume; be consistent in calculations. Include the following:

1. Material category, including source separated material streams.
2. Generation point of waste.
3. Total quantity of waste, by weight.
4. Quantity of waste salvaged, both estimated and actual.

5. Quantity of waste recycled, both estimated and actual.
6. Total quantity of waste diverted (salvaged plus recycled).
7. Total quantity of waste diverted (salvaged plus recycled) as a percentage of total waste.

D. Other Submittals:

1. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, and/or receipts.
2. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, and/or receipts.
3. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.
4. Specific LEED v4 Submittals:

    a. Provide completed LEED v4 Construction and Demolition Waste Calculator for LEED MRp2 and MRc5.
    b. Provide final report detailing waste streams generated, including tipping slips, disposal rates, and diversion rates.

E. Commingling Waste Vendor Submittals: Provide annual report from local or state government authority and summary attachment of diverted materials with the average annual recycling rate. Figures in the summary must be derived from the annual reports in concise clear language.

1. Commingling waste shall be considered one material stream.
2. Provide tipping invoices for commingled waste and the following:

    a. Vendor’s most recent annual report from local or state government authority.
    b. Vendor’s annual report summary attachment of diverted materials in tonnage, with the average annual recycling rate.

3. If Wood Derived Fuel (WDF) was listed as a diverted material in the above, vendors shall furnish a letter from the biomass plant stating their DOE operating permit number and that WDF was received from vendor, for the same year as the annual report.

PART 2 - PRODUCTS [Not Used]

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

A. General: Implement Waste Management Plan as approved by the Designer. Provide containers, storage, signage, transportation, and other items as required to implement WMP for the entire duration of the Contract.

1. Deliver waste directly to construction and demolition handling facilities. Do not deliver to transfer stations.

B. Commingled Waste: Commingling waste at the job site may be allowed, provided that the following conditions are met:

1. Commingled waste shall be included in the Waste Management Plan (WMP).
2. Additional comingled waste must be pre-approved by the Designer via WMP addenda, prior to tipping on the job site.

3.2 WASTE MANAGEMENT PLAN IMPLEMENTATION

A. Manager: The Contractor shall designate an on-site person responsible for instructing workers and overseeing and documenting results of the Waste Management Plan for the Project.

B. Distribution: The Contractor shall distribute copies of the Waste Management Plan to the Job Site Foreman, each Subcontractor, the WRTA, and the Designer.

C. Instruction: The Contractor shall provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the Project.

D. Separation Facilities: The Contractor shall lay out and label a specific area to facilitate separation of materials for recycling, salvage, reuse, and return. Recycling and waste bin areas are to be kept neat and clean and clearly marked in order to avoid contamination of materials. Location shall be acceptable to the WRTA.

1. Commingling: Waste commingling shall be approved prior to jobsite tipping, per requirements of this Section.

END OF SECTION

SECTION 017700

CONTRACT CLOSEOUT

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 FINAL CLEANING

A. Unless otherwise specified under the various Sections of the Specifications, the Contractor shall perform final cleaning operations as herein specified prior to final inspection.

B. Maintain project site free from accumulations of waste, debris, and rubbish, caused by operations. At completion of work, remove waste materials, rubbish, tools, equipment, machinery and surplus materials, and clean all sight-exposed surfaces; leave project clean and ready for occupancy.

C. Cleaning shall include all surfaces and areas, interior and exterior which the Contractor has accessed or impacted whether existing or new.

D. Refer to Sections of the Specifications for cleaning of specific products or work.

E. Use only those materials which will not create hazards to health or property and which will not damage surfaces or areas.

F. Use only those cleaning materials and methods that are recommended by the manufacturer of surface material to be cleaned and will maintain the quality of the air and environment.

G. Employ experienced workmen, or professional cleaners, for final cleaning operations.

H. Remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels, and other foreign materials from sight-exposed and all other interior and exterior surfaces.

I. Clean and polish mirrors and other such surfaces.

J. All new and existing glass and plastic surfaces throughout the building shall be thoroughly cleaned by qualified window cleaners at the expense of the Contractor just prior to acceptance of the Work.

K. Repair, patch and touch up marred surfaces to specified finish, to match adjacent surfaces as acceptable to the WRTA.

L. Clean and polish glossy and other surfaces to a clear shine and provide wax where necessary.

M. Ventilating Systems: Clean permanent filters and replace disposable filters as provided in applicable specifications. Units should not be operated without filters in place at any time. “Throw away” filters should be used when operating units prior to Substantial Completion. A Final Cleaning Report shall be prepared and include a section on all aspects of the ventilation systems’ final testing, post testing cleaning and final cleanliness status including ductwork and any other systems as required by the applicable specifications.

N. Broom clean exterior paved surfaces and rake clean other surfaces of the grounds.

O. Leave all architectural metals, hardware, and fixtures in undamaged polished conditions.

P. Leave pipe and duct spaces, plenums, furred spaces and the like clean of debris and decayable materials.

Q. At the end of the project, the Contractor and each Subcontractor shall remove all tools, equipment, machinery, and surplus materials from the job site. The Contractor shall remove all waste materials and rubbish from the project at this time. All temporary structures shall be removed and the project shall be left clean and returned to a usable condition acceptable to WRTA.

R. Subsequent to installation of User Agency furniture, telephones, and equipment, and prior to issue of Certificate of Use and Occupancy, the Contractor shall provide an additional cleaning to remove any soil resulting from installations of such furniture and equipment at no additional cost to WRTA. Such additional cleaning may include, but not be limited to dusting of horizontal surfaces, vacuuming, and washing of hard or resilient floor surfaces and re-waxing where required.

1.3 GLASS

A. All broken or defective glass, mirrors and the like not required to be replaced under the provisions of Section 088000 - GLAZING, shall be replaced at the expense of the Contractor.

1.4 AS-BUILT DRAWINGS

A. As-built Drawings shall be prepared and maintained by the Contractor for each and every Contract Drawing. As-built Drawings shall be kept up-to-date. Information from on-going Work shall be recorded on As-built Drawings within 48 hours of Work being performed.

B. The Contractor and each Subcontractor shall be required to maintain one set of As-built Drawings, as the work relates to their Sections of the Specifications, at the site.

C. The As-built Drawings shall be stored and maintained in the Contractor's field office apart from other documents used for construction. The As-built Drawings shall be maintained in a clean, dry, and legible condition..

D. As-built Drawings, as submitted by the Contractor shall be reviewed in the field by the Designer or its Consultants and shall occur during the construction process and prior to the related work being completed and covered up.

E. The As-built Drawings shall be available at all times for inspection by the WRTA or Designer. All deficiencies noted shall be promptly corrected.

F. The following information shall be indicated on the As-Built Drawings:

1. Record all changes, including, but not limited to, change orders, in the location, size, number and type both horizontally and vertically of all elements of the Project which deviate from those indicated on all the Contract Drawings.
2. The tolerance for the actual location of utilities and appurtenances within the building to be marked on the As-built Drawings shall be plus or minus two (2) inches.
3. The location of all underground utilities and appurtenances referenced to permanent surface improvements, both horizontally and vertically at ten (10) ft. intervals and at all changes of direction.
4. The location of all internal utilities and appurtenances, concealed by finish materials, including but not limited to valves, coils, dampers, vents, cleanouts, strainers, pipes, junction boxes, turning vanes, variable and constant volume boxes, ducts, traps and maintenance devices. The location of these internal utilities, appurtenances, and devices shall be shown by offsets to the column grid lines on the Drawings.
5. Each of the utilities and appurtenances shall be referenced by showing a tag number, area served and function on the As-built Drawings.

G. At the end of each month and before payment for materials installed, the Contractor, each Subcontractor, and agents of the Commonwealth shall review As-built Drawings and at closeout shall also review Closeout Documentation for purpose of payment.

1. If the changes in location of all installed elements are not shown on the As-Built Drawings and verified in the field, then the material shall not be considered as installed and payment will be withheld.

H. Prior to the installation of all finish materials, a review of the As-built Drawings shall be made to confirm that all changes have been recorded. All costs to investigate such conditions shall be borne by the applicable party as determined by the Designer.

I. At the completion of the contract, each Subcontractor shall submit to the Contractor a complete set of its respective As-built Drawings indicating all changes. After checking the above drawings, the Contractor shall certify in writing on the title sheet of the drawings that they are complete and correct and shall submit the As-built Drawings to the Designer.

1. As-Built Drawings shall be submitted electronically to the Designer, in a format which can be added to the complete plans as constructed.

J. The Designer shall review the drawings and shall verify by letter to the WRTA that the work is accurate. The Designer shall incorporate all changes on the original drawings; thus creating Record Drawings. The Designer shall submit to the WRTA, electronic files in the version of Autocad, or BIM compatible with those currently being utilized by WRTA. Inaccuracies in As-built Drawings, as determined by the Designer and the WRTA, may be grounds for

postponement of the final inspection or delay the processing of final payment until such inaccuracies are corrected by the Contractor.

1.5 OPERATING AND MAINTENANCE REQUIREMENTS

A. At least two weeks prior to the time of turning over this contract to the Operating Agency for Use and Occupancy, or Final Acceptance, the Contractor shall secure and deliver to the Operating Agency via the Designer, three (3) complete, indexed files and three (3) electronic copies in a format acceptable to WRTA, containing approved operating and maintenance manuals, shop drawings, record of paint colors, floor and ceiling materials and other data as follows.

1. Operating manuals and operating instructions for each model and type of equipment in each of the various systems. Include operating instructions for systems integrating several pieces of equipment.
2. Catalog data sheets for each item of mechanical or electrical or equipment actually installed including performance curves, rating data and parts lists.
3. Catalog sheets, maintenance manuals, and approved shop drawings of all mechanical or electrical equipment controls and fixtures with all details clearly indicated, including size of lamps and other maintenance supplies.
4. Names, addresses and telephone numbers of all Subcontractors and suppliers, together with repair and service companies for each of the major systems installed under this contract.
5. Provide a steel cabinet for storage of manuals and operating instructions.

B. Failure to provide operating and maintenance manuals or inaccuracies therein may be grounds for cancellation and postponement of any scheduled final inspection and will delay project closeout and payment.

1.6 CAPITAL ASSET MANAGEMENT INFORMATION SYSTEM (CAMIS)

A. As the project progresses, Contractor and Subcontractors shall submit information for installed and removed equipment, including, but not limited to, equipment data and preventive maintenance schedules, for each building system, and any updates thereto, in a format acceptable to WRTA for entry into CAMIS.

1.7 CLOSEOUT REQUIREMENTS AND SUBMITTALS

A. Procedural Requirements Prior to Use and Occupancy: Punch List:

1. During the finishing stages of the project, the Contractor shall make frequent inspections with Subcontractors, the Designer, and the WRTA Resident Engineer, so as to progressively check for and correct faulty work.
2. During the course of construction of the project, the Contractor shall procure and maintain test records and certificates that will be required prior to issuance of the Department of Public Safety (DPS) Certificate of Occupancy or final construction approval by DPS, as applicable, and the Division of Capital Asset Management and Maintenance (WRTA) Certificate of Agency Use and Occupancy.

3. When the Contractor determines that it is Substantially Complete*, it shall prepare for submission to the Designer a list of items to be completed or corrected. The failure to include any items on such list does not alter the responsibility of the Contractor to complete all work in accordance with Contract Documents. The Contractor's list shall be accompanied with certificates that will be required as prerequisites for applying for a DPS inspection.
    a. *NOTE: Substantially Complete means that less than one percent (1%) of the adjusted contract price, including change orders, remains to be done, that none of the remaining work will affect health, safety, or function, and meets the requirements of the Contract.
4. Upon receipt of the Contractor's list of items to be completed or corrected, the Designer will promptly make a thorough inspection, together with representatives of WRTA and the Operating Agency, and prepare a "punch list", setting forth in accurate detail any items on the Contractor's list and additional items that are not acceptable. Concurrently, the Contractor will arrange for a DPS inspection.
5. When the punch list has been prepared, and any DPS Inspector comments have been included, the Designer will arrange a meeting with the Contractor and Subcontractors, and the WRTA, to identify and explain all punch list items and answer questions on the Work that must be done before Final Acceptance.

[Designer Note; If a DPS inspector (including, but not limited to AABA, boiler, elevator or any other authorized inspector) requires modifications and/or additions that were not included in the construction documents, the Designer should review the applicable code(s) and provide written interpretation to the WRTA together with his/her recommendations.]

6. The Contractor shall immediately correct all punch list items that affect health, safety or function (as determined by the Designer, completion of which is required before issuance of a WRTA Certificate of Agency Use and Occupancy).

B. Contractor's Prerequisites for Department of Public Safety (DPS) Certificate of Inspection and/or Certificate of Occupancy: Prior to requesting a Department of Public Safety (DPS) inspection, the Contractor shall provide (via transmittal to the WRTA Resident Engineer) the following "closeout submittals:"

1. Project record documents and as-built marked-up drawings.
2. Approved operating and maintenance (O & M) data.
3. Extended guarantees and warranties.
    a. Contractor's General Guarantee shall effectively include:
        1) A written guarantee, for one (1) year from date of Substantial Completion of the project, against defective workmanship, material, installation and equipment for all work of the project. Repair or replacement of defective workmanship, material, installation or equipment that develop within this period shall be accomplished promptly upon notification to the Contractor, to the satisfaction of the Operating Agency, at no cost.
        2) Replace or repair material or equipment that requires excessive service during the guarantee period.
        3) Guarantee shall include 24-hour service of complete system(s) during guarantee period at no additional cost.
        4) Provide manufacturer's engineering and technical staff at site promptly to analyze and rectify problems that develop during guarantee period. If problems cannot be rectified promptly, to the satisfaction of the User Agency, advise the Designer in writing; describe efforts to rectify situation and provide analysis of cause of problem.

b. Manufacturer's Guarantee or Warranty:
   1) In addition to guarantee requirements above, obtain manufacturers' written installation, equipment, and material warranties for time periods indicated in the various Specification Sections of the Contract Documents. Such manufacturers' warranties contained within the Specification Sections, together with any other warranties offered in manufacturers' published data, are to be transferred to the User Agency.
c. Keys and keying schedule.
d. Spare parts and materials ("attic stock"),
e. Evidence of compliance with requirements of governing authorities including, without limitations, the following:
   1) Certificate of Inspection, in form of signed permits from the electrical, plumbing, gas, fire department, boiler, and any other required inspectors.
   2) Certification from the local fire department to the effect that all detection, alarm and suppression systems, and other equipment or systems under fire department jurisdiction are approved.
   3) When carpeting and/or draperies are provided, a flame, smoke and fuel-rating certificate provided by the supplying Contractors.
   4) Elevator certification(s) from the elevator inspector obtained through the Contractor's Elevator Trade Contractor.
   5) A letter from the Plumbing Trade Contractor that the potable water supply has been sanitized.
   6) Septic system certification obtained from the town by the Contractor (when applicable).
   7) Pressurized vessel certifications from the boiler inspector obtained through the Mechanical Trade Contractor.
   8) When air balancing is required, the air balancing report prepared by the Mechanical Trade Contractor (or commissioning agent, when applicable), and accepted by the design Registered Professional Engineer licensed in the Commonwealth of Massachusetts.
   9) When smoke control/fire emergency ventilation system is required, the test report prepared by the Mechanical Trade Contractor (or commissioning agent, when applicable), and accepted by the design Registered Professional Engineer licensed in the Commonwealth of Massachusetts.
   10) Evidence of test and approval for Department of Environmental Protection (DEP) and Department of Public Health (DPH), when applicable.

C. Designer's Prerequisites for Department of Public Safety (DPS) Certificate of Inspection and/or Certificate of Occupancy: Prior to requesting a Department of Public Safety (DPS) inspection, the Designer shall provide (via transmittal to the WRTA Resident Engineer) the following "closeout submittals:"

1. Certification, from the design Registered Professional Engineer licensed in the Commonwealth of Massachusetts, stating that the fire protection systems have been installed in accordance with the approved fire protection construction documents and meet the requirements of 780 CMR 903.1.
2. Structural Engineer-of-Record (SER) final report as required by 780 CMR 1705.3.
3. Certification, from the design Registered Professional Engineer licensed in the Commonwealth of Massachusetts, stating that the emergency lighting and power systems have been installed in accordance with the approved electrical construction documents.

D. Upon completion of the Work for which a permit has been issued, the DPS building official shall conduct a final inspection pursuant to 780 CMR 115.5.

E. Beneficial and Temporary Occupancy:

1. Beneficial (partial) Occupancy:
   a. WRTA may allow beneficial (partial) occupancy of portions of a building in order to allow a User Agency to set up and test their own operational equipment in select building areas. It does not allow for use and/or occupancy of the general public when, in fact, the building cannot function for the use(s) it is intended to accommodate, nor when there are outstanding items that effect health, safety and/or function.
   b. It is WRTA policy to disallow beneficial occupancy if the fire alarm and suppression systems are inoperative.
   c. Beneficial occupancy of building areas shall not constitute Substantial Completion, or Final Acceptance of work by WRTA, and shall not institute the guarantee period for any work.
   d. A punch list will be developed for building areas to receive beneficial occupancy and the building areas will be photographed prior to such occupancy of said portion or portions of the work.

2. Temporary Occupancy:
   a. When, according to 780 CMR 120.3 – Temporary Occupancy upon the request of the holder of a permit, a Temporary Certificate of Occupancy (TCO) may be issued before the completion of the entire work covered by the permit, provided that such portion or portions shall be occupied safely prior to full completion of the building or structure without endangering life or public welfare. The Building Official may consult with all sub-trade Inspectors for issues pertaining to life safety and shall consult with the Fire Official pertaining to issues of adequacy of fire protection systems prior to the issuance of a Temporary Certificate.
   b. The Building Official may issue a Temporary Certificate of Occupancy (TCO) that can allow public use and occupancy of said portion or portions of the work, subject to punch list(s) being established prior to such occupancy.
   c. Issuance of a Department of Public Safety (DPS) Temporary Certificate of Occupancy (TCO) does not relieve the Contractor of the WRTA requirements of the contract and does not constitute Substantial Completion of the project.
   d. Temporary Occupancy of building areas will institute the guarantee period for completed work of all Divisions except 21 through 28 of the Specifications for those building areas so used and occupied, exclusive of remaining work indicated on associated punch lists. Use of systems provided under Divisions 21 through 28 of the Contract Documents for temporary services and facilities shall not constitute Substantial Completion, or Final Acceptance of work by WRTA, and shall not institute the guarantee period.
      (1) If it is determined that there are no items on the punch list that affect health, safety or function and it is agreed by the Building Official, the Designer and the WRTA that the entire building can be granted a Temporary Certificate of Occupancy (TCO), the work of all Divisions including 21 through 28 of the Specifications for the entire building so used and occupied, exclusive of remaining work indicated on associated punch lists, will institute the guarantee period for completed work of all Divisions including the systems provided under Divisions 21 through 28.

(2) Whereas a User Agency cannot properly maintain building systems without operating and maintenance documentation, trade contractors for Divisions 21 through 28 will be responsible for maintaining their respective building systems at no additional cost to the contract until the project is substantially complete and Operating and Maintenance (O & M) manuals, reviewed and approved by the Designer, are provided to the WRTA.

(3) Issuance of a Temporary Certificate of Occupancy (TCO) may require remaining punch list work to be completed during irregular work hours. Such work will be performed at no additional cost to the contract.

e. The following WRTA criteria, and any other criteria that may be imposed by the Building Official, are required for a DPS Temporary Certificate of Occupancy (TCO):

(1) Upon receipt of the Contractor's list of items to be completed or corrected, the Designer will promptly make a thorough inspection, together with representatives of WRTA and the Operating Agency, and prepare a "punch list", setting forth in accurate detail any items on the Contractor's list and additional items that are not acceptable. The Designer and WRTA will identify and tag (by asterisk) all items that, in their opinion, affect health, safety or function. The Building Official may include additional items that, in her/his opinion, affect items that endanger life or public welfare.

(2) When the punch list has been prepared, and all DPS Inspector comments* have been included, the Contractor shall immediately correct all punch list items that affect health, safety or function (all asterisked items). This work must be completed before the issuance of a DPS Temporary Certificate of Occupancy (TCO).

* NOTE: If a DPS inspector (including, but not limited to AABA, boiler, elevator or any other authorized inspector) requires modifications and/or additions that were not included in the construction documents, the Designer should review the applicable code(s) and provide written interpretation to the WRTA together with their recommendations.

g. Evidence of compliance with requirements of governing authorities including, without limitations, the following:

1) Certificate of Inspection, in form of signed permits from the electrical, plumbing, gas, fire department, boiler, and any other required inspectors.

2) Certification from the local fire department to the effect that all detection, alarm and suppression systems, and other equipment or systems under fire department jurisdiction are approved.

3) When carpeting and/or draperies are provided, a flame, smoke and fuel-rating certificate provided by the supplying Contractor.

4) Elevator certification(s) from the elevator inspector obtained through the Contractor's Elevator Trade Contractor.

5) A letter from the Plumbing Trade Contractor that the potable water supply has been sanitized.

6) Septic system certification obtained from the town by the Contractor (when applicable).

7) Pressurized vessel certifications from the boiler inspector obtained through the Mechanical Trade Contractor.

8) When air balancing is required, the air balancing report prepared by the Mechanical Trade Contractor (or commissioning agent, when applicable).

9) When smoke control/fire emergency ventilation system is required, the test report prepared by the Mechanical Trade Contractor (or commissioning agent, when applicable).
10) Evidence of test and approval for Department of Environmental Protection (DEP) and Department of Public Health (DPH), when applicable.

F. WRTA's Prerequisites for WRTA Certificate of Agency Use and Occupancy: WRTA Certificate of Agency Use and Occupancy E-1 Form. Prior to requesting a Division of Capital Asset Management and Maintenance (WRTA) Certificate of Agency Use and Occupancy, the WRTA Resident Engineer will procure and have ready and available the following approved items (referred to as Closeout Submittals):

1. Operating and maintenance (O & M) manuals and written operating instructions for the various systems.
2. Catalog data sheets for each item of mechanical or electrical equipment actually installed including performance curves, rating data and parts lists.
3. Catalog sheets, maintenance manuals, and approved shop drawings of all mechanical and electrical equipment controls and fixtures with all details clearly indicated, including size of lamps.
4. Balancing report.
5. Names, addresses, and telephone numbers of repair and service companies for each of the major systems installed under the construction contract.
6. Signed Department of Public Safety (DPS) Certificate of Occupancy per 780 CMR 120.0
7. Licensed Builder Final Affidavit/Report.
8. Designer Affidavit of Compliance.
9. Filed Sub-Bid and Non Filed Sub-Bid Contractor Affidavits that specified equipment and installed items have been seismically braced in accordance with code requirements.
10. Monetized punch list of the remaining Work that must be done before Final Acceptance.
11. As-built documents should be completed (both electronic files and transparencies) and ready to transfer over to the WRTA. As-built documents shall consist of, but not be limited to, the following:
    a. Drawings (in AutoCAD or Revit, in format accessible to WRTA)
        1) Contract drawings, for all disciplines, marked-up to clearly indicate as-built conditions.
        2) All clarification and/or changed conditions sketches (SK's).
    b. Specifications (in .pdf format)
        1) All construction specifications.
        2) All addenda.
    c. Shop drawings, submittals, etc. (scanned format)*
        1) All approved shop drawings, submittals, etc.
12. Approved documents submitted to the WRTA or the Designer shall be electronically scanned (including the associated transmittals and, where applicable, the Designer-of-Record's and WRTA's comments) as a .pdf document. All scanned approved submittals shall be included on a CD.
13. The electronic file names, for each approved submittal, shall contain the following information:
    a. For APPROVED or APPROVED AS NOTED Shop Drawings:
        1) Project Number Submittal's Date, APPPROVED, Submittal Name, Submittal's Specification Section Name and Number, and Submittal's Revision Number.
        2) As an example, the file name of an approved submittal for Concrete

a) Design Mix: DFS991DC1 030106 APPROVED Concrete Design Mix Cast In Place Concrete 033000 Rev0.PDF

b. For Shop Drawings submitted for information only, e.g. welders certificate, the electronic file name shall contain the following information:
   1) Project Number Submittal's Date, FORINFO, Submittal Name, Submittal's Specification Section Name and Number, and Submittal's Revision Number.
   2) As an example the file name of a for information only submittal for a welder's certificate:
      a) DFS991DC1 030106 FOR INFO Welders Certificate Quality Requirements 014000 Rev0.PDF

c. Unless otherwise stated all submitted documents shall include an electronic scanned image as noted above.

d. The electronic file name shall be printed on every shop-drawing page.

14. The WRTA will attach the monetized punch list to the WRTA Certificate of Agency Use and Occupancy, indicate the official date of Use and Occupancy, establish the date upon which all remaining punch list items must be completed (normally 30-45 calendar days), and procure appropriate signatures on the original and three (3) copies.
15. After receipt of signatures, the WRTA will distribute the signed copies.
16. Project schedules (in Primavera format, unless otherwise authorized), baseline, and all updates.
17. Notification to Operating Agency and/Or User Agency of Proposed Use and Occupancy Date: The WRTA is to notify the Operating Agency and/or User Agency of the project Use and Occupancy date at least seven (7) calendar days in advance.

G. WRTA's Prerequisites for WRTA Certificate of Final Inspection, Release, and Acceptance: WRTA Final Certificate of Final Inspection, Release, and Acceptance (E-2 Form). Upon receipt of the WRTA Certificate of Agency Use and Occupancy, and its adjunct monetized punch list, the Contractor shall cause the completion of all of the other punch list items within timeframe required by said certificate, but not more than 45 calendars days if the timeframe is not indicated on the said certificate.

1. If the Contractor fails to pursue completion of the remaining monetized punch list work, on a continual basis, within the timeframe required by the certificate, WRTA may, after seven (7) calendar days written notice, elect to complete the work with separate forces and charge the work against the Contractor.
2. At the end of the Contractor's one (1) year guarantee period, the Contractor shall transfer manufacturers' equipment and material warranties that are still in force to the Operating Agency.

1.8 GUARANTEES AND WARRANTIES

A. Submit to the Designer all extended guarantees and warranties that have been specified in various, individual Sections of the Specifications. Guarantees shall be assembled by Specification No. and Section in accordance with Specifications Table of Contents.

1. Guarantees and warranties shall be enforceable in the Commonwealth of Massachusetts and subject to interpretation in accordance with the laws of the Commonwealth of Massachusetts.

2. Guarantees and warranties shall begin at the date of WRTA's Certificate of Agency Use and Occupancy of the Project. Guarantees and warranties which start at the date of shipment from the factory, or from the completion date of an individual portion of the project, are not acceptable.

B. Unless more stringent requirements are otherwise specified, guarantee all work against defects of materials, equipment and workmanship for one year from the date of issue of WRTA's Certificate of Agency Use and Occupancy for the building or portion thereof, whichever occurs first.

C. If, within any guarantee period, repairs or changes are required in connection with guaranteed work, Contractor shall promptly upon receipt of notice from WRTA, and without additional expense to WRTA, within ten business days:

1. Place in satisfactory condition in every particular all guaranteed work and correct all defects.
2. Make good all damage to building, site equipment, or contents thereof, including redecoration which, in the opinion of the Designer, results from the use of material, equipment or workmanship which are inferior, defective or not in accord with the terms of the Contract.

D. If Contractor, after such notice, fails to proceed immediately to comply with terms of guarantee, WRTA may correct defects and hold Contractor liable for all expenses incurred.

E. Promptly after completion of the work, obtain from each Subcontractor where a guarantee is required, a warranty addressed to and in favor of WRTA or the User Agency if directed by WRTA.

F. Delivery of any warranty required does not relieve the Contractor from any obligation assumed under other provisions of the Contract.

G. Deliver guarantees and warrantees to the Designer before or with the application for Final Payment.

H. The general warranty set forth in the General Conditions is in addition to, exclusive of, and not in substitution of such guarantees as may be required in the Specifications.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

STANDARD SPECIFICATIONS

WRTA Standard Specifications are intended for use only on projects of the Division of Capital Asset Management and Maintenance in the Commonwealth of Massachusetts. Each section will require editing by a registered architect or engineer before issue. Refer to the User's Guide for additional requirements.

NOTES TO THE DESIGNER

Guarantees and Warranties – When specifying guarantees and/or warranties for work, products, materials and/or equipment, the Designer must account for WRTA's requirement that guarantees and warranties start at the date of Certificate of Agency Use and Occupancy. Guarantees or warranties that start at the date of shipment from the factory, or from the completion date of an individual portion of the project, are not acceptable.

Filed Sub-Bids MGL Chapter 149: For sections listed in the table of contents with an asterisk (*), the threshold amount for requiring a filed sub-bid is $ 25,000. If the cost estimate for the scope of the work of that filed sub-bid is below $ 25,000, then delete the requirement for the filed sub-bid for that section.

Certain items essential to Use and Occupancy that can be overlooked, include but are not limited to, the following:

1. Provide properly colored and positioned exit signs.
2. Properly located emergency lighting fixtures.
3. Complete or, by agreement, schedule personnel training.
4. Final cleaning.
5. Ventilating systems:
    a. Clean permanent filters and replace disposable filters if units were operated during construction.
    b. Clean ducts, blowers, and coils if units were operated without filters during construction.
    c. Leave pipe and duct spaces, plenums, furred spaces and the like clean of debris and materials subject to decay.
6. Provide a properly working lock for the medical environmental closets (if applicable).
7. Assure that exterior and interior fire rated and egress doors are operating properly and have the proper hardware.
8. Assure that fire-rating labels are on doors and frames that are supposed to have them.
9. Assure that smoke barriers are properly installed and located.
10. Assure that the spare set of each type of sprinkler head and a head removal tool have been provided.
11. Assure that floors drain properly.
12. Assure that proper hot water temperatures are provided. Unless otherwise specified or required by a User Agency, the temperature set on building master controllers of hot water shall apply:
    a. HW to toilet rooms and janitors closets shall be 140°F.
    b. HW to individual tubs or showers shall be controlled, in addition to the master controller above, with thermostatic valves set to furnish HW at a temperature not exceeding 110°F and equipped with anti-scald feature.
    c. HW rinse water to dishwashers shall be controlled at 180°F.
13. Assure that proper water pressure is provided for the sprinkler system.
14. Assure that low-consumption (LC) toilets have been installed (1.6 gpf or less).
15. Re-lamp if permanent lighting system was used during construction.
16. As-built marked-up drawings should be completed and transferred over to the Designer.

Exclusive of other items that the DPS inspector may impose, there is a history of specific items that are essential for, temporary occupancy. These items include, but are not limited to the following:

1. Properly colored and positioned exit signs.
2. Properly located emergency lighting fixtures.
3. Clean ducts, blowers, and coils if units were operated without filters during construction.
4. Install permanent filters and replace disposable filters if units were operated during construction.
5. Properly working lock for the medical environmental closets (if applicable).
6. Assure that exterior and interior fire rated and egress doors are operating properly and have the proper hardware.
7. Assure that smoke barriers are properly installed and located.
8. Assure that proper water pressure is provided for the sprinkler system.
9. Assure that proper hot water temperatures are provided. Unless otherwise specified or required by a User Agency, the temperature set on building master controllers of hot water shall apply:
    a. HW to toilet rooms and janitors closets shall be 140 degrees F.
    b. HW to individual tubs or showers shall be controlled, in addition to the master controller above, with thermostatic valves set to furnish HW at a temperature not exceeding 110 degrees F and equipped with anti-scald feature.
    c. HW rinse water to dishwashers shall be controlled at 180 degrees F.
10. Emergency eyewash equipment must be hard-plumbed and employ tempered water.

END

SECTION 017839

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the GENERAL REQUIREMENTS AND COVENANTS - DIVISION I, and the SPECIAL PROVISIONS - DIVISIONS IIA and IIB, which are hereby made a part of this Specification Section.

B. Examine all Drawings and all Sections of the Specifications for requirements and provisions affecting the Work of this Section.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Section includes administrative and procedural requirements for project record documents, including the following:

a. Record Drawings of all new spaces and modified infrastructure systems.
b. Record BIM models where applicable.
c. Record Drawings of civil work and underground utilities which have been demolished or removed.
d. Record Specifications.
e. Record Product Data.
f. Miscellaneous record submittals.

1.3 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit one set(s) of marked-up record prints.
2. Number of Copies: Submit copies of record Drawings and BIM models as follows:

a. Initial Submittal:

1) Submit one paper-copy set(s) of marked-up record prints.
2) Submit unlocked AutoCAD and Revit electronic files.
3) Submit record digital data files and plots.
4) Engineer will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.

b. Final Submittal:

1) Submit one paper-copy set(s) of marked-up record prints.
2) Submit record digital data files and three sets of record digital data file plots.
3) Plot each drawing file, whether or not changes and additional information were recorded.

B. Record Specifications: Submit annotated PDF electronic files of Project Specifications, including addenda and contract modifications.

C. Record Product Data: Submit annotated PDF electronic files and directories of each submittal.

1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.

D. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit annotated PDF electronic files and directories of each submittal.

E. Reports: Submit written report weekly indicating items incorporated into project record documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.

1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.

a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
b. Accurately record information in an acceptable drawing technique.
c. Record data as soon as possible after obtaining it.
d. Record and check the markup before enclosing concealed installations.
e. Cross-reference record prints to corresponding archive photographic documentation.

2. Content: Types of items requiring marking include, but are not limited to, the following:

a. Dimensional changes to Drawings.
b. Revisions to details shown on Drawings.
c. Depths of foundations below first floor.
d. Locations and depths of underground utilities.
e. Revisions to routing of piping and conduits.

f. Revisions to electrical circuitry.
g. Actual equipment locations.
h. Duct size and routing.
i. Locations of concealed internal utilities.
j. Changes made by Change Order, Change Directive inclusive of RFIs, Bulletins and Addenda.
k. Changes made following Engineer's written orders.
l. Details not on the original Contract Drawings.
m. Field records for variable and concealed conditions.
n. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at the same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Engineer. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:

1. Format: Same digital data software program (AutoCAD and Revit), version, and operating system as the original Contract Drawings.
2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
3. Refer instances of uncertainty to Engineer for resolution.
4. Engineer will furnish the Contractor with one set of digital data files of the Contract Drawings for use in recording information.

C. Newly Prepared Record Drawings and Digital Data Files: Prepare new Drawings instead of preparing record Drawings where Engineer determines that neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.

1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.
2. Consult Engineer for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction.

D. Integrate newly prepared record Drawings into record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.

E. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Format: AutoCAD and Revit electronic file.
3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
4. Identification: As follows:

    a. Project name.
    b. Date.
    c. Designation "PROJECT RECORD DRAWINGS."
    d. Name of Engineer.
    e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals instead of submitted as record Product Data.
5. Note related Change Orders, record Product Data, and record Drawings where applicable.

B. Format: Submit record Specifications as annotated PDF electronic file.

2.3 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders, record Specifications, and record Drawings where applicable.

B. Format: Submit record Product Data as annotated PDF electronic file.

1. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.

2.4 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

B. Format: Submit miscellaneous record submittals as PDF electronic file.

1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.

B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Engineer's reference during normal working hours.

END OF SECTION

SECTION 018100

COMMISSIONING

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PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Commissioning: Commissioning is a planned, collaborative process of witnessing and testing that confirms that a new building and its systems meet the Owner's Project Requirements (OPR) and the project's Basis of Design (BOD). The OPR is a written document that details the ideas, concepts and criteria that are defined by the owner to be important to the success of the project. The BOD includes design information necessary to accomplish the OPR, including system descriptions, indoor environmental quality criteria, design assumptions, and references to applicable codes, standards, regulations and guidelines. Achievement of these goals begins in the Pre-Design phase, continues through the Design, Construction and Acceptance Phases and concludes in the Post-Acceptance Phase with actual verification of performance. Commissioning shall encompass and coordinate the traditionally separate functions of system documentation, equipment startup, control system calibration, testing and balancing, performance testing and training. The commissioning process will be directed by an independent, third-party Commissioning Authority (CA) whose services will be provided by DCAMM.

1. In addition to collaborating in the development of the project's BOD and OPR, during the Pre-Design Phase the Commissioning Authority shall review the size and skill levels of the Owner's maintenance staff in relation to the requirements of the new building in order to fill any deficiencies.
2. In the Design Phase the Commissioning Authority shall complete the following tasks:
    a. Write commissioning specifications that define contractor responsibilities and provide samples of required commissioning documentation (based on the most recent industry-accepted format) to the Designer for integration into the project specifications.
    b. Develop the Commissioning Plan, detailing commissioning team organization, schedule, training and documentation requirements. Include all related testing, verification and quality control procedures.
    c. Establish the schedule for all commissioning activities, including periodic design reviews. Insure that commissioning activities do not interfere with any phase of the project.
    d. Review the design calculations and performance criteria for the project, identifying operation and maintenance problems. Provide written comments and a checklist of

required actions to be completed by the Designer prior to phase approval and recommend alternatives where appropriate.

e. Check and confirm that the BOD includes all of the elements defined in the OPR at the end of the Design Phase.

3. In the Construction Phase the Commissioning Authority shall complete the following tasks:
   a. Update the Commissioning Plan to reflect any changes in the BOD.
   b. Coordinate the commissioning process with the Project Team through project planning and scheduled meetings.
   c. Review contractor submittals in collaboration with the Project Team for conformance to project specifications and operation and maintenance requirements and report findings.
   d. Observe and document system verification checks.
   e. Observe and document equipment and system start-ups.
   f. Document testing and balancing work.
4. In the Acceptance Phase the Commissioning Authority shall complete the following tasks:
   a. Monitor and document functional performance tests on all building systems in collaboration with the Project Team.
   b. Review O&M documentation and develop O&M training plans and videos. Ensure that the Owner's staff is able to operate and maintain all building systems.
   c. Review all as-built documents and warranty information in collaboration with the Project Team. Submit warranty information and preventive maintenance schedules for all building systems in a comprehensive, five-year preventive maintenance plan. The format for this submittal shall be approved jointly by DCAMM and the Owner. This submittal shall also include list(s) of recommended spare parts, bench stock and special tools/equipment required for the first year of building operation.
   d. Convene and chair a comprehensive final debriefing with the entire Project Team (including the owner's maintenance staff) to coordinate correction of any required re-testing and identification of any training deficiencies prior to building turnover.
   e. In collaboration with the Designer, Contractor(s) and General Contractor populate all operational information, including equipment data, for each building system in the digital format specified by DCAMM.
5. In the Post-Acceptance Phase the Commissioning Authority shall complete the following tasks:
   a. Coordinate with the project team to ensure that any required "off-season" tests are completed.
   b. Ensure that any required changes are provided as written updates in the project documentation.
   c. Confirm that all equipment continues to perform as designed and alert the Owner to any warranty claims by providing a review of all system warranties prior to their one-year expiration date.
   d. Document the estimated savings generated by the commissioning process through specific examples of avoided costs collected during all project phases. The required format will be provided by DCAMM. Compare the actual tested performance of the building's completed systems with established standards.
   e. Implement a measurement and verification (M&V) plan consistent with Option D: Energy Conservation Measure Isolation as specified in the International Performance Measurement & Verification Protocol (IPMVP) Volume III: Concepts and Options for Determining Energy Savings in New Construction,

April, 2003. The M&V period must cover at least one year of post-construction occupancy.

6. The commissioning process does not eliminate or reduce the responsibility of the system designers and installing contractors to provide a finished and fully functioning product.

B. Commissioning Authority: The Commissioning Authority directs and approves the commissioning work.

C. Responsibility of Disciplines: The parties listed below are part of the commissioning team and will be required to participate in the commissioning process. The responsibilities relative to commissioning for each of these parties is defined in this section.

1. Designer
2. Engineer
3. Owner
4. Commissioning Authority
5. General Contractor
6. Mechanical/Electrical Coordinator
7. Test Technician
8. Mechanical Contractor
9. Plumbing Contractor
10. Fire Protection Contractor
11. Electrical Contractor
12. Controls Contractor
13. Testing, Adjusting and Balancing Contractor
14. All Subcontractors and equipment suppliers/manufacturers that are associated with the above disciplines.

D. Abbreviations:

1. The following are common abbreviations used in the Specifications and in the commissioning process. Definitions are found in Section 1.11.

A/E-	Designer and Design Engineers	EC-	Electrical Contractor
CA-	Commissioning Authority	FM-	Facility Manager
CC	Controls Contractor	FT-	Functional Performance Test
MC-	Mechanical Contractor	GC-	General Contractor (prime)
PC-	Prefunctional Checklist	Subs-	Subcontractors
Cx-	Commissioning	TAB-	Test and Balance Contractor
MEC	Mechanical/Electrical Coordinator	TT	Test Technician

1.3 COORDINATION

A. Commissioning Team. The members of the commissioning team consist of the Commissioning authority (CA), Facility Manager (FM), the designated representative of the General Contractor (GC), the Designer and design engineers (A/E), the Mechanical Contractor (MC), the Electrical Contractor (EC), the TAB representative, the Controls Contractor (CC), Mechanical/Electrical Coordinator (MEC), Test Technician (TT) and any other installing Subcontractors or suppliers

of equipment. The Owner's building or plant operator/engineer is also a member of the commissioning team.

B. Management: The CA is hired by DCAMM, directs and coordinates all commissioning activities and reports to the Owner. All Project Team members work together to fulfill their contracted responsibilities and meet the objectives of the Contract Documents.

C. Scheduling: The CA will work with the General Contractor according to established protocols to schedule commissioning activities. The CA will provide sufficient notice to the General Contractor and/or MEC for scheduling commissioning activities. The General Contractor will integrate all commissioning activities into the master schedule. All parties will address scheduling problems and make necessary notifications in a timely manner in order to expedite the commissioning process.

1. The CA will provide the initial schedule of primary commissioning events at the commissioning scoping meeting. As construction progresses more detailed schedules are developed by the CA and are incorporated into the project schedule by the General Contractor.

1.4 COMMISSIONING PROCESS

A. Commissioning Process. The following narrative provides a brief overview of the typical commissioning tasks during construction and the general order in which they occur.

1. Commissioning during construction begins with a scoping meeting conducted by the CA wherein the commissioning process is reviewed with the commissioning team members.
2. Additional meetings scheduled by the CA will be required throughout construction, to plan, scope, coordinate, and schedule future activities and resolve problems.
3. Equipment documentation is submitted to the Engineer during normal submittals, including detailed start-up procedures. The CA will review and comment on applicable items.
4. The Subcontractors develop startup plans and startup documentation formats and provide to the CA. The CA uses this information to supplement prefunctional checklists to be completed, during the startup process.
5. The Subcontractors execute and document the prefunctional checklists and perform startup and initial checkout. The CA documents that the checklists and startup were completed according to the approved plans. This may include the CA witnessing start-up and prefunctional tests of selected equipment.
6. The CA develops specific equipment and system Functional Performance Test procedures. The Subcontractors review the procedures.
7. The procedures are executed by the Subcontractors, and witnessed and documented by the CA. The Owner's FM is also invited to witness testing.
8. Items of non-compliance in material, installation, or setup are corrected at the Sub's expense and the system in question is retested.
9. The CA reviews the O&M documentation for completeness.
10. The CA approves the training plan and audits training.
11. The CA assembles all project documentation into Systems Manuals
12. Deferred testing is conducted, as specified or required.

1.5 RELATED WORK

A. All of the following sections apply to the Work of this section. This list does not limit the work that may be required by the General Contractor under additional specification section for the completion of the Commissioning process.

1. Section 017700 - CONTRACT CLOSEOUT
2. Section 013100 - PROJECT MANAGEMENT AND COORDINATION
3. Section 140001 - ELEVATORS
4. Section 210001 - FIRE PROTECTION
5. Section 220001 - PLUMBING
6. Section 230001 - HEATING, VENTILATING AND AIR CONDITIONING
7. Section 260001 - ELECTRICAL WORK

1.6 COMMISSIONING COMPLETION

A. Prerequisites to functional completion

1. All TAB work and commissioning activities must be complete prior to Functional Completion, unless approved in writing by the CA. Exceptions to this are the planned control system training performed after occupancy and any required seasonal or approved deferred testing. This requirement covers all systems, but is not limited to:
   a. Completed and signed start-up and prefunctional checklist documentation
   b. Requested trend log data
   c. Submission of final approved TAB report
   d. Completion of all functional testing
   e. Required training of Owner maintenance personnel
   f. Submission of the approved O&M manuals
   g. All identified deficiencies have been corrected or are approved by the DCAMM Project Manager to be excepted from this milestone.

B. The General Contractor will determine the date of Functional Completion after reviewing the Commissioning Agent’s recommendation for Functional Completion.

C. Commissioning activities are non-compensable and cannot be a cause for delay claims.

1.7 SYSTEMS TO BE COMMISSIONED

A. The following systems will be commissioned in this project, but this list does not limit the testing that may be required to achieve LEED certification of the project by the United States Green Building Council. Testing requirements are part of this section. Each member of the commissioning team shall review all test procedures in this section to determine if his/her presence is required for each test (for example, certain tests of mechanical equipment may require the support of electrical personnel and vice versa)

Equipment and System	Functional Test Requirements Specified In:
Plumbing System	
Plumbing Water System	3.12
HVAC System	
Hot Water Heating System (Boilers, Pumps, Distribution	3.13
Terminal Units (FCU, FPT, VAV, CUH, UH)	3.14
Packaged DX Split System Air Conditioning or Heat Pump	3.15
Exhaust Fans	3.16
Building Automation System (BAS)	3.17
Test and Balance Work (TAB)	3.18
Air Handling Units (Recirculating and 100% O.A.)	3.19
Cold Water Cooling System (Chillers, Cooling Towers, Pumps, Distribution)	TBD
Electrical System	
Emergency Generator(s)	3.20
Emergency Lighting	3.21
Fire Alarm System	3.22
Short Circuit Trip	3.23
Lighting Control System	3.24
Automatic Transfer Switch(es)	3.25
Life Safety System	
Fire alarm system	TBD
Fire suppression/protection systems	TBD
Egress pressurization systems	TBD
Other	
Telecommunications System	

1.8 RESPONSIBILITIES

A. The responsibilities of all parties in the commissioning process are provided in this section.

B. All Parties:

1. Attend commissioning scoping meeting and additional meetings, as necessary.

C. Designer (of A/E):

1. Construction Phase
   a. Attend the commissioning scoping meeting and selected commissioning team meetings.
   b. Perform normal submittal review, construction observation, as-built drawing preparation, O&M manual preparation, etc., as contracted.
   c. Provide any design narrative documentation requested by the CA.
   d. Coordinate resolution of system deficiencies identified during commissioning, according to the contract documents.
   e. Prepare and submit design intent documentation clarifications for inclusion in the O&M manuals. Review and approve the O&M manuals.
2. Post Construction Phase
   a. Coordinate resolution of design non-conformance and design deficiencies identified during warranty-period commissioning.

D. Design Engineer:

1. Construction Phase
   a. Perform normal submittal review, construction observation, as-built drawing preparation, etc., as contracted. One site observation should be completed just prior to system startup.
   b. Provide any design narrative and sequences documentation requested by the CA. The designers shall assist (along with the contractors) in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation are not sufficient for writing detailed testing procedures.
   c. Participate in the resolution of system deficiencies identified during commissioning, according to the contract documents.

E. Commissioning Authority (CA): The CA is not responsible for design concept, design criteria, compliance with codes, design or general construction scheduling, cost estimating, or construction management. The CA may assist with problem-solving, non-conformance or the resolution of deficiencies, but the ultimate responsibility resides with the General Contractor and the A/E. The primary role of the CA is to observe and document performance and confirm that systems are functioning in accordance with the Owner's Project Requirements (OPR), documented design intent (BOD) and the Contract Documents. Contractors will provide all tools and equipment to start and functionally test building equipment and systems.

1. Construction Phase
   a. Coordinate and direct the commissioning activities in a logical, sequential and efficient manner using consistent protocols and forms, centralized documentation, clear and regular communications and consultations with all necessary parties, frequently updated timelines and schedules and technical expertise.
   b. Submit commissioning schedule to GC, MEC, TT, and A/E to ensure that commissioning activities are being scheduled into the master schedule.
   c. Plan and conduct a commissioning scoping meeting and other commissioning meetings.

d. Request and review additional information required to perform commissioning tasks, including O&M materials, contractor start-up and checkout procedures.
e. Before startup review the current control sequences and interlocks and work with contractors and design engineers until sufficient clarity has been obtained, in writing, to be able to write detailed testing procedures.
f. Review systems being commissioned for compliance with commissioning needs, concurrent with the A/E reviews.
g. Perform site visits, as necessary, to observe component and system installations. Attend selected planning and job-site meetings to obtain information on construction progress.
h. Verify systems startup by reviewing start-up reports and by selected site observation.
i. Review TAB execution plan.
j. Verify air and water systems balancing by spot testing, by reviewing completed reports and by selected site observation.
k. With necessary assistance and review from installing contractors, write the functional performance test procedures for equipment and systems. This may include energy management control system trending, stand-alone data logger monitoring or manual functional testing.
l. Analyze any functional performance trend logs and monitoring data to verify performance.
m. Coordinate, witness, and approve manual functional performance tests performed by installing contractors. Coordinate retesting as necessary until satisfactory performance is achieved.
n. Maintain a master deficiency and resolution log and a separate testing record. Provide the GC, MEC, TT, and A/E with written progress reports and test results with recommended actions.
o. Witness performance testing of all other owner contracted tests or tests by manufacturer's personnel over which the CA may not have direct control (a smoke control system, for example). Document these tests and include results in Systems manuals.
p. Compile and maintain a commissioning record.
q. Review O&M manuals submitted by contractors.
r. Provide a final commissioning report (as described in this section).
s. Develop a systems manual.
t. Prepare a standard trend logging package of primary parameters that will provide the operations staff clear indications of system function in order to identify proper system operation and trouble shoot problems. The CA shall also provide any needed information on interpreting the trends.

2. Post Construction Phase
   a. Coordinate and supervise required seasonal or deferred testing and deficiency corrections.
   b. Return to the site during the opposite season from when functional testing was performed (approximately 6 months into the Post Construction Phase) and review with facility staff the current building operation and the condition of outstanding issues related to the original and seasonal commissioning.

F. General Contractor (GC), Mechanical/Electrical Coordinator (MEC), and or Test Technician (TT):

1. Construction Phase
    a. Facilitate the coordination of the commissioning work by the CA. The GC, TT, and MEC will ensure that commissioning activities are being entered into the master schedule.
    b. Attend a commissioning scoping meeting and other commissioning team meetings.
    c. Perform the normal review of Contractor submittals and completed commissioning test results.
    d. When necessary, observe and witness prefunctional checklists, startup, and functional testing of selected equipment.
    e. Review commissioning progress and deficiency reports.
    f. Coordinate the resolution of non-compliance and design deficiencies identified in all phases of commissioning.
    g. Arrange for facility operating and maintenance personnel to attend various field commissioning activities and field training.
    h. Prepare and submit As-built documentation for inclusion in the O&M manuals.
    i. Provide written notice for the completion of the commissioning testing.
2. Post Construction Phase
    a. Assist the CA and User Agency as necessary in the seasonal or deferred testing and deficiency corrections required by the specifications.
    b. Ensure that any seasonal or deferred testing and any deficiency issues are addressed.

G. Mechanical, Controls, and TAB Contractors: The commissioning responsibilities applicable to each of the mechanical, controls, and TAB contractors under 1.05 RELATED WORK A. above is as follows (all references apply to commissioned equipment only):

1. Construction Phases
    a. Attend a commissioning scoping meeting and other meetings necessary to facilitate the Commissioning process.
    b. Subcontractors shall provide the CA with normal cut sheets and shop drawing submittals of commissioned equipment.
    c. Provide additional requested documentation (prior to normal O&M manual submittals) to the CA for development of start-up and functional testing procedures.
        1) Typically this documentation will clearly identify detailed manufacturer installation and start-up, operating, troubleshooting and maintenance procedures. It will also include full details of any owner-contracted tests, fan and pump curves, full factory testing reports, if any, and full warranty information, including all responsibilities of the Owner to keep the warranty in force. In addition, the installation, start-up, and checkout materials that are shipped with the equipment and the field checkout sheet forms to be used by the factory or field technicians shall be submitted to the Commissioning Agent.
        2) The Commissioning Agent may request further documentation necessary for the commissioning process.
        3) This data request may be made prior to normal submittals.
    d. Provide a copy of the O&M manuals and submittals of commissioned equipment, through normal channels, to the CA and A/E for review and approval.
    e. Subcontractors shall assist (along with the design engineers) in clarifying the operation and control of commissioned equipment in areas where the

specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.

f. Provide assistance to the CA in preparing the specific functional performance test procedures. Subs shall review test procedures to ensure feasibility, safety, and equipment protection and provide necessary written alarm limits to be used during the tests.

g. Develop a full start-up and initial checkout plan using manufacturer's start-up procedures and the prefunctional checklists from the CA for all commissioned equipment. Submit to CA and A/E for review and approval prior to startup.

h. During the startup and initial checkout process, execute the mechanical-related portions of the prefunctional checklists for all commissioned equipment.

i. Perform and clearly document all completed startup and system operational checkout procedures, providing a copy to the CA and A/E.

j. Address current A/E punch list items before functional testing. Air and water TAB shall be completed with discrepancies and problems remedied before functional testing of the respective air- or water-related systems.

k. Provide skilled technicians to execute starting of equipment and to execute the functional performance tests. Ensure that they are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem solving.

l. Provide skilled technicians to perform functional performance testing under the direction of the CA for specified equipment. Assist the CA in interpreting the monitoring data, as necessary.

m. Correct deficiencies (differences between specified and observed performance) as interpreted by the CA and A/E and retest the equipment.

n. Prepare O&M manuals according to the Contract Documents, including clarifying and updating the original sequences of operation to as-built conditions.

o. During construction, maintain as-built drawings.

p. Provide training of the Owner's operating staff using expert qualified personnel, as specified. Maintain sign-in sheets and provide copies to CA.

q. Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty.

2. Post Construction Phase

a. Execute seasonal or deferred functional performance testing, witnessed by the CA, according to the specifications.

b. Correct deficiencies and make necessary adjustments to O&M manuals and as-built drawings for applicable issues identified in any seasonal testing.

H. Mechanical Contractor: The responsibilities of the HVAC mechanical contractor, during Construction Phases in addition to those listed in (A) are:

1. Provide startup for all HVAC equipment, except for the building automation control system.
2. Assist and cooperate with the TAB contractor and CA by:

a. Putting all HVAC equipment and systems into operation and continuing the operation during each working day of TAB and commissioning, as required.

b. Including cost of sheaves and belts that may be required by TAB.

c. Providing test holes in ducts and plenums where directed by TAB to allow air measurements and air balancing. Providing an approved plug.

d. Providing temperature and pressure taps according to the Construction Documents for TAB and commissioning testing.

3. Install a P/T plug at each water sensor, which is an input point to the control system.
4. List and clearly identify on the as-built drawings the locations of all airflow stations.
5. Prepare a preliminary schedule for Division 15501 pipe and duct system testing, flushing, and cleaning, equipment start-up and TAB start and completion for use by the CA. Update the schedule as appropriate.
6. Notify the CA 48 hours prior to pipe and duct system testing, flushing, cleaning, startup of each piece of equipment and TAB will occur. Be responsible to notify the General Contractor and CA ahead of time, when commissioning activities not yet performed or not yet scheduled will delay construction. Be proactive in seeing that commissioning processes are executed and that the CA has the scheduling information needed to efficiently execute the commissioning process.

I. Controls Contractor: The commissioning responsibilities of the controls contractor, during Construction Phases in addition to those listed in (A) are:

1. Sequences of Operation Submittals:
   a. The Controls Contractor's submittals of control drawings shall include complete detailed sequences of operation for each piece of equipment, regardless of the completeness and clarity of the sequences in the specifications. They shall include:
      1) An overview narrative of the system (1 or 2 paragraphs) generally describing its purpose, components, and function.
      2) All interactions and interlocks with other systems.
      3) Detailed delineation of control between any packaged controls and the building automation system, listing what points the BAS monitors only and what BAS points are control points and are adjustable.
      4) Written sequences of control for packaged controlled equipment. (Equipment manufacturers' stock sequences may be included, but will generally require additional narrative).
      5) Start-up sequences.
      6) Warm-up mode sequences.
      7) Normal operating mode sequences.
      8) Unoccupied mode sequences.
      9) Shutdown sequences.
      10) Capacity control sequences and equipment staging.
      11) Temperature and pressure control: setbacks, setups, resets, etc.
      12) Detailed sequences for all control strategies, e.g., economizer control, optimum start/stop, staging, optimization, demand limiting, etc.
      13) Effects of power or equipment failure with all standby component functions.
      14) Sequences for all alarms and emergency shut downs.
      15) Seasonal operational differences and recommendations.
      16) Initial and recommended values for all adjustable settings, set points and parameters that are typically set or adjusted by operating staff; and any other control settings or fixed values, delays, etc. that will be useful during testing and operating the equipment.
      17) Schedules, if known.
      18) To facilitate referencing in testing procedures, all sequences shall be written in small statements, each with a number for reference. For a given system,

numbers will not repeat for different sequence sections, unless the sections are numbered.

2. Control Drawings Submittal:
   a. The control drawings shall have a key to all abbreviations.
   b. The control drawings shall contain graphic schematic depictions of the systems and each component.
   c. The schematics will include the system and component layout of any equipment that the control system monitors, enables, or controls, even if the equipment is primarily controlled by packaged or integral controls.
   d. Provide a full points list with at least the following included for each point:
      1) Controlled system
      2) Point abbreviation
      3) Point description
      4) Display unit
      5) Control point or set point (Yes / No)
      6) Monitoring point (Yes / No)
      7) Intermediate point (Yes / No)
      8) Calculated point (Yes / No)
   e. Key:
   f. Point Description: DB temp, airflow, etc.
   g. Control or Set point: Point that controls equipment and can have its set point changed (OSA, SAT, etc.)
   h. Intermediate Point: Point whose value is used to make a calculation which then controls equipment (space temperatures that are averaged to a virtual point to control reset).
   i. Monitoring Point: Point that does not control or contribute to the control of equipment, but is used for operation, maintenance, or performance verification.
   j. Calculated Point: “Virtual” point generated from calculations of other point values.
3. The Controls Contractor shall keep the CA and A/E informed of all changes to this list during programming and setup.
4. An updated as-built version of the control drawings and sequences of operation shall be included in the final controls O&M manual submittal.
5. Assist and cooperate with the TAB contractor in the following manner:
   a. Meet with the TAB contractor prior to beginning TAB and review the TAB plan to determine the capabilities of the control system toward completing TAB. Provide the TAB any needed unique instruments for setting terminal unit boxes and instruct TAB in their use (handheld control system interface for use around the building during TAB, etc.).
   b. For a given area, have all required prefunctional checklists, calibrations, startup and selected functional tests of the system completed and approved by the CA prior to TAB.
   c. Provide a qualified technician to operate the controls to assist the TAB contractor in performing TAB, or provide sufficient training for TAB to operate the system without assistance.
6. Assist and cooperate with the CA in the following manner:
   a. Using a skilled technician who is familiar with this building, execute the functional testing of the controls system as specified for the controls contractor. Assist in the functional testing of all equipment specified. Provide two-way radios during the testing.
   b. Execute all control system trend logs specified.

7. The controls contractor shall prepare a written plan indicating in a step-by-step manner, the procedures that will be followed to test, checkout and adjust the control system prior to functional performance testing. At minimum, the plan shall include for each type of equipment controlled by the automatic controls:
   a. System name.
   b. List of devices.
   c. Step-by-step procedures for testing each controller after installation, including:
      1) Process of verifying proper hardware and wiring installation.
      2) Process of downloading programs to local controllers and verifying that they are addressed correctly.
      3) Process of performing operational checks of each controlled component.
      4) Plan and process for calibrating valve and damper actuators and all sensors.
      5) A description of the expected field adjustments for transmitters, controllers and control actuators should control responses fall outside of expected values.
   d. A copy of the log and field checkout sheets that will document the process. This log must include a place for initial and final read values during calibration of each point and clearly indicate when a sensor or controller has "passed" and is operating within the contract parameters.
   e. A description of the instrumentation required for testing.
   f. Indicate what tests on what systems should be completed prior to TAB using the control system for TAB work. Coordinate with the CA and TAB contractor for this determination.
8. Provide a signed and dated certification to the CA and A/E upon completion of the checkout of each controlled device, equipment and system prior to functional testing for each piece of equipment or system, that all system programming is complete as to all respects of the Contract Documents, except functional testing requirements.
9. Beyond the control points necessary to execute all documented control sequences, provide monitoring, control and virtual points as requested by the CA to demonstrate system operation.
10. List and clearly identify on the as-built duct and piping drawings the locations of all static and differential pressure sensors (air, water and building pressure).

J. TAB Contractor: The duties of the TAB contractor, in addition to those listed:

1. Six weeks prior to starting TAB, submit to the CA and A/E the qualifications of the site technician for the project, including the name of the contractors and facility managers of recent projects the technician on which was lead.
2. Submit the outline of the TAB plan and approach for each system and component to the CA, A/E, and the controls contractor six weeks prior to starting the TAB. This plan will be developed after the TAB has some familiarity with the control system.
3. The submitted plan will include:
   a. Certification that the TAB contractor has reviewed the construction documents and the systems with the design engineers and contractors to sufficiently understand the design intent for each system.
   b. An explanation of the intended use of the building control system. The controls contractor will comment on feasibility of the plan.
   c. All field checkout sheets and logs to be used that list each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.

d. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
e. Final test report forms to be used.
f. Detailed step-by-step procedures for TAB work for each system and issue: terminal flow calibration (for each terminal type), diffuser proportioning, branch / submain proportioning, total flow calculations, rechecking, diversity issues, expected problems and solutions, etc. Criteria for using air flow straighteners or relocating flow stations and sensors will be discussed. Provide the analogous explanations for the waterside.
g. List of all airflow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
h. Details of how total flow will be determined (Air: sum of terminal flows via BAS calibrated readings or via hood readings of all terminals, supply (SA) and return air (RA) pitot traverse, SA or RA flow stations. Water: pump curves, circuit setter, flow station, ultrasonic, etc.).
i. The identification and types of measurement instruments to be used and their most recent calibration date.
j. Specific procedures that will ensure that both air and water side are operating at the lowest possible pressures and provide methods to verify this.
k. Confirmation that TAB understands the outside air ventilation criteria under all conditions.
l. Details of whether and how minimum outside air cfm will be verified and set, and for what level (total building, zone, etc.).
m. Details of how building static and exhaust fan / relief damper capacity will be checked.
n. Proposed selection points for sound measurements and sound measurement methods.
o. Details of methods for making any specified coil or other system plant capacity measurements.
p. Details of any TAB work to be done in phases (by floor, etc.), or of areas to be built out later.
q. Details regarding specified deferred or seasonal TAB work.
r. Details of any specified false loading of systems to complete TAB work.
s. Details of all exhaust fan balancing and capacity verifications, including any required room pressure differentials.
t. Details of any required interstitial cavity differential pressure measurements and calculations.
u. Plan for hand-written field technician logs of discrepancies, deficient or uncompleted work by others, contract interpretation requests and lists of completed tests (scope and frequency).
v. Plan for formal progress reports (scope and frequency).
w. Plan for formal deficiency reports (scope, frequency and distribution).

4. A running log of events and issues shall be kept by the TAB field technicians. Submit hand-written reports of discrepancies, deficient or uncompleted work by others, contract interpretation requests and lists of completed tests to the CA and General Contractor at least twice a week.
5. Communicate in writing to the controls contractor all set point and parameter changes made or problems and discrepancies identified during TAB which affect the control system setup and operation.

6. Provide a draft TAB report within two weeks of completion. A copy will be provided to the CA and A/E. The report will contain a full explanation of the methodology, assumptions and the results in a clear format with designations of all uncommon abbreviations and column headings. The report should follow the latest and most rigorous reporting recommendations by AABC, NEBB or ASHRAE Standard 111.
7. Provide the CA and A/E with any requested data, gathered, but not shown on the draft reports.
8. Provide a final TAB report for the CA and A/E with details, as in the draft.
9. Conduct functional performance tests and checks on the original TAB as specified.

K. Electrical Contractors: The commissioning responsibilities applicable to the electrical contractor are as follows (all references apply to commissioned equipment only):

1. Construction Phases
    a. Include the cost of commissioning in the contract price, if not yet let.
    b. In each purchase order or subcontract written, include requirements for submittal data, O&M data and training.
    c. Attend a commissioning scoping meeting and other necessary meetings scheduled by the CA to facilitate the Commissioning process.
    d. Contractors shall provide normal cut sheets and shop drawing submittals to the CA of commissioned equipment.
    e. Provide additional requested documentation, prior to normal O&M manual submittals, to the CA for development of start-up and functional testing procedures.
        1) Typically this will include detailed manufacturer installation and start-up, operating, troubleshooting and maintenance procedures, full details of any owner-contracted tests, fan and pump curves, full factory testing reports, if any, and full warranty information, including all responsibilities of the Owner to keep the warranty in force clearly identified. In addition, the installation and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the Commissioning Agent.
        2) The Commissioning Agent may request further documentation necessary for the commissioning process.
        3) This data request may be made prior to normal submittals.
    f. Provide a copy of the O&M manuals submittals of commissioned equipment, through normal channels, to the CA for review and approval.
    g. Subcontractors shall assist (along with the design engineers) in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.
    h. Provide assistance to the CA in preparation of the specific functional performance test procedures. Subs shall review test procedures to ensure feasibility, safety and equipment protection and provide necessary written alarm limits to be used during the tests.
    i. Develop a full start-up and initial checkout plan using manufacturer's start-up procedures and the prefunctional checklists from the CA. Submit manufacturer's detailed start-up procedures and the full start-up plan and procedures and other requested equipment documentation to CA for review.

j. During the startup and initial checkout process, execute and document the electrical-related portions of the prefunctional checklists provided by the CA for all commissioned equipment.
k. Perform and clearly document all completed startup and system operational checkout procedures, providing a copy to the CA and A/E.
l. Address current A/E punch list items before functional testing. Air and water TAB shall be completed with discrepancies and problems remedied before functional testing of the respective air- or water-related systems.
m. Provide skilled technicians to execute starting of equipment and to execute the functional performance tests. Ensure that they are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem-solving.
n. Perform functional performance testing under the direction of the CA for specified equipment. Assist the CA in interpreting the monitoring data, as necessary.
o. Correct deficiencies (differences between specified and observed performance) as interpreted by the CA, and A/E and retest the equipment.
p. Prepare O&M manuals according to the Contract Documents, including clarifying and updating the original sequences of operation to as-built conditions.
q. During construction, maintain as-built drawings and prepare final as-built drawings at project completion.
r. Provide training of the Owner's operating personnel as specified.
s. Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty.

2. Post Construction Phase
   a. Execute seasonal or deferred functional performance testing, witnessed by the CA, according to the specifications.
   b. Correct deficiencies and make necessary adjustments to O&M manuals and as-built drawings for applicable issues identified in any seasonal testing.

1.9 TESTING REQUIREMENTS

A. Specific functional testing requirements are listed for each system in Part 3 of this section. From these requirements, the Commissioning Authority (CA) shall develop step-by-step procedures to be executed by the Subs as directed by the Commissioning Authority. The test requirements for each piece of equipment or system contain the following:

1. The contractors responsible to execute the tests, under the direction of the CA.
2. A list of the integral components being tested.
3. Prefunctional checklists associated with the components.
4. Functions and modes to be tested.
5. Required conditions of the test for each mode.
6. Special procedures.
7. Required methods of testing.
8. Required monitoring.
9. Acceptance criteria.
10. Sampling strategies allowed.

1.10 TESTING PREREQUISITES

A. The following applicable generic prerequisite checklist items are required to be listed on each written functional test form and be completed and checked off by CA prior to functional testing.

1. All related equipment has been started up and start-up reports and prefunctional checklists submitted and approved ready for functional testing:
2. All control system functions for this and all interlocking systems are programmed and operable per contract documents, including final set points and schedules with debugging, loop tuning and sensor calibrations completed. Controls contractor to sign and date when ready.
3. Test and balance (TAB) complete and approved for the HVAC air and water systems.
4. All A/E punch list items for this equipment corrected.
5. These functional test procedures reviewed and approved by installing contractor.
6. Safeties and operating ranges reviewed by the CA.
7. Test requirements and sequences of operation attached.
8. Schedules and set points attached.
9. False loading equipment, system and procedures ready.
10. Sufficient clearance around equipment for servicing.

1.11 MONITORING

A. Monitoring is a method of testing as a stand-alone method or to augment manual testing.

B. All points listed in the required monitoring section of the test requirements which are control system monitored points shall be trended by the controls contractor. At the CA's request, the controls contractor shall trend up to 20% more points than listed herein at no extra charge.

C. Provide data electronically (Microsoft Excel) in 15 minute intervals for all analog hardware and software points.

1.12 DEFINITIONS

A. Acceptance Phase - phase of construction after startup and initial checkout when functional performance tests, O&M documentation review and training occurs.

B. Basis of Design - The basis of design is the documentation of the primary thought processes and assumptions behind design decisions that were made to meet the design intent. The basis of design describes the systems, components, conditions and methods chosen to meet the intent.

C. Control system - the central building energy management control system.

D. Data logging - monitoring flows, currents, status, pressures, etc. of equipment using stand-alone data loggers separate from the control system.

E. Deferred Functional Tests - FTs that are performed later, after substantial completion, due to partial occupancy, equipment, seasonal requirements, design or other site conditions that disallow the test from being performed.

F. Deficiency - a condition in the installation or function of a component, piece of equipment or system that is not in compliance with the Contract Documents (that is, does not perform properly or is not complying with the design intent).

G. Design Intent - a dynamic document that provides the explanation of the ideas, concepts and criteria that are considered to be very important to the owner. It is initially the outcome of the programming and conceptual design phases.

H. Design Narrative or Design Documentation - sections of either the Design Intent or Basis of Design.

I. Functional Performance Test (FT) - test of the dynamic function and operation of equipment and systems using manual (direct observation) or monitoring methods. Functional testing is the dynamic testing of systems (rather than just components) under full operation (e.g., the chiller pump is tested interactively with the chiller functions to see if the pump ramps up and down to maintain the differential pressure set point). Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc. The systems are run through all the control system's sequences of operation and components are verified to be responding as the sequences state. The commissioning authority develops the functional test procedures in a sequential written form, coordinates, oversees and documents the actual testing, which is performed by the installing contractor or vendor. FTs are performed after prefunctional checklists and startup are complete.

J. Indirect Indicators - indicators of a response or condition, such as a reading from a control system screen reporting a damper to be 100% closed.

K. Manual Test - using hand-held instruments, immediate control system readouts or direct observation to verify performance (contrasted to analyzing monitored data taken over time to make the "observation").

L. Monitoring - the recording of parameters (flow, current, status, pressure, etc.) of equipment operation using data loggers or the trending capabilities of control systems.

M. Over-written Value - writing over a sensor value in the control system to see the response of a system (e.g., changing the outside air temperature value from 50F to 75F to verify economizer operation). See also "Simulated Signal."

N. Owner-Contracted Tests - tests paid for by the Owner outside the GC's contract and for which the CA does not oversee. These tests will not be repeated during functional tests if properly documented.

O. Prefunctional Checklist (PC) - a list of items to inspect and elementary component tests to conduct to verify proper installation of equipment, by the Sub. Prefunctional checklists are primarily static inspections and procedures to prepare the equipment or system for initial operation (e.g., belt tension, oil levels OK, labels affixed, gages in place, sensors calibrated, etc.). However, some prefunctional checklist items entail simple testing of the function of a component, a piece of equipment or system (such as measuring the voltage imbalance on a three phase pump motor of a chiller system). The word prefunctional refers to before functional testing. Prefunctional checklists augment and are combined with the manufacturer's start-up

checklist. The commissioning authority only requires that the procedures be documented in writing, and does not witness much of the prefunctional check listing, except for larger or more critical pieces of equipment.

P. Sampling - functionally testing only a fraction of the total number of identical or near identical pieces of equipment.

Q. Seasonal Performance Tests - FT that are deferred until the system(s) will experience conditions closer to their design conditions.

R. Simulated Condition - condition that is created for the purpose of testing the response of a system (e.g., applying a hair blower to a space sensor to see the response in a VAV box).

S. Simulated Signal - disconnecting a sensor and using a signal generator to send an amperage, resistance or pressure to the transducer and DDC system to simulate a sensor value.

T. Startup - the initial starting or activating of dynamic equipment, including executing prefunctional checklists.

U. Subs - the Subcontractors to the General Contractor who provide and install building components and systems.

V. Test Procedures - the step-by-step process which must be executed to fulfill the test requirements. The test procedures are developed by the CA.

W. Test Requirements - requirements specifying what modes and functions, etc. shall be tested. The test requirements are not the detailed test procedures.

X. Trending - monitoring using the building control system.

Y. Post Construction Phase - Post Construction Phase for entire project, including equipment components. Warranty begins at Substantial Completion and extends for at least one year, unless specifically noted otherwise in the Contract Documents and accepted submittals.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. All standard testing equipment required to perform startup and initial checkout and required functional performance testing shall be provided by the Division contractor for the equipment being tested. For example, the mechanical contractor of Division 15 shall ultimately be responsible for all standard testing equipment for the HVAC system and controls system in Division 15, except for equipment specific to and used by TAB in their commissioning responsibilities. Two-way radios shall be provided by the Division Controller.

B. Special equipment, tools and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment, according to these Contract Documents shall be included in the base bid price to the Contractor and left on site.

C. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the Specifications.

PART 3 - EXECUTION

3.1 MEETINGS

A. Scoping Meeting: Within 30 days of commencement of construction, the CA will schedule, plan and conduct a commissioning scoping meeting with the entire commissioning team in attendance. Meeting minutes will be distributed to all parties by the CA.

B. Miscellaneous Meetings: Other meetings will be planned and conducted by the CA as construction progresses. These meetings will cover coordination, deficiency resolution and planning issues with particular Subs. The CA will plan these meetings and will minimize unnecessary time being spent by Subs.

3.2 REPORTING

A. The CA will provide regular reports to the Owner and A/E, with increasing frequency as construction and commissioning progresses.

B. The CA will regularly communicate with all members of the commissioning team, keeping them apprised of commissioning progress and scheduling changes through memos, progress reports, etc.

C. Testing or review approvals and non-conformance and deficiency reports are made regularly with the review and testing as described in later sections.

3.3 SUBMITTALS

A. The Commissioning authority will review submittals related to the commissioned equipment for conformance to the Contract Documents as it relates to the commissioning process, to the functional performance of the equipment and adequacy for developing test procedures. This review is intended primarily to aid in the development of functional testing procedures.

B. The CA may request additional design narrative from the A/E and Controls Contractor, depending on the completeness of the design intent documentation and sequences provided with the Specifications.

3.4 START-UP, PREFUNCTIONAL CHECKLISTS AND INITIAL CHECKOUT

A. The following procedures apply to all equipment to be commissioned,

B. General:

1. Prefunctional checklists are important to ensure that the equipment and systems are hooked up and operational. It ensures that functional performance testing (in-depth system checkout) may proceed without unnecessary delays. Each piece of equipment receives full prefunctional checkout. No sampling strategies are used. The prefunctional testing for a given system must be successfully completed prior to formal functional performance testing of equipment or subsystems of the given system.

C. Start-up and Initial Checkout Plan:

1. The primary role of the CA in this process is to ensure that there is written documentation that each of the manufacturer-recommended procedures have been completed. Parties responsible for prefunctional checklists and startup are identified in the commissioning scoping meeting and in the checklist forms. Parties responsible for executing functional performance tests are identified in the testing requirements for each system.
2. The Subcontractor responsible for the purchase of the equipment develops the full start-up plan by combining the manufacturer's detailed start-up and checkout procedures from the O&M manual and the normally used field checkout sheets. The plan will include checklists and procedures with specific boxes or lines for recording and documenting the checking and inspections of each procedure and a summary statement with a signature block at the end of the plan.
3. The full start-up plan could consist of something as simple as:
   a. The manufacturer's standard written start-up procedures copied from the installation manuals with check boxes by each procedure and a signature block added by hand at the end.
   b. The manufacturer's normally used field checkout sheets.
4. The Subcontractors shall submit the full startup plan to the General Contractor who will be responsible for reviewing and stamping the submittal. The General Contractor shall be responsible for transmitting the full submittal to the CA and A/E for approval.

D. Sensor and Actuator Calibration:

1. All field-installed temperature, relative humidity, CO, CO2 and pressure sensors and gages, and all actuators (dampers and valves) on all equipment shall be calibrated using the methods described below. Sensors installed in the unit at the factory with calibration certification provided need not be field calibrated.
2. All procedures used shall be fully documented on the prefunctional checklists or other suitable forms, clearly referencing the procedures followed and written documentation of initial, intermediate and final results. All sensors shall be calibrated to the tolerances for the specific product.

E. Valve and Damper Stroke Setup and Check:

1. For all valve and damper actuator positions checked, verify the actual position against the BAS readout.

F. Execution of Prefunctional Checklists and Startup:

1. The CA shall observe, at minimum, the procedures for each type of equipment to be commissioned.

2. The Subs and vendors shall execute startup and provide the CA with a signed and dated copy of the completed start-up and prefunctional tests and checklists.
3. Only individuals that have direct knowledge and witnessed that a line item task on the prefunctional checklist was actually performed shall initial or check that item off. It is not acceptable for witnessing supervisors to fill out these forms.

G. Deficiencies, Non-Conformance and Approval in Checklists and Startup:

1. The Sub Contractors shall clearly list any outstanding items of the initial start-up and prefunctional procedures that were not completed successfully, at the bottom of the procedures form or on an attached sheet. The procedures form and any outstanding deficiencies are provided to the CA within two days of test completion.
2. The CA reviews the report and submits either a non-compliance report or an approval form to the A/E and GC. When satisfactorily completed, the CA recommends approval of the execution of the checklists and startup of each system to the A/E using a standard form.

3.5 FUNCTIONAL PERFORMANCE TESTING

A. This sub-section applies to all commissioning functional testing for all divisions.

B. The general list of equipment to be commissioned is found in this section.

C. The parties responsible to execute each test are listed with each test.

D. Objectives and Scope:

1. The objective of functional performance testing is to demonstrate that each system is operating according to the documented design intent and Contract Documents. Functional testing facilitates bringing the systems from a state of substantial completion to full dynamic operation. Additionally, during the testing process, areas of deficient performance are identified and corrected, improving the operation and functioning of the systems.
2. In general, each system should be operated through all modes of operation (seasonal, occupied, unoccupied, warm-up, cool-down, part- and full-load) where there is a specified system response. Verifying each sequence in the sequences of operation is required. Proper responses to such modes and conditions as power failure, freeze condition, low oil pressure, no flow, equipment failure, etc. shall also be tested. Specific modes required in this project are given in Sections.

E. Development of Test Procedures:

1. Before test procedures are written, the CA shall obtain all requested documentation and a current list of change orders affecting equipment or systems, including an updated points list, program code, control sequences and parameters.
2. The CA shall develop specific test procedures and forms to verify and document proper operation of each piece of equipment and system. Each Sub or vendor responsible to execute a test, shall provide limited assistance to the CA in developing the procedures review (answering questions about equipment, operation, sequences, etc.). Prior to

execution, the CA shall provide a copy of the test procedures to the Sub(s) who shall review the tests for feasibility, safety, equipment and warranty protection.

3. The CA shall review owner-contracted, factory testing or required owner acceptance tests which the CA is not responsible to oversee, including documentation format, and shall determine what further testing or format changes may be required to comply with the Specifications. Redundancy of testing shall be minimized.
4. The test procedure forms developed shall include (but not be limited to) the following information:
    a. System and equipment or component name(s)
    b. Equipment location and ID number
    c. Date
    d. Project name
    e. Participating parties
    f. A copy of the specification section describing the test requirements
    g. A copy of the specific sequence of operations or other specified parameters being verified
    h. Formulas used in any calculations
    i. Required pre-test field measurements
    j. Instructions for setting up the test.
    k. Special cautions, alarm limits, etc.
    l. Specific step-by-step procedures to execute the test, in a clear, sequential and repeatable format
    m. Acceptance criteria of proper performance with a Yes / No check box to allow for clearly marking whether or not proper performance of each part of the test was achieved.
    n. A section for comments
    o. Signatures and date block for the CA
5. Sampling:
    a. The recommended sampling rates are specified with each type of equipment in the testing sections of this specification. It is noted that no sampling by Subs is allowed in prefunctional checklist execution. The following is an example of how multiple pieces of equipment that are identical may be tested.
        1) Randomly test at least 20% of each group of identical equipment. In no case test less than three units in each group. This 20%, or three, constitute the “first sample.”
        2) If 10% of the units in the first sample fail the functional performance tests, test another 20% of the group (the second sample).
        3) If 10% of the units in the second sample fail, test all remaining units in the whole group.
    b. If at any point, frequent failures are occurring and testing is becoming more troubleshooting than verification, the CA may stop the testing and require the responsible Sub to perform and document a checkout of the remaining units, prior to continuing with functionally testing the remaining units.

F. Coordination and Scheduling:

1. The Subs shall provide sufficient notice to the CA and General Contractor regarding their completion schedule for the prefunctional checklists and startup of all equipment and systems. The CA will schedule functional tests through the General Contractor and

affected Subs. The CA shall direct, witness and document the functional testing of all equipment and systems. The Subs shall execute the tests.

2. In general, functional testing is conducted after prefunctional testing and startup has been satisfactorily completed. The control system is sufficiently tested and approved by the CA before it is used for TAB or to verify performance of other components or systems.

G. Problem Solving:

1. The CA will recommend solutions to problems found, however the burden of responsibility to solve, correct and retest problems is with the GC, Subs and A/E.

3.6 DOCUMENTATION, NON-CONFORMANCE AND APPROVAL OF TESTS

A. Documentation:

1. The CA shall witness and document the results of all functional performance tests using the specific procedural forms developed for that purpose. Prior to testing, these forms are provided to the General Contractor for review and approval and to the Subs for review. The CA will include the filled out forms in the Systems manuals.

B. Non-Conformance:

1. The CA will record the results of the functional test on the procedure or test form. All deficiencies or non-conformance issues shall be noted and reported to the General Contractor and A/E on a standard non-compliance form.
2. Corrections of minor deficiencies identified may be made during the tests at the discretion of the CA. In such cases the deficiency and resolution will be documented on the procedure form.
3. Cost of Retesting:
   a. The cost for the Sub to retest a prefunctional or functional test, if they are responsible for the deficiency, shall be theirs.
   b. For a deficiency identified, not related to any prefunctional checklist or start-up fault, the following shall apply: The CA will direct the retesting of the equipment once at no “charge” to the Subs for their time.
   c. Any required retesting by any contractor shall not be considered a justified reason for a claim of delay or for a time extension by the General Contractor.

C. Approval:

1. The CA notes each satisfactorily demonstrated function on the test form. Formal approval of the functional test is made later after review by the CA and by the A/E. The CA recommends acceptance of each test to the A/E using a standard form. The CA gives final approval on each test using the same form, providing a signed copy to the General Contractor.

3.7 DEFERRED TESTING

A. Unforeseen Deferred Tests:

1. If any check or test cannot be completed due to the building structure, required occupancy condition or other deficiency, execution of checklists and functional testing may be delayed upon approval of the CA. These tests will be conducted in the same manner as the seasonal tests as soon as possible. Services of necessary parties will be negotiated.

B. Seasonal Testing:

1. During the Post Construction Phase, seasonal testing (tests delayed until weather conditions are closer to the system's design) shall be completed as part of this contract. The CA shall coordinate this activity. Tests will be executed, documented and deficiencies corrected by the appropriate Subs, with facilities staff and the CA witnessing. Any final adjustments to the O&M manuals and as-builts due to the testing will be noted by the GC.

3.8 OPERATION AND MAINTENANCE MANUALS

A. Standard O&M Manuals:

1. The specific content and format requirements for the standard O&M manuals are detailed in the specific Sections.
2. CA Review:
   a. Prior to substantial completion, the CA shall review the O&M manuals, documentation to verify compliance with the Specifications. The CA will communicate deficiencies in the manuals to the A/E and GC. Upon a successful review of the corrections, the CA recommends approval and acceptance of these sections of the O&M manuals to the A/E and GC.
3. Final Report Details:
   a. The final commissioning report shall include an executive summary, list of participants and roles, brief building description, overview of commissioning and testing scope and a general description of testing and verification methods. For each piece of commissioned equipment, the report should contain the disposition of the commissioning authority regarding the adequacy of the equipment and documentation in the following areas: 1) Equipment meeting the equipment specifications, 2) Equipment installation, 3) Functional performance and efficiency, 4) Equipment documentation and design intent. All outstanding non-compliance items shall be specifically listed. Recommendations for improvement to equipment or operations, future actions, commissioning process changes, etc. shall also be listed. The functional performance and efficiency section for each piece of equipment shall include a brief description of the verification method used (manual testing, BAS trend logs, data loggers, etc.) and include observations and conclusions from the testing.

3.9 TRAINING OF OWNER PERSONNEL

A. The General Contractor shall be responsible for training coordination and scheduling and ultimately for ensuring that training is completed.

B. The CA shall be responsible for approving the content and adequacy of the training of Owner personnel for commissioned equipment.
   1. The CA shall interview the facility manager and lead engineer to determine the special needs and areas where training will be most valuable. The Owner and CA shall decide how rigorous the training should be for each piece of commissioned equipment. The CA shall communicate the results to the Subs and vendors who have training responsibilities.
   2. In addition to these general requirements, the specific training requirements of Owner personnel by Subs and vendors is specified in the specific Sections.
   3. Each Sub and vendor responsible for training will submit a written training plan to the CA for review and approval prior to training. The plan will cover the following elements:
      a. Equipment (included in training)
      b. Intended audience
      c. Location of training
      d. Objectives
      e. Subjects covered (description, duration of discussion, special methods, etc.)
      f. Duration of training on each subject
      g. Instructor for each subject
      h. Methods (classroom lecture, video, site walk-through, actual operational demonstrations, written handouts, etc.)
      i. Instructor and qualifications
   4. For the primary HVAC equipment, the Controls Contractor shall provide a short discussion of the control of the equipment during the mechanical or electrical training conducted by others.
   5. The CA develops an overall training plan and coordinates and schedules, with the GC. The CA develops criteria for determining that the training was satisfactorily completed, including attending some of the training, etc. The CA recommends approval of the training to the A/E and General Contractor using a standard form.
   6. The design engineer shall at the first training session present the overall system design concept and the design concept of each equipment section. This presentation shall be 8 hours in length and include a review of all systems using the simplified system schematics (one-line drawings) including boiler water systems, AHU systems, heating systems, fuel gas supply systems, supply air systems, exhaust system and outside air strategies, dust collection and BAS system.

PLUMBING

3.10 PLUMBING WATER SYSTEM

A. Parties Responsible to Execute Functional Test

   1. CA: witness and document testing.
   2. Plumbing Contractor to make all adjustments.

B. Integral Components or Related Equipment Being Tested

   1. This procedure applies to the following systems:
      a. Hot and Cold Domestic Water Systems
      b. Hot and Cold Non-Potable Water Systems

2. Hot water heaters (heaters, mixing valves)
3. Recirculating pumps

C. Prerequisites: The applicable prerequisite checklist items shall be checked off prior to functional testing. The commissioning agent may also spot-check misc. items and calibrations on the prefunctional checklists previously completed by the installer, before the beginning of functional testing.

D. Functions/Modes Required To Be Tested, Test Methods and Seasonal Test Requirements

Function/Mode	Test Method
1. Test each sequence in the sequence of operations, and other significant modes and sequences not mentioned; including startup, shutdown, unoccupied & manual modes and power failure. Test functionality of this piece of equipment or system in all control strategies or interlocks that it is associated with.	Manual
2. Verify schedules and set points to be reasonable and appropriate	
3. Mixing valve operation and temperature control	Either
4. Sensor calibration checks on hot water temperature	Manual

E. Special Procedures (other equipment to test with, etc.; reference to function ID)

1. None

F. Required Monitoring

1. None

G. Acceptance Criteria (Referenced by function or mode ID)

1. For the conditions, sequences and modes tested, equipment responds to changing conditions and parameters appropriately as expected, as specified and according to acceptable operating practice.

H. Sampling Strategy for Identical Units

1. No sampling. Test all units.

END OF PLUMBING WATER SYSTEM

MECHANICAL

3.11 HOT WATER HEATING SYSTEM (BOILERS, PUMPS, DISTRIBUTION)

A. Parties Responsible to Execute Functional Test:

1. Vendor Support Representative
2. Controls Contractor: Operate the controls, as needed
3. HVAC mechanical contractor or vendor: Assist in testing sequences
4. CA: To witness and document testing

B. Integral Components or Related Equipment Being Tested: Prefunctional tests must be complete for all of the components listed below prior to performing this functional test.

1. Boilers
2. HW pumps
3. HW pump VFDs
4. Burner and blower
5. Pressurized compression tank and air separation
6. Water treatment and water makeup systems

C. Prerequisites:

1. The applicable prerequisite checklist items listed in Part 1 of this section and paragraph B above shall be listed on each functional test form and checked off prior to functional testing. The commissioning agent will also spot-check misc. items and calibrations on the prefunctional checklists previously completed by the installer, before the beginning of functional testing.

D. Functions/Modes Required To Be Tested, Test Methods and Seasonal Test Requirements.

1. The following testing requirements are in addition to and do not replace any testing requirements elsewhere in this Specification.

Function / Mode	Test Method Manual, Monitoring, Either or Both	Required Seasonal Test[1]
General 1. Test each sequence in the sequence of operations, and other significant modes and sequences not mentioned; including startup, shutdown, unoccupied & manual modes and power failure. Test functionality of this piece of equipment or system in all control strategies or interlocks with which it is associated.	Manual	
In addition to, or as part of (1) above, the following modes or tests are required:		
2. Supply pump staging, bypass valve operation, if no VFD and HWT reset. VFD operation: modulation to minimum, control system PID, proportional band of speed vs controlling parameter, verification of program settings,, alarms, etc.	Both	Heating
3. Check all alarms and safeties (high and low pressure and temperature, etc.), PRV and flow switch functions	Manual	
4. Test each possible lead boiler as lead boiler, and each pump as lead pump. Test pump lockouts.	Manual	
5. Verify boiler inlet/outlet pressures with startup report and manufacturer's recommendations.	Manual	
6. Sensor and actuator calibration checks on: HWST, HWRT, pressure sensor controlling pump speed, mixing valve and other random checks (EMS readout against hand-held calibrated instrument must be within 0.5°F for temps. or within a tolerance equal to 10% of the pressure set point, with a test gage).	Manual	
7. Constancy of differential pressure (pump control parameter)	Monitoring	Heating
8. Trend all temperature, pressure, speed and control points from the start of	Monitoring	Both

Function / Mode	Test Method Manual, Monitoring, Either or Both	Required Seasonal Test[1]
functional performance testing until Post Construction Phase is complete.		
9. Burner operation and controls, fuel gas pilot, flow and pressure, flue gases and barometric dampers outlet temperature emission controls.		
10. Water treatment, water levels, pressure and temperature safeties and alarms.		
11. Verify schedules and set points to be reasonable and appropriate		

E. Special Procedures (other equipment to test with, etc.; reference to function ID):

1. False load boiler, if necessary.
2. Testing of boiler safety valves.
3. Boiler inspector's tests.

F. Acceptance Criteria (referenced by function or mode ID):

1. For the conditions, sequences, and modes tested, the boilers, integral components and related equipment respond to varying loads and changing conditions and parameters appropriately as expected, as specified and according to acceptable operating practice.
2. Boiler shall maintain the supply water set point to within +/- 3.0F of set point dead band without excessive hunting.
3. Pumping system and controls shall maintain the current desired pressure set point to within an amount equal to 10% of the set point value either side of the dead band without excessive hunting.
4. Max sound: 84 dBA
5. Gas pressure: 2.5" wC, 85% efficiency
6. Max pressure: 160 PSIG
7. Emissions < 200 ppm CO, < 20 ppm NOx

G. Sampling Strategy for Identical Units: No sampling, test all.

END OF HOT WATER HEATING SYSTEM (BOILERS, PUMPS, DISTRIBUTION)

3.12 TERMINAL UNITS (FCU, FPT, VAV, CUH, UH)

A. Parties Responsible to Execute Functional Test:

1. Controls Contractor: Operate the controls to activate the equipment.
2. CA to record results.

3. Mechanical Contractor to make any adjustments.

B. Integral Components or Related Equipment Being Tested: Prefunctional tests must be complete for all of the components listed below prior to performing this functional test.

1. VAV Boxes w/ and w/o Reheat Coils
2. Radiation
3. Unit Heaters
4. Air Handling Systems

C. Prerequisites:

1. The applicable prerequisite checklist items listed in the Part 1 of this section and paragraph B above shall be listed on each functional test form and checked off prior to functional testing. The commissioning agent will also spot-check misc. items and calibrations on the prefunctional checklists previously completed by the installer, before the beginning of functional testing.

D. Functions/Modes Required To Be Tested, Test Methods:

1. The following testing requirements are in addition to and do not replace any testing requirements elsewhere in this Specification.

Function/Mode	Test Method Manual, Monitoring, Either or Both[2]	Required Seasonal Test[1]
General 1. Test each sequence in the sequence of operations, and other significant modes and sequences not mentioned; including startup, warm-up, shutdown, unoccupied & manual modes and power failure and restoration. Test functionality of this piece of equipment or system in all control strategies or interlocks that it is associated with, including all damper, valve and fan functions.	Manual	
In addition to, or as part of (1) above, the following modes or tests are required:		
2. Sensor activator calibration checks on: SAT, zone air temperature damper position and other random checks (EMS readout against visual or hand-held calibrated instrument must be within 0.5°F for temps. or within a tolerance equal to 10% of static pressure set point, with an inclined manometer)	Manual	
3. Device and actuator calibration and stroke checks for heating coil valve and dampers	Manual	
4. For the TU's tested, check the prefunctional checklist items.	Observation	
5. Verify control parameters and set points to be reasonable and appropriate by reviewing the full program of 5% of all the TU's with each other for consistency. Verify the max. and min. cfm set points of all tested TU's against the control drawing and TAB values. Verify other TU programming parameters such as K-factors, dead bands, set points, stroke times, etc.	Observation	
6. Verify proper operation of valve in both cooling and heating modes under occupied and unoccupied conditions.	Both	Both
7. Verify no hunting or significant overshoot by valves and dampers.	Either	

Function/Mode	Test Method Manual, Monitoring, Either or Both[2]	Required Seasonal Test[1]
8. Verify by measurement, CCV & HCV positive shutoff (no leak-thru)	Manual	
9. All alarms (fan status, low limits, etc.)	Manual	
10. Verify that TU is maintaining space set point temperatures and fans are being cycled as specified	Monitoring	Both Design
11. Trend all temperature, pressure, speed and control points from the start of functional performance testing until Post Construction Phase is complete.	Monitoring	Both

E. Special Procedures (other equipment to test with, etc.; reference to function ID): None

F. Acceptance Criteria (referenced by function or mode ID):

1. For the conditions, sequences and modes tested, the TU, integral components and related equipment respond to varying loads and changing conditions and parameters appropriately as expected, as specified and according to acceptable operating practice.
2. Space temperature during occupied modes shall average within +/- 1°F of set point and always remain within 1°F of the ends of the dead band without excessive hunting of the coil valve or complaints of drafts or stuffiness from occupants.

G. Sampling Strategy for Identical:

1. Units of the same type and function, but different in size, are considered identical for sampling purposes.
2. Testing:
   a. Randomly test at least 25% of each group of identical equipment (the 1st sample). In no case test less than three units in each group. If 10% of the units in the first sample fail the functional performance tests, test another 10% of the group (the 2nd sample). If 10% of the units in the 2nd sample fail, test all remaining units in the whole group, fully at the contractor's expense. This sampling applies to the testing subsections. That is, if calibration is off on more than 10% of the tested piece of equipment, then another sample shall have calibrations checked, but not all other tests need to be done on the second sample.
3. Monitoring:
   a. Twenty five percent of the total number of zones in the building, chosen by the Owner, shall be monitored. Within this 25%, shall be included a distribution of all air handlers, zones expected to have the greatest heating and cooling demand, perimeter and core zones and zones identified from the commissioning process that have exhibited potential problems.

END OF TERMINAL UNITS (FCU, FPT, VAV, CUH, UH)

3.13 PACKAGED DX SPLIT SYSTEM AIR CONDITIONING OR HEAT PUMP

A. Parties Responsible to Execute Functional Test:

1. Controls Contractor: Operate the controls to activate the equipment.
2. CA: To witness and document testing.
3. TAB Contractor to verify airflows.
4. Unit Manufacturer's Representative.

B. Integral Components or Related Equipment Being Tested:

1. Prefunctional tests must be complete for all of the components listed below prior to performing this functional test.
   a. Unit (fans, coils, condenser, compressors, ducts, VFD)

C. Prerequisites:

1. The applicable prerequisite checklist items listed in the Part 1 of this section and paragraph B above shall be listed on each functional test form and checked off prior to functional testing. The commissioning agent will also spot-check misc. items and calibrations on the prefunctional checklists previously completed by the installer, before the beginning of functional testing.

D. Functions/Modes Required To Be Tested, Test Methods:

1. The following testing requirements are in addition to and do not replace any testing requirements elsewhere in this Specification.

Function / Mode	Test Method Manual, Monitoring, Either or Both[2]	Required Seasonal Test[1]
General 1. Test each sequence in the sequence of operations, and other significant modes and sequences not mentioned; including startup, shutdown, unoccupied & manual modes and power failure. Test functionality of this piece of equipment or system in all control strategies or interlocks that it is associated with.	Manual	
In addition to, or as part of (1) above, the following modes or tests are required:		
2. Supply air, and reset temp. control functions	Both	
3. SF, RF and exhaust fan interlocks	Either	
4. Compressor unloading & condenser fan staging for head pressure control	Both	
5. Damper interlocks and correct modulation in all modes, including fire and smoke dampers	Manual	
6. Temperature difference across cooling coils	Manual	

Function / Mode	Test Method Manual, Monitoring, Either or Both[2]	Required Seasonal Test[1]
7. Verify TAB reported SF cfm with control system reading	Manual	
8. All alarms (low limits, high static, freezestat, etc.)	Manual	
9. Unit cooling capacity tests	Manual	Design
10. Sensor and actuator calibration checks on: SAT, RAT, and other random checks (EMS readout against hand-held calibrated instrument must be within 0.5°F for temps. or within a tolerance equal to 10% of static pressure set point, with an inclined manometer)	Manual	
11. Trend all temperature, pressure, speed and control points from the start of functional performance testing until Post Construction Phase is complete.	Monitoring	Both
12. Verify control strategies, schedules and set points to be reasonable and appropriate		

E. Special Procedures (other equipment to test with, etc.; reference to function ID): None

F. Acceptance Criteria (referenced by function or mode ID):

1. For the conditions, sequences and modes tested, the system, integral components and related equipment respond to varying loads and changing conditions and parameters appropriately as expected, as specified and according to acceptable operating practice.

G. Sampling Strategy: Test all units.

END OF PACKAGED DX SPLIT SYSTEM AIR CONDITIONING OR HEAT PUMP

3.14 EXHAUST FANS

A. Parties Responsible to Execute Functional Test

1. Controls Contractor: Operate the controls to activate the equipment.
2. CA: To witness and document testing.
3. TAB Contractor to verify airflows.
4. Mechanical Contractor to make any adjustments.

B. Integral Components or Related Equipment Being Tested: Prefunctional checklists must be complete for all of the components listed below prior to performing this functional test.

1. Controls
2. Terminal equipment

C. Prerequisites: The applicable prerequisite checklist items shall be signed off prior to functional testing. The commissioning agent may spot-check misc. items and calibrations on the prefunctional checklists before the beginning of functional testing.

D. Functions/Modes Required To Be Tested, Test Methods:

Function/Mode	Test Method	Seasonal Test
General 1. Test each sequence in the sequence of operations, and other significant modes and sequences not mentioned; including startup, shutdown, unoccupied & manual modes and power failure. Test functionality of this piece of equipment or system in all control strategies or interlocks that it is associated with.	Manual	
2. Verify schedules and set points to be reasonable and appropriate		
3. Function at fire alarm (off, depressurization, etc.)	Manual	
4. Check TAB report record of sound power level tests and space pressures and compare to specifications	Review	
5. Sensor calibration checks on any controlling temperature or pressure sensor	Manual	

E. Special Procedures (other equipment to test with, etc.; reference to function ID)

1. None.

F. Acceptance Criteria (referenced by function or mode ID)

1. For the conditions, sequences and modes tested, the fans, integral components and related equipment respond to changing conditions and parameters appropriately as expected, as specified and according to acceptable operating practice.

END OF EXHAUST FANS

3.15 BUILDING AUTOMATION SYSTEM (BAS)

A. Parties Responsible to Execute Functional Test:

1. Controls Contractor: Operate the controls to activate the equipment.
2. CA: To witness and document testing.

B. Integral Components or Related Equipment Being Tested: Prefunctional tests must be complete for all of the components listed below prior to performing this functional test.

1. Building Automation System
2. All prefunctional checklists of controlled equipment

C. Prerequisites:

1. The applicable prerequisite checklist items listed in the Part 1 of this section and paragraph B above shall be listed on each functional test form and checked off prior to functional testing. The commissioning agent will also spot-check misc. items and calibrations on the prefunctional checklists previously completed by the installer, before the beginning of functional testing.

D. A significant part of the BAS functional testing requirements is the successful completion of the functional tests of equipment the BAS controls or interlocks with. Uncompleted equipment functional tests or outstanding deficiencies in those tests lend the required BAS functional testing incomplete.

E. Integral or stand-alone controls are functionally tested with the equipment they are attached to, including any interlocks with other equipment or systems and thus are not covered under the BAS testing requirements, except for any integrated functions or interlocks listed below.

F. In addition to the controlled equipment testing, the following tests are required for the BAS, where features have been specified. The following testing requirements are in addition to and do not replace any testing requirements elsewhere in the specifications.

Function/Mode	Test Method Manual (demonstration), Monitoring, Either or Both
MISC. FUNCTIONS	
1. All specified functions and features are set up, debugged and fully operable	Verbal discussion of features
2. Power failure and battery backup and power-up restart functions	Demonstration
3. Specified trending and graphing features demonstration	See equipment trends
4. Global commands features	Demonstration
5. Security and access codes	Demonstration
6. Occupant over-rides (manual, telephone, key, keypad, etc.)	Demonstration
7. O&M schedules and alarms	Demonstration
8. Scheduling features fully functional and setup, including holidays	Observation in terminal screens or printouts
9. Included features not specified to be setup are installed (list)	Demonstration
10. Demonstrate functionality of field panels using local operator keypads and local ports (plug-ins) using portable computer/keypad	Demonstration of 100% of panels and 10% of ports
11. All graphic screens and value readouts completed	Demonstration
12. Set point changing features and functions	Done during equipment testing
13. Communications to remote sites	Demonstration
14. Sensor calibrations	Sampled during equipment tests
15. Final as-builts or redlines (per spec) control drawings, final points list, program code, set points, schedules, warranties, etc. per specs, submitted for O&Ms.	Observation
16. Verify that points that are monitored only, having no control function, are checked for proper reporting to BAS.	Observation
17. Optional Start/Stop Routine.	
18. Final room numbers programmed into system.	
19. Worcester standard point naming conventions used.	

Function/Mode	Test Method Manual (demonstration), Monitoring, Either or Both
INTEGRATED TESTS	
20. Fire alarm interlocks and response	Demonstration
21. Demand limiting (including over-ride of limiting)	Monitoring
22. Sequential staging ON of equipment	Either
23. All control strategies and sequences not tested during controlled equipment testing	Either
24. Other integrated tests specified in the contract documents	
25. Emergency power operation and return to normal power.	
26. Fire protection and suppression systems	Demonstration

G. Special Procedures (other equipment to test with, etc.; reference to function ID): None

H. Acceptance Criteria (referenced by function or mode ID):

1. For the conditions, sequences and modes tested, the BAS, integral components and related equipment respond to changing conditions and parameters appropriately as expected, as specified and according to acceptable operating practice.

END OF BUILDING AUTOMATION SYSTEM (BAS)

3.16 TEST AND BALANCE WORK (TAB)

A. Parties Responsible to Execute Functional Test:

1. TAB Contractor: Perform checks using test instruments.
2. Controls Contractor: Operate the controls to activate the equipment.
3. CA: To witness and document testing.

B. Integral Components or Related Equipment Being Tested: Prefunctional tests must be complete for all of the components listed below prior to performing this functional test.

1. TAB water-side
2. TAB air-side
3. TAB equipment and systems
4. TAB electrical

C. Prerequisites

1. The applicable prerequisite checklist items listed in the beginning of this Section shall be listed on each functional test form and checked off prior to functional testing. The commissioning agent will also spot-check misc. items and calibrations on the prefunctional checklists previously completed by the installer, before the beginning of functional testing.

D. Purpose:

1. The purpose of this test is to spot check the TAB work to verify that it was done in accordance with the contract documents and acceptable practice and that the TAB report is accurate.

E. The following tests and checks will be conducted. The following testing requirements are in addition to and do not replace any testing requirements elsewhere in this Specification.

Test or Check	Test Method	Required Seasonal Test[3]
1. A random sample of up to 5 % the TAB report data shall be selected for verification (air velocity, air or water flow rate, pressure differential, electrical or sound measurement, etc.). The original TAB contractor will execute the checks, witnessed by the commissioning authority. The TAB contractor will use the same test instruments as used in the original TAB work. A failure[1] of more than 10% of the selected items of a given system[2] shall result in the failure of acceptance of the system TAB report and the TAB contractor shall be responsible to rebalance the system, provide a new system TAB report and repeat random verifications of the new TAB report. The random testing will include the verification of minimum outdoor air intake flows at minimum, maximum and intermediate total airflow rates for 100% of the air handlers. Other selected data to be verified will be made known upon day of testing.	Demonstration	
2. Verify that final settings of all valves, splitters, dampers and other adjustment devices have been permanently marked by the TAB Contractor.	Demonstration	
3. Verification that the air system is being controlled to the lowest possible static pressure while still meeting design loads, less diversity. This shall include a review of TAB methods, control set points established by TAB and a physical verification of at least one leg from fan to diffuser having all balancing dampers wide open and that during full cooling of all TUs taking off downstream of the static pressure sensor, the TU on the critical leg has its damper 90% or more open.	Demonstration	

Test or Check	Test Method	Required Seasonal Test[3]
4. Verification that the water system is being controlled to the lowest possible pressure while still meeting design loads, less diversity. This shall include a review of TAB methods, control set points established by TAB and a physical verification of at least one leg from the pump to the coil having all balancing valves wide open and that during full cooling the cooling coil valve of that leg is 90% or more open.	Demonstration	

[1]Failure of an item is defined as follows:
For airflow of supply and return: a deviation of more than 10% of instrument reading
For minimum outside airflow: 20% of instrument reading (30% for reading at intermediate supply flow for inlet vane or VFD OSA compensation system using linear proportional control)
For temperatures: a deviation of more than 1°F
For air and water pressures: a deviation of more than 10% of full scale of test instrument reading
For sound pressures: a deviation of more than 3 decibels. (Variations in background noise must be considered)

[2]Examples of a "system" are: the air distribution system served by one air handler or the hydronic hot water supply system served by a boiler. Systems can be defined smaller if inaccuracies in TAB work within the smaller defined system will have little or no impact on connected systems.

[3]Cooling season, Heating season or Both. "Design" means within 5°of season design (ASHRAE 2 1/2%), or 95% of loading design. A blank cell denotes no special seasonal test is required and that test can be executed during any season, if condition simulation is appropriate.

F. Special Procedures (other equipment to test with, etc.; reference to function ID): None

G. Required Monitoring: None

H. Acceptance Criteria (referenced by function or mode ID): Provided in footnote to test table above.

I. Sampling Strategy for Identical Units: Described in test table above.

END OF TEST AND BALANCE WORK (TAB)

3.17 AIR HANDLING UNITS (RECIRCULATING AND 100% O.A.)

A. Parties Responsible to Execute Functional Test

1. Controls Contractor: Operate the controls to activate the equipment.
2. CA: To witness and document testing.
3. TAB Contractor to verify air and water flows.
4. Mechanical Contractor to fix any problems.
5. Unit Manufacturer's Representative.

B. Integral Components or Related Equipment Being Tested: Prefunctional tests must be complete for all of the components listed below prior to performing this functional test.

1. Chilled Water System to cooling section
2. Hot water heating system or gas to unit heating section

C. Prerequisites:

1. The applicable prerequisite checklist items listed in the Part 1 of this section and paragraph B above shall be listed on each functional test form and checked off prior to functional testing. The commissioning agent will also spot-check misc. items and calibrations on the prefunctional checklists previously completed by the installer, before the beginning of functional testing.

D. Functions/Modes Required To Be Tested, Test Methods :

1. The following testing requirements are in addition to and do not replace any testing requirements elsewhere in this Specification.

Function / Mode	Test Method Manual, Monitoring, Either or Both[2]	Required Seasonal Test[1]
General 1. Test each sequence in the sequence of operations, and other significant modes and sequences not mentioned; including startup, shutdown, unoccupied & manual modes and power failure. Test functionality of this piece of equipment or system in all control strategies or interlocks that it is associated with.	Manual	
In addition to, or as part of (1) above, the following modes or tests are required:		
2. Hot water coil and face and bypass dampers temperature control functions	Both	Heating
3. Economizer functions	Both	Cooling
4. SF, RF and exhaust fan interlocks	Either	
5. Damper interlocks and correct modulation in all modes, including fire and smoke dampers and CO_2 control	Manual	
6. Temperature difference across heating and cooling coils	Manual	Both
7. Smoke detectors and smoke evac control from fire alarm control panel.	Manual	
8. Verify TAB reported SF and RF cfm with control system reading	Manual	
9. All alarms (low limits, high static, freezestat, etc.)	Manual	
10. Supply and return fans static pressure and volume matching control	Monitoring	Design
11. Sensor and actuator calibration checks on: SAT, MAT, OSAT, CO_2, economizer and RA dampers and other random checks (EMS readout against hand-held calibrated instrument must be within 0.5°F for temps. or within a tolerance equal to 10% of static pressure set point, with an inclined manometer)	Manual	
12. Trend all temperature, pressure, speed and control points from the start of functional performance testing until Acceptance Phase is complete. Provide CA with all requested data until approved.	Monitoring	Both
13. Verify control strategies, schedules and set points to be reasonable and appropriate		

E. Special Procedures (other equipment to test with, etc.; reference to function ID): None

F. Acceptance Criteria (referenced by function or mode ID):

1. For the conditions, sequences and modes tested, the system, integral components and related equipment respond to varying loads and changing conditions and parameters appropriately as expected, as specified and according to acceptable operating practice.

G. Sampling Strategy: Test all units.

END OF AIR HANDLING UNITS (RECIRCULATING AND 100% O.A.)

ELECTRICAL ((SAMPLE: to be modified by Designer to suit project conditions))

3.18 EMERGENCY GENERATOR

A. Parties Responsible to Execute Functional Test

1. Vendor Support Representative
2. Electrical Contractor
3. CA: To witness and document testing

B. Integral Components or Related Equipment Being Tested: Prefunctional Test Complete?

1. Generator Motor
2. Generator Cooling System
3. Generator Fuel System
4. Phase Rotation

C. Prerequisites:

1. The applicable prerequisite checklist items listed in the Part 1 of this section and paragraph B above shall be listed on each functional test form and checked off prior to functional testing. The commissioning agent will also spot-check misc. items and calibrations on the prefunctional checklists previously completed by the installer, before the beginning of functional testing.

D. Functions/Modes Required To Be Tested, Test Methods:

1. The following testing requirements are in addition to and do not replace any testing requirements elsewhere in this Specification.

Function/Mode	Test Method Manual, Monitoring, Either or Both	Required Seasonal Test[1]
General 1. Test each sequence in the sequence of operations, and other significant modes and sequences not mentioned; including startup, shutdown, remote annunciation. Test functionality of this piece of equipment or system in all control strategies or interlocks with which it is associated.	Manual	Both
2. Stimulate power outage and subsequent automatic transfer switch operation(s)	Manual	
3. Generator start capability upon signal from ATS upon loss of utility power	Manual	
4. Check all alarms and annunciators local and remote and remote	Manual	
5. Demonstrate interior of enclosure operational, i.e., lighting, battery chargers, etc.	Manual	
6. Demonstrate proper functioning of governor and regulator	Manual	
7. Verify operation of all mechanical equipment elevators and fire pump from generator power and restart upon re-energizing normal power.		

[1]Cooling season, Heating season or Both. "Design" means within 5°of season design (ASHRAE 2 1/2%), or 95% of loading design. A blank cell denotes no special seasonal test is required and that test can be executed during any season, if condition simulation is appropriate.

E. Acceptance Criteria (referenced by function or mode ID):

1. For the conditions, sequences and modes tested, the generator, integral components and related equipment respond to varying loads and changing conditions and parameters appropriately as expected, as specified and according to acceptable operating practice.

END OF EMERGENCY GENERATOR

3.19 EMERGENCY LIGHTING

A. Parties Responsible to Execute Functional Test:

1. Electrical Contractor
2. CA: To witness and document testing

B. Integral Components or Related Equipment Being Tested: Prefunctional tests must be complete for all of the components listed below prior to performing this functional test.

1. Emergency Lighting Fixtures
2. Emergency Bypass Relays

C. Prerequisites:

1. The applicable prerequisite checklist items listed in Part 1 of this section and paragraph B above shall be listed on each functional test form and checked off prior to functional testing. The commissioning agent will also spot-check misc. items and calibrations on the prefunctional checklists previously completed by the installer, before the beginning of functional testing.

D. Functions/Modes Required To Be Tested, Test Methods:

1. The following testing requirements are in addition to and do not replace any testing requirements elsewhere in this Specification.

Function / Mode	Test Method Manual, Monitoring, Either or Both	Required Seasonal Test
General 1. Test all manual controls individually.	Manual	
2. Demonstrate all automatic functions using manual control overrides.		
3. Demonstrate all interlocking functions, i.e., security/fire alarm.		

E. Acceptance Criteria

1. Acceptance is achieved when all functions of the specified system have been demonstrated.

F. Sample strategy for identical units: No sampling, test all.

END OF EMERGENCY LIGHTING

3.20 SHORT CIRCUIT TRIP

A. Parties Responsible to Execute Functional Test:

1. Electrical Contractor
2. CA: To witness and document testing

B. Integral Components or Related Equipment Being Tested: Prefunctional tests must be complete for all of the components listed below prior to performing this functional test.

1. Breaker trip settings for all adjustable trip type breakers

C. Prerequisites:

1. The applicable prerequisite checklist items listed in Part 1 of this section and paragraph B above shall be listed on each functional test form and checked off prior to functional testing. The commissioning agent will also spot-check misc. items and calibrations on the

prefunctional checklists previously completed by the installer, before the beginning of functional testing.

D. Functions/Modes Required To Be Tested, Test Methods:

1. The following testing requirements are in addition to and do not replace any testing requirements elsewhere in this Specification.

Function/Mode	Test Method Manual, Monitoring, Either or Both	Required Seasonal Test
General 1. Review breaker settings per the short circuit protection study.	Manual	

E. Acceptance Criteria (referenced by function or mode ID):

1. System is in compliance when trip settings are observed to be coordinated with report recommendations.

F. Sampling strategy for identical units: No sampling, test all.

END OF SHORT CIRCUIT TRIP

3.21 LIGHTING CONTROL SYSTEM

A. Parties Responsible to Execute Functional Test:

1. Vendor Support Representative
2. Electrical Contractor
3. CA: To witness and document testing

B. Integral Components or Related Equipment Being Tested: Prefunctional tests must be complete for all of the components listed below prior to performing this functional test.

1. Head end system (PC)
2. Relay panels
3. Occupancy sensors
4. Low voltage switches
5. Daylight switches and override
6. System software

C. Prerequisites:

1. The applicable prerequisite checklist items listed in Part 1 of this section and paragraph B above shall be listed on each functional test form and checked off prior to functional testing. The commissioning agent will also spot-check misc. items and calibrations on the prefunctional checklists previously completed by the installer, before the beginning of functional testing.

D. Functions/Modes Required To Be Tested, Test Methods:

1. The following testing requirements are in addition to and do not replace any testing requirements elsewhere in this Specification.

Function/Mode	Test Method Manual, Monitoring, Either or Both	Required Seasonal Test
General 1. Demonstrate all functions of the lighting control/low voltage switching system and head end equipment.	Manual	

E. Acceptance Criteria (referenced by function or mode ID):

1. Acceptance is achieved when all lighting functions are successfully demonstrated.

F. Sampling Strategy for Identical Units: No sampling, test all.

END OF LIGHTING CONTROL SYSTEM

3.22 AUTOMATIC TRANSFER SWITCH(ES)

A. Parties Responsible to Execute Functional Test:

1. Vendor Support Representative
2. Electrical Contractor
3. Building Inspector
4. CA: To witness and document testing
5. Balancing Contractor to verify flows

B. Integral Components or Related Equipment Being Tested: Prefunctional tests must be complete for all of the components listed below prior to performing this functional test.

1. Manual and automatic operation
2. Function annunciation

C. Prerequisites:

1. The applicable prerequisite checklist items listed in Part 1 of this section and paragraph B above shall be listed on each functional test form and checked off prior to functional testing. The commissioning agent will also spot-check misc. items and calibrations on the prefunctional checklists previously completed by the installer, before the beginning of functional testing.

D. Functions/Modes Required To Be Tested, Test Methods:

1. The following testing requirements are in addition to and do not replace any testing requirements elsewhere in this Specification.

Function/Mode	Test Method Manual, Monitoring, Either or Both	Required Seasonal Test
General 1. Verify installation of switch.	Manual	
2. Demonstrate compliance with electrical sequence of operation.		

E. Acceptance Criteria

1. Acceptance is achieved when all functions of the specified system have been demonstrated.

F. Sample strategy for identical units: No sampling, test all.

END OF AUTOMATIC TRANSFER SWITCH(ES)

END OF SECTION

SECTION 018119

CONSTRUCTION INDOOR AIR QUALITY MANAGEMENT

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Environmental Tobacco Smoke Control: Prevent exposure of building systems to environmental tobacco smoke during construction.
2. Construction Indoor Air Quality Management Plan: Requirements for minimum indoor air quality performance standards during the construction period.
3. Indoor Air Quality Assessment: Requirements for assessment of minimum indoor air quality performance standards through either building flush-out or air testing before occupancy
4. With regard to these goals the Contractor shall develop, for WRTA Project Manager and Designer review, a Construction Indoor Air Quality Management Plan for this Project.

B. Related Work: The following items are not included in this Section and are specified under the designated Sections:

1. Section 011000 - GENERAL REQUIREMENTS:
   a. General submittal requirements.
2. Section 013200 - CONSTRUCTION PROGRESS DOCUMENTATION:
   a. Photographic documentation requirements.
3. Section 015000 - TEMPORARY FACILITIES AND CONTROLS:
   a. Temporary construction facilities and controls.
4. Section 017419 - CONSTRUCTION WASTE MANAGEMENT:
   a. Demolition and construction waste management procedures.
5. Division 23 - HVAC.
6. Divisions 02 through 33 Specification Sections:
   a. Specific requirements relating to indoor air quality for each Section.

1.3 PERFORMANCE REQUIREMENTS

A. Environmental Tobacco Smoke Control: Prevent exposure of building systems to environmental tobacco smoke during construction. At a minimum, take the following measures:

1. Do not allow smoking in enclosed portions of the project site. Do not allow smoking on the rooftop.
   a. This prohibition includes electronic cigarettes.
2. Locate exterior designated smoking areas at least 25 feet (7.5 m) away from entries, outdoor air intakes and operable windows. Provide signage for designated smoking areas, located within 10 feet of each entry.

B. During construction meet or exceed the minimum requirements of the recommended Control Measures of the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guidelines for Occupied Buildings under Construction, Second Edition, November 2007, Chapter 3.

C. Protect absorptive materials from moisture damage when stored on-site and after installation.

D. Construction Indoor Air Quality Management Plan: During construction, comply with the following requirements:

1. If permanently installed air handlers are used during construction, filtration media with a Minimum Efficiency Reporting Value (MERV) of 13 shall be used at each return air grille, as determined by ASHRAE 52.2-2007. Replace filtration media immediately prior to occupancy.

E. Indoor Air Quality Assessment: Comply with one of the following requirements:

1. Option 1: Perform a building flush-out with outside air, either before occupancy or during occupancy.
2. Option 2: Conduct IAQ testing for air contaminant levels in the building, after construction ends and before occupancy.

1.4 SUBMITTALS

A. Construction Indoor Air Quality Management Plan: With the completed Form of Bidder's Proposal, the Contractor shall submit a preliminary Construction IAQ Management Plan.

1. Within 21 calendar days after receipt of Notice to Proceed, the Contractor shall submit to the WRTA Project Manager a finalized Construction IAQ Management Plan.
2. The proposed Plan shall comply with Division 23 – HVAC requirements.
3. The proposed Plan shall include, but not be limited to, the following:
   a. Protection of ventilation system components during construction.
   b. Cleaning and replacing contaminated ventilation system components after construction, including filtration media.
   c. Temporary ventilation.
   d. Protection of absorptive materials from moisture damage when stored on-site and after installation, including exterior wall rain protection.
   e. Sequence of finish installation plan.
   f. Selection of cleaning products and procedures to be used during construction and final cleaning.
   g. Other items as required by SMACNA IAQ Guidelines for Occupied Buildings under Construction, Chapter 3.

4. Coordinate Construction IAQ Management Plan with User Agency's current IAQ management plans and procedures.
5. Comply with the requirements of LEED EQ prerequisite and credits.

B. Indoor Air Quality Data: Submit emission test data as required, with testing laboratory and date clearly identified.

C. Safety Data Sheets (SDS), formerly known as Material Safety Data Sheets (MSDS): Submit for materials as required, with date clearly identified. SDS must contain specific chemical content data identifying the percent of the total product mass represented by each listed chemical.

D. Product Data: Submit for each type of filtration media used during construction and installed immediately prior to occupancy, with MERV values clearly identified.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Take special care to prevent accumulation of moisture on materials and within packaging during delivery, storage, and handling to prevent development of mold and mildew inside packaging and on products.

B. Immediately remove from site and properly dispose of materials showing signs of mold and mildew, including materials with moisture stains.

PART 2 - PRODUCTS

2.1 FILTRATION MEDIA

A. Filtration Media: Comply with ASHRAE 52.2-2007 and provide MERV as required.

PART 3 - EXECUTION

3.1 CONSTRUCTION IAQ MANAGEMENT PLAN IMPLEMENTATION

A. IAQ Manager: The Contractor shall designate an on-site person responsible for instructing workers and overseeing and documenting results of the Construction IAQ Management Plan for the Project.

B. Distribution: The Contractor shall distribute copies of the Construction IAQ Management Plan to the Job Site Foreman, each subcontractor, the WRTA Project Manager, and the Designer.

C. Instruction: The Contractor shall provide on-site instruction of appropriate procedures and methods to be used by all parties at the appropriate stages of the Project.

D. Preconditioning: Allow products, which have odors and significant VOC emissions, to off-gas in a dry, well-ventilated space for sufficient period to dissipate odors and emissions prior to delivery to Project.

1. Remove containers and packaging from materials prior to conditioning to maximize off-gassing of VOCs.
2. Condition products in ventilated warehouse or other building.
3. Ventilate interior spaces directly to the exterior to minimize accumulation of odors and VOC emissions during construction.

E. Coordinate Construction IAQ Management Plan with construction cleaning as indicated in Section 015000 - TEMPORARY FACILITIES AND CONTROLS and with final cleaning as indicated in Section 017700 - CONTRACT CLOSEOUT.

END OF SECTION

SECTION 019115

FACILITY EXTERIOR ENCLOSURE COMMISSIONING

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. WRTA will engage a Commissioning Authority during the design phase of the project for Facility Exterior Enclosure Commissioning. The responsibilities of the Designer and General Contractor with respect to the Commissioning Authority are included in this Section.

B. Work Included: This Section includes exterior enclosure commissioning procedures, including substructure, superstructure, exterior enclosure, and roofing construction that protects climate-controlled interior spaces from unconditioned spaces and the exterior environment, as follows:

1. Below-grade construction including foundations, basements, and slab-on-grade that functions as part of the exterior enclosure system but excluding structural systems and components.
2. Superstructure floor and roof construction that functions as part of the exterior enclosure system.
3. Exterior enclosure construction, above grade, including exterior opaque walls, windows, and doors including sheathing, framing, and insulation, and interior finish materials attached to the exterior wall.
4. Roofing, including roofing system, roofing insulation, and skylights, hatches, and other roof openings.
5. If part of the project requirements, include all interior partitions or walls within the building surrounding areas with different ambient conditions than the rest of the interior space.

C. Items To Be Installed Only: Not Applicable.

D. Items To Be Furnished Only: Not Applicable.

E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 018100 - COMMISSIONING for requirements for building system commissioning.
2. Division 03 through 14 Sections for facility exterior enclosure commissioning requirements specific to the Work of each Section.

1.3 COMMISSIONING AUTHORITY

A. For the General Contractor's information, The Commissioning Authority is experienced in the practices that encompass exterior enclosure commissioning, including understanding systems design intent, performing architectural and shop drawing peer reviews, evaluating submittal compliance, administering preconstruction meetings, performing/supervising field performance testing, fulfilling field construction administration responsibilities, evaluating component/assembly compliance and performing forensic evaluations, as relating to Divisions 02 through 33 Sections for facility enclosure commissioning requirements specific to the Work of each Section.

B. The Commissioning Authority holds testing facility accreditation with at least one of the following, International Accreditation Services, Inc. (ISA), American Architectural Manufacturers Association (AAMA), (International Standards Organization) ISO/IEC 17025.

C. The Commissioning Authority will not be financially associated with any of the Subcontractors or vendors prior to engaging in this contract

1.4 SUBCONTRACTOR'S RESPONSIBILITIES

A. Subcontractors are responsible for the following with respect to facility commissioning, as applicable to their portion of the Work:

1. Update schedule monthly throughout the construction period.
2. Attend pre-construction and construction-phase building enclosure coordination meetings.
3. Provide schedule and perform field quality control tests and inspections required by the Contract Documents to the Commissioning Authority.
4. Update schedule monthly throughout the construction period.
5. Submit field quality control testing and inspection reports on exterior enclosure construction to the Commissioning Authority.
6. Submit operation and maintenance data for systems, subsystems, and components to the Commissioning Authority.
7. Provide cut sheets and shop drawing submittals of commissioned systems to the Commissioning Authority.
8. Provide input for final commissioning documentation to the Commissioning Authority.
9. Participate in testing/inspection procedures meetings.
10. Provide a complete set of Coordination Drawings to the Commissioning Authority showing the coordination and integration of all Work on all commissioned systems.
11. Permit the Commissioning Authority to access locations of installed systems, subsystems, and components for testing and inspection.
12. Reimburse WRTA for non-compliant tests and inspections, and pay for costs of new tests and re-inspections.
13. Provide test data, letters of compatibility, and certificates to Commissioning Authority.
14. Participate in maintenance orientation and inspection.
15. Participate in operation and maintenance training sessions.
16. Address User Agency and Designer punch list items.
17. Participate in final review at acceptance meeting.

1.5 DESIGNER'S RESPONSIBILITIES

A. Provide paper and electronic copies of project drawings and specifications to the Commissioning Authority.

B. Provide written responses to design review comments from the Commissioning Authority or other parties as requested.

C. Attend design, pre-construction and construction-phase coordination meetings.

D. Participate in meetings to develop testing procedures.

E. Provide resolution for items for which the Commissioning Authority and Subcontractor may be in disagreement.

1.6 COMMISSIONING AUTHORITY'S RESPONSIBILITIES

A. Provide project-specific construction checklists and commissioning process test procedures.

B. Witness the construction/installation of building enclosure systems, assemblies, equipment, and components.

C. Compile test data, inspection reports, and certificates and include them in the systems manual and commissioning process report.

D. Review project drawings and specifications at 30, 60 and 100% completion for constructability, durability, performance and conformance to exterior enclosure specification requirements.

E. Review shop drawings, product data, and samples for compliance with the Contract Documents.

F. Review coordination drawings.

G. Attend Design, Pre-Construction and Construction Phase meetings.

H. Perform or manage mock-up performance testing.

I. Document the construction of commissioned components at the completion of mock-up testing.

J. Review proposals and requests for substitutions and changes for compliance with the Contract Documents and for compatibility with Work of other Subcontractors.

K. Inspect and document exterior enclosure work for compliance with the Contract Documents, including:

1. Maintenance of a list of observed deficiencies and discrepancies.
2. Development of protocols for functional performance testing.
3. Performance or management of functional performance testing.

L. Issue letter of compliance after resolution of all non-compliance issues related to building enclosure systems, assemblies, equipment and components.

M.

1.7 COMMISSIONING DOCUMENTATION

A. Provide the following information to the Commissioning Authority for inclusion in the Commissioning Plan:

1. Submittals, information for systems manuals, and other required documents and reports.
2. Identification of installed exterior enclosure components, assemblies, systems, and equipment, including design changes that occurred during the construction phase.
3. Certificate of completion, certifying that exterior enclosure assemblies, systems, equipment and associated controls are complete and ready for testing.
4. Test and inspection reports and certificates.
5. Corrective action documents.

B. The Commissioning Authority will provide regular reports to the WRTA Project Representative (and other parties as requested) as construction and commissioning progress.

C. A final Summary Report (including backup documentation) and letter of compliance will be provided by the Commissioning Authority to the WRTA Project Representative upon completion of exterior envelope construction and the resolution of all non-compliance issues related to building enclosure systems, assemblies, equipment and components.

D. All acquired documentation, logs, minutes, reports, deficiency lists, communications, findings, unresolved issues, will be compiled in appendices and provided with the Summary Report.

1.8 PRECONSTRUCTION TESTING

A. Preconstruction Mockup Testing: <Insert project-specific commissioning procedures governing mockups and phased mockup testing>

1.9 COMMISSIONING SUBMITTALS

A. Commissioning submittals to the General Contractor that require action by the Designer will be returned to the Designer by the General Contractor.

1.10 QUALITY ASSURANCE

A. Commissioning quality assurance requirements for individual construction activities are described in specification sections that define those individual activities. Specified commissioning tests, inspections, and related actions do not limit the General Contractor's responsibility to maintain other quality assurance procedures that ensure compliance with Contract Document requirements.

B. Pre-Construction Commissioning Conference: Before construction of the exterior enclosure starts the Commissioning Authority will schedule a pre-construction commissioning conference at the project site with the WRTA Project Representative, General Contractor, and Designer.

The Commissioning Authority will conduct the meeting to review commissioning responsibilities and personnel assignments.

1. Attendees: Authorized representatives of WRTA, Commissioning Authority, Designer and consultants; General Contractor and its superintendent; major Subcontractors; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to commissioning.
2. Agenda: Discuss items of significance that could affect progress, including the following:

    a. Commissioning plan and related specifications.
    b. Tentative construction schedule per General Contractor.
    c. Phasing.
    d. Critical work sequencing and long-lead items per General Contractor.
    e. Designation of key personnel and their duties.
    f. Mock-up construction and testing.
    g. Procedures for testing and inspecting.
    h. Submittal procedures.
    i. LEED requirements.
    j. Preparation of Record Documents.
    k. User Agency's occupancy requirements.
    l. Security.

3. Minutes: The Commissioning Authority will record and distribute meeting minutes.

1.11 FUNCTIONAL PERFORMANCE TESTING

A. Objectives and Scope: The objective of functional performance testing is to demonstrate that each exterior enclosure assembly/system is functioning according to the documented design intent of the Contract Documents and in accordance with the OPR and BOD. Functional testing transitions a material assembly from a state of substantial completion to full operation. Areas of non-compliant performance are identified and corrected during the testing process, improving the operation and functioning of the building envelope/assemblies.

B. Development of Test Procedures: Before specific test protocols and procedures are developed, the Commissioning Authority will request all documentation and a current list of change orders affecting exterior enclosure/assemblies. The Commissioning Authority shall develop specific test procedures to verify and document the proper operation of each exterior enclosure element.

C. Functional Performance Testing: All functional performance testing of building envelope/assemblies shall be witnessed by the Commissioning Authority unless otherwise specified. . Any Subcontractors or vendor responsible for testing shall assist the Commissioning Authority in developing the procedures review by answering questions about assemblies and sequences, etc. Prior to execution, the Commissioning Authority will provide a copy of the test procedures to the General Contractor and Subcontractors, who will review the tests for feasibility and warranty protection.

D. Test Methods:

1. A mock-up test must be included to verify component and assembly performance prior to the beginning of construction.
2. Functional performance testing and verification may be achieved by manual testing. The Commissioning Authority may also substitute specified methods or require an additional method to be executed .The Commissioning Authority will determine which method is most appropriate for tests that do not have a method specified.
3. Simulated Conditions: Simulating conditions (not by an overwritten value) shall be allowed, though timing the testing to experience actual conditions is encouraged wherever practical.

E. Sampling: Multiple identical assemblies may be functionally tested using a sampling strategy, since significant application and functional differences in otherwise identical materials or assemblies invalidate their common identity. A small size or capacity difference alone does not constitute a difference. It is noted that no sampling by Subcontractors is allowed in pre-functional checklist execution.

F. The General Contractor and Subcontractors shall provide sufficient notice to the Commissioning Authority regarding their completion schedule for the construction of the exterior enclosure systems and assemblies. The Commissioning Authority will schedule functional tests through the General Contractor.

G. The Commissioning Authority shall witness and document the results of all functional performance tests.

H. The Commissioning Authority may recommend solutions to problems found through the commissioning process, but it is the responsibility of the General Contractor, Subcontractors and Designer to resolve and retest deficiencies.

1.12 NON-CONFORMANCE

A. All deficiencies or non-conformance issues shall be noted and reported by the Commissioning Authority to the General Contractor, Designer and WRTA Project Representative.

B. Corrections of minor deficiencies identified during functional performance testing or inspections may be made at the time of testing/inspection at the discretion of the Commissioning Authority. In such cases the deficiency and resolution will be documented.

C. Failure Due to Manufacturer Defect: If 10 percent of identical pieces of materials or assemblies fail to meet a required performance specification in the Contract Documents all identical units may be considered unacceptable by the Subcontractor, Commissioning Authority, Designer or WRTA Project Representative. Size alone does not constitute a difference.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 VERIFICATION

A. Certify that building exterior enclosure systems, subsystems, and construction have been completed according to the Contract Documents.

B. The Commissioning Authority will witness and document field quality control tests and inspections.

1. Confirm that field quality control testing of the exterior enclosure has been completed and approved, discrepancies have been corrected and corrective work has been approved.

C. Annotate checklist or data sheet when a deficiency is observed.

D. Deferred Testing:

1. If tests cannot be completed because of a deficiency outside the scope of the Exterior Enclosure the deficiency shall be documented and reported to the WRTA Project Representative. Deficiencies shall be resolved and corrected by Subcontractors as applicable and tests rescheduled.
2. If the testing plan indicates specific seasonal testing, appropriate initial performance tests shall be completed and documented and additional tests scheduled.

E. Testing Reports:

1. Reports shall include measured data, data sheets, and a comprehensive summary describing the building exterior enclosure system(s) at the time of testing.
2. Deficiencies shall be documented in a preliminary test report and evaluated by the Designer to determine corrective action. Deficiencies shall be corrected and retested.

END OF SECTION

STANDARD SPECIFICATIONS

WRTA Standard Specifications are only intended for use on projects managed by the Division of Capital Asset Management and Maintenance in the Commonwealth of Massachusetts. The specifications are intended to assist the Designer with incorporating WRTA and MGL Chapter 149 filed sub-bid requirements in documents used for bidding and construction. Each section will require editing by a registered architect or engineer before issue.

SECTION 024100

DEMOLITION

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included:

1. Demolition and removal of selected portions of buildings and structures and as required for new work. Refer to the Drawings for additional requirements.
2. Demolition and removal of selected site elements and as required for new work. Refer to the Drawings for additional requirements.
3. Salvage of existing items to be reused or turned over to the facility.
4. Removal and legal disposal of demolished materials off site. Except those items specifically designated to be relocated, reused, or turned over to the facility, all existing removed materials, items, trash and debris shall become property of the Contractor and shall be completely removed from the site and legally disposed of at her/his expense. Salvage value belongs to the Contractor. On-site sale of materials is not permitted.
5. Demolition and removal work shall properly prepare for alteration work and new construction to be provided under the Contract.
6. Scheduling and sequencing operations without interrupting utilities serving occupied areas. If interruption is required, obtain written permission from the utility company and the WRTA Project Manager. Schedule interruption when the least amount of inconvenience will result.

B. Alternates: Not Applicable.

C. Items To Be Installed Only: Not Applicable.

D. Items To Be Furnished Only: Not Applicable.

E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 015000 - TEMPORARY FACILITIES AND CONTROLS:
   a. Maintenance of access, cleaning during construction, dust and noise control.
2. Section 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL:
   a. Waste management and recycling.
3. Section 210001 - FIRE PROTECTION:

a. Disconnecting, capping and otherwise making inactive existing fire protection services in areas where demolition and removal work is required.
b. Disconnect and reinstallation of fire protection equipment temporarily interrupted during construction.

4. Section 220001 - PLUMBING:
   a. Disconnecting, capping and otherwise making inactive existing plumbing services in areas where demolition and removal work is required.
   b. Disconnection and reinstallation of plumbing equipment temporarily interrupted during construction.
5. Section 230001 - HEATING, VENTILATING AND AIR CONDITIONING:
   a. Disconnecting, capping and otherwise making inactive existing HVAC services in areas where demolition and removal work is required.
   b. Disconnect and reinstallation of HVAC equipment temporarily interrupted during construction.
6. Section 260001 - ELECTRICAL WORK:
   a. Disconnecting, capping and otherwise making inactive existing electrical services in areas where demolition and removal work is required.
   b. Disconnect and reinstallation of electrical equipment temporarily interrupted during construction.
7. Section 311000 – SITE CLEARING:
   a. Excavating and removal of existing pavement, sub-surface building and utility structures and lines, appurtenances, and other elements indicated on the Drawings.

1.3 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and Salvage: Detach items from existing construction and deliver them to the User Agency ready for reuse, at a location designated by the User Agency. Protect from weather until accepted by User Agency.

C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated. Protect from weather until reinstallation.

D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.4 MATERIALS OWNERSHIP

A. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques, antiques, and other items of interest or value to WRTA that may be encountered during selective demolition remain property of the Commonwealth or user Agency as applicable. Carefully remove each item or object in a manner to prevent damage and deliver promptly to a location acceptable to the WRTA Project Manger.

1.5 SUBMITTALS

A. LEED Submittals: ((Designer to insert requirements based on the LEED credits targeted.))

B. Schedule of Selective Demolition Activities: Indicate the following:

1. Detailed sequence of selective demolition and removal work, with early and late starting and finishing dates for each activity. Ensure User Agency's on-site operations are uninterrupted if applicable.
2. Interruption of utility services. Indicate how long utility services will be interrupted.
3. Coordination for shutoff, capping, and continuation of utility services.
4. Use of elevator and stairs.
5. Locations of proposed dust- and noise-control temporary partitions and means of egress, including for other occupants affected by selective demolition operations.
6. Coordination of User Agency's continuing occupancy of portions of existing building and of User Agency's partial occupancy of completed Work.
7. Means of protection for items to remain and items in path of waste removal from building.

C. Inventory: After selective demolition is complete, submit a list of items that have been removed and salvaged, and turned over to the User Agency.

D. Predemolition Videotapes: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by selective demolition operations. Comply with Division 01. Submit before Work begins.

E. Landfill Records: Provide trip tickets (receipts) indicating receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1. Comply with submittal requirements in Section 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL.

1.6 QUALITY ASSURANCE

A. Examination of Existing Conditions: The Contractor shall examine the Contract Drawings for demolition and removal requirements and provisions for new work. Verify all existing conditions and dimensions before commencing work. The Contractor shall visit the site and examine the existing conditions as he finds them and shall inform herself/himself of the character, extent and type of demolition and removal work to be performed. Submit any questions regarding the extent and character of the demolition and removal work in the manner and within the time period established for receipt of such questions during the bidding period.

B. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.

C. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

D. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

E. Standards: Comply with ANSI A10.6 and NFPA 241.

F. Predemolition Conference: Conduct conference at Project site to comply with requirements in Section 013100 - PROJECT MANAGEMENT AND COORDINATION. Review methods and procedures related to selective demolition including, but not limited to, the following:

1. Inspect and discuss condition of construction to be selectively demolished.
2. Review structural load limitations of existing structure.
3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
5. Review areas where existing construction is to remain and requires protection.

1.7 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped.

B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.

D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Designer.

E. Engage a professional engineer registered in the Commonwealth of Massachusetts to survey condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective demolition operations.

F. Survey of Existing Conditions: Record existing conditions by use of preconstruction videotapes.

1. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

G. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Service/System Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Arrange to shut off indicated utilities with utility companies and User Agency.
2. If services/systems are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
3. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing. Where entire wall is to be removed, existing services/systems may be removed with removal of the wall.
4. Prior to commencing cutting work in existing surfaces, take all precautionary measures to assure that mechanical and electrical services to the particular area have been made inactive. Coordinate with Fire Protection, Plumbing, HVAC, and Electrical subcontractors. Only licensed tradesmen of that particular trade shall disconnect and cap existing mechanical and electrical items that are to be removed, abandoned and/or relocated.
5. If, during the process of cutting work, existing utility lines are encountered which are not indicated on the Drawings, regardless of their condition, immediately report such items to the Designer. Do not proceed with work in such areas until instructions are issued by the Designer. Continue work in other areas.

3.3 PREPARATION

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Comply with requirements for access and protection specified in Section 015000 - TEMPORARY FACILITIES AND CONTROLS.
2. Maintain adequate passage to and from all exits at all times. Before any work is done which significantly alters access or egress patterns, consult with the Designer and obtain approval of code required egress. Under no condition block or interfere with the free flow of people at legally required exits, or in any way alter the required condition of such exits.

B. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of selective demolition.
2. Remove temporary shoring, bracing and structural supports when no longer required.
3. Post warning signs and place barricades as applicable during placement and removal of temporary shoring.

C. Conduct demolition operations to prevent injury to people and damage to adjacent buildings and facilities to remain. Ensure safe passage of people around demolition area(s).

1. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction. Provide temporary barricades as required to limit access to demolition areas.
2. Protect existing site improvements, appurtenances, and landscaping to remain.

D. Drain, purge, or otherwise remove, collect, and dispose of chemicals, gases, explosives, acids, flammables, or other dangerous materials before proceeding with demolition operations.

3.4 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during and after flame-cutting operations.
5. Maintain adequate ventilation when using cutting torches.
6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
9. Dispose of demolished items and materials promptly. Comply with requirements in Section 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL.

B. Removed and Salvaged Items:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to User Agency.
4. Transport items to storage area designated by the WRTA Project Manager.
5. Protect items from damage during transport and storage.

C. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Designer, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

E. Items for Re-use and Preservation of Existing Surfaces to Remain:

1. The Contractor shall inspect closely each item specifically designated to be relocated, re-used, or turned over to the Owner prior to its removal, and immediately report damages and defects to the Designer and WRTA Project Manager. The Contractor shall be responsible for any subsequent damage to the same other than latent defects not readily apparent from close inspection, and shall bear responsibility for its repair or same replacement as directed by the Designer, to the satisfaction of the WRTA Project Manager.
2. Unless special surface preparation is specified under other Specification Sections, leave existing surfaces that are to remain in a condition suitable to receive new materials and/or finishes.

3.5 PROTECTION OF PUBLIC AND PROPERTY

A. Provide all measures required by federal, state and municipal laws, regulations, and ordinances for the protection of surrounding property, the public, workmen, and Commonwealth's employees during all demolition and removal operations. Measures are to be taken, but not limited to installation of sidewalks, sheds, barricades, fences, warning lights and signs, trash chutes and temporary lighting.

B. Protect all walks, roads, streets, curbs, pavements, trees and plantings, on and off premises, and bear all costs for correcting such damage as directed by the Designer, and to the satisfaction of the WRTA Project Manager.

C. Demolition shall be performed in such a manner that will insure the safety of adjacent property. Protect adjacent property from damage and protect persons occupying adjacent property from

injuries which might occur from falling debris or other cause and so as not to cause interference with the use of other portions of the building, of adjacent buildings or the free access and safe passage to and from the same.

D. Every precaution shall be taken to protect against movement or settlement of the building, of adjacent buildings, structures, sidewalks, roads, streets, curbs and pavements. Provide and place at the Contractor's own expense, all necessary bracing and shoring in connection with demolition and removal work.

E. Remove portions of structures with care by using tools and methods that will not transfer heavy shocks to existing and adjacent building structures, both internal and external of the particular work area.

F. Provide and maintain in proper condition, suitable fire resistive dust barriers around areas where interior demolition and removal work is in progress. Dust barriers shall prevent the dust migration to adjacent areas. Remove dust barriers upon completion of major demolition and removal in the particular work area.

G. Protect unaltered portions of existing construction, including finishes, furnishings and equipment

H. Provide secure weather protection where demolition has removed a portion of the exterior envelope.

3.6 DISCOVERY OF HAZARDOUS MATERIALS

A. If hazardous materials, such as chemicals, asbestos-containing materials, or other hazardous materials are discovered during the course of the work, cease work in affected area only and immediately notify the Designer and the WRTA Project Manager of such discovery. Do not proceed with work in such areas until instructions are issued by the Designer. Continue work in other areas.

B. If unmarked containers are discovered during the course of the work, cease work in the affected area only and immediately notify the Designer and the WRTA Project Manager of such discovery. Do not proceed with work in such areas until instructions are issued by the Designer. Take immediate precautions to prohibit endangering the containers integrity. Continue work in other areas.

3.7 CUTTING

A. Perform all cutting of existing surfaces in a manner which will ensure a minimal difference between the cut area and new materials when patched. Use extreme care when cutting existing surfaces containing concealed utility lines which are indicated to remain and bear full responsibility for repairing or replacement of all such utilities that are accidentally damaged.

B. Provide a flush saw cut edge where pavement, curb and concrete removals abut new construction work or existing surfaces to remain undisturbed.

3.8 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Comply with requirements of Section 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL and the following.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

B. Burning: Do not burn demolished materials.

3.9 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Premises shall be left in a clean condition and ready to accept alteration work and new construction.

END OF SECTION

SECTION 024119 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Demolition and removal of selected portions of building or structure.

B. Related Requirements:

1. Section 011000 "Summary" for restrictions on the use of the premises, Owner-occupancy requirements, and phasing requirements.

1.3 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.

B. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed.

1.4 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

1.5 PREINSTALLATION MEETINGS

A. Predemolition Conference: Conduct conference at Project Site.

1. Inspect and discuss condition of construction to be selectively demolished.
2. Review structural load limitations of existing structure.
3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
5. Review areas where existing construction is to remain and requires protection.

1.6 ACTION SUBMITTALS

A. Proposed Protection Measures: Submit report, including drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and, for noise control. Indicate proposed locations and construction of barriers.

B. Schedule of Selective Demolition Activities: Indicate the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
2. Method of concrete excavation and equipment for the excavation and disposal of all materials
3. Interruption of utility services. Indicate how long utility services will be interrupted.
4. Coordination for shutoff, capping, and continuation of utility services.
5. Use of elevator and stairs.
6. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.

C. The Contractor shall not proceed with selective demolition activities until the Engineer has given written acceptance of all Action submittals.

1.7 INFORMATIONAL SUBMITTALS

A. Predemolition Photographs or Video: Submit before Work begins.

B. Warranties: Documentation indicated that existing warranties are still in effect after completion of selective demolition as applicable.

1.8 CLOSEOUT SUBMITTALS

A. As-Builts: At the start of construction, the Owner will provide a print set and an AutoCAD copy of the contract drawings to the Contractor for use its use to prepare project As-Built Drawings. Upon completion of the Work, submit a complete set of marked-up record drawings to the Owner in time to be used for the final inspection, and acceptance and for verification by the designer. Submittal and acceptance of As-Built drawings through Substantial Completion shall be a prerequisite to scheduling a final inspection of the Contract and these drawings and the Contract Documents will be used in checking completion of the Work. During the course of construction, drawing modifications for Requests for Information, submittals, nonconformance reports, value engineering, variations for its means and methods and other Contractor initiated changes will be made by the Contractor. All modifications shall be dated, and attention called to each entry by a “cloud” drawn around the area affected. Maintain a log of entries/revisions made. The Contractor shall incorporate changes into the electronic as-built files and submit to the Owner, as-built plans of all work installed, relocated, or abandoned. The as-built plans shall be prepared and submitted in electronic format (PDF format and as an AutoCAD drawing).

B. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes where applicable.

1.9 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: Not Applicable

1.10 FIELD CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.

1. Hazardous materials will be removed by Owner before start of the Work.
2. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

E. Hazardous Materials: Hazardous materials are present in buildings and structures to be selectively demolished. A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.

1. Hazardous material remediation is specified elsewhere in the Contract Documents.
2. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.
3. Owner will provide material safety data sheets for suspected hazardous materials that are known to be present in buildings and structures to be selectively demolished because of building operations or processes performed there.

F. Storage or sale of removed items or materials on-site is not permitted.

G. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Maintain fire-protection facilities in service during selective demolition operations.

1.11 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties. Notify warrantor before proceeding.

B. Notify warrantor on completion of selective demolition and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

PART 2 - PRODUCTS

2.1 PEFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations as applicable.

B. Review record documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in record documents.

C. Starting at the areas shown on the Plans, the Contractor shall evaluate and mark out the surfaces of the concrete to determine the full extent of the areas for repairs. Methods for evaluation shall include non-destructive methods such as visual observations and sounding via chain drag or acoustic impact tapping using a hammer in accordance with the ASTM D4580 Standard.

Before any existing concrete is removed, the Contractor will provide the Engineer clear access to the areas designated for repair. During this time in the presence of the Engineer, the contractor will sound surfaces of the concrete within and around the limits of areas designated for repair to confirm locations and extents of repairs. The Engineer may perform further sounding and inspections of the areas as needed and will approve and/or designate the areas where concrete removal and repair will be required.

It shall be the responsibility of the Contractor to inform the Engineer, in writing, of the date that a structure will be available for inspection operations. Notification shall be given to the Engineer at least seven (7) days prior to the date that the area in question will be in a condition acceptable to the Engineer.

The Contractor shall not be permitted to perform any further repair work until all necessary inspection operations have been performed, unless given permission by the Engineer. The Contractor shall include any costs related to the allowance for this inspection in the general cost of the work.

D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.

E. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs.

1. Comply with requirements specified in Section 013233 "Photographic Documentation."
2. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

1. Comply with requirements for existing services/systems interruptions specified in Section 011000 "Summary."

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
2. Arrange to shut off indicated utilities with utility companies.
3. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
4. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated to be removed.

    a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
    b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
    c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
    d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
    e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
    f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
    g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.

3.3 PREPARATION

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Comply with requirements for access and protection specified in Section 015000 "Temporary Facilities and Controls."

B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
4. Cover and protect furniture, furnishings, and equipment that have not been removed.
5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 015000 "Temporary Facilities and Controls."

3.4 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
5. Maintain adequate ventilation when using cutting torches.
6. All deteriorated concrete designated for removal under this item shall be removed within the limits shown on the Plans and where ordered by the Engineer. The lateral limits of each area to be repaired will be delineated by the Contractor and suitably marked and subsequently approved by the Engineer. Where several areas to be repaired are very close together, the Engineer may approve combining these individual repairs into a larger area.
7. The outlines of each such area shall first be cut to a depth of 1/2 inch with an approved power-saw capable of making straight cuts. In the event that reinforcing steel is encountered within the outer 1/2-inch depth during sawing operations, the depth of

sawcut shall immediately be adjusted to a shallower depth so as not to damage the steel bars. If so directed by the Engineer, sawcutting shall again be carried down to the 1/2-inch depth at other locations of repair provided reinforcing steel is not again encountered. Where over- breakage occurs resulting in a featheredge, the featheredge shall be squared up to a vertical edge in an approved manner. Where sawing is impractical, the area shall be outlined by chisel or other approved means.

8. The removal of deteriorated concrete shall be accomplished by pneumatic hammers approved by the Engineer. For concrete removal, the weight of pneumatic hammers shall not exceed 30 pounds. Fillets at inside corners of intersecting limit lines shall be carefully removed. After completion of concrete removal, the sides of the patch shall be vertical down to the bottom of the patch.
9. The minimum depth of concrete removal shall not be less than the specified minimum thickness of repair material.
10. If sound concrete has been reached and reinforcing has been exposed, but less than 1" clearance exists between the sound concrete and the inside surface of exposed reinforcing steel, enough sound concrete as is necessary to achieve this 1" minimum clearance shall be removed. The removal of this sound concrete shall also be included for payment under this Item.
11. Where the existing reinforcing steel is damaged or deteriorated (section loss greater than 10% of bar cross sectional area), it shall be supplemented with new reinforcing steel of the same size. Pneumatic tools shall not be placed in direct contact with reinforcing steel. Any existing reinforcing steel damaged, as a result of concrete removal operations, shall be repaired or replaced to the satisfaction of the Engineer and Owner, and at the Contractor's expense. Any existing steel that is unsuitable for further use through no fault of the Contractor, as determined by the Engineer, shall be replaced in accordance with Item 321313 – Concrete Paving. The Contractor shall furnish and install additional ties for the exposed reinforcing steel to remain in place.
12. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
13. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
14. Dispose of demolished items and materials promptly. Comply with requirements in Section 017419 "Construction Waste Management and Disposal."

B. Surface Preparation:
   1. Areas to be repaired must be clean, sound, and free of contaminants. All loose and deteriorated concrete shall be removed by mechanical means. Mechanically prepare the concrete substrate to obtain a surface profile of ± 0.06 inch with a new exposed aggregate surface.
   2. If reinforcing steel is exposed, then clean by mechanical cleaning and then high pressure washing with water that does not contain detergents or any bond inhibiting chemicals. Where active corrosion has occurred that would inhibit bonding, sandblast steel to white metal finish and coat with epoxy.
   3. After removals and edge conditioning are complete, remove bond inhibiting materials (dirt, grease, loosely bonded aggregate) by abrasion blasting or high-pressure water blasting with water that does not contain detergents or any bond inhibiting chemicals. Check the concrete surfaces after cleaning to ensure that surface is free from additional loose aggregate or that additional delaminations are not present.

C. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable,

protected storage location during selective demolition, cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 1/2" at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.

B. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, then remove concrete between saw cuts.

C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
4. Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials and dispose of at designated spoil areas on Owner's property.

D. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.7 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

3.8 SELECTIVE DEMOLITION SCHEDULE

A. Existing to Be Removed: Portions of Concrete slab-on-grade as shown on the Contract Drawings and as directed by the Engineer.

END OF SECTION 024119

SECTION 033100 - CONCRETE REPAIRS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. The work under this Item consists of furnishing and placing a polymer-modified, cementitious, fast-setting, patching mortar to patch horizontal surfaces of the loading dock concrete slab in areas of spalled and deteriorated concrete at the locations shown on the plans and as authorized and directed by the Engineer.

B. Section Includes:

1. Slab on Grade Repairs.

C. Related Sections:

1. Section 079200 – JOINT SEALANTS for sealing joints between existing concrete and proposed cementitious repair materials

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified ready-mix concrete manufacturer.

B. Material Certificates: For the following, from manufacturer:

1. Cementitious materials.
2. Steel reinforcement and reinforcement accessories.
3. Admixtures.
4. Curing compounds.
5. Applied finish materials.
6. Bonding agent or epoxy adhesive.

C. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities" (Quality Control Manual - Section 3, "Plant Certification Checklist").

B. ACI Publications: Comply with ACI 301 unless otherwise indicated.

1.6 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 - PRODUCTS

2.1 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces.

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces.

2.2 STEEL REINFORCEMENT

A. Deformed-Steel Welded Wire Reinforcement: ASTM A 497/A 497M, flat sheet.

B. Epoxy-Coated Welded Wire Reinforcement: ASTM A 884/A 884M, Class A, plain steel.

C. Reinforcing Bars: ASTM A 615/A 615M, Grade 60; deformed.

D. Epoxy-Coated Reinforcing Bars: ASTM A 775/A 775M or ASTM A 934/A 934M; with ASTM A 615/A 615M, Grade 60 deformed bars.

E. Steel Bar Mats: ASTM A 184/A 184M; with ASTM A 615/A 615M, Grade 60 deformed bars; assembled with clips.

F. Plain-Steel Wire: ASTM A 82/A 82M.

G. Deformed-Steel Wire: ASTM A 496/A 496M.

H. Epoxy-Coated-Steel Wire: ASTM A 884/A 884M, Class A coated.

I. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 plain-steel bars. Cut bars true to length with ends square and free of burrs.

J. Epoxy-Coated, Joint Dowel Bars: ASTM A 775/A 775M; with ASTM A 615/A 615M, Grade 60, plain-steel bars.

K. Tie Bars: ASTM A 615/A 615M, Grade 60, deformed.

L. Hook Bolts: ASTM A 307, Grade A, internally and externally threaded. Design hook-bolt joint assembly to hold coupling against paving form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.

M. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete specified, and as follows:

1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.
2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.

N. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating, compatible with epoxy coating on reinforcement.

O. Zinc Repair Material: ASTM A 780.

2.3 MATERIALS

A. Cementitious Material: The polymer modified cementitious system and any bonding agent needed shall consist of a specific system from the MassDOT Qualified Construction Materials List (QCML) for the application, with a finish color of concrete gray. The Contractor shall furnish notarized certification that all materials conform to the above requirements.

2.4 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Evaporation Retarder: Waterborne, monomolecular, film forming, manufactured for application to fresh concrete.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Axim Italcementi Group, Inc.; Caltexol CIMFILM.
b. BASF Construction Chemicals, LLC; Confilm.
c. ChemMasters; Spray-Film.
d. Conspec by Dayton Superior; Aquafilm.
e. Dayton Superior Corporation; Sure Film (J-74).
f. Edoco by Dayton Superior; BurkeFilm.
g. Euclid Chemical Company (The), an RPM company; Eucobar.
h. Kaufman Products, Inc.; VaporAid.
i. Lambert Corporation; LAMBCO Skin.
j. L&M Construction Chemicals, Inc.; E-CON.
k. Meadows, W. R., Inc.; EVAPRE.
l. Metalcrete Industries; Waterhold.
m. Nox-Crete Products Group; MONOFILM.
n. Sika Corporation, Inc.; SikaFilm.
o. SpecChem, LLC; Spec Film.
p. Symons by Dayton Superior; Finishing Aid.
q. TK Products, Division of Sierra Corporation; TK-2120 TRI-FILM.
r. Unitex; PRO-FILM.
s. Vexcon Chemicals Inc.; Certi-Vex EnvioAssist.
t. <Insert manufacturer's name; product name or designation>.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Anti-Hydro International, Inc.; A-H Curing Compound #2 DR WB.
b. ChemMasters; Safe-Cure Clear.
c. Conspec by Dayton Superior; D.O.T. Resin Cure
d. Dayton Superior Corporation; Day-Chem Rez Cure (J-11-W).
e. Edoco by Dayton Superior; DSSCC Clear Resin Cure
f. Euclid Chemical Company (The), an RPM company; Kurez W VOX.
g. Kaufman Products, Inc.; Thinfilm 420.
h. Lambert Corporation; AQUA KURE - CLEAR.
i. L&M Construction Chemicals, Inc.; L&M CURE R.
j. Meadows, W. R., Inc.; 1100-CLEAR SERIES.
k. Nox-Crete Products Group; Resin Cure E.
l. SpecChem, LLC; PaveCure Rez.
m. Symons by Dayton Superior; Resi-Chem Clear.
n. Tamms Industries, Inc., Euclid Chemical Company (The); TAMMSCURE WB 30C.
o. TK Products, Division of Sierra Corporation; TK-2519 WB.
p. Vexcon Chemicals Inc.; Certi-Vex Enviocure 100.

F. White, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 2, Class B, dissipating.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Anti-Hydro International, Inc.; A-H Curing Compound #2 WP WB.
b. ChemMasters; Safe-Cure 2000.
c. Conspec by Dayton Superior; D.O.T. Resin Cure White
d. Dayton Superior Corporation; Day-Chem White Pigmented Cure (J-10-W).
e. Edoco by Dayton Superior; Resin Emulsion Cure V.O.C. (Type II).
f. Euclid Chemical Company (The), an RPM company; Kurez VOX White Pigmented.
g. Kaufman Products, Inc.; Thinfilm 450.
h. Lambert Corporation; AQUA KURE - WHITE.
i. L&M Construction Chemicals, Inc.; L&M CURE R-2.
j. Meadows, W. R., Inc.; 1100-WHITE SERIES.
k. SpecChem, LLC; PaveCure Rez White.
l. Symons by Dayton Superior; Resi-Chem White.
m. Vexcon Chemicals Inc.; Certi-Vex Enviocure White 100.

2.5 RELATED MATERIALS

A. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

B. Epoxy Bonding Adhesive: ASTM C 881/C 881M, two-component epoxy resin capable of humid curing and bonding to damp surfaces; of class suitable for application temperature, of grade complying with requirements, and of the following types:

1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. The Contractor shall remove all deteriorated or spalled concrete and prepare surfaces, as directed in Item 024119 – Selective Demolitions in areas shown on the Contract Drawings and as directed by the Engineer.

B. The Contractor shall have the approval of the Engineer certifying that all spalled and deteriorated concrete has been removed and the surface has been properly prepared prior to patching the deteriorated areas. If the deterioration of the surfaces is deeper than manufacture requirements, then the repair will be made in maximum lifts of recommended depth. The preceding lift shall be allowed to reach final set before applying fresh material. The fresh mortar must be scrubbed into the preceding lift.

C. Concrete at the edges of all areas to be patched using Cementitious Mortar for Patching shall be removed to a minimum depth of 1/2 inch prior to the application of the mortar.

3.3 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.4 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

D. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

E. Zinc-Coated Reinforcement: Use galvanized-steel wire ties to fasten zinc-coated reinforcement. Repair cut and damaged zinc coatings with zinc repair material.

F. Epoxy-Coated Reinforcement: Use epoxy-coated steel wire ties to fasten epoxy-coated reinforcement. Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963/D 3963M.

G. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch overlap of adjacent mats.

3.5 JOINTS

A. General: Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.

1. When joining existing paving, place transverse joints to align with previously placed joints unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.

1. Continue steel reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of paving strips unless otherwise indicated.
2. Provide tie bars at sides of paving strips where indicated.
3. Butt Joints: Use bonding agent or epoxy bonding adhesive at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
4. Keyed Joints: Provide preformed keyway-section forms or bulkhead forms with keys unless otherwise indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.
5. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.

C. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows, to match jointing of existing adjacent concrete paving:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 1/4-inch radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate grooving-tool marks on concrete surfaces.

    a. Tolerance: Ensure that grooved joints are within 3 inches either way from centers of dowels.

2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.

    a. Tolerance: Ensure that sawed joints are within 3 inches either way from centers of dowels.

3. Doweled Contraction Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.

D. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 1/4-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate edging-tool marks on concrete surfaces.

3.6 CEMENTITIOUS MATERIAL PLACEMENT

The polymer modified cementitious system shall be applied in accordance with the manufacturers recommendations.

3.7 FLOAT FINISHING

A. General: Do not add water to concrete surfaces during finishing operations.

B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.

1. Burlap Finish: Drag a seamless strip of damp burlap across float-finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.
2. Medium-to-Fine-Textured Broom Finish: Draw a soft-bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.
3. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.

3.8 REPAIRS AND PROTECTION

A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Architect.

B. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory paving areas with portland cement concrete bonded to paving with epoxy adhesive.

C. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 033100

SECTION 072100

THERMAL INSULATION

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Rigid XPS insulation within Curtain Wall System.
2. Vapor retarders.

B. Alternates: Not Applicable.

C. Items To Be Installed Only: Not Applicable.

D. Items To Be Furnished Only: Not Applicable.

E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 092116 - GYPSUM BOARD ASSEMBLIES for acoustic insulation in gypsum board assemblies.
2. Section 220001 - PLUMBING for plumbing insulation.
3. Section 230001 - HEATING, VENTILATING, AND AIR CONDITIONING for mechanical insulation.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of building insulation through one source from a single manufacturer.

B. Installer Qualifications: A qualified installer who has been trained by and is acceptable to insulation manufacturer to install manufacturer's products.

C. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

D. Fire Test Performance for Insulation in Cavity Wall: Passes NFPA 285, Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components.

E. Testing Agency Qualifications: An independent agency qualified as a “Certified Infrared Thermographer” per ASNT SNT-TC-1A guidelines, Level I certification minimum.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in the manufacturer’s original containers, dry, undamaged, and with seals and labels intact.

B. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store in a dry and secure location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
2. Protect against ignition at all times. Do not deliver plastic insulating materials to Project site before installation time.
3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 FOAM-PLASTIC BOARD INSULATION

A. Available Manufacturers: Subject to compliance with requirements, products of the following manufacturers which may be incorporated into the Work include, but are not limited to, the following:

1. Owens Corning.

2. DiversiFoam Products.

3. Dow Chemical Company

B. Provide continuous extruded polystyrene insulation, unfaced. Each insulation board must be labeled with manufacturer's name, product brand name, ASTM material specification reference, and identification of the third-party inspection agency used for building code qualification.

1. Basis-of-Design: Owens Corning FOAMULAR® NGX 250 XPS

2.2 VAPOR RETARDERS

A. Polyethylene Vapor Retarders: ASTM D 4397, 6 mils thick, with maximum permeance rating of 0.13 perm

B. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and for other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of substances harmful to insulation or vapor retarders, including removing projections capable of puncturing vapor retarders or of interfering with insulation attachment.

3.3 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice, rain, and snow.

C. Extend rigid insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. On vertical surfaces, set rigid insulation units in adhesive applied according to manufacturer's written instructions. Use adhesive recommended by insulation manufacturer.

1. If not otherwise indicated, extend insulation a minimum of 48 inches below exterior grade line.

E. On horizontal surfaces, loosely lay rigid insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

F. Install sprayed-foam insulation with uniform full thickness and with density which will not displace adjacent materials.

3.4 FIELD QUALITY CONTROL

A. Independent Testing Agency: Cooperate with the Independent Testing Agency engaged by DCAMM for field quality control activities for the Work of this Section. Refer also to Section 014325 - TESTING AGENCY SERVICES.

B. Commissioning Authority: Cooperate with the Commissioning Authority engaged by DCAMM for field quality control activities for the Work of this Section. Refer also to Section 019115 - FACILITY EXTERIOR ENCLOSURE COMMISSIONING.

C. Cooperate with field quality control personnel. Allow inspectors access to scaffolding and work areas, as needed to perform inspections.

D. Additional inspections and retesting of materials which fail to comply with specified material and installation requirements shall be performed at Contractor's expense.

3.5 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION

SECTION 079200

JOINT SEALANTS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Joint sealants and fillers.

B. Alternates: Not Applicable.

C. Items To Be Installed Only: Not Applicable.

D. Items To Be Furnished Only: Not Applicable.

E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 081113 – Hollow Metal Doors and Frames.
2. Section 084113 – Aluminum-Framed Entrances and Storefront.
3. Section 084229 – Automatic Entrances
4. Section 084413 - GLAZED ALUMINUM CURTAIN WALLS for gaskets, sealants and glazing within the field of the curtain wall system.
5. Section 088000 - GLAZING for glazing sealants including butt-glazing at interior glazing.
6. Section 092116 - GYPSUM BOARD ASSEMBLIES for sealing perimeter joints of gypsum board partitions to reduce sound transmission.
7. Section 095113 - ACOUSTICAL PANEL CEILINGS for sealing edge moldings at perimeters of acoustical ceilings.

1.3 PERFORMANCE REQUIREMENTS

A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

C. Install sealant joints such that the sealant develops adhesion with the substrate on two sides. The sealant shall not have three-sided adhesion at any joint location.

1.4 SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples for Verification: For each type and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- wide joints formed between two 6-inch- long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

C. Qualification Data: For Installer.

D. Preconstruction Field Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on preconstruction testing specified in "Quality Assurance" Article.

E. Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:

1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

F. Field Test Report Log: For each elastomeric sealant application.

G. Product Test Reports: Based on comprehensive testing of product formulations performed by a qualified testing agency, indicating that sealants comply with requirements.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized Installer who is approved or licensed for installation of elastomeric sealants required for this Project.

B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

C. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.

1. Use manufacturer's standard test method to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.

    a. Adhesion Testing: Use ASTM C 794 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
    b. Compatibility Testing: Use ASTM C 1087 to determine sealant compatibility when in contact with joint sealant backing and glazing and gasket materials.

2. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
3. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
4. Testing will not be required if joint-sealant manufacturers submit joint preparation data that are based on recent previous testing of current sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

D. Preconstruction Field-Adhesion Testing: Before installing elastomeric sealants, field test their adhesion to Project joint substrates as follows:

1. Locate test joints where indicated on Project or, if not indicated, as directed by Designer.
2. Conduct field tests for each application indicated below:

    a. Each type of elastomeric sealant and joint substrate indicated.
    b. Each type of nonelastomeric sealant and joint substrate indicated.

3. Notify Designer seven days in advance of dates and times when test joints will be erected.

    a. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193.

        1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

4. Report whether sealant in joint connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
5. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

E. Provide joint tolerances in accordance with the manufacturer’s written instructions.

F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01.

1.6 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 degrees F
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.

4. Contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.7 WARRANTY

A. Special Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from the date of Certificate of Agency Use and Occupancy. Guarantees or warranties that start at the date of shipment from the factory, or from the completion date of an individual portion of the project, are not acceptable.

B. Special Manufacturer's Warranty: Manufacturer's standard form in which elastomeric sealant manufacturer agrees to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Five years from from the date of Certificate of Agency Use and Occupancy. Guarantees or warranties that start at the date of shipment from the factory, or from the completion date of an individual portion of the project, are not acceptable.

C. Special warranties specified in this Article exclude deterioration or failure of elastomeric joint sealants from the following:

1. Movement of the structure resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression caused by structural settlement or errors attributable to design or construction.
2. Disintegration of joint substrates from natural causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.

B. Colors of Exposed Joint Sealants: As indicated by manufacturer's designations.

2.2 JOINT SEALANTS

A. Elastomeric Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

B. Stain-Test-Response Characteristics: Elastomeric sealants shall be nonstaining to porous substrates. Provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

C. Single-Component Neutral-Curing Silicone Sealant:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Dow Corning Corporation; 790.
b. GE Silicones; SilPruf LM SCS2700.
c. Bondaflex Technologies Sil 290
d. Pecora Corporation; 864.
e. Tremco Inc.; Spectrem 1.
f. Or equal.

2. Extent of Use: Joints in exterior vertical and soffit surfaces.

D. Multi-component Pourable Urethane Sealant:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Bostik Findley; Chem-Calk 550.
b. Bondaflex Technologies PUR 2 SL
c. Meadows, W. R., Inc.; POURTHANE.
d. Pecora Corporation; Urexpan NR-200.
e. Tremco Inc.; THC-901, multi-component.
f. Or equal.

2. Extent of Use: Joints in exterior horizontal surfaces.

E. Single-Component Mildew-Resistant Acid-Curing Silicone Sealant:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Dow Corning Corporation; 786 Mildew Resistant.
b. GE Silicones; Sanitary SCS1700.
c. Bondaflex Technologies Sil 100 WF
d. Pecora898NST.
e. Tremco Inc.; Tremsil 200.
f. Or equal.

2. Extent of Use: Sanitary joints at interior toilet rooms and other wet areas.

F. Latex Sealant: Comply with ASTM C 834, Type P, Grade NF.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Bostik Findley; Chem-Calk 600.
b. Bondaflex Technologies Sil-A 700
c. Pecora Corporation; AC-20+.
d. Tremco Inc.; Tremflex 834.
e. Or equal.

2. Extent of Use: Joints at non-moving interior surfaces, except where indicated to be sanitary joints.

2.3 JOINT-SEALANT BACKING

A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type B (bicellular material with a surface skin) or other type, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at the back or the base of the joint, where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.4 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Remove loose mill scale from steel surfaces by sandblasting, or scraping and wire brushing where sandblasting is impractical. Remove protective coatings from the steel surface and residue on the steel.
3. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include concrete, masonry and unglazed surfaces of ceramic tile.
4. Remove laitance and form-release agents from concrete.
5. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following metal, glass, porcelain enamel and glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of joint primer or sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install bond-breaker tape to surfaces not intended to bond with the sealant in accordance with the manufacturer's recommendation.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
4. Provide sealant joints with minimum depth and width of 1/4 inch, and an appropriate depth to width ratio for the given application.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not damage or discolor sealants or adjacent surfaces.
3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.

3.4 FIELD QUALITY CONTROL

A. Independent Testing Agency: Cooperate with the Independent Testing Agency engaged by DCAMM for field quality control activities for the Work of this Section. Refer also to Section 014325 - TESTING AGENCY SERVICES.

B. Commissioning Authority: Cooperate with the Commissioning Authority engaged by DCAMM for field quality control activities for the Work of this Section. Refer also to Section 019115 - FACILITY EXTERIOR ENCLOSURE COMMISSIONING.

C. Cooperate with field quality control personnel. Allow inspectors access to scaffolding and work areas, as needed to perform inspections.

D. Additional inspections and retesting of materials which fail to comply with specified material and installation requirements shall be performed at Contractor's expense.

3.5 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

B. If sealant is accidentally applied to masonry or other porous surfaces in the vicinity of the work, remove with solvent in accordance with the manufacturer’s written instructions. For excess sealant installed on masonry and other porous surfaces at the joint, allow sealant to cure for 24 hours and remove by wire brushing or sanding. Remove any debris resulting from this process. For excess sealant installed on metal and other non-porous surfaces, remove the excess sealant with a solvent moistened cloth and remove solvent residue in accordance with the manufacturer’s recommendations.

3.6 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration, damage or discoloration at time of Substantial Completion. If, despite such protection, damage, discoloration or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION

SECTION 080002

GLASS AND GLAZING

(Filed Sub-Bid Required)

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

B. Time, Manner and Requirements for Submitting Sub-Bids:

1. Sub-bids for work under this Section shall be for the complete work and shall be submitted through WRTA's E-Bid Room as stipulated in the WRTA Instructions to Bidders.

2. Sub-bids filed with the Division of Capital Asset Management and Maintenance shall be accompanied by BID BOND or CASH or CERTIFIED CHECK or TREASURER'S CHECK or CASHIER'S CHECK issued by a responsible bank or trust company payable to the Commonwealth of Massachusetts in the amount of five percent of the sub-bid. A sub-bid accompanied by any other form of bid deposit than those specified will be rejected.

C. Sub Sub-Bid Requirements: (None required under this Section.)

D. Reference Drawings: The Work of this Trade Bid is shown on the following Contract Drawings: ((When issuing for bidding, insert a list of the drawings applicable to the work of this section, including drawing number and title.))

NUMBER	SHEET NAME
A-101	LEVEL1 FLOOR PLAN
A-201	INTERIOR ELEVATIONS @ WAITING AREA
A-202	ENLARGED VESTIBULE PLAN & ELEVATIONS
A-301	WALL SECTIONS AND ENLARGED ELEVATIONS
A-402	PLAN DETAILS
A-403	SECTION DETAILS - PART 1 OF 2
A-404	SECTION DETAILS - PART 2 OF 2
A-601	DOOR, WINDOW SCHEDULE AND DETAILS
A-701	ROOM FINISH SCHEDULE AND DETAILS

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. All Work of Section 088010 - INTERIOR GLAZING.

B. Alternates: Not Applicable.

END OF SECTION

SECTION 081113

HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Standard hollow-metal steel doors.
2. Standard hollow-metal steel frames.

B. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
1. Section 087100 - DOOR HARDWARE for door hardware for steel doors.
2. Section 088010 - INTERIOR GLAZING for field glazing for hollow metal doors and frames.
3. Section 099000 - PAINTING AND COATING for field painting steel doors and frames.

1.3 SUBMITTALS

A. Product Data: Include construction details, material descriptions, core descriptions, label compliance, fire-resistance rating, temperature-rise ratings, and finishes for each type of steel door and frame specified.

B. Shop Drawings:

1. Elevations of each door design, including transoms.
2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of anchorages, joints, field splices, and connections.
7. Details of accessories.
8. Details of moldings and removable stops.
9. Details of conduit and preparations for power, signal, and control systems.

C. Schedule: Provide a schedule of hollow metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.

D. Qualification Data: For Installer.

E. Product Test Reports: Based on evaluation of comprehensive fire tests performed by a qualified testing agency, for each type of standard steel door and frame.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Source Limitations: Obtain standard steel doors and frames through one source from a single manufacturer.

C. Fire-Rated Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings and temperature-rise limits indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

1. Smoke- and Draft-Control Assemblies: Provide an assembly with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.

D. Fire-Rated, Borrowed-Light Assemblies (Including Sidelights and Transoms): Complying with NFPA 80 and listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9.

E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors and frames palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch-high wood blocking. Do not store in a manner that traps excess humidity.

1. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.7 COORDINATION

A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Ceco Door Products; an ASSA ABLOY Group Company.
2. De LaFontaine.
3. Steelcraft, an Ingersoll Rand Company.

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 metallic coating.

D. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.

E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

F. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow metal frames of type indicated.

G. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143/C 143M.

H. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. density; with maximum flame-spread and smoke-development indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

I. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.3 STANDARD STEEL DOORS

A. General: Provide doors and transoms of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces, unless otherwise indicated. Comply with ANSI A250.8.

1. Design: Flush panel.
2. Core Construction: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, mineral-board, or vertical steel-stiffener core that produces doors complying with ANSI A250.8.
    a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.
    b. Thermal-Rated (Insulated) Exterior Doors: Where indicated, provide doors fabricated with thermal-resistance value (R-value) of not less than 4.0 degrees F x h x sq. ft./Btu when tested according to ASTM C 1363.
3. Top and Bottom Edges: Closed with flush 0.042-inch-thick end closures or channels of same material as face sheets.
4. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."

B. Exterior Doors: Face sheets fabricated from metallic-coated steel sheet. Provide doors complying with requirements indicated below by referencing ANSI A250.8 for level and model and ANSI A250.4 for physical-endurance level:

1. Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 2 (Seamless), 1-3/4 inches thick.

C. Interior Doors: Face sheets fabricated from cold-rolled steel sheet, unless otherwise indicated to comply with exterior door requirements. Provide doors complying with requirements indicated below by referencing ANSI A250.8 for level and model and ANSI A250.4 for physical-endurance level:

1. Level 2 and Physical Performance Level B (Heavy Duty), Model 2 (Seamless), 1-3/4 inches thick.

D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

E. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

2.4 STANDARD STEEL FRAMES

A. General: Comply with ANSI A250.8 and with details indicated for type and profile.

B. Exterior Frames: Fabricated from metallic-coated steel sheet.

1. Fabricate frames with mitered or coped and welded face corners and seamless face joints.
2. Frames for Level 3 Steel Doors: 0.067-inch-thick steel sheet.

C. Interior Frames: Fabricated from cold-rolled steel sheet, unless otherwise indicated to comply with exterior frame requirements.

1. Fabricate frames with mitered or coped and welded face corners and seamless face joints.
2. Frames for Level 2 Steel Doors: 0.053-inch-thick steel sheet.

D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.

2.5 FRAME ANCHORS

A. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
3. Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.
4. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch- diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch (1.0 mm) thick, and as follows:

1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.

2.6 HOLLOW METAL PANELS

A. Provide hollow metal panels of same materials, construction, and finish as specified for adjoining hollow metal work.

2.7 STOPS AND MOLDINGS

A. Moldings for Glazed Lites in Doors: Minimum 0.032 inch thick, fabricated from same material as door face sheet in which they are installed.

B. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch high unless otherwise indicated.

C. Loose Stops for Glazed Lites in Frames: Minimum 0.032 inch thick, fabricated from same material as frames in which they are installed.

2.8 LOUVERS

A. Provide louvers for interior doors, where indicated, that comply with SDI 111C, with blades or baffles formed of 0.020-inch-thick, cold-rolled steel sheet set into 0.032-inch-thick steel frame.

1. Sightproof Louver: Stationary louvers constructed with inverted V-shaped or Y-shaped blades.
2. Fire-Rated Automatic Louvers: Louvers constructed with movable blades closed by actuating fusible link, and listed and labeled for use in fire-rated door assemblies of type and fire-resistance rating indicated by same testing and inspecting agency that established fire-resistance rating of door assembly.

2.9 ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

B. Ceiling Struts: Minimum 1/4-inch-thick by 1-inch-wide steel.

C. Grout Guards: Formed from same material as frames, not less than 0.016 inch thick.

2.10 FABRICATION

A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117.

C. Hollow Metal Doors:

1. Exterior Doors: Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
2. Glazed Lites: Factory cut openings in doors.
3. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted.

D. Hollow Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

1. Full Profile Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and not visible.
2. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as doorframe. Fasten members at crossings and to jambs by butt welding.
3. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
4. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
5. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
6. Jamb Anchors: Provide number and spacing of anchors as follows:

    a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

        1) Two anchors per jamb up to 60 inches high.
        2) Three anchors per jamb from 60 to 90 inches high.
        3) Four anchors per jamb from 90 to 120 inches high.
        4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.

    b. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

        1) Three anchors per jamb up to 60 inches high.
        2) Four anchors per jamb from 60 to 90 inches high.
        3) Five anchors per jamb from 90 to 96 inches high.
        4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
        5) Two anchors per head for frames above 42 inches wide and mounted in metal-stud partitions.

    c. Compression Type: Not less than two anchors in each jamb.
    d. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.

7. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Keep holes clear during construction.

    a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
    b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

E. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.

F. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Section 087100 - DOOR HARDWARE.

1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
2. Reinforce doors and frames to receive nontemplated, mortised and surface-mounted door hardware.
3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
4. Coordinate locations of conduit and wiring boxes for electrical connections with Section 260001 - ELECTRICAL WORK.

G. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.

1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow metal work.
2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
4. Provide loose stops and moldings on inside of hollow metal work.
5. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.

2.11 STEEL FINISHES

A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:

1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.

C. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11.

1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.

    a. At fire-protection-rated openings, install frames according to NFPA 80.
    b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
    c. Install frames with removable glazing stops located on secure side of opening.
    d. Install door silencers in frames before grouting.
    e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
    f. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
    g. Field apply bituminous coating to backs of frames that are filled with grout.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.

    a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.

3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
5. Concrete Walls: Solidly fill space between frames and concrete with grout. Take precautions, including bracing frames, to ensure that frames are not deformed or damaged by grout forces.
6. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
7. In-Place Gypsum Board Partitions: Secure frames in place with postinstalled expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
8. Ceiling Struts: Extend struts vertically from top of frame at each jamb to overhead structural supports or substrates above frame unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction. Provide adjustable wedged or bolted anchorage to frame jamb members.
9. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:

    a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
    c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
    d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Standard Steel Doors:

    a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
    b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch .
    c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
    d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
3. Smoke-Control Doors: Install doors according to NFPA 105.

D. Glazing Stops: Comply with hollow metal manufacturer's written instructions.

1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow metal work immediately after installation.

C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

D. Metallic-Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION

SECTION 083110

ACCESS DOORS AND FRAMES

PART 1 GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the GENERAL REQUIREMENTS AND COVENANTS - DIVISION I, and the SPECIAL PROVISIONS - DIVISIONS IIA and IIB, which are hereby made a part of this Specification Section.

B. Examine all Drawings and all Sections of the Specifications for requirements and provisions affecting the Work of this Section.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Access doors and frames for walls and ceilings.

B. Related Work: The following items are not included in this Section and are specified under the designated Sections:

1. Section 087100 - DOOR HARDWARE for rim cylinder locks and master keying.
2. Section 095113 – Acoustic Panel Ceiling

1.3 SUBMITTALS

A. Environmental Product Declarations (EPD): For primary products specified in this Section, submit manufacturer's product-specific or industry-wide Type III EPD, conforming with ISO 14025, EN 15804 or ISO 21930. Submittal of EPDs is for information only and is not mandatory for product acceptance.

B. Product Data: For each type of access door and frame indicated. Include construction details, fire ratings, materials, individual components and profiles, and finishes.

C. Shop Drawings: Show fabrication and installation details of access doors and frames for each type of substrate. Include plans, elevations, sections, details, and attachments to other work.

D. Samples: For each door face material, at least 3 by 5 inches in size, in specified finish.

E. Access Door and Frame Schedule: Provide complete access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

F. Ceiling Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling-mounted items including access doors and frames, lighting fixtures, diffusers, grilles, speakers, sprinklers, and special trim are shown and coordinated with each other.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of access door and frame through one source from a single manufacturer.

B. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to access door and frame assemblies tested for fire-test-response characteristics per the following test method and that are listed and labeled by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. NFPA 252 for vertical access doors and frames.
2. ASTM E 119 for horizontal access doors and frames.

C. Size Variations: Obtain Engineer's acceptance of manufacturer's standard-size units, which may vary slightly from sizes indicated.

1.5 COORDINATION

A. Verification: Determine specific locations and sizes for access doors needed to gain access to concealed plumbing, mechanical, or other concealed work, and indicate in the schedule specified in "Submittals" Article.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. J. L. Industries.
2. Larsen's Manufacturing.
3. Nystrom Building Products.

2.2 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

A. Flush Access Doors and Trimless Frames: Fabricated from steel sheet at typical areas and from stainless-steel sheet at toilet and wet areas.

1. Locations: Wall and ceiling surfaces.
2. Door: Minimum 0.060-inch-thick sheet metal, set flush with surrounding finish surfaces.
3. Frame: Minimum 0.060-inch-thick sheet metal with drywall bead flange.
4. Hinges: Continuous piano.
5. Lock: Cylinder.
    a. Lock Preparation: Prepare door panel to accept cylinder specified in Section 087100, DOOR HARDWARE.

B. Recessed Access Doors and Trimless Frames: Fabricated from steel sheet at typical areas and from stainless-steel sheet at toilet and wet areas.

1. Locations: Wall and ceiling surfaces.
2. Door: Minimum 0.060-inch-thick sheet metal in the form of a pan recessed 5/8 inch for gypsum board infill.
3. Frame: Minimum 0.060-inch-thick sheet metal with drywall bead for gypsum board surfaces.
4. Hinges: Concealed pivoting rod hinge.
5. Lock: Cylinder.
    a. Lock Preparation: Prepare door panel to accept cylinder specified in Section 087100, DOOR HARDWARE.

C. Fire Rated, Uninsulated, Flush Access Doors and Frames with Exposed Trim: Fabricated from steel at typical areas and from stainless-steel sheet at toilets and wet areas.

1. Locations: Wall surfaces.
2. Fire-Resistance Rating: Not less than that of adjacent construction.
3. Door: Minimum 0.060-inch-thick sheet metal, flush construction.
4. Frame: Minimum 0.060-inch-thick sheet metal with 1-inch-wide, surface-mounted trim.
5. Hinges: Continuous piano.
6. Automatic Closer: Spring type.
7. Lock: Self-latching device with cylinder lock.
    a. Lock Preparation: Prepare door panel to accept cylinder specified in Section 087100, DOOR HARDWARE

2.3 STEEL MATERIALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

1. ASTM A 123/A 123M, for galvanizing steel and iron products.
2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.

B. Steel Sheet: Electrolytic zinc-coated, ASTM A 879/A 879M with cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.

C. Steel Finishes: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Surface Preparation for Steel Sheet: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, or other contaminants that could impair paint bond.

Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or SSPC-SP 8, "Pickling."

a. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

2. Factory-Primed Finish: Apply shop primer immediately after cleaning and pretreating.

D. Drywall Beads: Edge trim formed from 0.0299-inch zinc-coated steel sheet formed to receive joint compound and in size to suit thickness of gypsum board.

2.4 STAINLESS-STEEL MATERIALS

A. Rolled-Stainless-Steel Floor Plate: ASTM A 793, manufacturer's standard finish.

B. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 316. Remove tool and die marks and stretch lines or blend into finish.

1. Finish: Directional Satin Finish, No. 4.

2.5 FABRICATION

A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.

B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.

1. For trimless frames with drywall bead, provide edge trim for gypsum board and gypsum base securely attached to perimeter of frames.
2. For trimless frames with plaster bead for full-bed plaster applications, provide zinc-coated expanded metal lath and exposed casing bead welded to perimeter of frames.
3. Provide mounting holes in frames for attachment of units to metal or wood framing.
4. Provide mounting holes in frame for attachment of masonry anchors.

D. Recessed Access Doors: Form face of panel to provide recess for application of applied finish. Reinforce panel as required to prevent buckling.

1. For recessed doors with plaster infill, provide self-furring expanded metal lath attached to door panel.

E. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.

1. For cylinder lock, furnish two keys per lock and key all locks alike.
2. For recessed panel doors, provide access sleeves for each locking device. Furnish plastic grommets and install in holes cut through finish.

PART 3 EXECUTION

3.1 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.

B. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finish surfaces.

C. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.2 ADJUSTING AND CLEANING

A. Adjust doors and hardware after installation for proper operation.

B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION

SECTION 083326

OVERHEAD COILING GRILLES

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Manually-operated overhead coiling grilles.

B. Alternates: Not Applicable.

C. Items To Be Installed Only: Install the following items as furnished by the designated Sections:

1. Section 087100 - DOOR HARDWARE:
   a. Lock cylinders.

D. Items To Be Furnished Only: Not Applicable.

E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 055000 - METAL FABRICATIONS for miscellaneous steel supports.
2. Section 079200 - JOINT SEALANTS for weatherproof joints at hoods.
3. Section 087100 - DOOR HARDWARE for lock cylinders and keying.
4. Section 099000 - PAINTING AND COATING for field-applied paint finish.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide overhead coiling grilles capable of withstanding the effects of gravity loads and the following loads and stresses without evidencing permanent deformation of door components:

1. Seismic Performance: Overhead coiling grilles shall withstand the effects of earthquake motions determined according to Code.
   a. Component Importance Factor: 1.0 [1.5].

B. Operation-Cycle Requirements: Provide overhead coiling grille components and operators capable of operating for not less than 20,000 cycles and for 10 cycles per day.

1.4 SUBMITTALS

A. LEED Submittals: ((Designer to insert requirements based on the LEED credits targeted.))

B. Product Data: For each type and size of overhead coiling grille and accessory.

1. Summary of forces and loads on walls and jambs.

C. Shop Drawings: For special components and installations not dimensioned or detailed in manufacturer's product data.

D. Qualification Data: For Installer.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for both installation and maintenance of units required for this Project.

B. Source Limitations: Obtain overhead coiling grilles through one source from a single manufacturer.

1. Obtain operators and controls from overhead coiling grille manufacturer.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cornell Iron Works.
2. Overhead Door Corp.
3. Wayne-Dalton Corp.

B. Basis of Design Product: Cornell VISIONAIRE® MICROCOIL® GRILLE

2.2 GRILLE CURTAIN MATERIALS AND CONSTRUCTION

A. General: Fabricate overhead coiling grille curtain consisting of a network of 1/4-inch-minimum diameter horizontal rods, or rods covered with tube spacers, spaced as indicated. Interconnect rods by vertical links approximately 5/8 inch wide, spaced as indicated and rotating on rods.

1. Space rods at approximately 1-1/2 inches o.c.
2. Space links approximately 6 inches apart in a straight in-line pattern.
3. Aluminum Grille Curtain: ASTM B 221 alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
4. Stainless-Steel Grille Curtain: ASTM A 666 or ASTM A 240/A 240M, Type 300 series.
5. Glazing Insert: Manufacturer's standard glazing of clear polycarbonate sheet secured by the curtain links

B. Endlocks: Continuous end links, chains, or other devices at ends of rods; locking and retaining grille curtain in guides against excessive pressures, maintaining grille curtain alignment, and preventing lateral movement.

C. Bottom Bar: Manufacturer's standard continuous channel, tubular shape, or two angles, finished to match grille.

1. Astragal: Provide a replaceable, adjustable, continuous, compressible gasket of flexible vinyl, rubber, or neoprene; for placement between angles or fitted to shape, as a cushion bumper for grille.
2. Provide motor-operated grilles with combination bottom astragal and sensor edge.

D. Grille Curtain Jamb Guides: Manufacturer's standard extruded-aluminum shape having curtain groove with return lips or bars to retain curtain. Provide continuous integral wear strips to prevent metal-to-metal contact and to minimize operational noise; with removable stops on guides to prevent overtravel of curtain.

2.3 HOODS AND ACCESSORIES

A. Hood: Form to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Provide closed ends for surface-mounted hoods, and provide fascia for any portion of between-jamb mounting projecting beyond wall face. Provide intermediate support brackets as required to prevent sagging.

1. Fabricate hoods for aluminum grilles of minimum 0.032-inch-thick aluminum, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, complying with ASTM B 209.
2. Provide removable metal soffit of same material and finish as curtain if hood is mounted above ceiling, unless otherwise indicated.

B. Push/Pull Handles: For push-up-operated or emergency-operated grilles, provide manufacturer's standard lifting handles on each side of grille.

C. Fabricate locking device assembly with lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bar to engage through slots in tracks. Lock cylinder is specified in Section 087100 - DOOR HARDWARE.

D. If grille curtain is power operated, provide safety interlock switch to disengage power supply when grille is locked.

2.4 COUNTERBALANCING MECHANISM

A. General: Counterbalance grille curtain by means of adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to grille curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.

B. Counterbalance Barrel: Fabricate spring barrel of hot-formed, structural-quality, welded or seamless carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up grille curtain without distortion of curtain and to limit barrel deflection to not more than 0.03 in./ft. of span under full load.

C. Provide spring balance of one or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of grille curtain, with uniform adjustment accessible from outside barrel. Provide cast-steel barrel plugs to secure ends of springs to barrel and shaft.

D. Fabricate torsion rod for counterbalance shaft of cold-rolled steel, sized to hold fixed spring ends and carry torsional load.

E. Brackets: Provide mounting brackets of manufacturer's standard design, either cast iron or cold-rolled steel plate.

2.5 MANUAL GRILLE OPERATORS

A. Push-up Operation: Design counterbalance mechanism so required lift or pull for grille operation does not exceed 25 lbf .

2.6 ELECTRIC GRILLE OPERATORS

A. General: Provide electric grille operator assembly of size and capacity recommended and provided by grille manufacturer for grille specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, remote-control stations, control devices, integral gearing for locking grille, and accessories required for proper operation.

B. Comply with NFPA 70.

C. Disconnect Device: Provide hand-operated disconnect or mechanism for automatically engaging chain and sprocket operator and releasing brake for emergency manual operation while disconnecting motor, without affecting timing of limit switch. Mount disconnect and operator so they are accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.

D. Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency auxiliary operator.

E. Provide control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24-V, ac or dc.

F. Grille-Operator Type: Provide wall-, hood-, or bracket-mounted, jackshaft, gear-head-type grille operator unit consisting of electric motor, enclosed worm-gear running-in-oil primary drive, and chain and sprocket secondary drive; with quick disconnect-release for manual operation.

G. Electric Motors: Provide high-starting torque, reversible, continuous-duty, Class A insulated, electric motors complying with NEMA MG 1; with overload protection; sized to start, accelerate, and operate grille in either direction from any position, at not less than 2/3 fps and not more than 1 fps, without exceeding nameplate ratings or service factor.

1. Type: Polyphase, medium-induction type.
2. Service Factor: According to NEMA MG 1, unless otherwise indicated.
3. Coordinate wiring requirements and electric characteristics of motors with building electrical system.

H. Wiring for Controls and Safety Devices: Provide low voltage wiring for the devices following. Coordinate with building electrical service.

I. Remote-Control Station: Provide two-button constant-contact control station.

1. Provide interior units, full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.

J. Obstruction Detection Device: Provide each motorized door with indicated external automatic safety sensor capable of protecting full width of door opening. Activation of sensor immediately stops and reverses downward door travel.

K. Limit Switches: Provide adjustable switches, interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.

L. Provide electric operators with ADA-compliant audible alarm and visual indicator lights.

2.7 FINISHES, GENERAL

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.8 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 611.

2.9 STAINLESS STEEL FINISHES

A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches. Run grain of directional finishes with long dimension of each piece. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

C. Directional Satin Finish: No. 4.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install grilles and operating equipment, complete with necessary hardware, according to Shop Drawings, manufacturer's written instructions, and as specified.

3.2 ADJUSTING

A. Lubricate bearings and sliding parts; adjust grilles to operate easily, free of warp, twist, or distortion and with tight fit around entire perimeter.

END OF SECTION

SECTION 084113

ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Glazed aluminum-framed storefront systems and accessories.
2. Automatic-Sliding aluminum doors and hardware.
3. Glass and glazing for the work of this Section, as specified in Section 088000 - GLAZING.

B. Alternates: Not Applicable.

C. Items To Be Installed Only: Install the following items as furnished by the designated Sections:

1. Section 087100 - DOOR HARDWARE:
   a. Lock cylinders.

D. Items To Be Furnished Only: Not Applicable.

E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 079200 - JOINT SEALANTS for perimeter joint sealants.
2. Section 084413 - GLAZED ALUMINUM CURTAIN WALLS for curtain-wall systems that mechanically retain glazing on four sides.
3. Section 087100 - DOOR HARDWARE for lock cylinders and keying.
4. Section 260001 - ELECTRICAL WORK for conduits and junction boxes within frames for access control devices.

F. Related Requirements: Refer to the following Sections for technical requirements relating to Work of this Section:

1. Section 079200 - JOINT SEALANTS for sealant requirements to the extent not specified in this Section.
2. Section 088000 - GLAZING for glazing requirements to the extent not specified in this Section.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design entrance and storefront system, including comprehensive engineering analysis by a qualified professional engineer licensed in the Commonwealth of Massachusetts, using performance requirements and design criteria indicated.

B. General: Provide aluminum-framed systems, including anchorage, capable of withstanding, without failure, the effects of the following:

1. Structural loads.
2. Thermal movements.
3. Dimensional tolerances of building frame and other adjacent construction.
4. Failure includes the following:

a. Deflection exceeding specified limits.
b. Thermal stresses transferred to building structure.
c. Framing members transferring stresses, including those caused by thermal and structural movements, to glazing.
d. Noise or vibration created by wind, thermal and structural movements.
e. Loosening or weakening of fasteners, attachments, and other components.
f. Sealant failure.
g. Failure of operating units to function properly.

C. Structural Loads: Wind and seismic loads as indicated on the Structural Drawings, but not less than that required by Code.

D. Interstory Drift: Accommodate design displacement of adjacent stories indicated.

1. Design Displacement: As indicated on Drawings.
2. Test Performance: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.4 at design displacement [and 1.5 times the design displacement].

E. Seismic Performance: Provide aluminum-framed entrances and storefronts, and components capable of withstanding the effects of earthquake motions determined according to Code.

1. Seismic Drift Causing Glass Fallout: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.6 at design displacement [and 1.5 times the design displacement].
2. Vertical Interstory Movement: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.7 at design displacement [and 1.5 times the design displacement].

F. Deflection of Framing Members:

1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches (and to 1/240 of clear span plus 1/4 inch for spans greater than 13 feet 6 inches or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8 inch, whichever is smaller, amount not exceeding that which reduces glazing bite to less than

75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components directly below to less than 1/8 inch and clearance between members and operable units directly below to less than 1/16 inch.

G. Thermal Movements: Provide aluminum-framed systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 degrees F, ambient; 180 degrees F, material surfaces.

H. Air Infiltration Test: Test unit in accordance with ASTM E 283, as follows:

1. Static Air Pressure Difference: 6.24 psf for fixed storefront units, and 1.567 psf for doors.
2. Performance: Maximum air leakage shall not exceed the following: fixed storefront units, 1.0 cfm/sf.: glazed entrance door units, 0.3 cfm/sf of other areas.

I. Water Leakage Test: Test fixed framing system in accordance with ASTM E 331.

1. Test Pressure: 8 psf.
2. Performance: No leakage as defined in test method at specified test pressure. No uncontrolled water penetrating system or appearing on normally exposed interior surfaces.

J. Solar Heat-Gain Coefficient: Provide units with a whole-unit SHGC maximum as required by Code, determined according to NFRC 200 procedures. Submit proof of compliance with submittals as specified.

K. Thermal Transmittance: Provide window units that have a U-value as required by Code rated in BTU/hour/sq. ft./degrees F at 15-mph exterior wind velocity, when tested in accordance with AAMA 1503.1. Test unit to be 4 ft. x 6 ft. Submit proof of compliance with submittals as specified.

L. Condensation Resistance: Provide aluminum-framed systems with fixed glazing and framing areas having condensation-resistance factor (CRF) of not less than 45 for fixed storefront units and not less than 48 for doors when tested according to AAMA 1503.

1.4 SUBMITTALS

A. LEED Submittals: ((Designer to insert requirements based on the LEED credits targeted.))

B. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of product indicated.

C. Shop Drawings: For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work.

1. Include structural analysis data signed and sealed by the qualified professional engineer registered in the Commonwealth of Massachusetts responsible for their preparation.

2. Include structural analysis of story drift and deflection from anticipated live loads, and determination whether head receptors are required.
3. Include details of provisions for system expansion and contraction and for draining moisture occurring within the system to the exterior.
4. For entrances, include hardware schedule and indicate operating hardware types, functions, quantities, and locations.
5. All costs for professional engineering shall be included in the bid price for the Work of this Section.

D. Delegated-Design Submittal: For entrance and storefront systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer licensed in the Commonwealth of Massachusetts responsible for their preparation.

E. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

F. Qualification Data: For Installer.

G. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for aluminum-framed systems.

H. Performance Reports: Based on systems, components and glazing methods proposed for use on this Project, proof that units as glazed for this Project meet or exceed Code requirements for the following:

1. U-value.
2. Solar heat-gain coefficient.

I. Maintenance Data: For aluminum-framed systems to include in maintenance manuals.

J. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

A. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer licensed in the Commonwealth of Massachusetts.

B. Professional Engineer Qualifications: A professional engineer licensed in the Commonwealth of Massachusetts and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of entrance and storefront systems that are similar to those indicated for this Project in material, design, and extent.

C. Installer Qualifications: Capable of assuming engineering responsibility and performing work of this Section and who is acceptable to manufacturer.

1. Engineering Responsibility: Preparation of data for aluminum-framed systems including Shop Drawings based on testing and engineering analysis of manufacturer's standard

units in assemblies similar to those indicated for this Project and submission of reports of tests performed on manufacturer's standard assemblies.

D. Accessible Entrances: Comply with Massachusetts Architectural Access Board and the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)."

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of structural supports for aluminum-framed systems by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating aluminum-framed systems without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed entrances and storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including, but not limited to, excessive deflection.
b. Noise or vibration created by wind and thermal and structural movements.
c. Deterioration of metals and other materials beyond normal weathering.
d. Water penetration through fixed glazing and framing areas.
e. Failure of operating components.

2. Warranty Period: 10 years from the date of Certificate of Agency Use and Occupancy. Guarantees or warranties that start at the date of shipment from the factory, or from the completion date of an individual portion of the project, are not acceptable.

B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes fail within specified warranty period. Warranty does not include normal weathering.

1. Warranty Period: 10 years from the date of Certificate of Agency Use and Occupancy. Guarantees or warranties that start at the date of shipment from the factory, or from the completion date of an individual portion of the project, are not acceptable.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. EFCO, a Pella Company
2. Kawneer North America
3. Oldcastle BuildingEnvelope
4. United States Aluminum
5. United States Aluminum

2.2 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

1. Sheet and Plate: ASTM B 209.
2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
3. Extruded Structural Pipe and Tubes: ASTM B 429.
4. Structural Profiles: ASTM B 308/B 308M.
5. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.

B. Steel Reinforcement: With manufacturer's standard corrosion-resistant primer complying with SSPC-PS Guide No. 12.00 applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.

1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.3 FRAMING SYSTEMS

A. Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Construction: Thermal-break.

B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration, use self-locking devices.

2. Reinforce members as required to receive fastener threads.
3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.

D. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.

E. Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials. Form exposed flashing from sheet aluminum finished to match framing and of sufficient thickness to maintain a flat appearance without visible deflection.

F. Framing System Gaskets and Sealants: Manufacturer's standard recommended by manufacturer for joint type.

2.4 GLAZING SYSTEMS

A. Glazing: Provide insulating-glass units in accordance with requirements in Section 088000 - GLAZING.

B. Glazing Gaskets: Manufacturer's standard compression types, replaceable, molded or extruded, that maintain uniform pressure and watertight seal.

C. Spacers and Setting Blocks: Manufacturer's standard elastomeric types.

2.5 DOORS

A. Doors: Manufacturer's standard glazed doors, for sliding operation.

1. Door Construction: Mechanical clip fastening, SIGMA deep penetration plus welds and 1-1/8 inch long fillet welds inside and outside of all four corners. Glazing stops shall be hook-in type and EPDM glazing gaskets reinforced with non-stretchable cord.

2.6 DOOR HARDWARE

A. Hardware Sets:

1. Opening-Force Requirements:

a. Egress Doors: Not more than 30 lbf required to set door in motion and not more than 15 lbf required to open door to minimum required width.
b. Accessible Interior Doors: Not more than 5 lbf.

B. Locking Devices, General: Do not require use of key, tool, or special knowledge for operation.

1. Opening-Force Requirements:

a. Delayed-Egress Locks: Lock releases within 15 seconds after applying a force of not more than 15 lbf for not more than 3 seconds.

b. Latches and Exit Devices: Not more than 15 lbf required to release latch.

C. Mortise Auxiliary Locks: BHMA A156.5, Grade 1.

D. Panic Exit Devices: Listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.

1. Standard: BHMA A156.3, Grade 1.

E. Cylinders: As specified in Section 087100 - DOOR HARDWARE.

F. Strikes: Provide strike with black-plastic dust box for each latch or lock bolt; fabricated for aluminum framing.

G. Operating Trim: BHMA A156.6.

H. Closers: With accessories required for a complete installation, sized as required by door size, exposure to weather, and anticipated frequency of use, and adjustable to meet field conditions and requirements for opening force.

1. Standard: BHMA A156.4, Grade 1.

I. Concealed Overhead Holders: BHMA A156.8, Grade 1.

J. Surface-Mounted Holders: BHMA A156.16, Grade 1.

K. Door Stops: BHMA A156.16, Grade 1, floor or wall mounted, as appropriate for door location indicated, with integral rubber bumper.

L. Weather Stripping: Manufacturer's standard replaceable components.

1. Compression Type: Made of ASTM D 2000, molded neoprene, or ASTM D 2287, molded PVC.

M. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.

N. Silencers: BHMA A156.16, Grade 1.

O. Thresholds: Raised thresholds beveled with a slope of not more than 1:2, with maximum height of 1/2 inch.

1. Standard: BHMA A156.21.

P. Finger Guards: Manufacturer's standard collapsible neoprene or PVC gasket anchored to frame hinge-jamb at center-pivoted doors.

2.7 ACCESSORY MATERIALS

A. Insulating Materials: As specified in Section 072100 - THERMAL INSULATION.

B. Bituminous Paint (Isolation Coating): Cold-applied asphalt-mastic paint complying with ASTM D 1187 requirements containing no asbestos, formulated for 30-mil thickness per coat.

2.8 FABRICATION

A. Form aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Means to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.
4. Physical and thermal isolation of glazing from framing members.
5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing (without projecting stops).

E. Door Frames: Reinforce as required to support loads imposed by door operation and for installing hardware.

1. At exterior doors, provide compression weather stripping at fixed stops.
2. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.

F. Doors: Reinforce doors as required for installing hardware.

1. At pairs of exterior doors, provide sliding weather stripping retained in adjustable strip mortised into door edge.
2. At exterior doors, provide weather sweeps applied to door bottoms.

G. Hardware Installation: Factory install hardware to the greatest extent possible. Cut, drill, and tap for factory-installed hardware before applying finishes.

H. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.9 ALUMINUM FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. High-Performance Organic Finish (3-Coat Fluoropolymer): AA-C12C40R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: conversion coating; Organic Coating: manufacturer's standard 3-coat, thermocured system consisting of specially formulated inhibitive primer, fluoropolymer color coat, and clear fluoropolymer topcoat, with both color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2605 and with coating and resin manufacturers' written instructions.

1. Color and Gloss: Matching Existing

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General:

1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure nonmovement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
6. Seal joints watertight, unless otherwise indicated.

B. Metal Protection:

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape or installing nonconductive spacers as recommended by manufacturer for this purpose.
2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components necessary to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.

D. Set continuous sill members and flashing in full sealant bed as specified in Section 079200 - JOINT SEALANTS and to produce weathertight installation.

E. Install components plumb and true in alignment with established lines and grades, without warp or rack.

F. Install glazing as specified in Section 088000 - GLAZING.

1. Structural-Sealant Glazing:

a. Prepare surfaces that will contact structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.
b. Install weatherseal sealant according to Section 079200 - JOINT SEALANTS and according to sealant manufacturer's written instructions to produce weatherproof joints. Install joint filler behind sealant as recommended by sealant manufacturer.

G. Entrances: Install to produce smooth operation and tight fit at contact points.

1. Exterior Entrances: Install to produce tight fit at weather stripping and weathertight closure.
2. Field-Installed Hardware: Install surface-mounted hardware according to hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

H. Erection Tolerances: Install aluminum-framed systems to comply with the following maximum tolerances:

1. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet; 1/4 inch over total length.
2. Alignment:

a. Where surfaces abut in line, limit offset from true alignment to 1/16 inch.
b. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch.

3. Diagonal Measurements: Limit difference between diagonal measurement to 1/8 inch.

3.3 FIELD QUALITY CONTROL

A. Independent Testing Agency: Cooperate with the Independent Testing Agency engaged by WRTA for field quality control activities for the Work of this Section.

B. Commissioning Authority: Cooperate with the Commissioning Authority engaged by WRTA for field quality control activities for the Work of this Section.

C. Cooperate with field quality control personnel. Allow inspectors access to scaffolding and work areas, as needed to perform inspections.

D. Additional inspections and retesting of materials which fail to comply with specified material and installation requirements shall be performed at Contractor's expense.

E. Testing Services: Testing and inspecting of representative areas to determine compliance of installed systems with specified requirements shall take place as follows and in successive stages as indicated on Drawings. Do not proceed with installation of the next area until test results for previously completed areas show compliance with requirements.

1. Air Infiltration: Areas shall be tested for air leakage of 1.5 times the rate specified for laboratory testing under Part 1 "Performance Requirements" Article, but not more than 0.09 cfm/sq. ft. of fixed wall area when tested according to ASTM E 783 at a minimum static-air-pressure difference of 6.24 lbf/sq. ft.
2. Water Penetration: Areas shall be tested according to ASTM E 1105 at a minimum cyclic static-air-pressure difference of 0.67 times the static-air-pressure difference specified for laboratory testing under Part 1 "Performance Requirements" Article, but not less than 4.18 lbf/sq. ft., and shall not evidence water penetration.
3. Water Spray Test: Before installation of interior finishes has begun, a minimum area of 75 feet by 1 story of aluminum-framed systems designated by Designer shall be tested according to AAMA 501.2 and shall not evidence water penetration.

F. Repair or remove work where test results and inspections indicate that it does not comply with specified requirements.

3.4 ADJUSTING

A. Entrances: Adjust operating hardware for smooth operation according to hardware manufacturers' written instructions.

1. For doors accessible to people with disabilities, adjust closers to provide a 3-second closer sweep period for doors to move from a 70-degree open position to 3 inches from the latch measured to the leading door edge.

END OF SECTION

SECTION 084229

AUTOMATIC ENTRANCES

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the GENERAL REQUIREMENTS - DIVISION I.

B. Examine all Drawings and all Sections of the Specifications for requirements and provisions affecting the Work of this Section.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Power-operated automatic entrances.

B. Related Work: The following items are not included in this Section and are specified under the designated Sections:

1. Section 079200 - JOINT SEALANTS for installation of joint sealants installed with aluminum-framed systems and for sealants to the extent not specified in this Section.
2. Section 084110 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONT for swinging entrance doors.
3. Section 087100 - DOOR HARDWARE for lock cylinders and keying.
4. Section 088000 - EXTERIOR GLAZING for glazing requirements to the extent not specified in this Section.
5. Division 26 - ELECTRICAL for electrical service and connections.

1.3 DEFINITIONS

A. AAADM: American Association of Automatic Door Manufacturers.

B. Activation Device: Device that, when actuated, sends an electrical signal to the door operator to open the door.

C. Safety Device: Device that, to avoid injury, prevents a door from opening or closing.

D. For automatic door terminology, refer to BHMA A156.10 for definitions of terms.

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design automatic entrances, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. General: Provide aluminum-framed systems, including anchorage, capable of withstanding, without failure, the effects of the following:

1. Structural loads.
2. Windborne debris-impact-resistance performance.
3. Thermal movements.
4. Dimensional tolerances of building frame and other adjacent construction.
5. Failure includes the following:

a. Deflection exceeding specified limits.
b. Thermal stresses transferred to building structure.
c. Framing members transferring stresses, including those caused by thermal and structural movements, to glazing.
d. Noise or vibration created by wind and thermal and structural movements.
e. Loosening or weakening of fasteners, attachments, and other components.
f. Sealant failure.
g. Failure of operating units to function properly.

C. Structural Loads: Wind and seismic loads as indicated on the Structural Drawings, but not less than that indicated on the Structural Drawings.

D. Deflection of Framing Members:

1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches (and to 1/240 of clear span plus 1/4 inch for spans greater than 13 feet 6 inches or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8 inch, whichever is smaller, amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components directly below to less than 1/8 inch and clearance between members and operable units directly below to less than 1/16 inch.

E. Windborne-Debris-Impact-Resistance-Test Performance: Provide automatic entrances that pass large missile-impact and cyclic-pressure tests of ASTM E 1996 according to the IBC.

F. Thermal Movements: Provide aluminum-framed systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

G. Operating Temperature Range: Provide automatic entrances that operate within 20 to 122 deg F.

H. Air Infiltration Test: Test unit in accordance with ASTM E 283, as follows:

1. Static Air Pressure Difference: 1.567 psf.
2. Performance: Maximum air leakage shall not exceed 0.3 cfm/sf of other areas.

I. Solar Heat-Gain Coefficient: Provide units with a whole-unit SHGC maximum as required by Code, determined according to NFRC 200 procedures. Submit proof of compliance with submittals as specified.

J. Opening-Force Requirements:

1. Power-Operated Doors: Not more than 50 lbf required to manually set door in motion if power fails, and not more than 15 lbf required to open door to minimum required width.
2. Accessible Interior Doors: Not more than 5 lbf to fully open door.

K. Entrapment Force Requirements:

1. Power-Operated Sliding Doors: Not more than 30 lbf required to prevent stopped door from closing.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for automatic entrances. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For automatic entrances. Include plans, elevations, sections, details, hardware mounting heights, and attachments to other work.

1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
2. Wiring Diagrams: For power, signal, and control wiring.
3. Activation and safety devices.
4. Include hardware schedule and indicate hardware types, functions, quantities, and locations.

C. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

D. Delegated-Design Submittal: For automatic entrances indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Design Calculations: Calculate requirements for seismic restraints.

E. Qualification Data: For Installer.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for aluminum-framed systems.

G. Performance Reports: Based on systems, components and glazing methods proposed for use on this Project, proof that units as glazed for this Project meet or exceed Code requirements for the following:

1. U-value.
2. Solar heat-gain coefficient.

H. Maintenance Data: For aluminum-framed systems to include in maintenance manuals.

I. Warranties: Special warranties specified in this Section.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer with company certificate issued by AAADM.

B. Installer Qualifications: Capable of assuming engineering responsibility and performing work of this Section and who is acceptable to manufacturer.

1. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site.

C. Accessible Entrances: Comply with authorities having jurisdiction, local state building code and the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)."

D. Source Limitations for Automatic Entrances: Obtain automatic entrances from single source from single manufacturer.

E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

F. Power-Operated Door Standard: BHMA A156.10.

G. Emergency-Exit Door Requirements: Comply with requirements of authorities having jurisdiction for automatic entrances serving as a required means of egress.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings to receive automatic entrances by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating aluminum-framed systems

without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.8 COORDINATION

A. Coordinate sizes and locations of recesses in concrete floors for recessed sliding tracks and recessed control mats that control automatic entrances. Concrete, reinforcement, and formwork requirements are specified in Division 03.

B. Templates: Obtain templates for doors, frames, and other work specified to be factory prepared for installing automatic entrances, and distribute to parties involved. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing automatic entrances to comply with indicated requirements.

C. Coordinate hardware with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish. Coordinate hardware for automatic entrances with hardware required for rest of Project.

D. Electrical System Roughing-in: Coordinate layout and installation of automatic entrances with connections to power supplies and access-control system.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of automatic entrances that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including, but not limited to, excessive deflection.
b. Faulty operation of operators, controls, and hardware.
c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.

2. Warranty Period: Two years from date of Substantial Completion.

1.10 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, provide 12 months' full maintenance by skilled employees of automatic entrance Installer. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper automatic entrance operation at rated speed and capacity. Provide parts and supplies the same as those used in the manufacture and installation of original equipment.

1. Engage a certified inspector to perform safety inspection after each adjustment or repair and at end of maintenance period. Furnish completed inspection reports to Authority.

2. Perform maintenance, including emergency callback service, during normal working hours.
3. Include 24-hour-per-day, 7-day-per-week, emergency callback service.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Besam Automated Entrance Systems.
2. DORMA Automatics.
3. Stanley Access Technologies.

B. Basis of Deisgn Product: Stanley DURA-GLIDE 2000 SERIES

2.2 SLIDING AUTOMATIC ENTRANCES

A. General:

1. Configuration, single-slide or bi-part as indicated on the Drawings.
2. Glazing, as indicated on the Drawings.
3. Partial breakout allows only sliding panel to break out at any point of travel.
4. Fiberglass reinforced toothed drive belt to prevent slippage and uneven closing.
5. Multiple load bearing roller wheels.
6. Header fabricated of lightweight and corrosion resistant 6063-T6 aluminum.
7. Components fully tested and pre-assembled at the factory.
8. Power required 120 VAC, 60 Hz, 5 amps minimum.
9. Motion sensors.
10. Adjustable speed range.

2.3 FABRICATION

A. General: Factory fabricate automatic entrance components to designs, sizes, and thicknesses indicated and to comply with indicated standards.

1. Form aluminum shapes before finishing.
2. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
3. Use concealed fasteners to greatest extent possible. Where exposed fasteners are required, use countersunk Phillips flat-head machine screws, finished to match framing.

    a. Where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration, use self-locking devices.

b. Reinforce members as required to receive fastener threads.

4. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.

B. Framing: Provide automatic entrances as prefabricated assemblies. Complete fabrication, assembly, finishing, hardware application, and other work before shipment to Project site.

1. Fabricate tubular and channel frame assemblies with manufacturer's standard welded or mechanical joints. Provide subframes and reinforcement as required for a complete system to support required loads.
2. Perform fabrication operations in manner that prevents damage to exposed finish surfaces.
3. Form profiles that are sharp, straight, and free of defects or deformations.
4. Provide components with concealed fasteners and anchor and connection devices.
5. Fabricate components with accurately fitted joints with ends coped or mitered to produce hairline joints free of burrs and distortion.
6. Fabricate exterior components to drain water passing joints and condensation and moisture occurring or migrating within system to the exterior.
7. Provide anchorage and alignment brackets for concealed support of assembly from building structure.
8. Allow for thermal expansion of exterior units.

C. Doors: Factory fabricated and assembled in profiles indicated. Reinforce as required to support imposed loads and for installing hardware.

D. Door Operators: Factory fabricated and installed in headers, including adjusting and testing.

E. Glazing: Fabricate framing with minimum glazing edge clearances for thickness and type of glazing indicated, according to GANA's "Glazing Manual."

F. Hardware: Factory install hardware to greatest extent possible; remove only as required for final finishing operation and for delivery to and installation at Project site. Cut, drill, and tap for factory-installed hardware before applying finishes.

1. Provide sliding-type weather stripping, mortised into door, at perimeter of doors and breakaway sidelites.
2. Provide compression-type weather stripping at fixed stops of exterior doors. At locations without fixed stops, provide sliding-type weather stripping retained in adjustable strip mortised into door edge.
3. Provide weather sweeps mounted to underside of door bottoms of exterior doors.
4. Provide finger guards at each pivoted entrance door that has clearance at hinge side greater than 1/4 inch and less than 3/4 inch with door in any position. Anchor guards to hinge-jamb frame.

G. Activation and Safety Devices:

1. General: Factory install devices in doors and headers as required by BHMA A156.10 for type of door and direction of travel.
2. Install photoelectric beams in vertical jambs of sidelites, with dimension above finished floor as follows:

    a. Top Beam: 48 inches.
    b. Bottom Beam: 24 inches.

3. Install photoelectric beams in sides of guide rails, with dimension above finished floor not less than 24 inches.

2.4 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

1. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
2. Sheet and Plate: ASTM B 209.

B. Steel Reinforcement: With manufacturer's standard corrosion-resistant primer complying with SSPC-PS Guide No. 12.00 applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.

1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

C. Glazing: As specified in Section 088000 - EXTERIOR GLAZING.

D. Sealants and Joint Fillers: As specified in Section 079200 - JOINT SEALANTS.

E. Nonmetallic, Shrinkage-Resistant Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout; complying with ASTM C 1107; of consistency suitable for application.

F. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements, except containing no asbestos; formulated for 30-mil thickness per coat.

G. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

2.5 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Apply organic and anodic finishes to formed metal after fabrication unless otherwise indicated.

D. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.6 ALUMINUM FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

C. High-Performance Organic Finish (3-Coat Fluoropolymer): AA-C12C40R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: conversion coating; Organic Coating: manufacturer's standard 3-coat, thermocured system consisting of specially formulated inhibitive primer, fluoropolymer color coat, and clear fluoropolymer topcoat, with both color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2605 and with coating and resin manufacturers' written instructions.

1. Color and Gloss: As selected by Engineer from manufacturer's full range. Matching existing

D. High-Performance Organic Finish (2-Coat Fluoropolymer): AA-C12C40R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: conversion coating; Organic Coating: manufacturer's standard 2-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color coat, with color coat containing not less than 70 percent polyvinylidene fluoride resin by weight). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2605 and with coating and resin manufacturers' written instructions.

1. Color and Gloss: As selected by Engineer from manufacturer's full range. Matching existing

E. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances, header support, and other conditions affecting performance of automatic entrances.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Do not install damaged components. Fit frame joints to produce hairline joints free of burrs and distortion. Rigidly secure nonmovement joints. Seal joints watertight.

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.
2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

B. Entrances: Install automatic entrances plumb and true in alignment with established lines and grades without warp or rack of framing members and doors. Anchor securely in place.

1. Install surface-mounted hardware using concealed fasteners to greatest extent possible.
2. Set headers, carrier assemblies, tracks, operating brackets, and guides level and true to location with anchorage for permanent support.
3. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within system to exterior.
4. Level recesses for recessed thresholds using nonshrink grout.
5. Provide thresholds at exterior doors.

C. Door Operators: Connect door operators to electrical power distribution system as specified in Division 26 - ELECTRICAL.

D. Access-Control Devices: Connect access-control devices to access-control system as specified in Division 28 Sections.

E. Activation and Safety Devices: Install and adjust devices to provide detection field and functions indicated.

F. Glazing: Install glazing as specified in Section 088000 - EXTERIOR GLAZING.

G. Sealants: Comply with requirements specified in Section 079200 - JOINT SEALANTS to provide weathertight installation.

1. Set thresholds, bottom-guide track system, framing members and flashings in full sealant bed.
2. Seal perimeter of framing members with sealant.

H. Wiring within Automatic Entrance Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's written limitations on bending radii. Provide and use lacing bars and distribution spools.

3.3 ADJUSTING

A. Adjust door operators, controls, and hardware for smooth and safe operation and for weathertight closure; comply with requirements in BHMA A156.10.

B. Lubricate operating hardware and other moving parts as recommended by manufacturer.

C. Readjust door operators and controls after repeated operation of completed installation equivalent to 3 days' use by normal traffic (100 to 300 cycles). Lubricate hardware, operating equipment, and other moving parts.

D. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.4 CLEANING AND PROTECTION

A. Clean glass and metal surfaces promptly after installation. Remove excess glazing and sealant compounds, dirt, and other substances. Repair damaged finish to match original finish.

1. Comply with requirements in Section 088000 - EXTERIOR GLAZING for cleaning and maintaining glass.

3.5 DEMONSTRATION

A. Engage a certified inspector to train Authority's maintenance personnel to adjust, operate, and maintain automatic entrances.

END OF SECTION

SECTION 084113

ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Glazed aluminum-framed storefront systems and accessories.
2. Automatic-Sliding aluminum doors and hardware.
3. Glass and glazing for the work of this Section, as specified in Section 088000 - GLAZING.

B. Alternates: Not Applicable.

C. Items To Be Installed Only: Install the following items as furnished by the designated Sections:

1. Section 087100 - DOOR HARDWARE:
   a. Lock cylinders.

D. Items To Be Furnished Only: Not Applicable.

E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 079200 - JOINT SEALANTS for perimeter joint sealants.
2. Section 084413 - GLAZED ALUMINUM CURTAIN WALLS for curtain-wall systems that mechanically retain glazing on four sides.
3. Section 087100 - DOOR HARDWARE for lock cylinders and keying.
4. Section 260001 - ELECTRICAL WORK for conduits and junction boxes within frames for access control devices.

F. Related Requirements: Refer to the following Sections for technical requirements relating to Work of this Section:

1. Section 079200 - JOINT SEALANTS for sealant requirements to the extent not specified in this Section.
2. Section 088000 - GLAZING for glazing requirements to the extent not specified in this Section.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design entrance and storefront system, including comprehensive engineering analysis by a qualified professional engineer licensed in the Commonwealth of Massachusetts, using performance requirements and design criteria indicated.

B. General: Provide aluminum-framed systems, including anchorage, capable of withstanding, without failure, the effects of the following:

1. Structural loads.
2. Thermal movements.
3. Dimensional tolerances of building frame and other adjacent construction.
4. Failure includes the following:

a. Deflection exceeding specified limits.
b. Thermal stresses transferred to building structure.
c. Framing members transferring stresses, including those caused by thermal and structural movements, to glazing.
d. Noise or vibration created by wind, thermal and structural movements.
e. Loosening or weakening of fasteners, attachments, and other components.
f. Sealant failure.
g. Failure of operating units to function properly.

C. Structural Loads: Wind and seismic loads as indicated on the Structural Drawings, but not less than that required by Code.

D. Interstory Drift: Accommodate design displacement of adjacent stories indicated.

1. Design Displacement: As indicated on Drawings.
2. Test Performance: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.4 at design displacement [and 1.5 times the design displacement].

E. Seismic Performance: Provide aluminum-framed entrances and storefronts, and components capable of withstanding the effects of earthquake motions determined according to Code.

1. Seismic Drift Causing Glass Fallout: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.6 at design displacement [and 1.5 times the design displacement].
2. Vertical Interstory Movement: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.7 at design displacement [and 1.5 times the design displacement].

F. Deflection of Framing Members:

1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches (and to 1/240 of clear span plus 1/4 inch for spans greater than 13 feet 6 inches or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8 inch, whichever is smaller, amount not exceeding that which reduces glazing bite to less than

75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components directly below to less than 1/8 inch and clearance between members and operable units directly below to less than 1/16 inch.

G. Thermal Movements: Provide aluminum-framed systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 degrees F, ambient; 180 degrees F, material surfaces.

H. Air Infiltration Test: Test unit in accordance with ASTM E 283, as follows:

1. Static Air Pressure Difference: 6.24 psf for fixed storefront units, and 1.567 psf for doors.
2. Performance: Maximum air leakage shall not exceed the following: fixed storefront units, 1.0 cfm/sf.: glazed entrance door units, 0.3 cfm/sf of other areas.

I. Water Leakage Test: Test fixed framing system in accordance with ASTM E 331.

1. Test Pressure: 8 psf.
2. Performance: No leakage as defined in test method at specified test pressure. No uncontrolled water penetrating system or appearing on normally exposed interior surfaces.

J. Solar Heat-Gain Coefficient: Provide units with a whole-unit SHGC maximum as required by Code, determined according to NFRC 200 procedures. Submit proof of compliance with submittals as specified.

K. Thermal Transmittance: Provide window units that have a U-value as required by Code rated in BTU/hour/sq. ft./degrees F at 15-mph exterior wind velocity, when tested in accordance with AAMA 1503.1. Test unit to be 4 ft. x 6 ft. Submit proof of compliance with submittals as specified.

L. Condensation Resistance: Provide aluminum-framed systems with fixed glazing and framing areas having condensation-resistance factor (CRF) of not less than 45 for fixed storefront units and not less than 48 for doors when tested according to AAMA 1503.

1.4 SUBMITTALS

A. LEED Submittals: ((Designer to insert requirements based on the LEED credits targeted.))

B. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of product indicated.

C. Shop Drawings: For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work.

1. Include structural analysis data signed and sealed by the qualified professional engineer registered in the Commonwealth of Massachusetts responsible for their preparation.

2. Include structural analysis of story drift and deflection from anticipated live loads, and determination whether head receptors are required.
3. Include details of provisions for system expansion and contraction and for draining moisture occurring within the system to the exterior.
4. For entrances, include hardware schedule and indicate operating hardware types, functions, quantities, and locations.
5. All costs for professional engineering shall be included in the bid price for the Work of this Section.

D. Delegated-Design Submittal: For entrance and storefront systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer licensed in the Commonwealth of Massachusetts responsible for their preparation.

E. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

F. Qualification Data: For Installer.

G. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for aluminum-framed systems.

H. Performance Reports: Based on systems, components and glazing methods proposed for use on this Project, proof that units as glazed for this Project meet or exceed Code requirements for the following:

1. U-value.
2. Solar heat-gain coefficient.

I. Maintenance Data: For aluminum-framed systems to include in maintenance manuals.

J. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

A. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer licensed in the Commonwealth of Massachusetts.

B. Professional Engineer Qualifications: A professional engineer licensed in the Commonwealth of Massachusetts and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of entrance and storefront systems that are similar to those indicated for this Project in material, design, and extent.

C. Installer Qualifications: Capable of assuming engineering responsibility and performing work of this Section and who is acceptable to manufacturer.

1. Engineering Responsibility: Preparation of data for aluminum-framed systems including Shop Drawings based on testing and engineering analysis of manufacturer's standard

units in assemblies similar to those indicated for this Project and submission of reports of tests performed on manufacturer's standard assemblies.

D. Accessible Entrances: Comply with Massachusetts Architectural Access Board and the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)."

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of structural supports for aluminum-framed systems by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating aluminum-framed systems without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed entrances and storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including, but not limited to, excessive deflection.
b. Noise or vibration created by wind and thermal and structural movements.
c. Deterioration of metals and other materials beyond normal weathering.
d. Water penetration through fixed glazing and framing areas.
e. Failure of operating components.

2. Warranty Period: 10 years from the date of Certificate of Agency Use and Occupancy. Guarantees or warranties that start at the date of shipment from the factory, or from the completion date of an individual portion of the project, are not acceptable.

B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes fail within specified warranty period. Warranty does not include normal weathering.

1. Warranty Period: 10 years from the date of Certificate of Agency Use and Occupancy. Guarantees or warranties that start at the date of shipment from the factory, or from the completion date of an individual portion of the project, are not acceptable.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. EFCO, a Pella Company
2. Kawneer North America
3. Oldcastle BuildingEnvelope
4. United States Aluminum
5. United States Aluminum

2.2 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

1. Sheet and Plate: ASTM B 209.
2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
3. Extruded Structural Pipe and Tubes: ASTM B 429.
4. Structural Profiles: ASTM B 308/B 308M.
5. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.

B. Steel Reinforcement: With manufacturer's standard corrosion-resistant primer complying with SSPC-PS Guide No. 12.00 applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.

1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.3 FRAMING SYSTEMS

A. Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Construction: Thermal-break.

B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration, use self-locking devices.

2. Reinforce members as required to receive fastener threads.
3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.

D. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.

E. Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials. Form exposed flashing from sheet aluminum finished to match framing and of sufficient thickness to maintain a flat appearance without visible deflection.

F. Framing System Gaskets and Sealants: Manufacturer's standard recommended by manufacturer for joint type.

2.4 GLAZING SYSTEMS

A. Glazing: Provide insulating-glass units in accordance with requirements in Section 088000 - GLAZING.

B. Glazing Gaskets: Manufacturer's standard compression types, replaceable, molded or extruded, that maintain uniform pressure and watertight seal.

C. Spacers and Setting Blocks: Manufacturer's standard elastomeric types.

2.5 DOORS

A. Doors: Manufacturer's standard glazed doors, for sliding operation.

1. Door Construction: Mechanical clip fastening, SIGMA deep penetration plus welds and 1-1/8 inch long fillet welds inside and outside of all four corners. Glazing stops shall be hook-in type and EPDM glazing gaskets reinforced with non-stretchable cord.

2.6 DOOR HARDWARE

A. Hardware Sets:

1. Opening-Force Requirements:

a. Egress Doors: Not more than 30 lbf required to set door in motion and not more than 15 lbf required to open door to minimum required width.
b. Accessible Interior Doors: Not more than 5 lbf.

B. Locking Devices, General: Do not require use of key, tool, or special knowledge for operation.

1. Opening-Force Requirements:

a. Delayed-Egress Locks: Lock releases within 15 seconds after applying a force of not more than 15 lbf for not more than 3 seconds.

b. Latches and Exit Devices: Not more than 15 lbf required to release latch.

C. Mortise Auxiliary Locks: BHMA A156.5, Grade 1.

D. Panic Exit Devices: Listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.

1. Standard: BHMA A156.3, Grade 1.

E. Cylinders: As specified in Section 087100 - DOOR HARDWARE.

F. Strikes: Provide strike with black-plastic dust box for each latch or lock bolt; fabricated for aluminum framing.

G. Operating Trim: BHMA A156.6.

H. Closers: With accessories required for a complete installation, sized as required by door size, exposure to weather, and anticipated frequency of use, and adjustable to meet field conditions and requirements for opening force.

1. Standard: BHMA A156.4, Grade 1.

I. Concealed Overhead Holders: BHMA A156.8, Grade 1.

J. Surface-Mounted Holders: BHMA A156.16, Grade 1.

K. Door Stops: BHMA A156.16, Grade 1, floor or wall mounted, as appropriate for door location indicated, with integral rubber bumper.

L. Weather Stripping: Manufacturer's standard replaceable components.

1. Compression Type: Made of ASTM D 2000, molded neoprene, or ASTM D 2287, molded PVC.

M. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.

N. Silencers: BHMA A156.16, Grade 1.

O. Thresholds: Raised thresholds beveled with a slope of not more than 1:2, with maximum height of 1/2 inch.

1. Standard: BHMA A156.21.

P. Finger Guards: Manufacturer's standard collapsible neoprene or PVC gasket anchored to frame hinge-jamb at center-pivoted doors.

2.7 ACCESSORY MATERIALS

A. Insulating Materials: As specified in Section 072100 - THERMAL INSULATION.

B. Bituminous Paint (Isolation Coating): Cold-applied asphalt-mastic paint complying with ASTM D 1187 requirements containing no asbestos, formulated for 30-mil thickness per coat.

2.8 FABRICATION

A. Form aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Means to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.
4. Physical and thermal isolation of glazing from framing members.
5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing (without projecting stops).

E. Door Frames: Reinforce as required to support loads imposed by door operation and for installing hardware.

1. At exterior doors, provide compression weather stripping at fixed stops.
2. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.

F. Doors: Reinforce doors as required for installing hardware.

1. At pairs of exterior doors, provide sliding weather stripping retained in adjustable strip mortised into door edge.
2. At exterior doors, provide weather sweeps applied to door bottoms.

G. Hardware Installation: Factory install hardware to the greatest extent possible. Cut, drill, and tap for factory-installed hardware before applying finishes.

H. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.9 ALUMINUM FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. High-Performance Organic Finish (3-Coat Fluoropolymer): AA-C12C40R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: conversion coating; Organic Coating: manufacturer's standard 3-coat, thermocured system consisting of specially formulated inhibitive primer, fluoropolymer color coat, and clear fluoropolymer topcoat, with both color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2605 and with coating and resin manufacturers' written instructions.

1. Color and Gloss: Matching Existing

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General:

1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure nonmovement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
6. Seal joints watertight, unless otherwise indicated.

B. Metal Protection:

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape or installing nonconductive spacers as recommended by manufacturer for this purpose.
2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components necessary to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.

D. Set continuous sill members and flashing in full sealant bed as specified in Section 079200 - JOINT SEALANTS and to produce weathertight installation.

E. Install components plumb and true in alignment with established lines and grades, without warp or rack.

F. Install glazing as specified in Section 088000 - GLAZING.

1. Structural-Sealant Glazing:

a. Prepare surfaces that will contact structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.
b. Install weatherseal sealant according to Section 079200 - JOINT SEALANTS and according to sealant manufacturer's written instructions to produce weatherproof joints. Install joint filler behind sealant as recommended by sealant manufacturer.

G. Entrances: Install to produce smooth operation and tight fit at contact points.

1. Exterior Entrances: Install to produce tight fit at weather stripping and weathertight closure.
2. Field-Installed Hardware: Install surface-mounted hardware according to hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

H. Erection Tolerances: Install aluminum-framed systems to comply with the following maximum tolerances:

1. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet; 1/4 inch over total length.
2. Alignment:

a. Where surfaces abut in line, limit offset from true alignment to 1/16 inch.
b. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch.

3. Diagonal Measurements: Limit difference between diagonal measurement to 1/8 inch.

3.3 FIELD QUALITY CONTROL

A. Independent Testing Agency: Cooperate with the Independent Testing Agency engaged by WRTA for field quality control activities for the Work of this Section.

B. Commissioning Authority: Cooperate with the Commissioning Authority engaged by WRTA for field quality control activities for the Work of this Section.

C. Cooperate with field quality control personnel. Allow inspectors access to scaffolding and work areas, as needed to perform inspections.

D. Additional inspections and retesting of materials which fail to comply with specified material and installation requirements shall be performed at Contractor's expense.

E. Testing Services: Testing and inspecting of representative areas to determine compliance of installed systems with specified requirements shall take place as follows and in successive stages as indicated on Drawings. Do not proceed with installation of the next area until test results for previously completed areas show compliance with requirements.

1. Air Infiltration: Areas shall be tested for air leakage of 1.5 times the rate specified for laboratory testing under Part 1 "Performance Requirements" Article, but not more than 0.09 cfm/sq. ft. of fixed wall area when tested according to ASTM E 783 at a minimum static-air-pressure difference of 6.24 lbf/sq. ft.
2. Water Penetration: Areas shall be tested according to ASTM E 1105 at a minimum cyclic static-air-pressure difference of 0.67 times the static-air-pressure difference specified for laboratory testing under Part 1 "Performance Requirements" Article, but not less than 4.18 lbf/sq. ft., and shall not evidence water penetration.
3. Water Spray Test: Before installation of interior finishes has begun, a minimum area of 75 feet by 1 story of aluminum-framed systems designated by Designer shall be tested according to AAMA 501.2 and shall not evidence water penetration.

F. Repair or remove work where test results and inspections indicate that it does not comply with specified requirements.

3.4 ADJUSTING

A. Entrances: Adjust operating hardware for smooth operation according to hardware manufacturers' written instructions.

1. For doors accessible to people with disabilities, adjust closers to provide a 3-second closer sweep period for doors to move from a 70-degree open position to 3 inches from the latch measured to the leading door edge.

END OF SECTION

SECTION 085113

ALUMINUM WINDOWS

(Part of Work of Section 080001 - METAL WINDOWS, Filed Sub-Bid Required)

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Fixed and operable aluminum-framed windows with factory-installed glass and glazing.

B. Alternates: Not Applicable.

C. Items To Be Installed Only: Not Applicable.

D. Items To Be Furnished Only: Not Applicable.

E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 079200 - JOINT SEALANTS for joint sealants from window frames to adjacent building surfaces.
2. Section 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS
3. Section 084413 - GLAZED CURTAIN WALLS.

1.3 PERFORMANCE REQUIREMENTS

A. General: Provide aluminum windows capable of complying with performance requirements indicated, based on testing manufacturer's windows that are representative of those specified and that are of test size indicated below:

1. Minimum size required by AAMA/NWWDA/CSA 101/I.S.2/A440.

B. AAMA/NWWDA Performance Requirements: Provide aluminum windows of the performance class and grade indicated that comply with AAMA/NWWDA/CSA 101/I.S.2/A440.

1. Performance Class: Architectural Grade AW.

2. Performance Grade: Minimum for performance class indicated.
3. Exception to AAMA/NWWDA/CSA 101/I.S.2/A440: In addition to requirements for performance class and performance grade, design glass framing system to limit lateral deflections of glass edges to less than 1/175 of glass-edge length or 3/4 inch whichever is less, at design pressure based on the following:

C. Structural Performance: Provide aluminum windows capable of withstanding the following, including wind loads based on passing AAMA/NWWDA/CSA 101/I.S.2/A440, Uniform Load Structural Test, at basic wind speed indicated and as required by Code:

1. Deflection: Design glass framing system to limit lateral deflections of glass edges to less than 1/175 of glass-edge length or 3/4 inch, whichever is less, at design pressure based on structural computations.
2. Wind Loads: As indicated on the Structural Drawings, but not less than that required by Code.
3. Seismic Loads: Provide aluminum windows and components capable of withstanding the effects of earthquake motions determined according to Code.

    a. Component Importance Factor: 1.0 [1.5].

4. Movements of supporting structure including, but not limited to, story drift and deflection from uniformly distributed and concentrated live loads as required by Code. Deflection may require special considerations including but not limited to head receptors.

D. Air Infiltration: Maximum rate not more than indicated when tested according to AAMA/NWWDA/CSA 101/I.S.2/A440, Air Infiltration Test.

1. Maximum Rate: As required by Code.

E. Water Resistance: No water leakage as defined in AAMA/NWWDA/CSA referenced test methods at a water test pressure equaling that indicated, when tested according to AAMA/NWWDA/CSA 101/I.S.2/A440, Water Resistance Test.

1. Test Pressure: 20 percent of positive design pressure, but not less than 2.86 lbf/sq. ft. or more than 12 lbf/sq. ft.

F. Condensation-Resistance Factor: Provide aluminum windows tested for thermal performance according to AAMA 1503, showing a CRF of 52 where windows are indicated to be "thermally improved."

G. Thermal Transmittance: Provide aluminum windows with a whole-window U-value maximum indicated at 15-mph exterior wind velocity and winter condition temperatures when tested according to AAMA 1503.

1. U-Value: As required by Code. Submit proof of compliance with submittals as specified.

H. Solar Heat-Gain Coefficient: Provide aluminum windows with a whole-window SHGC maximum as required by Code, determined according to NFRC 200 procedures. Submit proof of compliance with submittals as specified.

I. Thermal Movements: Provide aluminum windows, including anchorage, that accommodate thermal movements of units resulting from the following maximum change (range) in ambient and surface temperatures without buckling, distortion, opening of joints, failure of joint sealants, damaging loads and stresses on glazing and connections, and other detrimental effects. Base engineering calculation on actual surface temperatures of materials due to solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 degrees F, ambient; 180 degrees F material surfaces.

1.4 SUBMITTALS

A. LEED Submittals: ((Designer to insert requirements based on the LEED credits targeted.))

B. Product Data: Include construction details, material descriptions, fabrication methods, dimensions of individual components and profiles, hardware, finishes, and operating instructions for each type of aluminum window indicated.

C. Shop Drawings: Include plans, elevations, sections, details, hardware, attachments to other Work, operational clearances, and the following:

1. Mullion details, including reinforcement and stiffeners.
2. Joinery details.
3. Expansion provisions.
4. Flashing and drainage details.
5. Weather-stripping details.
6. Thermal-break details.
7. Glazing details.
8. Window cleaning provisions.
9. Window System Operators: Show locations, mounting, and details for installing operator components and controls.
10. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer licensed in the Commonwealth of Massachusetts and responsible for their preparation and used to determine the following:
    a. Structural test pressures and design pressures from basic wind speeds indicated.
    b. Deflection limitations of glass framing systems.
11. All costs for professional engineering shall be included in the bid price for the Work of this Section.

D. Samples for Verification: Full-size operable window of each type of window.

E. Qualification Data: For Installer, professional engineer and testing agency.

F. Field Quality-Control Test Reports: From a qualified testing and inspecting agency engaged by Contractor.

G. Product Test Reports: Based on evaluation of comprehensive tests performed within the last four years by a qualified testing agency, for each type, grade, and size of aluminum window. Test results based on use of downsized test units will not be accepted.

H. Performance Reports: Based on systems, components and glazing methods proposed for use on this Project, proof that windows as glazed for this Project meet or exceed Code requirements for the following:

1. U-value.
2. Solar heat-gain coefficient.

I. Maintenance Data: For operable window sash, operating hardware, weather stripping, and finishes to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An installer acceptable to aluminum window manufacturer for installation of units required for this Project.

B. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer licensed in the Commonwealth of Massachusetts.

C. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the Commonwealth of Massachusetts and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of windows that are similar to those indicated for this Project in material, design, and extent.

D. Source Limitations: Obtain aluminum windows through one source from a single manufacturer.

E. Product Options: Information on Drawings and in Specifications establishes requirements for aluminum windows' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.

F. Fenestration Standard: Comply with AAMA/NWWDA/CSA 101/I.S.2/A440, "Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors," for minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.

1. Provide AAMA certified aluminum windows with an attached label.

G. Glazing Publications: Comply with published recommendations of glass manufacturers and GANA's "Glazing Manual" unless more stringent requirements are indicated.

H. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects, performance to specification criteria, and set quality standards for materials and execution.

1. Build mockup for types of windows indicated, in locations shown on Drawings.

I. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01. Review methods and procedures related to aluminum windows including, but not limited to, the following:

1. Inspect and discuss condition of substrate and other preparatory work performed by other trades.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review required testing and inspecting procedures.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify aluminum window openings by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating aluminum windows without field measurements. Coordinate wall construction to ensure that actual opening dimensions correspond to established dimensions.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace aluminum windows that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:

1. Failure to meet performance requirements.
2. Structural failures including excessive deflection.
3. Water leakage, air infiltration, or condensation.
4. Faulty operation of movable sash and hardware.
5. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
6. Insulting glass failure.

B. Warranty Period: Ten years from the date of Certificate of Agency Use and Occupancy. Guarantees or warranties that start at the date of shipment from the factory, or from the completion date of an individual portion of the project, are not acceptable.

C. Warranty Period for Metal Finishes: Ten years from the date of Certificate of Agency Use and Occupancy. Guarantees or warranties that start at the date of shipment from the factory, or from the completion date of an individual portion of the project, are not acceptable.

D. Warranty Period for Glass: Ten years from the date of Certificate of Agency Use and Occupancy. Guarantees or warranties that start at the date of shipment from the factory, or from the completion date of an individual portion of the project, are not acceptable.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Aluminum Windows:

a. Architectural Window Manufacturing Corporation.
b. Custom Window Company.
c. EFCO, a Pella Company.
d. Graham Architectural Products Corp.
e. Kawneer North America.
f. Mannix; a Division of Interstate Window Corp.
g. Peerless Products, Inc.
h. Wausau.
i. Or equal.

2.2 MATERIALS

A. Aluminum Extrusions: Alloy and temper recommended by aluminum window manufacturer for strength, corrosion resistance, and application of required finish, but not less than 22,000-psi (150-MPa) ultimate tensile strength, not less than 16,000-psi (110-MPa) minimum yield strength, and not less than 0.062-inch (1.6-mm) thickness at any location for the main frame and sash members.

B. Fasteners: Aluminum, nonmagnetic stainless steel, epoxy adhesive, or other materials warranted by manufacturer to be noncorrosive and compatible with aluminum window members, trim, hardware, anchors, and other components.

1. Reinforcement: Where fasteners screw anchor into aluminum less than 0.125 inch (3.2 mm) thick, reinforce interior with aluminum or nonmagnetic stainless steel to receive screw threads, or provide standard, noncorrosive, pressed-in, splined grommet nuts.
2. Exposed Fasteners: Unless unavoidable for applying hardware, do not use exposed fasteners. For application of hardware, use fasteners that match finish of member or hardware being fastened, as appropriate.

C. Anchors, Clips, and Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.

D. Reinforcing Members: Aluminum, nonmagnetic stainless steel, or nickel/chrome-plated steel complying with ASTM B 456 for Type SC 3 severe service conditions, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.

E. Compression-Type Weather Stripping, typical: Provide compressible weather stripping designed for permanently resilient sealing under bumper or wiper action and for complete concealment when aluminum window is closed.

F. Sliding-Type Weather Stripping for Double-Hung and Horizontal-Sliding Windows: Provide woven-pile weather stripping of wool, polypropylene, or nylon pile and resin-impregnated backing fabric. Comply with AAMA 701/702.

1. Weather Seals: Provide weather stripping with integral barrier fin or fins of semirigid, polypropylene sheet or polypropylene-coated material. Comply with AAMA 701/702.

G. Replaceable Weather Seals: Comply with AAMA 701/702.

H. Sealant: For sealants required within fabricated windows, provide window manufacturer's standard, permanently elastic, nonshrinking, and nonmigrating type recommended by sealant manufacturer for joint size and movement.

2.3 GLAZING

A. Insulating-Glass Units for Vertical Glazing: 1 inch thick insulating glass consisting of two lites of 1/4 inch glass, low e coating on the No. 2 surface and argon gas filled. Provide one of the following or equal:

1. VE1-2M by Viracon.
   a. Visible Light Transmittance: 70 percent.
   b. Reflectance Visible Light: 11 percent.
   c. U Value (Winter): 0.25.
   d. Shading Coefficient: 0.43.
   e. Solar Heat Gain Coefficient: 0.37.
2. Solarban 60 by PPG Industries.
   a. Visible Light Transmittance: 70 percent.
   b. Reflectance Visible Light: 11 percent.
   c. U Value (Winter): 0.29.
   d. Shading Coefficient: 0.44.
   e. Solar Heat Gain Coefficient: 0.38.
3. SN-68 by Guardian Industries.
   a. Visible Light Transmittance: 68 percent.
   b. Reflectance Visible Light: 10 percent.
   c. U Value (Winter): 0.29.
   d. Shading Coefficient: 0.43.
   e. Solar Heat Gain Coefficient: 0.37.

B. Matching: To the greatest extent practical, glass on the exterior of the building shall match. Coordinate with mock-ups and specified requirements.

C. Glazing System: Manufacturer's standard factory-glazing system that produces weathertight seal.

2.4 HARDWARE

A. Hardware Requirements: Based on project requirements. Provide hardware that complies with AAMA/NWWDA/CSA 101/I.S.2/A440. Finish as selected by Designer from manufacturer's full range.

2.5 INSECT SCREENS

A. General: Design windows and hardware to accommodate screens in a tight-fitting, removable arrangement, with a minimum of exposed fasteners and latches. Provide for each operable exterior sash or ventilator.

B. Aluminum Insect Screen Frames: Manufacturer's standard aluminum alloy complying with SMA 1004. Fabricate frames with mitered or coped joints, concealed fasteners, and removable PVC spline/anchor concealing edge of frame.

1. Aluminum Tubular Framing Sections and Cross Braces: Roll formed from aluminum sheet with minimum wall thickness as required for class indicated.
2. Finish: Match aluminum window members.

C. Stainless-Steel Wire Fabric: 18-by-16 mesh of 0.009-inch-diameter, nonmagnetic stainless-steel wire, Type 304 or 316, complying with FS RR-W-365, Type VI.

D. Wickets: Not permitted.

2.6 ACCESSORIES

A. Window Cleaner Anchor Bolts: Provide window cleaner anchor bolts of standard design, complying with requirements of authorities having jurisdiction. Fabricate bolts of nonmagnetic stainless steel.

1. Reinforce window units or mullions to receive bolts and provide additional anchorage of units at bolt locations.

2.7 FABRICATION

A. General: Fabricate aluminum windows, in sizes indicated, that comply with AAMA/NWWDA/CSA 101/I.S.2/A440 for performance class and performance grade indicated. Include a complete system for assembling components and anchoring windows.

B. Thermally Improved Construction: Fabricate aluminum windows with an integral, concealed, low-conductance thermal barrier; located between exterior materials and window members exposed on interior side; in a manner that eliminates direct metal-to-metal contact.

C. Weather Stripping: Provide full-perimeter weather stripping for each operable sash and ventilator.

D. Weep Holes: Provide concealed weep holes and internal passages to conduct infiltrating water to exterior.

E. Mullions: Provide mullions and cover plates as shown, matching window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections, as indicated. Provide mullions and cover plates capable of withstanding design loads of window units.

F. Factory-Glazed Fabrication: Glaze aluminum windows in the factory where practical and possible for applications indicated. Comply with AAMA/NWWDA/CSA 101/I.S.2/A440.

2.8 FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. High-Performance Organic Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1. Fluoropolymer Three-Coat System: Manufacturer's standard three-coat, thermocured system consisting of specially formulated inhibitive primer, fluoropolymer color coat, and clear fluoropolymer topcoat, with both color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2605.
   a. Color and Gloss: As selected by Designer from manufacturer's full range, including metallics.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances; rough opening dimensions; levelness of sill plate; coordination with wall flashings, vapor retarders, and other built-in components; operational clearances; and other conditions affecting performance of work.

1. Masonry Surfaces: Visibly dry and free of excess mortar, sand, and other construction debris.
2. Metal Surfaces: Dry; clean; free of grease, oil, dirt, rust, corrosion, and welding slag; without sharp edges or offsets at joints.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components; Drawings; and Shop Drawings.

B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction.

C. Set sill members in bed of sealant or with gaskets, as indicated, for weathertight construction.

D. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.

E. Metal Protection: Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials by complying with requirements specified in "Dissimilar Materials" Paragraph in Appendix B in AAMA/NWWDA/CSA 101/I.S.2/A440.

3.3 FIELD QUALITY CONTROL

A. Independent Testing Agency: Cooperate with the Independent Testing Agency engaged by DCAMM for field quality control activities for the Work of this Section. Refer also to Section 014325 - TESTING AGENCY SERVICES.

B. Commissioning Authority: Cooperate with the Commissioning Authority engaged by DCAMM for field quality control activities for the Work of this Section. Refer also to Section 019115 - FACILITY EXTERIOR ENCLOSURE COMMISSIONING.

C. Cooperate with field quality control personnel. Allow inspectors access to scaffolding and work areas, as needed to perform inspections.

D. Additional inspections and retesting of materials which fail to comply with specified material and installation requirements shall be performed at Contractor's expense.

E. Testing Services: Testing and inspecting of installed windows shall take place as follows:

1. Testing Methodology: Testing of windows for air infiltration and water resistance shall be performed according to AAMA 502, Test Method A, by applying same test pressures required to determine compliance with AAMA/NWWDA/CSA 101/I.S.2/A440 in Part 1 "Performance Requirements" Article.
2. Testing Extent: Three windows as selected by Designer and a qualified independent testing and inspecting agency. Windows shall be tested immediately after installation.
3. Test Reports: Shall be prepared according to AAMA 502.

F. Remove and replace windows where test results indicate that they do not comply with specified requirements.

3.4 ADJUSTING

A. Adjust operating sashes and ventilators, screens, hardware, operators, and accessories for a tight fit at contact points and weather stripping for smooth operation and weathertight closure. Lubricate hardware and moving parts.

3.5 PROTECTION AND CLEANING

A. Protect window surfaces from contact with contaminating substances resulting from construction operations. In addition, monitor window surfaces adjacent to and below exterior concrete and masonry surfaces during construction for presence of dirt, scum, alkaline deposits, stains, or other contaminants. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written recommendations.

B. Clean aluminum surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.

C. Clean factory-glazed glass immediately after installing windows. Comply with manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels and clean surfaces.

D. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

END OF SECTION

SECTION 085653

SECURITY WINDOWS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Interior and Exterior Bullet Resisting Transaction Windows.

B. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 085113 – Aluminum Windows

1.3 SUBMITTALS

A. Product Data: For each type of window.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Show locations of cutouts for compartment-mounted toilet accessories.

C. Samples for Verification: For each exposed finish

D. Product Test Reports: Indicating compliance with requirements

E. Warranty: Sample of finish warranty

1.4 DELIVERY, STORAGE AND HANDLING

A. Pack window units in manufacturer's standard shipping containers and protective packaging. Deliver units in manufacturer's original packaging and unopened containers with identification labels intact.

B. Store window units and accessories on raised blocks to prevent moisture damage protected from exposure to weather and vandalism

PART 2 - PRODUCTS

2.1 MANUFACTURED UNIT

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. QUICKSERV.

2. ARMORTEX.

3. COVENANT

B. Basis of Design: QUICKSERV QSP-713S Mini Combo

2.2 PERFORMANCE CRITERIA

A. System Design:

1. Design and size components to withstand dead loads and live loads caused by pressure and negative wind loads acting normal to plane of window as calculated in accordance with applicable code.

B. System Internal Drainage: Drain water entering joints, condensation occurring in glazing channels, and migrating moisture occurring within system, to exterior by weep drainage network.

C. Air and Vapor Seal: Maintain continuous air barrier and vapor retarder throughout assembly, primarily in line with [inside] pane of glass and heel bead of glazing compound. [Position thermal insulation on exterior surface of air barrier and vapor retarder

D. Ballistic Resistant: Level [**3**] in accordance with UL 752 – Testing for Ballistic Resistance for the complete assembly including framing, glazing, deal tray and base.

2.3 MATERIALS

A. Aluminum Extrusions: ASTM B221/B221M. Provide alloy and temper recommended by manufacturer for strength, corrosion resistance, and application of required finish, but not less than 22,000-psi (150-MPa) ultimate tensile strength and not less than 0.125 inch (3.2 mm) thick at any location for main frame and sash members.

B. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

C. Metallic-Coated Steel Sheet: 1. ASTM A653/A653M, CS (Commercial Steel), Type B; with G90 (Z275)zinc (galvanized) coating designation. 2. AMS5511, steel, corrosion-resistant, sheet, strip, and plate, 19Cr - 9.5Ni (304L), solution heat treated. 3. AMS5513, steel, corrosion-resistant, sheet, strip, and plate 19cr 9.2Ni (SAE 30304) solution heat treated.

D. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: 1. ASTM A666, austenitic stainless steel, Type 304, stretcher-leveled standard of flatness. 2. ASME SA-240/SA-240M, chromium and chromium-nickel stainless steel plate, sheet, and strip for general applications.

E. Concealed Bolts: ASTM A307, Grade A unless otherwise indicated.

F. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30-mil (0.76-mm) thickness per coat.

G. Sealants: For sealants required within fabricated security windows, provide type recommended by manufacturer for joint size and movement. Sealant shall remain permanently elastic, nonshrinking, and nonmigrating.

H. Gaskets: For gaskets required within fabricated security windows, provide type recommended by manufacturer for joint size and movement. Gaskets shall remain permanently elastic, nonshrinking, and nonmigrating.

2.4 WINDOW COMPONENTS

A. Comply with requirements of UL listing for ballistics-resistance levels as specified.

B. Bullet Resistant Glazing: Level [**3**] in accordance with UL 752

C. Anchors, Clips, and Window Accessories: Stainless steel; hot-dip, zinc-coated steel or iron, of sufficient strength to withstand design pressure indicated.

D. Transaction Drawers: includes transfer area, Level 1 Bullet Resistant in closed position

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify construction is ready to receive Products specified in this section.

B. Verify rough openings are correct size and in correct location

C. For glazing materials whose orientation is critical for performance, verify installation orientation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.

B. Protection: Where dissimilar metals will contact each other, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended in writing by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

3.3 ADJUSTING

A. Adjust horizontal-sliding, transaction security windows to provide a tight fit at contact points for smooth operation and a secure enclosure.

B. Adjust transaction drawers to provide a tight fit at contact points for smooth operation and [weathertight and] secure enclosure.

C. Remove and replace defective work, including security windows that are warped, bowed, or otherwise unacceptable

END OF SECTION

SECTION 087100

DOOR HARDWARE

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Commercial door hardware.
2. Cylinders for doors specified in other Sections as listed below.
3. Electrified door hardware and transformers.

B. Alternates: Not Applicable.

C. Items To Be Installed Only: Not Applicable.

D. Items To Be Furnished Only: Furnish the following items for installation by the designated Sections:

1. Section 083326 - OVERHEAD COILING GRILLES:
   a. Lock cylinders.
2. Section 083613 - SECTIONAL DOORS:
   a. Lock cylinders.
3. Section 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS:
   a. Lock cylinders.

E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 081113 - HOLLOW METAL DOORS AND FRAMES for astragals provided as part of a fire-rated labeled assembly and for door silencers provided as part of the frame.
2. Section 083326 - OVERHEAD COILING GRILLES for overhead coiling grille hardware, except cylinders.
3. Section 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS for entrance door hardware, except cylinders.
4. Section 260001 - ELECTRICAL WORK for power for electrified door hardware and interface with building control and security systems.

1.3 SUBMITTALS

A. Product Data: Include installation details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Details of electrified door hardware, indicating the following:

1. Wiring Diagrams: Detail wiring for power, signal, and control systems and differentiate between manufacturer-installed and field-installed wiring. Include the following:

a. System schematic.
b. Point-to-point wiring diagram.
c. Riser diagram.
d. Elevation of each door.

2. Detail interface between electrified door hardware and fire alarm access control and building control and security systems.

C. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening.

a. Organize door hardware sets in same order as in the Door Hardware Schedule at the end of Part 3.

3. Content: Include the following information:

a. Type, style, function, size, label, hand, and finish of each door hardware item.
b. Manufacturer of each item.
c. Fastenings and other pertinent information.
d. Location of each door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
e. Explanation of abbreviations, symbols, and codes contained in schedule.
f. Mounting locations for door hardware.
g. Door and frame sizes and materials.
h. Description of each electrified door hardware function, including location, sequence of operation, and interface with other building control systems.

1) Sequence of Operation: Include description of component functions that occur in the following situations: authorized person wants to enter; authorized person wants to exit; unauthorized person wants to enter; unauthorized person wants to exit. Reset time period for time delayed hardware.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

D. Keying Schedule: Prepared by or under the supervision of supplier, detailing the WRTA Project Manager's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations.

E. Product Certificates: Signed by manufacturers of electrified door hardware certifying that products furnished comply with requirements.

1. Certify that door hardware approved for use on types and sizes of labeled fire doors complies with listed fire door assemblies.

F. Qualification Data: For firms and persons specified in "Quality Assurance" Article.

1. Include lists of completed projects with project names and addresses of architects and owners, and other information specified.

G. Maintenance Data: For each type of door hardware to include in maintenance manuals specified in Division 01.

H. Warranties: Special warranties specified in this Section.

I. Fire Door Assembly Inspection and Testing Reports: Submit a written report of the results of functional testing and inspection for fire door assemblies, in compliance with NFPA 80-2007/2010 requirements. Written report shall be provided to the WRTA Project Manager to be made available to the Authority Having Jurisdiction (AHJ). Report shall include the door number for each fire door assembly, door location, door and frame material, fire rating, and summary of deficiencies..

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Supplier Qualifications: Door hardware supplier with warehousing facilities in Project's vicinity and who is or employs a qualified Architectural Hardware Consultant, available during the course of the Work to consult with Contractor, Designer, and the WRTA Project Manager about door hardware and keying.

1. Electrified Door Hardware Supplier Qualifications: An experienced door hardware supplier who has completed projects with electrified door hardware similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance, and who is acceptable to manufacturer of primary materials.

a. Engineering Responsibility: Prepare data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

2. Scheduling Responsibility: Preparation of door hardware and keying schedules.

C. Architectural Hardware Consultant Qualifications: A person who is currently certified by the Door and Hardware Institute as an Architectural Hardware Consultant and who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project.

1. Electrified Door Hardware Qualifications: Experienced in providing consulting services for electrified door hardware installations.

D. Source Limitations: Obtain each type and variety of door hardware from a single manufacturer, unless otherwise indicated.

1. Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated. Manufacturers that are listed to perform electrical modifications, by a testing and inspecting agency acceptable to authorities having jurisdiction, are acceptable.

E. Regulatory Requirements: Comply with provisions of the following:

1. Where indicated to comply with accessibility requirements, comply with Massachusetts Architectural Access Board and the Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," as follows:

a. Handles, Pulls, Latches, Locks, and other Operating Devices: Shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist.
b. Door Closers: Comply with the following maximum opening-force requirements indicated:

1) Interior Hinged Doors: 5 lbf applied perpendicular to door.
2) Sliding or Folding Doors: 5 lbf applied parallel to door at latch.
3) Fire Doors: Minimum opening force allowable by authorities having jurisdiction.

c. Thresholds: Not more than 1/2 inch high. Bevel raised thresholds with a slope of not more than 1:2.

2. Requirements of 521 CMR 20.8.1 and NFPA 101: Comply with the following for means of egress doors:

a. Latches, Locks, and Exit Devices: Not more than 15 lbf to release the latch. Locks shall not require the use of a key, tool, or special knowledge for operation.
b. Delayed-Egress Locks: Lock releases within 15 seconds after applying a force not more than 15 lbf for not more than 3 seconds.
c. Door Closers: Not more than 15 lbf to open door to minimum required width.
d. Thresholds: Not more than 1/2 inch high.

3. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

F. Fire-Rated Door Assemblies: Provide door hardware for assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing at positive pressure according to NFPA 252.

G. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meet requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.

1. Air Leakage Rate: Maximum air leakage of 0.3 cfm/sq. ft. at the tested pressure differential of 0.3-inch wg of water.

H. Keying Conference: Conduct conference at Project site to comply with requirements in Division 01. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including, but not limited to, the following:

1. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
2. Preliminary key system schematic diagram.
3. Requirements for key control system.
4. Address for delivery of keys.

I. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01. Review methods and procedures related to electrified door hardware including, but not limited to, the following:

1. Inspect and discuss electrical roughing-in and other preparatory work performed by other trades.
2. Review sequence of operation for each type of electrified door hardware.
3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review required testing, inspecting, and certifying procedures.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver keys to manufacturer of key control system.

1.6 COORDINATION

A. Coordinate layout and installation of recessed pivots and closers with floor construction. Cast anchoring inserts into concrete. Concrete, reinforcement, and formwork requirements are specified in Section 033000 - CAST-IN-PLACE CONCRETE.

B. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing door hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

C. Electrical System Roughing-in: Coordinate layout and installation of electrified door hardware with connections to power supplies, fire alarm system and detection devices, access control and building control system.

D. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.

1.7 WARRANTY

A. Special Warranty: Written warranty, executed by manufacturer agreeing to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of operators and door hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

B. Warranty Period: Three years from the date of Certificate of Agency Use and Occupancy. Guarantees or warranties that start at the date of shipment from the factory, or from the completion date of an individual portion of the project, are not acceptable.

C. Warranty Period for Manual Closers: Ten years from the date of Certificate of Agency Use and Occupancy. Guarantees or warranties that start at the date of shipment from the factory, or from the completion date of an individual portion of the project, are not acceptable.

1.8 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for the facility’s continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. Scheduled and acceptable manufacturers must provide all the functions and features of the specified product or it will not be approved.

Item	Scheduled Manufacturer	Acceptable Manufacturers
Hinges	Ives (IVE)	McKinney, Hager, Stanley
Continuous Hinges	Markar (MAR)	Stanley, Ives
Locksets & Deadlocks	Schlage (SCH)	Sargent, Best
Access Control Locks	Schlage (SCH)	User Standard
Cylinders & Keying	Schlage (SCH)	User Standard
Core	User Standard	
Exit Devices & Mullions	Von Duprin (VON)	Precision, Sargent
Door Closers & Auto-matic Operators	LCN (LCN)	Sargent
Push & Pull Plates & Bars	Ives (IVE)	Rockwood, Burns
Flush Bolts & Coordina-tors	Ives (IVE)	Rockwood, Burns
Protection Plates	Ives (IVE)	Rockwood, Burns
Stops & Holders	Ives (IVE)	Rockwood, Burns
Overhead Stops	Glynn-Johnson (GLY)	Sargent, Rixson
Silencers	Ives (IVE)	Rockwood, Burns
Thresholds & Weather-strip	National Guard (NGP)	Pemko, Reese

B. Hand of Door: Drawings show direction of slide, swing, or hand of each door leaf. Furnish each item of hardware for proper installation and operation of door movement as shown.

C. Where the hardware specified is not adaptable to the finished shape or size of the members requiring hardware, furnish suitable types having the same operation and quality as the type specified, subject to the Designer's approval.

2.2 MATERIALS

A. Fasteners:

1. Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation.
2. Furnish screws for installation with each hardware item. Finish exposed (exposed under any condition) screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work as closely as possible including "prepared for paint" surfaces to receive painted finish.
3. Provide concealed fasteners for hardware units that are exposed when door is closed except to the extent that no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is

exposed in other work unless their use is the only means of reinforcing the work adequately to fasten the hardware securely.

4. All hardware shall be installed with the fasteners provided by the hardware manufacturer.

B. Hinges:

1. The following is a guide for hinge type required for this specification:
   a. 1-3/4" thick doors up to and including 3'-0" wide:
      1) Exterior: standard weight, ball bearing, bronze/stainless steel, 4-1/2" high
      2) Interior: standard weight, ball bearing, steel, 4-1/2" high
   b. 1-3/4" thick doors over 3'-0" wide:
      1) Exterior: heavy weight, ball bearing, bronze/stainless steel, 5" high
      2) Interior: heavy weight, ball bearing, steel, 5" high
2. Provide 3 hinges per door leaf for doors 90 inches or less in height, and one additional hinge for each 30 inches of additional door height.
3. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
   a. Steel Hinges: Steel pins
   b. Non-Ferrous Hinges: Stainless steel pins
   c. Out-Swinging Exterior Doors: Non-removable pins
   d. Interior Doors: Non-rising pins
4. The width of hinges shall be 4-1/2" or as required for clearance.

C. Continuous Hinges:

1. Provide continuous hinges fabricated from anodized aluminum or stainless steel as scheduled.
2. Provide bearings at each hinge knuckle for quiet, smooth, self-lubricating operation.
3. Hinges shall be capable of supporting door weights up to 600 pounds, and shall be successfully tested for 1,500,000 cycles.
4. Install hinges with fasteners supplied by manufacturer. Hole pattern shall be symmetrically patterned.

D. Flush Bolts:

1. Automatic and manual flush bolts shall have forged bronze faceplates with extruded brass levers and with wrought brass guides and strikes. Doors up to 7'-6" in height shall have 12" steel or brass rods. Manual flush bolts for doors over 7'-6" in height shall be increased by 6" for each additional 6" of door height. Provide dust-proof strikes where scheduled.

E. Coordinators:

1. Where pairs of doors are equipped with automatic flush bolts, an astragal, or other hardware that requires synchronized closing of the doors, provide a bar-type coordinating device, surface applied to the underside of the stop at the frame head.
2. Finish of the coordinator to be prime coat to receive the same finish paint as the doorframe.
3. Provide a filler bar of the correct length for the unit to span the entire width of the opening, and appropriate brackets for parallel arm door closers and surface vertical rod exit device strikes. Factory-prep coordinators for vertical rod devices if required.

F. Mortise Locks:

1. Mortise locks shall be certified as ANSI A156.13, Grade 1 Operational, Grade 1 Security, and shall be manufactured from heavy gauge steel, containing components of steel with a zinc dichromate plating for corrosion resistance. Lock case shall be multi-function and field reversible for handing without opening the case.
2. Locks are to have a standard 2-3/4" backset with a full 3/4" throw 2-piece stainless steel mechanical anti-friction latch bolt. Deadbolt shall be a full 1" throw, constructed of stainless steel.
3. Lever trim shall be solid brass, bronze, or stainless steel, cast or forged in the design specified, with wrought roses and external lever spring cages. Levers shall be thru-bolted to assure proper alignment, and shall have a 2-piece spindle. Lever trim on the secure side of doors serving rooms considered by the authority having jurisdiction to be hazardous shall have a tactile warning.
   a. Basis of Design, Lever Style: Schlage 17A.
4. Locks meeting this specification: Schlage L9000 series, Sargent 8200 series, Best 40H series, and Corbin Russwin ML2000 Series.

G. Access Control Locks:

1. Lockset and exit device trim listed to UL294.
2. Lockset and exit device trim to meet or exceed A156.25 Grade 1 Operational and Security.
3. Lockset and exit device listed to UL10C, shall be compliant with ICC / ANSI A117.1, NFPA 101, and NFPA 80.
4. Lockset and exit device trim to be manufactured with open architecture characteristics capable of handling new and existing access control software and credential reading technology.
5. Lockset and exit device trim to be modular in design, to have the ability to change credential reader without being removed from door.
6. Provide option for tamper torx screws on inside escutcheon for higher securit.
7. Locking escutcheon, security lever trim are to be non-handed, operate independently of non-locking levers for extended life cycles. Handing to be field reversible.
8. Lockset and exit device trim to have the following standard status switches: Lock/Unlock Status (Clutch Position), Request-to-Exit Switch, Request to Enter Switch, Door Position Switch, Deadbolt Position, Interior Cover Tamper Guard.
9. Lockset and exit device trim to communicate battery status and communication status.
10. Exterior lever to be designed with ability to rotate freely while door remains securely locked, preventing damage to internal lock components from vandalism by excessive force.
11. Furnish locks with the appropriate function which will be field configurable without taking the lock off the door.
12. Power supply required 12VDC or 24VDC.
13. Connection cabling to be:
    a. Data: 24AWG, 4 conductor shielded (Belden 9843, 9841 or equivalent).
    b. DC Power: 18 AWG, 2 conductor, Belden 8760 or equivalent)
    c. Other wiring options may be available based on application, environment, and length of cabling required.
14. Should power be lost to device, lockset and exit device trim to have the ability to be field configured to manage access control in one of the three field configurable methods below:

a. Fail locked (secured)
b. Fail unlocked (unsecured)
c. Fail As-Is

15. Lockset and exit device trim to have real-time communication with access control system, such that all events at lockset and exit device trim are communicated real-time to network control software.
16. Lost communication between the device and network, lockset and exit device trim to have ability to manage access control offline in one of four field configurable methods below:
    a. Fail locked (secured)
    b. Fail unlocked (unsecured)
    c. Fail As-Is
17. Fail to Degraded/cache mode utilizing cache memory with field selectable options to either grant access up to the last 1,000 unique previously accepted User IDs, or grant access up to the last 1,000 unique previously accepted Facility/Site codes.
18. Lockset and Exit Trim system interface to be:
    a. Wiegand or Clock & Data via PIB300 (Panel Interface Board).
    b. Directly via RS485.
19. Lockset and exit device trim utilized with brightblue software, SMS Premier/Enterprise software, or 3rd Party software to have capability to be remotely locked down real-time without user interface at the device.
20. Lockset and exit device trim utilized with third-party software to have capability to be remotely unlocked real-time without user interface at the device.
21. Lockset and exit device trim to have visual tri-colored LED to indicate operational systems status, system error conditions and low power conditions.
22. Lockset and exit device trim to have audible feedback that can be enabled or disabled.
23. Credential reader capabilities for brightblue Software, SMS Premier/Enterprise Software or 3rd Party Partner integrated software may include and may not be limited to:
    a. 13.56 MHz Smart card credential - Secure section (Multi-Technology and Smartcard): Schlage, XceedID ISO-X, MIFARE, ISO-X Lite, my-d, DESFire 8-EV1.
    b. 13.56 MHz Serial number only (Multi-Technology and Smartcard): MIFARE, DESfire, iClass,Inside Pictotag, ST Micro, TI Tagit.
    c. 125 kHz Proximity card credentials: Schlage, XceedID, HID, GE/CASI ProxLite and AWID.
    d. Multi-Technology readers that read both 13.56 MHz Smart Cards + 125 kHz Prox cards.
    e. Dual credential reading capabilities credential card/fob + pin.
    f. 12 button keypad with backlit buttons.
    g. Magnetic card triple track reader capable of reading tracks 1, 2 or 3 per configuration in field.
    h. Full insertion reader capable of reading information along full length of magnetic stripe.
24. The lock and exit device trim will have the ability to utilize multiple manufacturer's key systems in the lever including:
    a. Full Size cylinders from Schlage, Falcon and Sargent up to 6-pin cylinders
    b. Full Size Interchangeable Cores from Schlage, Sargent, Corbin Russwin, Medeco, and Yale format by Medeco in up to 6 pin cylinders
    c. Small Format Interchangeable core up to 7 pin by Schlage, Falcon, BEST, Sargent, Corbin Russwin, Medeco, Yale, and others.

H. Exit Devices:

1. Exit devices shall be touchpad type, fabricated of brass, bronze, stainless steel, or aluminum, plated to the standard architectural finishes to match the balance of the door hardware.
2. All exit devices shall incorporate a fluid damper or other means which reduce noise associated with exit device operation. Touchpad shall extend a minimum of one half of the door width. End-cap will have two-point attachment to door. Touch-pad shall match exit device finish, and shall be stainless steel for US26, US26D, US28, US32, and US32D finishes. Provide compression springs in devices, latches, and outside trims or controls.
3. All devices to incorporate a security dead latching feature.
4. Provide roller strikes for all rim and surface mounted vertical rod devices, ASA strikes for mortise devices, and manufacturer's standard strikes for concealed vertical rod devices.
5. Mechanism case shall sit flush on the face of all flush doors, or spacers shall be furnished to fill gaps behind devices. Where glass trim or molding projects off the face of the door, provide glass bead kits.
6. All non-fire-rated exit devices shall have cylinder dogging.
7. Where lever handles are specified as outside trim for exit devices, provide heavy-duty lever trims with forged or cast escutcheon plates. Provide vandal-resistant levers that will travel to a 90-degree down position when more than 35 pounds of torque are applied, and which can easily be re-set. Lever style will match the lever style of the locksets.
8. Exit devices shall be UL listed panic exit hardware. All exit devices for fire rated openings shall be UL labeled fire exit hardware.
9. Provide electrical options as scheduled.
10. Exit devices meeting this specification: Von Duprin 98 series, Precision Apex series, Sargent 80 series with dead latching.

I. Door Closers:

1. Door closers shall have fully hydraulic, full rack and pinion action with a high strength cast iron cylinder. Cylinder body shall be 1-1/2” in diameter, and double heat-treated pinion shall be 11/16” in diameter.
2. Hydraulic fluid shall be of a type requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F. Fluid shall be fireproof and shall pass the requirements of the UL10C “positive pressure” fire test.
3. Spring power shall be continuously adjustable over the full range of closer sizes, and allow for reduced opening force for the physically handicapped. Hydraulic regulation shall be by tamper-proof, non-critical valves. Closers shall have separate adjustment for latch speed, general speed, and back check.
4. All closers shall have solid forged steel main arms (and forged forearms for parallel arm closers).
5. Closers shall not incorporate a pressure relief valve.
6. All closers shall have metal covers.
7. Closer cylinders, arms, and metal covers shall have a powder coating finish which has been certified to exceed 100 hours salt spray testing by an independent testing laboratory used by BHMA for ANSI certification. For metal components that can't be powder coated, a special rust inhibiting finish (SRI) must be used.
8. Door closers meeting this specification: LCN 4010/4110 series, and Sargent 281Series.

J. Push Plates: 8" wide x 16" high x 0.050" thick. Where door stile does not allow 8" wide plates, 4" wide plates may be used.

K. Door Pulls & Push Bars: Solid bar stock, diameter and length as scheduled. Push bars shall be of sufficient length to span from center to center of each stile.

L. Protection Plates: Provide kick plates as scheduled, with 4 beveled edges. Furnish with machine or wood screws, finished to match plates. Plates shall be 8" high x 2" LWOD on single doors, 1" LWOD on pairs of doors.

M. Door Stops and Holders:

1. It shall be the responsibility of the hardware supplier to provide door stops for all doors in accordance with the following requirements:
   a. Wall stops shall be used wherever possible.
   b. Where wall stops cannot be used, provide dome type floor stops of the proper height.
   c. At any opening where a wall or floor stop cannot be used, a heavy-duty overhead stop must be used.

N. Thresholds and Weatherstrip: Furnish as scheduled and per architectural details. Match finish of other items as closely as possible. Provide only those units where resilient or flexible seal strip is easily replaceable and readily available. Provide thermal-break at thresholds at exterior walls.

O. Silencers: "Push-in" type silencers for each hollow metal or wood frame, three for each single frame, two for each pair frame. Omit where gasketing is scheduled.

P. Automatic Operators:

1. Provide low energy automatic operator units with hydraulic closer complying with ANSI A156.19 where automatic operators are specified..
2. Provide hydraulic fluid of a type requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F. Fluid shall be fireproof and shall pass the requirements of the UL10C “positive pressure” fire test.
3. Provide units with conventional door closer opening and closing forces unless the power operator motor is activated. Provide door closer assembly with adjustable spring size, back-check, and opening and closing speed adjustment valves to control door
4. Provide units with on/off switch for manual operation, motor start up delay, vestibule interface delay, electric lock delay, and door hold open delay.
5. Provide units with conventional door closer opening and closing forces unless the power operator motor is activated. Provide door closer assembly with adjustable spring size, back-check valve, sweep valve, latch valve to control door.
6. Provide drop plates, brackets, or adapters for arms as required for details.
7. Provide hard-wired actuator switches for operation as specified. Actuators shall be weather-resistant type at exterior applications.
8. Provide key switches, with LED’s, recommended and approved by the manufacturer of the automatic operator as required for the function as described in the operation description of the hardware group with the provisions below.
9. Where automatic operators are scheduled, provide complete assemblies of controls, switches, power supplies, relays, and parts/material recommended and approved by the

manufacturer of the automatic operator for each individual leaf. Actuators shall control both doors simultaneously at pairs. Exterior and vestibule doors with automatic operators shall be sequenced to allow ingress or egress through both sets of openings as directed by the Designer. Locate the actuators, key switches, and other controls as directed by the Designer.

10. Provide units with vestibule inputs, which allow sequencing operation of two units, and a SPDT relay for interfacing with latching or locking devices.
11. Acceptable manufacturers and/or products: LCN 4600 series, Norton 6900 series, Besam Power Swing.

2.3 FINISHES

A. With the exception of all items listed below, the finish of all hardware shall be US26D - satin chrome or US32D - satin stainless steel. Exceptions are as follows:

1. Door Closers: Aluminum powder coat finish.
2. Coordinators: Prime painted.
3. Thresholds: Mill finish aluminum.
4. Weatherstrip and Sweeps: Clear anodized aluminum.
5. Silencers: Grey.

2.4 KEYING

A. Provide a new key system from the same manufacturer as the locks conforming to the following requirements:

1. Provide restricted patented removable core cylinders at all keyed devices, removable mullions, and exit device trim. Restricted system shall control the access to the products by requiring a signed letter of authorization and/or authorization form from the Owner or authorized agent of the Owner. Patent shall protect against the unauthorized manufacturing and duplication of the products. Restricted patented cores shall not be operable by non-patented key blanks. Restricted patented cores shall incorporate a mechanism to check for the patented features on the keys. Provide construction cores with construction master keying for use during construction. The hardware supplier, accompanied by the Owner or Owner’s security agent, shall install permanent keyed cores upon completion of the project. The temporary construction cores are to be returned to the hardware supplier.
2. Provide permanent cores and cylinders keyed by the manufacturer or authorized distributor as directed by the Owner. Provide owner with a copy of the bitting list, return receipt requested.
3. The hardware supplier, accompanied by a qualified factory representative for the manufacturer of the cores and cylinders, shall meet with Owner and Designer to review keying requirements and lock functions prior to ordering finish hardware. Submit a keying schedule to Designer for approval.
4. Provide cores and cylinders, unless noted otherwise, operated by a Great Grand Master Key System to be established for this project. Allow for ten Grand Master Keys under the Great Grand. Do not use the letter "I", “O”, or “X” for any of the grand masters. Allow for twenty-four Master Keys under each Grand Master, and sixty-four changes under

each master key. All cylinders shall be keyed in alike or different sets as noted by their respective key set number. Do not use the letter "I" or “O” in any of the master key sets.

5. Provide patented restricted keys as follows:
   a. Ten grand master keys for each set.
   b. Ten master keys for each set.
   c. Three keys per core and/or cylinder.
   d. Two construction core control keys
   e. Two permanent core control keys
   f. Six construction master keys for each type (Contractor is to provide one set of construction keys to Designer)
6. Visual key control:
   a. Keys shall be stamped with their respective key set number and stamped “DO NOT DUPLICATE".
   b. Grand master and master keys shall be stamped with their respective key set letters.
   c. Do not stamp any keys with the factory key change number.
   d. Do not stamp any cores with key set on face (front) of Core. Stamp on back or side of cores so not to be visible when core is in cylinder.
7. Deliver grand master keys, master keys, change keys, and/or key blanks from the factory or authorized distributor directly to the Owner in sealed containers, return receipt requested. Failure to comply with these requirements may be cause to require replacement of all or any part of the keying system that was compromised at no additional cost to the Owner.
8. Approved products: Schlage Everest T, Best CORMAX, Sargent Signature.

B. All master keys shall be delivered directly to the WRTA Project Manager by the hardware supplier, who shall obtain an itemized transmittal for delivery of same.

C. Provide key cabinet suitable for size of project. Locate as acceptable to the WRTA Project Manager.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Steel Doors and Frames: Comply with DHI A115 series.

1. Surface-Applied Door Hardware: Drill and tap doors and frames according to SDI 107.

B. Wood Doors: Comply with DHI A115-W series.

C. Where on-site modification of doors and frames is required, prepare hardware locations in accordance with the following:

1. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.
2. Wood Doors: Comply with DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."
3. Where doors are in rated assemblies, comply with NFPA 80 for restrictions on on-site door hardware preparation.

3.3 INSTALLATION

A. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. Custom Steel Doors and Frames: DHI's "Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames."
3. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."

B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work. Do not install surface-mounted items until finishes have been completed on substrates involved.

1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

C. Key Control System: Place keys on markers and hooks in key control system cabinet, as determined by final keying schedule.

D. Boxed Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings. Verify location with Designer.

1. Configuration: Provide the least number of power supplies required to adequately serve doors with electrified door hardware.

E. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Section 079200 - JOINT SEALANTS.

3.4 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

1. Spring Hinges: Adjust to achieve positive latching when door is allowed to close freely from an open position of 30 degrees.
2. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
3. Door Closers: Adjust sweep period so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the leading edge of the door.

B. Six-Month Adjustment: Approximately six months after date of Substantial Completion, Installer shall perform the following:

1. Examine and readjust each item of door hardware as necessary to ensure function of doors, door hardware, and electrified door hardware.
2. Consult with and instruct the WRTA Project Manager's personnel on recommended maintenance procedures.
3. Replace door hardware items that have deteriorated or failed due to faulty design, materials, or installation of door hardware units.

3.5 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items as necessary to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

3.6 DOOR HARDWARE SCHEDULE

A. The intent of the hardware specification is to specify the hardware for interior and exterior doors, and to establish a type, continuity, and standard of quality. However, it is the door hardware supplier’s responsibility to thoroughly review existing conditions, schedules, specifications, drawings, and other Contract Documents to verify the suitability of the hardware specified.

B. Discrepancies, conflicting hardware, and missing items are to be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application.

C. Hardware items are referenced in the following hardware schedule. Refer to the above specifications for special features, options, cylinders/keying, and other requirements.

D. Hardware Sets:

HEADING # 01 - (AUTOMATIC SLIDING ENTRY DOOR)

For use on Door #(s): 106A1, 106A2, 106B1, 106B2

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	MFR
1	EA	SENSOR		
2	EA	CYLINDER	AS REQUIRED	
2	EA	TRACKER		
1	EA	POWER SUPPLY		
1		HARDWARE	BY MANUFACTURER	

HEADING # 02 - (SINGLE WITH FAIL SECURE ELECTRIFIED LOCKSET X CLOSER X CARD READER)

For use on Door #(s): 103, 104, 105, 110

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	MFR
3	EA	HINGE	5BB1 SERIES AS SPECIFIED	IVE
1	EA	EU MORTISE LOCK	RX-L9092EU-CON	SCH
1	EA	SURFACE CLOSER	4011/4111EDA AS SPECIFIED	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
1	EA	STOP	WS407/FS436 AS SPECIFIED	IVE
1	EA	GASKETING	488S	ZER
1	EA	ELEC. EXIT DEVICE (DOOR 104 ONLY)	EL-99-75-L-LX-RX	VON
1	EA	POWER SUPPLY	PS902 120/240 VAC	SCE
1	EA	CREDENTIAL READER	SPECIFIED ELSEWHERE	

HEADING # 03 - (SINGLE WITH OFFICE LOCKSET X CLOSER)

For use on Door #(s): 102

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	MFR
3	EA	HINGE	5BB1 SERIES AS SPECIFIED	IVE
1	EA	OFFICE LOCK	L9080	SCH
2	EA	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
1	EA	STOP	WS407/FS436 AS SPECIFIED	IVE
1	EA	SILENCER	SR64	ZER

HEADING # 04 - (MOTORIZED OVERHEAD GRILLE)

For use on Door #(s): 111,112

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	MFR
1	EA	CYLINDER	AS REQUIRED	SCH
1		BALANCE OF HARDWARE	BY MANUFACTURER	

END OF SECTION

SECTION 088000

GLAZING

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Glass and glazing for the following Sections:
   a. Section 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS.
   b. Section 084413 - GLAZED ALUMINUM CURTAIN WALLS.
2. Blast-resistant security film.

B. Alternates: Not Applicable.

C. Items To Be Installed Only: Not Applicable.

D. Items To Be Furnished Only: Not Applicable.

E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 088010 - INTERIOR GLAZING for interior glazing.

1.3 DEFINITIONS

A. Manufacturers of Glass Products: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

C. Interspace: Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.

D. Deterioration of Coated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining

and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in metallic coating.

E. Deterioration of Insulating Glass: Failure of hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

F. Deterioration of Laminated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1.4 PERFORMANCE REQUIREMENTS

A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Glass Design: Glass thickness designations indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites in the thickness designations indicated for various size openings, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:

1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:

    a. Specified Design Wind Loads: As required by Code.

    b. Specified Design Snow Loads for Sloped Glazing: As required by Code.
    c. Probability of Breakage for Vertical Glazing: 8 lites per 1000 for lites set vertically or not more than 15 degrees off vertical and under wind action.

        1) Load Duration: 60 seconds or less/

    d. Probability of Breakage for Sloped Glazing: 1 lite per 1000 for lites set more than 15 degrees off vertical and under wind and snow action.

        1) Load Duration: 30 days.

    e. Maximum Lateral Deflection: For the following types of glass supported on all 4 edges, provide thickness required that limits center deflection at design wind pressure to 1/50 times the short side length or 1 inch, whichever is less.

        1) For monolithic-glass lites heat-treated to resist wind loads.

2) For insulating glass.
3) For laminated-glass lites.

f. Minimum Glass Thickness for Exterior Lites: Not less than 6 mm.

C. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 degrees F, ambient; 180 degrees F, material surfaces.

D. Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:

1. For monolithic-glass lites, properties are based on units with lites 6.0 mm thick.
2. For laminated-glass lites, properties are based on products of construction indicated.
3. For insulating-glass units, properties are based on units with lites 6.0 mm thick and a nominal 1/2-inch-wide interspace.
4. Center-of-Glass Values: Based on using LBL-44789 WINDOW 6.3 computer program for the following methodologies:

a. U-Factors: NFRC 100 expressed as Btu/ sq. ft. x h x degrees F.
b. Solar Heat Gain Coefficient: NFRC 200.
c. Solar Optical Properties: NFRC 300.

1.5 SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

B. Samples: 12-inch- square Samples for each type of glass.

C. Glazing Schedule: Use same designations indicated on Drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.

D. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.

1. For solar-control low-e-coated glass, provide documentation demonstrating that manufacturer of coated glass is certified by coating manufacturer.

E. Qualification Data: For installers.

F. Preconstruction Adhesion and Compatibility Test Report: From glazing sealant manufacturer indicating glazing sealants were tested for adhesion to glass and glazing channel substrates and for compatibility with glass and other glazing materials.

G. Warranties: Special warranties specified in this Section.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance..

B. Source Limitations for Glass: Obtain the following through one source from a single manufacturer for each glass type: clear float glass, laminated glass and insulating glass.

C. Source Limitations for Glass Sputter-Coated with Solar-Control Low-E Coatings: Where solar-control low-e coatings of a primary glass manufacturer that has established a certified fabricator program is specified, obtain sputter-coated solar-control low-e-coated glass in fabricated units from a manufacturer that is certified by coated-glass manufacturer.

D. Source Limitations for Glazing Accessories: Obtain glazing accessories through one source from a single manufacturer for each product and installation method indicated.

E. Elastomeric Glazing Sealant Product Testing: Obtain sealant test results for product test reports in "Submittals" Article from a qualified testing agency based on testing current sealant formulations within a 36-month period.

1. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated, as documented according to ASTM E 548.
2. Test elastomeric glazing sealants for compliance with requirements specified by reference to ASTM C 920, and where applicable, to other standard test methods.

F. Preconstruction Adhesion and Compatibility Testing: Submit to elastomeric glazing sealant manufacturers, for testing indicated below, samples of each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member that will contact or affect elastomeric glazing sealants:

1. Use ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
2. Submit not fewer than eight pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
4. For materials failing tests, obtain sealant manufacturer's written instructions for corrective measures, including the use of specially formulated primers.
5. Testing will not be required if elastomeric glazing sealant manufacturers submit data based on previous testing of current sealant products for adhesion to, and compatibility with, glazing materials matching those submitted.

G. Safety Glazing Products: Comply with testing requirements in 16 CFR 120 and, for wired glass, ANSI Z97.1.

1. Subject to compliance with requirements, obtain safety glazing products permanently marked with certification label of the Safety Glazing Certification Council or another certification agency] acceptable to authorities having jurisdiction.

2. Where glazing units, including Kind FT glass and laminated glass, are specified in Part 2 articles for glazing lites more than 9 sq. ft. in exposed surface area of one side, provide glazing products that comply with Category II materials, for lites 9 sq. ft. or less in exposed surface area of one side, provide glazing products that comply with Category I or II materials, except for hazardous locations where Category II materials are required by 16 CFR 1201 and regulations of authorities having jurisdiction.

H. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publications: GANA Laminated Division's "Laminated Glass Design Guide" and GANA's "Glazing Manual."
2. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIR-A7, "Sloped Glazing Guidelines."
3. IGMA Publication for Sloped Glazing: IGMA TB-3001, "Sloped Glazing Guidelines."
4. IGMA Publication for Insulating Glass: SIGMA TM-3000, "Glazing Guidelines for Sealed Insulating Glass Units."

I. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the following testing and inspecting agency:

1. Insulating Glass Certification Council.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. For insulating-glass units that will be exposed to substantial altitude changes, comply with insulating-glass manufacturer's written recommendations for venting and sealing to avoid hermetic seal ruptures.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install liquid glazing sealants when ambient and substrate temperature conditions are outside limits permitted by glazing sealant manufacturer or below 40 degrees F.

1.9 WARRANTY

A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form, made out to the User Agency and signed by coated-glass manufacturer agreeing to replace

coated-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

1. Warranty Period: Ten years from the date of Certificate of Agency Use and Occupancy. Guarantees or warranties that start at the date of shipment from the factory, or from the completion date of an individual portion of the project, are not acceptable.

B. Manufacturer's Special Warranty on Laminated Glass: Manufacturer's standard form, made out to the User Agency and signed by laminated-glass manufacturer agreeing to replace laminated-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

1. Warranty Period: Five years from the date of Certificate of Agency Use and Occupancy. Guarantees or warranties that start at the date of shipment from the factory, or from the completion date of an individual portion of the project, are not acceptable.

C. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form, made out to the WRTA Project Manager and signed by insulating-glass manufacturer agreeing to replace insulating-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

1. Warranty Period: Ten years from the date of Certificate of Agency Use and Occupancy. Guarantees or warranties that start at the date of shipment from the factory, or from the completion date of an individual portion of the project, are not acceptable.

PART 2 - PRODUCTS

2.1 INSULATING-GLASS UNITS

A. Insulating-Glass Units for Vertical Glazing: 1 inch thick insulating glass consisting of two lites of 1/4 inch glass, low e coating on the No. 2 surface, 1/2 inch thick argon gas filled space, and mill finish air spacer. Provide one of the following or equal:

1. VE1-2M by Viracon.
   a. Visible Light Transmittance: 70 percent.
   b. Reflectance Visible Light: 11 percent.
   c. U Value (Winter): 0.25.
   d. Shading Coefficient: 0.43.
   e. Solar Heat Gain Coefficient: 0.37.
2. Solarban 60 by PPG Industries.
   a. Visible Light Transmittance: 70 percent.
   b. Reflectance Visible Light: 11 percent.
   c. U Value (Winter): 0.29.
   d. Shading Coefficient: 0.44.
   e. Solar Heat Gain Coefficient: 0.38.
3. SN-68 by Guardian Industries.
   a. Visible Light Transmittance: 68 percent.
   b. Reflectance Visible Light: 11 percent.
   c. U Value (Winter): 0.24 with argon gas.

d. Shading Coefficient: 0.43.
e. Solar Heat Gain Coefficient: 0.38.

B. Matching: To the greatest extent practical, glass on the exterior of the building shall match. Coordinate with mock-ups and specified requirements.

2.2 GLASS PRODUCTS

A. Tempered Float Glass: ASTM C 1048; Type I (transparent flat glass); Quality-Q3; Kind FT; 1/4 inch thick unless indicated otherwise.

B. Insulating-Glass Units, General: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interpane air space, and complying with ASTM E2190 and with requirements specified in this Section.

1. Provide Kind HS (heat-strengthened) float glass in place of annealed glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in Part 1 “Performance Requirements” paragraph.
2. Provide Kind FT (fully tempered) glass lites where safety glass is indicated.
3. Overall Unit Thickness and Thickness of Each Lite: Dimensions indicated for insulating-glass units are nominal and the overall thicknesses of units are measured perpendicularly from outer surfaces of glass lites at unit’s edge.
4. Sealing System: Dual seal, with primary and secondary sealants as follows:

    a. Manufacturer’s Standard Sealants. Butyl primary and silicone secondary sealants. Secondary sealant shall cover entire spacer bar at IGU perimeter.

5. Spacer Specifications: Manufacturer’s standard spacer material. Spacer corners shall be bent, soldered, or welded. Keyed spacer corners will not be accepted. Spacer may have a mid-span spacer key located at the midpoint of the insulating glass unit head. Where a mid-span spacer key is used, the key must be fully embedded (all sides) in butyl sealant.

C. Bullet Resistant Security Glazing:

1. Type: ASTM C 1349, clear symmetrical glass-clad polycarbonate.
2. Ballistic Resistance: UL 752, [Level 3 super-power handguns.]
3. Ballistic Safety Glazing: Comply with ballistic resistance specified and testing requirements in 16 CFR 1201 for Category II materials, and with other requirements specified.

2.3 GLAZING SEALANTS

A. General: Provide products of type indicated, complying with the following requirements:

1. Compatibility: Verify glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, interlayer of laminated glass, and glazing channel substrates, under conditions of service

and application, as demonstrated by sealant manufacturer based on testing and field experience.

2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
3. Colors of Exposed Glazing Sealants: As selected by Designer from manufacturer's full range.
4. Adhesives and sealants that are used inside the weatherproofing system shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

    a. Structural Glazing Adhesives: 100 g/L.
    b. Architectural Sealants: 250 g/L.

B. Elastomeric Glazing Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

1. Single-Component Neutral- and Basic-Curing Silicone Glazing Sealants: For 100/50% movement, typically at exterior locations, as follows:

    a. Dow Corning Corporation; 790.
    b. GE Silicones; SilPruf LM SCS2700.
    c. Tremco Inc.; Spectrem 1.

C. Glazing Sealants for Fire-Resistive Glazing Products: Identical to products used in test assemblies to obtain fire-protection rating.

2.4 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based elastomeric tape with a solids content of 100 percent; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C 1281 and AAMA 800 for project conditions.

1. Manufacturer: Tremco 440 Tape, preformed butyl type or Tremco Polyshim II Vision Strip, preshimmed butyl type or equal by CR Laurence or 3M or approved equal.

B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; packaged on rolls with release liner protecting adhesive; and complying with AAMA 800 for the following types:

1. Type 1, for glazing applications in which tape acts as the primary sealant.
2. Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.5 BLAST-RESISTANT SECURITY FILM

A. Blast-Resistant Security Film: 3M Ultra Safety and Security Window Film - Ultra 400 Series.

2.6 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions with a Shore, Type A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

F. Perimeter Insulation for Fire-Resistive Glazing: Identical to product used in test assembly to obtain fire-resistance rating.

2.7 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites in a manner that produces square edges with slight kerfs at junctions with outdoor and indoor faces.

C. Grind smooth and polish exposed glass edges and corners.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing glazing, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Presence and functioning of weep system.
3. Minimum required face or edge clearances.
4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass lites where length plus width is larger than 50 inches as follows:

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

3.4 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until just before each glazing unit is installed.

F. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

3.5 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.6 CLEANING AND PROTECTION

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

END OF SECTION

SECTION 088010

INTERIOR GLAZING

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Glass and glazing for the following products and applications:
   a. Back-painted glass.
   b. Glazing film.
   c. Unframed mirrors.
   d. Bullet resistant security glazing.

B. Alternates: Not Applicable.

C. Items To Be Installed Only: Not Applicable.

D. Items To Be Furnished Only: Not Applicable.

E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 088000 - GLAZING for exterior glass and glazing; including security film where applicable
2. Section 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS for glass and glazing for entrances and storefronts.
3. Section 084413 - GLAZED ALUMINUM CURTAIN WALLS for glass and glazing for curtain walls, including gaskets and sealants.
4. Section 085113 - ALUMINUM WINDOWS for factory glazing for metal windows.

1.3 DEFINITIONS

A. Manufacturers of Glass Products: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

C. Deterioration of Coated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in metallic coating.

D. Deterioration of Laminated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1.4 PERFORMANCE REQUIREMENTS

A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Glass Design: Glass thickness designations indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions.

1.5 SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

B. Samples: For the following products, in the form of 12-inch- square Samples for each type of glass.

C. Glazing Schedule: Use same designations indicated on Drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.

D. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.

1. For solar-control low-e-coated glass, provide documentation demonstrating that manufacturer of coated glass is certified by coating manufacturer.

E. Qualification Data: For installers.

F. Preconstruction Adhesion and Compatibility Test Report: From glazing sealant manufacturer indicating glazing sealants were tested for adhesion to glass and glazing channel substrates and for compatibility with glass and other glazing materials.

G. Product Test Reports: For each type of glass, sealants, and gaskets.

H. Warranties: Special warranties specified in this Section.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance..

B. Source Limitations for Glass: Obtain the following through one source from a single manufacturer for each glass type: clear float glass, and laminated glass.

C. Fire-Protection-Rated Glazing: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on positive-pressure testing according to NFPA 257 or UL 9, including the hose-stream test, and shall comply with NFPA 80.

1. Fire-protection-rated glazing required to have a fire-protection rating of 20 minutes shall be exempt from the hose-stream test, unless required by authorities having jurisdiction.

D. Source Limitations for Glazing Accessories: Obtain glazing accessories through one source from a single manufacturer for each product and installation method indicated.

E. Elastomeric Glazing Sealant Product Testing: Obtain sealant test results for product test reports in "Submittals" Article from a qualified testing agency based on testing current sealant formulations within a 36-month period.

1. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated, as documented according to ASTM E 548.
2. Test elastomeric glazing sealants for compliance with requirements specified by reference to ASTM C 920, and where applicable, to other standard test methods.

F. Preconstruction Adhesion and Compatibility Testing: Submit to elastomeric glazing sealant manufacturers, for testing indicated below, samples of each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member that will contact or affect elastomeric glazing sealants:

1. Use ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
2. Submit not fewer than eight pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
4. For materials failing tests, obtain sealant manufacturer's written instructions for corrective measures, including the use of specially formulated primers.
5. Testing will not be required if elastomeric glazing sealant manufacturers submit data based on previous testing of current sealant products for adhesion to, and compatibility with, glazing materials matching those submitted.

G. Glazing for Fire-Rated Door Assemblies: Glazing for assemblies that comply with NFPA 80 and that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252.

H. Safety Glazing Products: Comply with testing requirements in 16 CFR 120 and, for wired glass, ANSI Z97.1.

1. Subject to compliance with requirements, obtain safety glazing products permanently marked with certification label of the Safety Glazing Certification Council or another certification agency] acceptable to authorities having jurisdiction.
2. Where glazing units, including Kind FT glass and laminated glass, are specified in Part 2 articles for glazing lites more than 9 sq. ft. in exposed surface area of one side, provide glazing products that comply with Category II materials, for lites 9 sq. ft. or less in exposed surface area of one side, provide glazing products that comply with Category I or II materials, except for hazardous locations where Category II materials are required by 16 CFR 1201 and regulations of authorities having jurisdiction.

I. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publications: GANA Laminated Division's "Laminated Glass Design Guide" and GANA's "Glazing Manual."
2. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIR-A7, "Sloped Glazing Guidelines."

J. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockup for types of windows indicated, in locations shown on Drawings.

K. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install liquid glazing sealants when ambient and substrate temperature conditions are outside limits permitted by glazing sealant manufacturer or below 40 degrees F.

1.9 WARRANTY

A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form, made out to the WRTA Project Manager and signed by coated-glass manufacturer agreeing to replace coated-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

1. Warranty Period: Ten years from the date of Certificate of Agency Use and Occupancy. Guarantees or warranties that start at the date of shipment from the factory, or from the completion date of an individual portion of the project, are not acceptable.

B. Manufacturer's Special Warranty on Laminated Glass: Manufacturer's standard form, made out to the WRTA Project Manager and signed by laminated-glass manufacturer agreeing to replace laminated-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

1. Warranty Period: Five years from the date of Certificate of Agency Use and Occupancy. Guarantees or warranties that start at the date of shipment from the factory, or from the completion date of an individual portion of the project, are not acceptable.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. ASG Glass Company.

2. Guardian Industries.

3. Viracon

2.2 INTERIOR GLAZING

A. Laminated Glass: ASTM C 1172, and complying with testing requirements in 16 CFR 1201 for Category II materials, and with other requirements specified. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.

1. Construction for Framed Units: Laminate glass with polyvinyl butyral interlayer to comply with interlayer manufacturer's written recommendations.
2. Construction for Units with Exposed Edges: Laminate glass with cast-in-place and cured-transparent-resin interlayer to comply with interlayer manufacturer's written recommendations.
3. Interlayer Thickness: 0.030 in. thick for vertical glazing, 0.060 in. thick for sloped glazing.
4. Interlayer Color: Clear unless otherwise indicated.

B. Glazing Film: Translucent, dimensionally stable, cast PVC film, 2-mil-minimum thickness, with pressure-sensitive, clear adhesive back for adhering to glass and releasable protective backing.

1. Apply squarely aligned to glass edges, uniformly smooth, and free from tears, air bubbles, wrinkles, and rough edges, in single sheet completely overlaying the back face of clean glass, according to manufacturer's written instructions, including surface preparation and application temperature limitations

C. Glass Mirrors, General: ASTM C 1503; manufactured using copper-free, low-lead mirror coating process.

1. Mirror Edge Treatment: Flat polished edge.

D. Bullet Resistant Security Glazing:

1. Type: ASTM C 1349, clear symmetrical glass-clad polycarbonate.
2. Ballistic Resistance: UL 752, Level 3 super-power handguns.]
3. Ballistic Safety Glazing: Comply with ballistic resistance specified and testing requirements in 16 CFR 1201 for Category II materials, and with other requirements specified.

2.3 GLAZING SEALANTS

A. General: Provide products of type indicated, complying with the following requirements:

1. Compatibility: Verify glazing sealants that are compatible with one another and with other materials they will contact, including glass products, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
3. Colors of Exposed Glazing Sealants: As selected by Designer from manufacturer's full range.
4. Adhesives and sealants that are used inside the weatherproofing system shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

a. Structural Glazing Adhesives: 100 g/L.
b. Architectural Sealants: 250 g/L.

B. Elastomeric Glazing Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

1. Single-Component Neutral- and Basic-Curing Silicone Glazing Sealants: For 100/50% movement, typically at exterior locations, as follows:

a. Dow Corning Corporation; 790.

b. GE Silicones; SilPruf LM SCS2700.
c. Tremco Inc.; Spectrem 1.
d. Or equal.

2. Single-Component Neutral- and Basic-Curing Silicone Glazing Sealants: For 50% movement, typically at interior locations, as follows:

a. Dow Corning Corporation; 795.
b. GE Silicones; SilPruf SSG4000.
c. Tremco Inc.; Spectrem 2.

C. Glazing Sealants for Fire-Resistive Glazing Products: Identical to products used in test assemblies to obtain fire-protection rating.

2.4 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based elastomeric tape with a solids content of 100 percent; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C 1281 and AAMA 800 for project conditions.

1. Basis of Design: Tremco; 440 Tape, preformed butyl type.
2. Basis of Design: Tremco; Polyshim II Vision Strip, preshimmed butyl type.

B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; packaged on rolls with release liner protecting adhesive; and complying with AAMA 800 for the following types:

1. Type 1, for glazing applications in which tape acts as the primary sealant.
2. Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.5 BLAST-RESISTANT SECURITY FILM

A. Blast-Resistant Security Film: 3M Ultra Safety and Security Window Film - Ultra 400 Series.

2.6 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric or silicone material with a Shore, Type A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions with a Shore, Type A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

F. Perimeter Insulation for Fire-Resistive Glazing: Identical to product used in test assembly to obtain fire-resistance rating.

G. Mirror Mastic: An adhesive setting compound, asbestos-free, produced specifically for setting mirrors and certified by both mirror manufacturer and mastic manufacturer as compatible with glass coating and substrates on which mirrors will be installed.

H. Mirror Hardware, Top and Bottom Aluminum J-Channels: Aluminum extrusions with a return deep enough to produce a glazing channel to accommodate mirrors of thickness indicated and in lengths required to cover bottom and top edges of each mirror in a single piece.

2.7 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites in a manner that produces square edges with slight kerfs at junctions with outdoor and indoor faces.

C. Grind smooth and polish exposed glass edges and corners.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing glazing, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Presence and functioning of weep system.
3. Minimum required face or edge clearances.
4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass lites where length plus width is larger than 50 inches as follows:

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

J. Wall-Mounted Mirrors: Install mirrors with mastic and mirror hardware. Attach mirror hardware securely to mounting surfaces with mechanical fasteners installed with anchors or inserts as applicable. Install fasteners so heads do not impose point loads on backs of mirrors.

K. Glazing Film: Apply squarely aligned to glass edges, uniformly smooth, and free from tears, air bubbles, wrinkles, and rough edges, in single sheet completely overlaying the back face of clean glass, according to manufacturer's written instructions, including surface preparation and application temperature limitations.

3.4 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until just before each glazing unit is installed.

F. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

3.5 FIELD QUALITY CONTROL

A. Independent Testing Agency: Cooperate with the Independent Testing Agency engaged by WRTA for field quality control activities for the Work of this Section. Refer also to Section 014325 - TESTING AGENCY SERVICES.

B. Commissioning Authority: Cooperate with the Commissioning Authority engaged by WRTA for field quality control activities for the Work of this Section. Refer also to Section 019115 - FACILITY EXTERIOR ENCLOSURE COMMISSIONING.

C. Cooperate with field quality control personnel. Allow inspectors access to scaffolding and work areas, as needed to perform inspections.

D. Additional inspections and retesting of materials which fail to comply with specified material and installation requirements shall be performed at Contractor's expense.

3.6 CLEANING AND PROTECTION

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

END OF SECTION

SECTION 090003

ACOUSTICAL TILE

(Filed Sub-Bid Required)

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

B. Time, Manner and Requirements for Submitting Sub-Bids:

1. Sub-bids for work under this Section shall be for the complete work and shall be submitted through WRTA's E-Bid Room as stipulated in the WRTA Instructions to Bidders.

2. Sub-bids filed with the Division of Capital Asset Management and Maintenance shall be accompanied by BID BOND or CASH or CERTIFIED CHECK or TREASURER'S CHECK or CASHIER'S CHECK issued by a responsible bank or trust company payable to the Commonwealth of Massachusetts in the amount of five percent of the sub-bid. A sub-bid accompanied by any other form of bid deposit than those specified will be rejected.

C. Sub Sub-Bid Requirements: (None required under this Section.)

D. Reference Drawings: The Work of this Filed Sub-Bid is shown on the following Contract Drawings:

AD-111	DEMOLITION LEVEL 1 RCP
A-111	LEVEL 1 RCP
A-301	WALL SECTIONS AND ENLARGED ELEVATIONS
A-401	PARTITION TYPES AND DETAILS

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. All Work of Section 095113 - ACOUSTICAL PANEL CEILINGS.

B. Alternates: Not Applicable.

END OF SECTION

SECTION 092116

GYPSUM BOARD ASSEMBLIES

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Interior gypsum wallboard.
2. Tile backing panels.
3. Acoustic insulation in gypsum wallboard assemblies.
4. Non-load-bearing steel framing.
5. Marking and identification for fire- and smoke-partitions.

B. Alternates: Not Applicable.

C. Items To Be Installed Only: Install the following items as furnished by the designated Sections:

1. Section 210001 - FIRE PROTECTION:
   a. Access doors in gypsum board assemblies.
2. Section 220001 - PLUMBING:
   a. Access doors in gypsum board assemblies.
3. Section 230001 - HEATING, VENTILATING, AND AIR CONDITIONING:
   a. Access doors in gypsum board assemblies.
   b. Pipe and duct sleeves for placement into gypsum board openings.
4. Section 260001 - ELECTRICAL WORK:
   a. Access doors in gypsum board assemblies.

D. Items To Be Furnished Only: Not Applicable.

E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 054000 - COLD-FORMED METAL FRAMING or load-bearing steel framing.
2. Section 092117 - GYPSUM BOARD SHAFT WALL ASSEMBLIES for framing, gypsum panels, other components of shaft wall assemblies, and finishing gypsum board shaft wall assemblies.

3. Section 092600 - GYPSUM VENEER PLASTERING for gypsum base at veneer plaster and veneer plaster finish.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide fire stop tracks capable of withstanding deflection within limits and under conditions indicated.

1. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: Full-size Sample in 12-inch-long length for each trim accessory indicated.

C. Shop Drawings: If materials and systems other than those specified and those indicated on the Drawings are proposed for use, submit shop drawings signed and sealed by a structural engineer licensed in the Commonwealth of Massachusetts certifying proposed systems meet code requirements, project requirements and the following deflection criteria:

1. For gypsum board assemblies without applied rigid finishes L/240; for gypsum board assemblies with applied rigid finishes such as tile, stone, wood paneling L/360. Lateral load 5 ps.f. except greater at shafts. Lateral load at shafts shall be required based on analysis of equipment and systems using shaft.

1.5 QUALITY ASSURANCE

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. Marking and Identification for Fire- and Smoke-Partitions: Fire walls, fire barriers, fire partitions, smoke barriers, smoke partitions and other walls required to have protected openings or penetrations shall be effectively and permanently identified with signs or stenciling. Such identification shall:

1. Be located in accessible concealed floor, floor-ceiling or attic spaces; and
2. Be repeated at intervals not exceeding 30 feet measured horizontally along the wall or partition; and
3. Include lettering not less than 0.5 inch in height, incorporating the suggested wording: "FIRE AND/OR SMOKE BARRIER – PROTECT ALL OPENINGS," or other wording.

C. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

D. Mockups: Before beginning gypsum board installation, install mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Install mockups for the following:

a. Each level of gypsum board finish indicated for use in exposed locations.
b. Each texture finish indicated.

2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
3. Simulate finished lighting conditions for review of mockups.
4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original packages, containers, and bundles bearing brand name and identification of manufacturer or supplier.

1. Deliver and store materials in accordance with Gypsum Association Publications GA-216, GA-238 and GA-801.

B. Store materials inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack panels flat to prevent sagging.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install interior products until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 NON-LOAD-BEARING STEEL FRAMING, GENERAL

A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal, unless otherwise indicated.
2. Protective Coating: manufacturer's standard corrosion-resistant zinc coating, unless otherwise indicated.

2.2 SUSPENSION SYSTEM COMPONENTS

A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch-diameter wire, or double strand of 0.0475-inch-diameter wire.

B. Hanger Attachments to Concrete:

1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E 488 by an independent testing agency.

a. Type: Postinstalled, expansion anchor.

C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.162-inch diameter.

D. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.0538 inch and minimum 1/2-inch- wide flanges with depth as required for span and loading and indicated on Drawings.

E. Furring Channels (Furring Members): 0.0538-inch bare-steel thickness, with minimum 1/2-inch-wide flanges, 3/4 inch deep.

F. Grid Suspension System for Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Armstrong World Industries, Inc.; Drywall Grid Systems.
b. Chicago Metallic Corporation; Drywall Furring System.
c. USG Corporation; Drywall Suspension System.

2.3 STEEL FRAMING FOR FRAMED ASSEMBLIES

A. Steel Studs and Runners: ASTM C 645.

1. Minimum Base-Metal Thickness: 0.0312 inch.

B. Slip-Type Head Joints: Where indicated, provide one of the following:

1. Single Long-Leg Runner System: ASTM C 645 top runner with 2-inch- deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top runner

and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.

2. Double-Runner System: ASTM C 645 top runners, inside runner with 2-inch-deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit inside runner.
3. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.

    a. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

        1) Dietrich Metal Framing; SLP-TRK Slotted Deflection Track.
        2) Steel Network Inc. (The); VertiClip Series.
        3) Superior Metal Trim; Superior Flex Track System (SFT).

C. Fire stop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness compatible with studs and in width to accommodate depth of studs.

1. Grace Construction Products; FlameSafe FlowTrak System.
2. Fire Trak Corp.; Fire Trak attached to studs with Fire Trak Slip Clip.
3. Metal-Lite, Inc.; The System.

D. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.

1. Minimum Base-Metal Thickness: 0.0312 inch.

E. Cold-Rolled Channel Bridging: 0.0538-inch bare-steel thickness, with minimum 1/2-inch- wide flanges.

1. Depth: 1-1/2 inches.
2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch-thick, galvanized steel.

F. Hat-Shaped, Rigid Furring Channels: ASTM C 645.

1. Minimum Base Metal Thickness: 0.0312 inch..
2. Depth: 1-1/2 inches.

G. Resilient Furring Channels: 1/2-inch-deep, steel sheet members designed to reduce sound transmission.

1. Configuration: Asymmetrical or hat shaped.

H. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches wall attachment flange of 7/8 inch, minimum bare-metal thickness of 0.0179 inch, and depth required to fit insulation thickness indicated.

I. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

J. Isolation Strip at Exterior Walls: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

2.4 INTERIOR GYPSUM BOARD

A. General: Complying with ASTM C 1396/C 1396M, as applicable to type of gypsum board indicated and whichever is more stringent.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. USG Corporation.
b. Georgia Pacific Gypsum.
c. Lafarge North America.
d. National Gypsum Company.

B. Fire-Resistant Type X:

1. Thickness: 5/8 inch.
2. Long Edges: Tapered.

C. Ceiling Type: Manufactured to have more sag resistance than regular-type gypsum board.

1. Thickness: 5/8 inch.
2. Long Edges: Tapered.

D. Abuse-Resistant Type: Manufactured to produce greater resistance to surface indentation and through-penetration (impact resistance) than standard, regular-type and Type X gypsum board.

1. Core: 5/8 inch, Type X.
2. Long Edges: Tapered.

E. Impact-Resistant Type: Manufactured to produce greater resistance to through-penetration than typical abuse-resistant gypsum wallboard through the use of fiberglass mesh embedded into the core. Must provide Level 2 or Level 3 resistance to soft and hard body impacts per ASTM C1629..

1. Core: 5/8 inch, Type X.
2. Long Edges: Tapered.

F. Flexible Type: Manufactured to bend to fit radii and to be more flexible than standard regular-type gypsum board of same thickness.

1. Thickness: 1/4 inch.
2. Long Edges: Tapered.

2.5 TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A108.1.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

   a. Custom Building Products; Wonderboard.
   b. FinPan, Inc.; Util-A-Crete Concrete Backer Board.
   c. National Gypsum; PermaBase Cement Board.
   d. USG Corporation; DUROCK Cement Board.

2. Thickness: 1/2 inch.

2.6 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
2. Shapes:

   a. Cornerbead.
   b. Bullnose bead.
   c. LC-Bead: J-shaped; exposed long flange receives joint compound.
   d. Expansion (control) joint.
   e. Curved-Edge Cornerbead: With notched or flexible flanges.

B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Fry Reglet Corp.
   b. Gordon, Inc.
   c. Pittcon Industries.

2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221, Alloy 6063-T5.
3. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.

2.7 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Wallboard: Paper.

2. Exterior Gypsum Soffit Board: Paper.
3. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
4. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
3. Fill Coat: For second coat, use setting-type, sandable topping compound.
4. Finish Coat: For third coat, use setting-type, sandable topping compound.
5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound.

D. Joint Compound for Tile Backing Panels:

1. Cementitious Backer Units: As recommended by backer unit manufacturer.

2.8 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

1. Use adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

D. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

E. Acoustical Sealant: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

1. Use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Acoustical Sealant for Exposed and Concealed Joints:

    a. Pecora Corp.; AC-20 FTR Acoustical and Insulation Sealant.
    b. United States Gypsum Co.; SHEETROCK Acoustical Sealant.

3. Acoustical Sealant for Concealed Joints:

    a. Ohio Sealants, Inc.; Pro-Series SC-170 Rubber Base Sound Sealant.
    b. Pecora Corp.; BA-98.
    c. Tremco, Inc.; Tremco Acoustical Sealant.

2.9 IDENTIFICATION LABELS FOR FIRE- AND SMOKE-PARTITIONS

A. Identification Labels: Vinyl adhesive signs, to comply with applicable local Code.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    a. Fire Wall Signs, Inc.
    b. Safety Supply Warehouse.

2. Text: "FIRE AND SMOKE BARRIER – PROTECT ALL OPENINGS"

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames and framing, for compliance with requirements and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.

1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

B. Coordination with Sprayed Fire-Resistive Materials:

1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches o.c.
2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

3.3 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754. Also comply with requirements in ASTM C 840 that apply to framing installation.

B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

C. Install bracing at terminations in assemblies.

D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING SUSPENSION SYSTEMS

A. Install suspension system components in sizes and spacings indicated on Drawings, but not less than those required by referenced installation standards for assembly types and other assembly components indicated.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.

    a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.

    a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.

3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
5. Do not attach hangers to steel roof deck.
6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
8. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

E. Seismic Bracing: Sway-brace suspension systems with hangers used for support..

F. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

G. Installation Tolerances: Install suspension systems that are level to within [1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

3.5 INSTALLING FRAMED ASSEMBLIES

A. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

B. Install studs so flanges within framing system point in same direction.

C. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on doorframes; install runner track section (for cripple studs) at head and secure to jamb studs.

    a. Install two studs at each jamb, unless otherwise indicated.
    b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
    c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.

3. Other Framed Openings: Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.

    a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.

5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
6. Curved Partitions:

    a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs. For tight radii, hinged track is acceptable.
    b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of not less than 2 studs at ends of arcs, place studs 6 inches o.c.

D. Direct Furring: Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

E. Z-Furring Members:

1. Erect insulation vertically and hold in place with Z-furring members spaced 24 inches o.c.
2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.

3.6 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
2. Fit gypsum panels around ducts, pipes, and conduits.
3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

3.7 APPLYING INTERIOR GYPSUM BOARD

A. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing, unless otherwise indicated.
2. On partitions/walls, apply gypsum panels to minimize end joints.
3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

B. Multilayer Application:

1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints 1 framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
3. On Z-furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
4. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

C. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.

D. Curved Surfaces:

1. Install panels horizontally (perpendicular to supports) and unbroken, to extent possible, across curved surface plus 12-inch-long straight sections at ends of curves and tangent to them.
2. For double-layer construction, fasten base layer to studs with screws 16 inches o.c. Center gypsum board face layer over joints in base layer, and fasten to studs with screws spaced 12 inches o.c.

3.8 APPLYING EXTERIOR GYPSUM PANELS FOR CEILINGS AND SOFFITS

A. Apply panels perpendicular to supports, with end joints staggered and located over supports.

1. Install with 1/4-inch trimmed open joint space where panels abut other construction or structural penetrations.
2. Fasten with corrosion-resistant screws.

3.9 APPLYING TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A108.1, at locations indicated to receive tile, with joints treated to comply with ANSI A108.11.

B. Areas Not Subject to Wetting: Install regular-type gypsum wallboard panels to produce a flat surface except at showers, tubs, and other locations indicated to receive water-resistant panels.

C. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.10 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Designer for visual effect.

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners, unless otherwise indicated.
2. LC-Bead: Use at exposed panel edges.
3. Curved-Edge Cornerbead: Use at curved openings.

D. Exterior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners.
2. LC-Bead: Use at exposed panel edges..

E. Aluminum Trim: Install in locations indicated on Drawings.

3.11 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints, rounded or beveled edges, and damaged surface areas.

C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below:

1. GA Level 1: Ceiling plenum areas and concealed areas not exposed to view.
2. GA Level 2: Panels that are substrate for tile.
3. GA Level 3: Not used.
4. GA Level 4: Panel surfaces that will be exposed to view (typical panels).
5. GA Level 5: Where indicated on Drawings.

E. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.12 INSTALLING IDENTIFICATION FOR FIRE- AND SMOKE-PARTITIONS

A. Marking and Identification for Fire- and Smoke-Partitions: Permanently install as required by Code.

3.13 PROTECTION

A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

B. Remove and replace panels that are wet, moisture damaged, or exhibit mold growth. Repair of damaged panels in place is not acceptable.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION

SECTION 095113

ACOUSTICAL PANEL CEILINGS

(Part of Work of Section 090003 - ACOUSTICAL TILE, Filed Sub-Bid Required)

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Acoustical ceiling tiles and panels.
2. Suspension systems, grid systems and ceiling hangers.
3. Acoustical sealant at edge moldings at acoustical ceilings.
4. Trim and accessories.

B. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 092116 - GYPSUM BOARD ASSEMBLIES for gypsum board ceilings and soffits.
2. Section 210001 - FIRE PROTECTION for fire-suppression components located in ceilings.
3. Section 230001 - HEATING, VENTILATING AND AIR CONDITIONING for air handling and distribution components located in ceilings.
4. Section 260001 - ELECTRICAL WORK for light fixture and alarm system components located in ceilings.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items. Show the following:

1. Ceiling suspension members.
2. Method of attaching hangers to building structure. Furnish layouts for cast-in-place anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.

3. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
4. Minimum Drawing Scale: 1/4 inch = 1 foot.

C. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.

1. Acoustical Panel: Set of 6 inch square Samples of each type, color, pattern, and texture.
2. Exposed Suspension System Members, Moldings, and Trim: Set of 12 inch long Samples of each type, finish, and color.

D. Asbestos Certification: Manufacturer's written certification that acoustical ceiling products contain no asbestos (0.0000%). Product labels indicating that it is the user's responsibility to test the products for asbestos are unacceptable and sufficient cause for rejection of the product on site.

E. Maintenance Data: For finishes to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Source Limitations:

1. Acoustical Ceiling Panels: Obtain each type through one source from a single manufacturer.
2. Suspension Systems: Obtain each type through one source from a single manufacturer.

B. Fire-Test-Response Characteristics: Provide acoustical panel ceilings that comply with the following requirements:

1. Fire-Resistance Characteristics: Where indicated, provide acoustical panel ceilings identical to those of assemblies tested for fire resistance per ASTM E 119 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

a. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.
b. Identify materials with appropriate markings of applicable testing and inspecting agency.

2. Surface-Burning Characteristics: Provide acoustical panels complying with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84:

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.7 COORDINATION

A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Acoustical Ceiling Panels: Full-size panels equal to 2.0 percent of quantity installed.
2. Suspension System Components: Quantity of each exposed component equal to 2.0 percent of quantity installed.
3. Hold-Down Clips: Equal to 2.0 percent of quantity installed.

PART 2 - PRODUCTS

2.1 ACOUSTICAL PANELS, GENERAL

A. Products: Subject to compliance with specified requirements, provide one of the following products for each type indicated.

B. ACT-1: As indicated.

1. Manufacturer and Model Number:
   a. USG, Mars ClimaPlus No. 86985.
   b. Armstrong, Ultima No. 1912.
   c. CertainTeed, Symphony M.
2. Panel Size: 24 inches by 48 inches, minimum 1 inch thick.
3. Panel Edge: Square.
4. Noise Reduction Coefficient (NRC): 0.90 or better.
5. Ceiling Attenuation Class (CAC): Not less than 35.
6. Color: White.

7. Grid Material: Painted steel.
8. Grid Face Width: 9/16 inch.

C. ACT-2: General office use and as indicated.

1. Manufacturer and Model Number:
   a. USG, Mars ClimaPlus No. 86985.
   b. Armstrong, Ultima No. 1912.
   c. CertainTeed, Symphony M.
2. Panel Size: 24 inches by 24 inches by 3/4 inch.
3. Panel Mounting: Revealed edge.
4. Noise Reduction Coefficient (NRC): Not less than 0.70.
5. Ceiling Attenuation Class (CAC): Not less than 35.
6. Color: White.
7. Grid Material: Painted steel.
8. Grid Face Width: 9/16 inch.

2.2 METAL SUSPENSION SYSTEMS

A. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.

1. Manufacturer: USG, Armstrong, CertainTeed, or Chicago Metallic.
2. Structural Classification: Intermediate-duty system.
3. End Condition of Cross Runners: Override (stepped) or butt-edge type.
4. Face Design: Flat, flush.
5. Cap Material: Steel or aluminum cold-rolled sheet.
6. Color: White, prefinished.
7. Grid Face Width: As specified with ACT type.

B. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated.

1. Anchors in Concrete: Anchors with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing per ASTM E 488 or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency; zinc-plated for Class SC1 service.

2. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing per ASTM E 1190, conducted by a qualified testing and inspecting agency.

C. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

1. Zinc-Coated Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.

2. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106 diameter wire.

D. Hold-Down Clips: At vestibules and areas subject to wind uplift, provide manufacturer's standard hold-down clips spaced 24 inches on all cross tees.

2.3 METAL EDGE MOLDINGS AND TRIM

A. Roll-Formed Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that fit acoustical panel edge details and suspension systems indicated; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension system runners.

1. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.
2. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.
3. For narrow-face suspension systems, provide suspension system and manufacturer's standard edge moldings that match width and configuration of exposed runners.

2.4 ACOUSTICAL SEALANT

A. Acoustical Sealant for Concealed Joints: Manufacturer's standard nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant, with a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24), recommended for sealing interior concealed joints to reduce airborne sound transmission.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

A. General: Install acoustical panel ceilings to comply with ASTM C 636 per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

1. The layout and installation of acoustical panel ceilings and suspension systems shall be coordinated with other work penetrating the ceiling. This includes, but is not limited to, light fixtures, HVAC diffusers and equipment, and fire suppression system components.
2. Acoustical panels shall be cut and fit around light fixtures, HVAC diffusers and equipment and fire suppression system components to set flush or recessed as recommended by manufacturer.

B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
5. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
6. Do not attach hangers to steel deck tabs.
7. Space hangers not more than 48 o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.

C. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.

1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

D. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

E. Install acoustical panels with undamaged edges and fit accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.

1. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
2. Install hold-down clips in areas indicated, in areas required by authorities having jurisdiction, and for fire-resistance ratings; space as recommended by panel manufacturer's written instructions, unless otherwise indicated.

3.4 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

SECTION 096723

EPOXY RESIN FLOORING

PART1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Epoxy flooring systems.

B. Related Work: The following items are not included in this Section and are specified under the designated Sections:

1. Section 07920 - JOINT SEALANTS..

1.2 SYSTEM DESCRIPTION

A. Epoxy composition flooring and base composed of an epoxy resin incorporating ceramic coated inorganic quartz aggregate, with a cleanable skid-resistant safety topping and sealed finish.

1.3 SUBMITTALS

A. Product Data: Submit printed product descriptions, physical properties data, color charts, specifications, and application instructions as applicable, for each material specified except reinforcement and sealants.

B. Samples:

1. Flooring and Base Combination: Each type and color; 12 inches x 12 inches x height of base plus one inch, complete with dividing strip at the toe and bead at top of base. Mount sample on plywood.
2. Liquid Binder for Reinforcement: One quart.
3. Clear Sealer: One quart.

C. Quality Control Submittals:

1. Test Reports: At the request of the Director, furnish test reports from an independent testing laboratory showing that the submitted flooring materials meet or exceed specified physical properties and performance requirements.
2. Certificates: Affidavit required under Article 3.1.
3. Installer's Qualifications Data: Affidavit required under Quality Assurance Article.
4. List of Completed Installations: At the request of the Director, furnish a list of at least 5 comparable installations of the submitted flooring materials with a satisfactory service life of not less than 3 years.

D. Contract Closeout Submittals:

1. Maintenance Data: Deliver 2 copies of the flooring manufacturer's printed recommendations for cleaning and maintaining the installed flooring to the Director's Representative.

1.4 QUALITY ASSURANCE

A. Installer's Qualifications: The person supervising the Work of this Section and the workers installing the flooring system shall be personally experienced in epoxy resin flooring work and shall have been regularly employed by a company engaged in this type of flooring installation for a minimum of 3 years.

1. Furnish to the Director the names and addresses of 5 similar projects which the foregoing people have worked on during the past 3 years.

B. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, through one source from a single manufacturer. Provide secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from source recommended by manufacturer of primary materials.

1. Materials furnished for each type and color of flooring and base shall be from the same batch number.

C. Mockups: Apply mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Apply full-thickness mockups on 48-inch- square floor area selected by Design Professional.
   a. Include 48-inch length of integral cove base.
2. Simulate finished lighting conditions for Design Professional's review of mockups.
3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

D. Pre-installation Conference: Prior to installation of flooring, meet at the Project site with the Manufacturer’s Representative, the Installer, the Architect, the Owner’s Representative and the Owner’s Testing Agency. Record discussions and furnish copy to each participant. Topics to be discussed shall include, but not be limited to:

1. Existing and new slab conditions
2. Owner’s Testing Agency results of mandatory testing
3. Surface preparation
4. Required room temperatures
5. Ventilation
6. Step-by-step application procedures
7. Curing time and methods
8. Protection of completed Work

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the Site in factory sealed containers, clearly labeled and marked with manufacturer's name, address, batch number, and date of manufacture.

B. Store materials in accordance with manufacturer's printed instructions.

1.6 PROJECT CONDITIONS

A. Environmental Requirements:

1. Maintain temperature and relative humidity conditions necessary for proper installation and curing of the Work. Comply with flooring manufacturer's recommendations.
2. Maintain sufficient ventilation in areas to receive the Work of this Section. Follow flooring manufacturer's recommendations.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Decorative quartz epoxy flooring shall be Dex-O-Tex Decor-Flor as manufactured by Crossfield Products Corp. in Rancho Dominguez, California and Roselle Park, New Jersey or equal by one of the following:

1. DUR-A-FLEX.
2. Stonhard, Inc.
3. Tnemec Company Inc.

B. Basis of Design Product: DUR-A-FLEX Dur-A-Chip One

C. VOC Content of Liquid-Applied Flooring Components: Mot more than 100 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

2.2 PROPERTIES

A. Physical Properties: Provide flooring system that meets or exceeds the listed Minimum physical property requirements when tested in according to the referenced standard test method in parentheses.

1. Compressive Strength"
   a. Complete System (ASTM Cl09): 8,556 psi.
   b. Resin Component (ASTM D695): 12,900 psi.
   c. Surface Hardness (ASTM D2240): Durometer D 85
2. Aggregate Hardness (Moh's Mineral Scale): 6 1/2-7
3. Indentation Characteristics (MIL-PRF-3134 Para. 4.7.4.2.1-Steadily Applied Load): 0.005 indentation
4. Impact Resistance (MIL-PRF-3134 Para. (4.7.3): 0.011 indentation, no cracking, loss of bond.
5. Adhesion (ACI Comm. 503.1-92): No cracking, loss of bond 345 psi. (100% failure in concrete)
6. Water Absorption (MIL-PRF-3134): Less than 1%
7. Abrasion Resistance (ASTM C501): 19 Wear Index (H-22 Wheel)
8. Tensile Strength (ASTM D638) Resin Component: 4,400 psi.
9. Elongation (ASTM D638) Resin Component:: 19.6%

B. Colors: As selected by the Director from Manufacture's standard colors

C. Sealant: One-part, mildew resistant silicone sealant (Type ID) specified in Section 07920.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine surfaces scheduled to receive the Work of this Section for defects that will adversely affect the execution and quality of the Work. Do not proceed until unsatisfactory conditions are corrected.

B. Certification: Furnish affidavit by the flooring installer that the surfaces to receive the Work of this Section have been examined and are acceptable for application of the approved flooring. Do not install the flooring until such certification has been acknowledged by the Director in writing.

3.2 PREPARATION

A. Substrate: Perform preparation and cleaning procedures according to flooring manufacturer's instructions for particular substrate conditions involved, and as specified. Provide clean, dry, and neutral substrate for flooring application.

B. Concrete Surfaces: Shot-blast, acid etch or power scarify as required to obtain optimum bond of flooring to concrete. Remove sufficient material to provide a sound surface, free of laitance, glaze, efflorescence, and any bond-inhibiting curing compounds or form release agents. Remove grease, oil, and other penetrating contaminates. Repair damaged and deteriorated concrete to acceptable condition. Leave surface free of dust, dirt, laitance, and efflorescence.

C. Materials: Mix epoxy resin components when required, and prepare materials according to flooring system manufacturer's instructions.

3.3 APPLICATION

A. General: Apply each component of decorative quartz epoxy flooring system according to manufacturer's directions to produce a uniform monolithic flooring surface of thickness indicated.

B. Broadcast Coats: Apply liberal application of clear epoxy resin mixture, allow to self-level, broadcast (by hand or spray machine) ceramic coated quartz aggregate, allow to set to hardness, sweep off excess unbonded aggregate and repeat process to achieve total nominal thickness of 1/16 in. - 1/8 in.

C. Finish or Sealing Coats: After quartz filled broadcast coats have cured sufficiently, apply finish coats of type recommended by flooring manufacturer to produce finish matching approved submittal sample and in number of coats and spreading rates recommended by manufacturer.

1. Finished floor shall be 11/16 in. - 1/8 in thick, uniform in color and free of trowel marks.

D. Cove Base: Apply cove base mix to wall surfaces at locations shown to form cove base height of 4 inches unless otherwise indicated. Follow manufacturer's printed instructions and details including taping, mixing, priming, troweling, sanding, and top-coating of cove base.

3.4 CURING, PROTECTION AND CLEANING.

A. Cure decorative quartz epoxy flooring materials according to manufacturer's directions, taking care to prevent contamination during application stages and before completing curing process. Close application area for a minimum of 24 hours.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

A. Separate measurement and payment will not be made for the work of this Section. The cost for all work, complete in place; furnishing and installing all materials, equipment and accessories required; providing all tools, labor, transportation, handling and storage; and performing all work incidental to completion of work of this Section shall be included in the Contract Lump Sum Prices for the work.

END OF SECTION

SECTION 097720

DECORATIVE FIBERGLASS REINFORCED WALL PANELS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the GENERAL REQUIREMENTS AND COVENANTS - DIVISION I, and the SPECIAL PROVISIONS - DIVISIONS IIA and IIB, which are hereby made a part of this Specification Section.

B. Examine all Drawings and all Sections of the Specifications for requirements and provisions affecting the Work of this Section.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Glass-fiber reinforced plastic (FRP) wall paneling and trim accessories.

B. Related Work: The following items are not included in this Section and are specified under the designated Sections:

1. Section 061000 - ROUGH CARPENTRY for wood furring for installing plastic paneling.
2. Section 079200 - JOINT SEALANTS.
3. Section 092900 - GYPSUM BOARD.

1.3 SUBMITTALS

A. Shop Drawings: Indicating panel layouts

B. Product Data: For each type of product indicated.

C. Samples for Verification: For plastic paneling and trim accessories, in manufacturer's standard sizes.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain plastic paneling and trim accessories from single manufacturer.

B. Installer: Company specializing in performing the Work of this Section with a record

of successful in-service performance, as well as sufficient production capacity to complete the Work of this Section within schedule

C. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 450 or less.
3. Testing Agency: Acceptable to the Fire Marshall

D. Tolerances: Not more than 1/16 inch difference in true plane at joints between adjacent boards before finishing. After finishing, joints shall not be visible. Not more than 1/8 inch in 10 feet deviation from true plane, plumb, level and proper relation to adjacent surfaces in finished work.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver materials factory packaged on strong pallets.

B. Store panels and trim lying flat, under cover and protected from the elements. Allow panels to acclimate to room temperature (range of 60 to 75°F) for 48 hours prior to installation.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install plastic paneling until spaces are enclosed and weathertight and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Crane Composites.
2. Marlite.
3. Nudo Products, Inc.

B. Basis of Design: Marlite Symmetrix™ SmartSeam FRP

C. General: Gelcoat-finished, glass-fiber reinforced plastic (FRP) panels complying with ASTM D 5319.

1. Nominal Thickness: Not less than 0.075 inch.
2. Dimensions:
    a) Thickness – 0.090 “ (2.29mm) nominal
    b) Width - 4'-0” (1.22m) nominal
    c) Length – [10’-0” (3.0m)][8’-0” (2.4m)][As indicated on the drawings] nominal
3. Panel Height: Either 8 ft. or 10 ft. to suit wall heights without horizontal joints.
4. Tolerance:

a) Length and Width: +/-1/8 “ (3.175mm)
b) Square - Not to exceed 1/8 “ for 8 foot (2.4m) panels or 5/32 “ (3.96mm) for 10 foot (2.4m) panels

5. Surface Finish: As selected by Designer from manufacturer's full range.
6. Color: As selected by Designer from manufacturer's full range.

2.2 ACCESSORIES

A. Trim Accessories: Manufacturer's heavy weight extruded aluminum trim designed to retain and cover edges of panels. Provide division bars, inside corners, outside corners, and caps as needed to conceal edges.

1. Color: As selected by Designer from manufacturer's full range.

B. Concealed Mounting Splines: Continuous, H-shaped aluminum extrusions designed to fit into grooves routed in edges of factory-laminated panels and to be fastened to substrate.

C. Adhesive: construction adhesives complying with ASTM C 557..

1. Low-Emitting Materials: Provide adhesives in compliance with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
2. VOC Content: 50 g/L or less.
3. Do not use adhesives that contain urea formaldehyde.
4. Methylene chloride and perchloroethylene may not be intentionally added to adhesives.

D. Sealant: Single-component, mildew-resistant, neutral-curing silicone sealant recommended by plastic paneling manufacturer and complying with requirements in Section 079200 - JOINT SEALANTS.

1. Low-Emitting Materials: Provide adhesives in compliance with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
2. VOC Content, Architectural Sealants: 250 g/L or less.
3. Methylene chloride and perchloroethylene may not be intentionally added to sealants.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Examine backup surfaces to determine that corners are plumb and straight, surfaces are smooth, uniform, clean and free from foreign matter, nails countersunk, joints and cracks filled flush and smooth with the adjoining surface.

1. Verify that stud spacing does not exceed 24” (61cm) on-center.

B. Prepare substrate by sanding high spots and filling low spots as needed to provide flat, even surface for panel installation.

C. Clean substrates of substances that could impair bond of adhesive, including oil, grease, dirt, and dust.

D. Condition panels by unpacking and placing in installation space before installation according to manufacturer's written recommendations.

E. Lay out paneling before installing. Locate panel joints to provide equal panels at ends of walls not less than half the width of full panels and so that trimmed panels at corners are not less than 12 inches wide.

1. Mark plumb lines on substrate at panel joint locations for accurate installation.
2. Locate trim accessories to allow clearance at panel edges according to manufacturer's written instructions.

3.3 INSTALLATION

A. Comply with manufacturer's recommended procedures and installation sequence and approved submittals. Install panels in a full spread of adhesive. Install trim accessories with adhesive.

B. Fill grooves in trim accessories with sealant before installing panels and bed inside corner trim in a bead of sealant.

C. Maintain uniform space between panels and wall fixtures. Fill space with sealant.

D. Remove excess sealant and smears as paneling is installed. Clean with solvent recommended by sealant manufacturer and then wipe with clean dry cloths until no residue remains.

END OF SECTION

SECTION 097823

INTERIOR PHENOLIC WALL PANELING

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the GENERAL REQUIREMENTS AND COVENANTS - DIVISION I, and the SPECIAL PROVISIONS - DIVISIONS IIA and IIB, which are hereby made a part of this Specification Section.

B. Examine all Drawings and all Sections of the Specifications for requirements and provisions affecting the Work of this Section.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Interior phenolic wall panels, soffits, trim and attachment systems.

B. Related Work: The following items are not included in this Section and are specified under the designated Sections:

1. Section 092110 - GYPSUM BOARD ASSEMBLIES for secondary support framing supporting wall panels.

1.3 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of wall panel and accessory.

B. Shop Drawings: Show fabrication and installation layouts of wall panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, and accessories.

C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.

1. Panels: 12 inches square.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of wall panel through one source from a single manufacturer.

B. Manufacturer Qualifications: Minimum of 10 years successful experience producing phenolic materials.

C. Installer Qualifications: Minimum of 2 years documented installation experience of specified materials.

D. Flame spread/ smoke development rating: Class A tested to ASTM E84, Type V Construction.

E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, sheets, wall panels, and other manufactured items so as not to be damaged or deformed. Package wall panels for protection during transportation and handling.

B. Unload, store, and erect wall panels in a manner to prevent bending, warping, twisting, and surface damage.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Trespa.
2. Wilsonart.
3. Formica.

B. Basis of Design: Trespa TopLab® VERTICAL Premium Decors

C. Thickness: 3/8 inch as indicated for interior walls with concealed fasteners, “Z” clip installations. Panels shall have uniform thickness (+0.03 in.) and flatness (maximum difference of 0.03 in.) for 10- foot span.

D. Trim: Provide aluminum corner trim that is standard with manufacturer’s standard mounting system.

E. Fire Performance: Flame spread (ASTM E-84) UL registered and labeled for quality consistency. Class 1 or Class A.

F. Performance Requirements: Surface impact resistance 9 lb., scratch resistance: 0.8 lb.

G. Mounting System: Manufacturer approved sub-frame system to support cladding weights of up to 8 pounds per square foot, fabricated of 0.09-inch 6063-T5 extruded aluminum.

H. Sub-Frame: Aluminum "Z" clips and trim to be manufactured specifically to meet the following requirements:

1. Handle the weight of phenolic panels.
2. Fasteners for panel assembly shall be designed to keep panels consistently flat at each joint.
3. Capable of holding panels up to 6 ft. high x 12 ft. wide.
4. Allow 1/4 in. ventilation gap between the wall and the back side of the panel clip, to prevent condensation behind the panels.
5. System to allow interchanging of components at a later date, with a dry-fit installation. No liquid adhesives to be used.

I. Trim and Clip Material:

1. Visible: Al 6061-T6.
2. Concealed: Al 6063-T5.
3. Thickness: not less than 0.62 in.

J. Fasteners: Manufacturer approved austenitic stainless-steel fastener with bi-metal welded carbon steel point. Fabricate the panels and attach the Z-Clips and trim to ensure proper tolerances. Field fabrication shall be allowed where necessary, but shall be kept to an absolute minimum. All fabrication shall be done under controlled shop conditions when possible.

K. All panel-exposed edges shall be square cut, with an eased edge.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 WALL PANEL INSTALLATION

A. General: Install wall panels in accordance with manufacturer's recommendations and approved submittals. Install with orientation, sizes, and locations indicated on Drawings. Install panels and fixing system as per shop drawings and specification.

1. Install aluminum sub-frame to support the "Z" clip sub-frame assembly, maximum attachment distance of 27 inches.

3.3 CLEANING AND PROTECTION

A. On completion of wall panel installation, clean finished surfaces as recommended by wall panel manufacturer. Maintain in a clean condition during construction.

B. Replace wall panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 099000

PAINTING AND COATING

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Field painting of exposed interior items and surfaces.
2. Field painting of exposed exterior items and surfaces.
3. Surface preparation for painting.

B. Alternates: Not Applicable.

C. Items To Be Installed Only: Not Applicable.

D. Items To Be Furnished Only: Not Applicable.

E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 051200 - STRUCTURAL STEEL FRAMING for shop priming structural steel.
2. Section 055000 - METAL FABRICATIONS for shop priming ferrous metal.
3. Section 055100 - METAL STAIRS for shop priming ferrous metal.
4. Section 081113 - HOLLOW METAL DOORS AND FRAMES for factory priming steel doors and frames.
5. Section 092116 - GYPSUM BOARD ASSEMBLIES for surface preparation of gypsum board.

1.3 DEFINITIONS AND EXTENT

A. General: Standard coating terms defined in ASTM D 16 apply to this Section.

1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
2. Eggshell refers to low-sheen finish with a gloss range between 20 and 35 when measured at a 60-degree meter.

3. Semigloss refers to medium-sheen finish with a gloss range between 35 and 70 when measured at a 60-degree meter.
4. Full gloss refers to high-sheen finish with a gloss range more than 70 when measured at a 60-degree meter.

B. This Section includes surface preparation and field painting of exposed exterior and interior items and surfaces.

1. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.

C. Paint exposed surfaces, except where these Specifications indicate that the surface or material is not to be painted or is to remain natural. If an item or a surface is not specifically mentioned, paint the item or surface the same as similar adjacent materials or surfaces. If a color of finish is not indicated, Designer will select from standard colors and finishes available.

1. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron supports, and surfaces of mechanical and electrical equipment that do not have a factory-applied final finish.

D. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.

1. Prefinished items include the following factory-finished components:

a. Architectural woodwork.
b. Acoustical wall panels.
c. Metal toilet enclosures.
d. Metal lockers.
e. Kitchen appliances.
f. Elevator entrance doors and frames.
g. Elevator equipment.
h. Finished mechanical and electrical equipment.
i. Light fixtures.

2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:

a. Foundation spaces.
b. Furred areas.
c. Ceiling plenums.
d. Utility tunnels.
e. Pipe spaces.
f. Duct shafts.
g. Elevator shafts.

3. Finished metal surfaces include the following:

a. Anodized aluminum.
b. Stainless steel.
c. Chromium plate.

d. Copper and copper alloys.
e. Bronze and brass.

4. Operating parts include moving parts of operating equipment and the following:

a. Valve and damper operators.
b. Linkages.
c. Sensing devices.
d. Motor and fan shafts.

5. Labels: Do not paint over UL, FMG, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

1.4 SUBMITTALS

A. Product Data: For each paint system indicated. Include block fillers and primers.

1. Material List: An inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
2. Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material.

B. Samples for Verification: For each color and material to be applied, with texture to simulate actual conditions, on representative Samples of the actual substrate.

1. Provide stepped Samples, defining each separate coat, including block fillers and primers. Use representative colors when preparing Samples for review. Resubmit until required sheen, color, and texture are achieved.
2. Provide a list of materials and applications for each coat of each Sample. Label each Sample for location and application.
3. Submit two eight inch by 12 inch Samples for each type of finish coating for Designer's review of color and texture only.

C. Qualification Data: For Applicator.

1.5 QUALITY ASSURANCE

A. Applicator Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

B. Source Limitations: Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats.

C. Mockups: Provide a full-coat benchmark finish sample for each type of coating and substrate required. Comply with procedures specified in PDCA P5. Duplicate finish of approved sample Submittals.

1. Designer will select one room or surface to represent surfaces and conditions for application of each type of coating and substrate.

    a. Wall Surfaces: Provide samples on at least 100 sq. ft.
    b. Small Areas and Items: Designer will designate items or areas required.

2. Apply benchmark samples, according to requirements for the completed Work, after permanent lighting and other environmental services have been activated. Provide required sheen, color, and texture on each surface.

    a. After finishes are accepted, Designer will use the room or surface to evaluate coating systems of a similar nature.

3. Final approval of colors will be from benchmark samples.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label and the following information:

1. Product name or title of material.
2. Product description (generic classification or binder type).
3. Manufacturer's stock number and date of manufacture.
4. Contents by volume, for pigment and vehicle constituents.
5. Thinning instructions.
6. Application instructions.
7. Color name and number.
8. VOC content.

B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F. Maintain storage containers in a clean condition, free of foreign materials and residue.

1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily.

1.7 PROJECT CONDITIONS

A. Apply waterborne paints only when temperatures of surfaces to be painted and surrounding air are between 50 and 90 deg F.

B. Apply solvent-thinned paints only when temperatures of surfaces to be painted and surrounding air are between 45 and 95 deg F.

C. Do not apply paint in snow, rain, fog, or mist; or when relative humidity exceeds 85 percent; or at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

1.8 EXTRA MATERIALS

A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Paint: Furnish four unopened gallons of each type of paint and coating work, in color and gloss as used for the Project.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work are listed in the Finish Schedule at the end of this Section.

2.2 PAINT MATERIALS, GENERAL

A. Material Compatibility: Provide block fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.

1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for paint application.

1. Proceed with paint application only after unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.

2. Start of painting will be construed as Applicator's acceptance of surfaces and conditions within a particular area.

B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.

1. Notify Designer about anticipated problems when using the materials specified over substrates primed by others.

3.2 PREPARATION

A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of size or weight of the item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.

B. Cleaning: Before applying paint or other surface treatments, clean substrates of substances that could impair bond of the various coatings. Remove oil and grease before cleaning.

1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions and technical bulletins for each particular substrate condition and as specified.

1. Provide barrier coats over incompatible primers or remove and reprime.
2. Cementitious Materials: Prepare concrete, concrete unit masonry, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.

    a. Use abrasive blast-cleaning methods if recommended by paint manufacturer.
    b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces if moisture content exceeds that permitted in manufacturer's written instructions.
    c. Clean concrete floors to be painted with a 5 percent solution of muriatic acid or other etching cleaner. Flush the floor with clean water to remove acid, neutralize with ammonia, rinse, allow to dry, and vacuum before painting.

3. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.

a. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.
b. Prime, stain, or seal wood to be painted immediately on delivery. Prime edges, ends, faces, undersides, and back sides of wood, including cabinets, counters, cases, and paneling.
c. If transparent finish is required, backprime with spar varnish.
d. Backprime paneling on interior partitions where masonry, plaster, or other wet wall construction occurs on back side.
e. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately on delivery.

4. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with SSPC's recommendations.

a. Blast steel surfaces clean as recommended by paint system manufacturer and according to SSPC-SP 6/NACE No. 3.
b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.

5. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.

D. Material Preparation: Mix and prepare paint materials according to manufacturer's written instructions.

1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
3. Use only thinners approved by paint manufacturer and only within recommended limits.

E. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.3 APPLICATION

A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.

1. Paint colors, surface treatments, and finishes are indicated in the paint schedules.
2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
3. Provide finish coats that are compatible with primers used.

4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, grilles, convector covers, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.
5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
6. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
7. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
8. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
9. Sand lightly between each succeeding enamel or varnish coat.

B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

1. The number of coats and film thickness required are the same regardless of application method. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
2. Omit primer over metal surfaces that have been shop primed and touchup painted.
3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure that edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure, and until application of another coat of paint does not cause undercoat to lift or lose adhesion.

C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.

1. Brushes: Use brushes best suited for type of material applied. Use brush of appropriate size for surface or item being painted.
2. Rollers: Use rollers of carpet, velvet-back, or high-pile sheep's wool as recommended by manufacturer for material and texture required.
3. Spray Equipment: Use airless spray equipment with orifice size as recommended by manufacturer for material and texture required.

D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate to achieve dry film thickness indicated. Provide total dry film thickness of the entire system as recommended by manufacturer.

E. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and occupied spaces.

F. Mechanical items to be painted include, but are not limited to, the following:

1. Uninsulated metal piping.
2. Uninsulated plastic piping.
3. Pipe hangers and supports.
4. Tanks that do not have factory-applied final finishes.
5. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
6. Duct, equipment, and pipe insulation having "all-service jacket" or other paintable jacket material.
7. Mechanical equipment that is indicated to have a factory-primed finish for field painting.

G. Electrical items to be painted include, but are not limited to, the following:

1. Switchgear.
2. Panelboards.
3. Electrical equipment that is indicated to have a factory-primed finish for field painting.

H. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.

I. Prime Coats: Before applying finish coats, apply a prime coat, as recommended by manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.

J. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

K. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections.

1. Provide satin finish for final coats.

L. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.4 FIELD QUALITY CONTROL

A. The WRTA Project Manager reserves the right to invoke the following test procedure at any time and as often as the WRTA Project Manager deems necessary during the period when paint is being applied:

1. The WRTA Project Manager will engage a qualified independent testing agency to sample paint material being used. Samples of material delivered to Project will be taken, identified, sealed, and certified in the presence of Contractor. Refer to Section 014325 - TESTING AGENCY SERVICES for additional requirements.

2. Testing agency will perform appropriate tests for the following characteristics as required by the WRTA Project Manager.
3. The WRTA Project Manager may direct Contractor to stop painting if test results show material being used does not comply with specified requirements. Contractor shall remove noncomplying paint from Project site, pay for testing, and repaint surfaces previously coated with the noncomplying paint. If necessary, Contractor may be required to remove noncomplying paint from previously painted surfaces if, on repainting with specified paint, the two coatings are incompatible.

3.5 CLEANING

A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from Project site.

1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping without scratching or damaging adjacent finished surfaces.

3.6 PROTECTION

A. Protect work of other trades, whether being painted or not, against damage from painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Designer.

B. Provide "Wet Paint" signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work.

1. After work of other trades is complete, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

3.7 PAINT SCHEDULE

A. Schedule: Provide products and number of coats specified. Use of manufacturer's proprietary product names to designate colors, materials, generic class, standard of quality and performance criteria and is not intended to imply that products named are required to be used to the exclusion of equivalent performing products of other manufacturers.

B. Exterior Paint Schedule:

C. Interior Paint Schedule:

1. Interior Gypsum Wallboard and Plaster Walls for Latex Eggshell Finish:

One Coat	1.	Moore Eco Spec WB Interior Latex Primer (372)
	2.	Duron Genesis Latex Primer
	3.	S-W Harmony Latex Wall Primer
	4.	PPG Pure Performance Latex Primer
	5.	Glidden Professional Lifemaster No VOC Latex Primer (9116)
And Two Coats	1.	Moore Eco Spec WB Interior Latex Eggshell (374)

2. Duron Genesis Latex Eggshell
3. S-W ProMar 200 Zero VOC Latex Eggshell
4. PPG Pure Performance Latex Eggshell
5. Glidden Professional Lifemaster No VOC Latex Eggshell (9300)

2. Interior Gypsum Wallboard and Plaster Ceilings for Latex Flat Finish:

One Coat
1. Moore Eco Spec WB Interior Latex Primer (372)
2. Duron Genesis Latex Primer
3. S-W Harmony Latex Wall Primer
4. PPG Pure Performance Latex Primer
5. Glidden Professional Lifemaster No VOC Latex Primer (9116)

And Two Coats
1. Moore Eco Spec WB Interior Latex Flat (373)
2. Duron Genesis Latex Flat
3. S-W ProMar 200 Zero VOC Latex Flat
4. PPG Pure Performance Latex Flat
5. Glidden Professional Lifemaster No VOC Latex Flat (9100)

3. Interior Gypsum Wallboard and Plaster for Latex Semi-Gloss Finish:

One Coat
1. Moore Eco Spec WB Interior Latex Primer (372)
2. Duron Genesis Latex Primer
3. S-W Harmony Latex Wall Primer
4. PPG Pure Performance Latex Primer
5. Glidden Professional Lifemaster No VOC Latex Primer (9116)

And Two Coats
1. Moore Eco Spec WB Interior Latex Semi-Gloss (376)
2. Duron Genesis Latex Semi-Gloss
3. S-W ProMar 200 Zero VOC Latex Semi-Gloss
4. PPG Pure Performance Latex Semi-Gloss
5. Glidden Professional Lifemaster No VOC Latex Semi-Gloss (9200)

4. Flat Interior Architectural Woodwork, Finish Carpentry, and Wood Doors for Latex Semi-Gloss Paint Finish (softwoods, paint grade hardwoods, MDO, and hardwood veneers):

One Coat
1. Moore Eco Spec WB Interior Latex Primer (372)
2. Duron Genesis Latex Primer
3. S-W Harmony Latex Primer
4. PPG Pure Performance Latex Primer
5. Glidden Professional Lifemaster No VOC Latex Primer (9116)

And Two Coats
1. Moore Eco Spec WB Interior Latex Semi-Gloss (376)
2. Duron Genesis Latex Semi-Gloss
3. S-W ProMar 200 Zero VOC Latex Semi-Gloss
4. PPG Pure Performance Latex Semi-Gloss
5. Glidden Professional Lifemaster No VOC Latex Semi-Gloss (9200)

5. Interior Architectural Woodwork, Finish Carpentry and Millwork for Satin Transparent Finish (all hardwoods and hardwood veneers, except paint grade and factory-finished items):

Sand		120 grit sandpaper
Sand		220 grit sandpaper
One Coat Stain	1.	Carver Tripp Waterbase Stain
	2.	Knute's Restoration EF Waterbase Stain
	3.	American Formulating & Manuf., SafeCoat Durostain
	4.	S-W Minwax Water Based Stain
And Two Coats	1.	Bona Kemi USA, Bona Tech Mega Waterbase Polyurethane
	2.	Target Coatings, Oxford Hybrid Satin Varnish
	3.	American Formulating & Manuf., Polyureseal BP
	2.	S-W Minwax Water Based Polyurethane
Sand Between Urethane Coats		220 grit sandpaper

6. Interior Metals (Doors, Frames and Similar Items), Epoxy (Not specified to receive other coating systems/not shop finished):

One Coat	1.	Approved primer, in shop under other Sections (where specified). If not shop primed, provide primer recommended by finish coating manufacturer
And One Coat	1.	Tnemec N69 Epoxoline at 2.0 mils DFT
	2.	PPG PMC Amerlock 400 at 2.0 to 4.0 mils DFT
	3.	Dupont 25P at 3.0 to 4.0 mils DFT
	4.	International Interseal 670 HS at 3.0 mils DFT
	5.	S-W Macropoxy 646 at 5.0 to 10.0 mils DFT
And One Coat	1.	Tnemec 1029 Tufcryl at 2.0 to 3.0 mils DFT
	2.	PPG PMC Amerlock 400 at 2.0 to 4.0 mils DFT
	3.	Dupont High Solids Acrylic Coating 3.0 mils DFT
	4.	International Intercryl 530 at 3.0 to 4.0 mils DFT
	5.	S-W DTM Acrylic at 2.5 to 4.0 mils DFT

7. Interior Exposed Steel, Joists, Ductwork, Conduit and Similar Items (where indicated):

One Coat	1.	Tnemec 115 WB Unibond or 15 Unibond at 2.5 to 3.0 mils DFT
	2.	PPG PMC Amercoat 220 Acrylic at 3.0 mils DFT
	3.	RD Muracryl at 2.5 to 3.0 mils DFT
	4.	International Intercryl 530 at 2.5 to 3.0 mils DFT
	5.	S-W Waterborne Dry Fall at 3.0 to 4.5 mils DFT

8. Mechanical and Electrical Work (Paint all exposed items throughout the project except factory finished items with factory-applied baked enamel finishes which occur in mechanical rooms or areas, and excepting chrome or nickel plating, stainless steel, and

aluminum other than mill finished. Paint all exposed ductwork and inner portion of all ductwork: Same as specified for other interior metals, hereinabove.

END OF SECTION

SECTION 102113

TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Floor-mounted overhead-braced toilet partitions and wall-hung urinal screens fabricated from recycled plastic.

B. Alternates: Not Applicable.

C. Items To Be Installed Only: Not Applicable.

D. Items To Be Furnished Only: Not Applicable.

E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 102813 - TOILET ACCESSORIES for partition mounted accessories.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Show locations of cutouts for compartment-mounted toilet accessories.

C. Samples for Verification: Of each type of color and finish required for units, prepared on 6-inch-square Samples of same thickness and material indicated for Work.

1.4 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating toilet compartments without field measurements. Coordinate wall, floor, ceilings, and other contiguous construction to ensure that actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Scranton Products, Inc. Hiny-Hiders or comparable product by one of the following:

1. Accurate Partitions Corporation.
2. Bradley Corporation; Mills Partitions.
3. General Partitions Mfg. Corp.
4. Global Steel Products, Corp.
5. Legacy Polymer Products, Inc.

B. Door, Panel, and Pilaster Construction: Solid, high-density polyethylene material, not less than 1 inch thick, seamless, with eased edges, and with homogenous color and pattern throughout thickness of material.

1. Color and Pattern: One color and pattern in each room as selected by Designer from manufacturer's full range of colors and patterns.

C. Toilet-Enclosure Style: Ceiling hung.

D. Pilasters and Fittings: Manufacturer's standard design.

2.2 ACCESSORIES

A. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories.

B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.

C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel or chrome-plated steel or brass, finished to match hardware, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use hot-dip galvanized or other rust-resistant, protective-coated steel.

2.3 FABRICATION

A. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, fasteners, and anchors at pilasters to suit floor conditions. Make provisions for setting and securing continuous head rail at top of each pilaster. Provide shoes at pilasters to conceal supports and leveling mechanism.

B. Doors: Unless otherwise indicated, provide 24-inch-wide in-swinging doors for standard toilet compartments and 36-inch-wide out-swinging doors with a minimum 32-inch-wide clear opening for compartments indicated to be accessible to people with disabilities.

1. Hinges: Manufacturer's standard self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees.
2. Latch and Keeper: Manufacturer's standard latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with accessibility requirements of authorities having jurisdiction at compartments indicated to be accessible to people with disabilities.
3. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent door from hitting compartment-mounted accessories.
4. Door Bumper: Manufacturer's standard rubber-tipped bumper at out-swinging doors.
5. Door Pull: Manufacturer's standard unit at out-swinging doors that complies with accessibility requirements of authorities having jurisdiction. Provide units on both sides of doors at compartments indicated to be accessible to people with disabilities.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.

1. Maximum Clearances:

a. Pilasters and Panels: 1/2 inch.
b. Panels and Walls: 1 inch.

2. Stirrup Brackets: Secure panels to walls and to pilasters with not less than two brackets near top and bottom of panel.

a. Locate wall brackets so holes for wall anchors occur in masonry or tile joints.
b. Align brackets at pilasters with brackets at walls.

B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Secure continuous head rail to each pilaster with not less than two fasteners. Hang doors to align tops of doors with tops of panels and adjust so tops of doors are parallel with overhead brace when doors are in closed position.

C. Wall-Hung Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb and to resist lateral impact.

3.2 ADJUSTING

A. Hardware Adjustment: Adjust and lubricate hardware according to manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors and doors in entrance screens to return doors to fully closed position.

END OF SECTION

SECTION 102813

TOILET ACCESSORIES

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Toilet accessories as scheduled on the Drawings.

B. Alternates: Not Applicable.

C. Items To Be Installed Only: Not Applicable.

D. Items To Be Furnished Only: Furnish the following items for installation by the designated Sections:

1. Section 220001 - PLUMBING:
   a. Toilet accessories.

E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 061000 - ROUGH CARPENTRY for blocking.
2. Section 088000 - GLAZING for frameless mirrors.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include the following:

1. Construction details and dimensions.
2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
3. Material and finish descriptions.
4. Features that will be included for Project.
5. Manufacturer's warranty.

B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

1. Identify locations using room designations indicated on Drawings.
2. Identify products using designations indicated on Drawings.

C. Maintenance Data: For toilet accessories to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Source Limitations: For products listed together in the same articles in Part 2, provide products of same manufacturer unless otherwise approved by Designer.

1.5 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. A & J Washroom Accessories, Inc.
2. American Specialties, Inc.
3. Bobrick Washroom Equipment, Inc.
4. Bradley Corporation.
5. General Accessory Manufacturing Co. (GAMCO).
6. Trueform

B. Basis of Design:
1. Toilet: Acorn R2141-T-3
2. Electrical Hand Dryer: TOTO Clean Dry High Speed Concealed Hand Dryer
3. Sink: Trueform Ramp sink, with drilled hole for sensor activated soap dispenser
4. Toilet Paper Dispenser: Bobrick B-2890

2.2 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, 0.0312-inch minimum nominal thickness, unless otherwise indicated.

B. Galvanized Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.

C. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.

2.3 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to the DCAMM Project Manager's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Work of Section 220001 - PLUMBING.

END OF SECTION

SECTION 104400

FIRE-PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Portable fire extinguishers.
2. Fire-protection cabinets for portable fire extinguishers, fire hose valves, and fire hoses.
3. Mounting brackets for fire extinguishers.

B. Alternates: Not Applicable.

C. Items To Be Installed Only: Not Applicable.

D. Items To Be Furnished Only: Not Applicable.

E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 099000 - PAINTING AND COATING for field painting fire-protection cabinets.
2. Section 210001 – FIRE PROTECTION for fire hose valves and standpipes.

1.3 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each item.

1. Fire Extinguishers: Include rating and classification.
2. Fire-Protection Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.
3. Show location of knockouts for hose valves.

B. Maintenance Data: For fire extinguishers, fire-protection cabinets and stairway evacuation chairs to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain fire extinguishers and fire-protection cabinets through one source from a single manufacturer.

B. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

C. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

D. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements of ASTM E 814 for fire-resistance rating of walls where they are installed.

1.5 COORDINATION

A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

B. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire hoses, hose valves, and hose racks indicated are accommodated

C. Coordinate size and location of stairway evacuation chair in stairway to maintain proper clearance in stairway.

PART 2 - PRODUCTS

2.1 PORTABLE FIRE EXTINGUISHERS

A. General: Provide fire extinguishers of type, size, and capacity for each fire-protection cabinet and mounting bracket indicated.

B. Multipurpose Dry-Chemical Type in Steel Container: UL-rated 2-A:10-B:C, 5-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

2.2 FIRE-PROTECTION CABINET

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. JL Industries, Inc.
2. Larsen's Manufacturing Company.
3. Potter Roemer; Div. of Smith Industries, Inc.

B. Cabinet Type: Suitable for fire extinguisher, and hose and hose valve where applicable.

C. Cabinet Material: Enameled-steel sheet.

D. Recessed Cabinet: Cabinet box recessed in walls of sufficient depth to suit style of trim indicated.

1. Trimless with Plaster Stop: Surface of surrounding wall finishes flush with exterior finished surface of cabinet frame and door, without overlapping trim attached to cabinet. Provide recessed flange, of same material as box, attached to box to act as plaster stop. If wall condition does not allow for trimless with plaster stop, provide flat 5/16 inch trim of same material as the cabinet box.

E. Door Material: Steel sheet with baked enamel finish, color as selected.

F. Door Style: Vertical duo panel with frame.

G. Door Glazing: Tempered break glass.

H. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

I. Accessories:

1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire-protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
2. Break-Glass Strike: Manufacturer's standard metal strike, complete with chain and mounting clip, secured to cabinet, or provide locking mechanism that allows for emergency access to the cabinet without the breaking of glass, simply by pulling sharply on the cabinet’s handle.
3. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Designer.

2.3 MOUNTING BRACKETS

A. Mounting Brackets: Manufacturer's standard steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.

B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Designer.

2.4 STAIRWAY EVACUATION CHAIRS

A. Stairway Evacuation Chairs: Provide manufacturer's standard completely assembled unit, minimum 300 pound capacity, wall mounted on brackets.

B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Evacu-Trac CD7 by Garaventa.
2. Evac+Chair by Evac+Chair Corp..

3. Model 49 Sirocco Stair Chair by Ferno.
4. Evacuation Chair Model 6253 by Stryker.

2.5 FABRICATION

A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub), with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.

1. Weld joints and grind smooth.
2. Construct fire-rated cabinets with double walls fabricated from 0.0428-inch-thick, cold-rolled steel sheet lined with minimum 5/8-inch-thick, fire-barrier material.

a. Provide factory-drilled mounting holes.

B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles selected.

1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch thick.
2. Miter and weld perimeter door frames.

C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.6 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Finish fire-protection cabinets after assembly.

D. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for hose valves and cabinets to verify actual locations of piping connections before cabinet installation.

B. Examine walls and partitions for suitable framing depth and blocking where recessed cabinets will be installed.

C. Examine fire extinguishers for proper charging and tagging. Contractor shall be responsible for fire extinguisher tagging by a certified service technician located within 75 miles of the project.

1. Remove and replace damaged, defective, or undercharged units.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare recesses for recessed fire-protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

A. General: Install fire-protection specialties in locations and at mounting heights indicated on the Drawings and acceptable to authorities having jurisdiction.

B. Fire-Protection Cabinets: Fasten fire-protection cabinets to structure, square and plumb.

1. Unless otherwise indicated, provide recessed fire-protection cabinets. If wall thickness is not adequate for recessed cabinets, provide semirecessed fire-protection cabinets.
2. Provide inside latch and lock for break-glass panels.
3. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.

C. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

D. Identification: Apply vinyl lettering at locations indicated.

3.4 INSTALLATION OF FIRE-RATED CABINETS

A. Install cabinet with not more than 1/16-inch tolerance between pipe OD and knockout OD. Center pipe within knockout.

B. Seal through penetrations with firestopping sealant as specified in Section 078413 - PENETRATION FIRESTOPPING.

3.5 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as fire-protection specialties are installed, unless otherwise indicated in manufacturer's written installation instructions.

B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

D. Touch up marred finishes, or replace fire-protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet manufacturer.

E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 122413

ROLLER SHADES

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Roller shades for manual shade operators.

B. Alternates: Not Applicable.

C. Items To Be Installed Only: Not Applicable.

D. Items To Be Furnished Only: Not Applicable.

E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 092600 – GYPSUM BOARD ASSEMBLIES.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions.

B. Shop Drawings: Show location and extent of roller shades. Include elevations, sections, details, and dimensions not shown in Product Data. Show installation details, mountings, attachments to other work, operational clearances, and relationship to adjoining work.

C. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Ceiling suspension system members and attachment to building structure.
2. Ceiling-mounted or penetrating items including light fixtures, air outlets and inlets, speakers, sprinklers, recessed shades, and special moldings at walls, column penetrations, and other junctures of acoustical ceilings with adjoining construction.

3. Shade mounting assembly and attachment.
4. Size and location of access to shade operator, motor, and adjustable components.
5. Minimum Drawing Scale: 1/4 inch = 1 foot.

D. Samples for Initial Selection: For each colored component of each type of shade indicated.

1. Include similar Samples of accessories involving color selection.

E. Samples for Verification:

1. Complete, full-size operating unit not less than 16 inches wide for each type of roller shade indicated.
2. For the following products:
   a. Shade Material: Not less than 12-inch- square section of fabric, from dye lot used for the Work, with specified treatments applied. Show complete pattern repeat. Mark top and face of material.
   b. Valance: Full-size unit, not less than 12 inches long.

F. Window Treatment Schedule: For roller shades. Use same designations indicated on Drawings.

G. Product Certificates: For each type of roller shade, signed by product manufacturer.

H. Qualification Data: For Installer.

I. Product Test Reports: For each type of roller shade.

J. Maintenance Data: For roller shades to include in maintenance manuals. Include the following:

1. Methods for maintaining roller shades and finishes.
2. Precautions about cleaning materials and methods that could be detrimental to fabrics, finishes, and performance.
3. Operating hardware.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

B. Source Limitations: Obtain roller shades through one source from a single manufacturer.

C. Fire-Test-Response Characteristics: Provide roller shade band materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. Flame-Resistance Ratings: Passes NFPA 701.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver shades in factory packages, marked with manufacturer and product name, fire-test-response characteristics, and location of installation using same designations indicated on Drawings and in a window treatment schedule.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install roller shades until construction and wet and dirty finish work in spaces, including painting, is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operable glazed units' operation hardware throughout the entire operating range. Notify Designer of discrepancies. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Rollers Shades: Before installation begins, for each size, color, texture, and pattern indicated, full-size units equal to 5 percent of amount installed.

PART 2 - PRODUCTS

2.1 ROLLER SHADES

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

1. MechoShade Systems, Inc.
2. Hunter Douglas Nysan Solar Control.
3. Crestron.

B. Basis of Design for Manually Operated Roller Shades: “Mecho 5”.

C. Shade Band Material: PVC-coated fiberglass

1. Pattern: As indicated
2. Style: As indicated
3. Colors: Match Designer's samples.
4. Material Openness Factor: As indicated
5. Material UV Blockage: As indicated
6. Bottom Hem: Straight

D. Rollers: Electrogalvanized or epoxy primed steel or extruded-aluminum tube of diameter and wall thickness required to support and fit internal components of operating system and the weight and width of shade band material without sagging; designed to be easily removable from support brackets; with removable spline fitting integral channel in tube for attaching shade material.

E. Direction of Roll: Regular, from back of roller

F. Mounting Brackets: Galvanized or zinc-plated steel.

G. Fascia: L-shaped, formed-steel sheet or extruded aluminum; long edges returned or rolled; continuous panel concealing front and bottom of shade roller, brackets, and operating hardware and operators; length as indicated on Drawings removable design for access.

H. Top/Back Cover: L-shaped; material and finish to match fascia; combining with fascia and end caps to form a six-sided headbox enclosure sized to fit shade roller and operating hardware inside.

I. Pocket-Style Headbox: U-shaped, formed-steel sheet or extruded aluminum; long edges returned or rolled; with a bottom cover consisting of slot opening of minimum dimension to allow lowering and raising of shade and a removable or an openable, continuous metal access panel concealing shade roller, brackets, and operating hardware and operators within.

J. Mounting: As indicated on Drawings, mounting permitting easy removal and replacement without damaging roller shade or adjacent surfaces and finishes.

K. Hold-Down Brackets and Hooks or Pins: Manufacturer's standard for anchoring roller shade bottom in place and keeping shade band material taut.

2.2 ROLLER SHADE FABRICATION

A. Product Description: Roller shade consisting of a roller, a means of supporting the roller, a flexible sheet or band of material carried by the roller, a means of attaching the material to the roller, a bottom bar, and an operating mechanism that lifts and lowers the shade.

B. Concealed Components: Noncorrodible or corrosion-resistant-coated materials.

1. Lifting Mechanism: With permanently lubricated moving parts.

C. Unit Sizes: Obtain units fabricated in sizes to fill window and other openings as follows, measured at 74 degrees F:

1. Shade Units Installed between (Inside) Jambs: Edge of shade not more than 1/4 inch from face of jamb. Length equal to head to sill dimension of opening in which each shade is installed.
2. Shade Units Installed Outside Jambs: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.

D. Installation Brackets: Designed for easy removal and reinstallation of shade, for supporting fascia, roller, and operating hardware and for hardware position and shade mounting method indicated.

E. Installation Fasteners: No fewer than two fasteners per bracket, fabricated from metal noncorrosive to shade hardware and adjoining construction; type designed for securing to supporting substrate; and supporting shades and accessories under conditions of normal use.

F. Color-Coated Finish: For metal components exposed to view, apply manufacturer's standard baked finish complying with manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness.

2.3 MANUAL ROLLER SHADE OPERATORS

A. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated. Provide stainless steel bead chains with upper and lower ball limit stops.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, accurate locations of connections to building electrical system, and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ROLLER SHADE INSTALLATION

A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions, and located so shade band is not closer than 2 inches to interior face of glass. Allow clearances for window operation hardware.

3.3 FIELD QUALITY CONTROL

A. Independent Testing Agency: Cooperate with the Independent Testing Agency engaged by WRTA for field quality control activities for the Work of this Section. Refer also to Section 014325 - TESTING AGENCY SERVICES.

3.4 ADJUSTING

A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.5 CLEANING AND PROTECTION

A. Clean roller shade surfaces after installation, according to manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.

C. Replace damaged roller shades that cannot be repaired, in a manner approved by Designer, before time of Substantial Completion.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Agency's maintenance personnel to adjust, operate, and maintain roller shades. Refer to Section 017700 - CONTRACT CLOSEOUT.

END OF SECTION

SECTION 124813

ENTRANCE FLOOR MATS AND FRAMES

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Cross-bolted aluminum scraper foot grilles.
2. Deep-construction aluminum foot grilles.
3. Polypropylene modular tile and rubber backed roll goods.

B. Alternates: Not Applicable.

C. Items To Be Installed Only: Not Applicable.

D. Items To Be Furnished Only: Not Applicable.

E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 033000 - CAST-IN-PLACE CONCRETE for concrete work, including forming, placing, and finishing concrete floor slabs, and for concrete materials for grouting and filling around and under recessed mats and frames.

1.3 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Show the following:

1. Items penetrating floor mats and frames, including door control devices.
2. Divisions between mat sections.
3. Perimeter floor moldings.

C. Samples for Initial Selection: For each type of product indicated.

1. Floor Mat: 12-inch- square, assembled sections of floor mat.
2. Frame Members: 12-inch- long Sample of each type and color.

D. Maintenance Data: For floor mat and frames to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain floor mats and frames through one source from a single manufacturer.

B. Accessibility Requirements: Provide installed floor mats that comply with Section 4.5 in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)" and the Massachusetts Architectural Access Board.

1.5 PROJECT CONDITIONS

A. Field Measurements: Indicate measurements on Shop Drawings.

1.6 COORDINATION

A. Coordinate size and location of recesses in concrete with installation of finish floors to receive floor mats and frames.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cross Bolted Aluminum Scraper Foot Grilles:

a. AFCO-USA.
b. Balco, Inc.
c. Construction Specialties, Inc.
d. Mats Inc.
e. Musson, R. C. Rubber Co. (The).

2. Deep Construction Aluminum Foot Grilles:

a. Balco, Inc.
b. Mats Inc.
c. Musson, R. C. Rubber Co. (The).
d. Tennessee Mat Company, Inc.

3. Polypropylene Modular Tile and Rubber Backed Roll Goods:

a. AFCO-USA.
b. Mats Incorporated.
c. Tennessee Mat Company, Inc.
d. US Mat & Rubber

2.2 METAL FRAME MATERIALS

A. Extruded Aluminum: ASTM B 221 alloy 6061-T6 or alloy 6063-T5, T6, or T52 as standard with manufacturer.

2.3 CONCRETE FILL AND GROUT MATERIALS

A. Provide concrete materials complying with Section 033000 - CAST-IN-PLACE CONCRETE for grout and fill around and under recessed mats and frames that produce concrete equivalent in strength to cast-in-place concrete slabs. For concrete fill, adjust aggregate size to not exceed one-third fill thickness.

2.4 FLOOR MATS

A. General: Provide colors, patterns, and profiles of materials, including metals and metal finishes indicated or specified. If not indicated, provide colors, patterns, and profiles selected by Designer from manufacturer's standards.

B. Cross Bolted Aluminum Scraper Foot Grilles: rated for exterior usage, clear-anodized finish, extruded-aluminum tread rails. Construct from aluminum alloy type 6061-T6 fabricated as grilles to sizes indicated with mechanically fastened rails (swedge or key lock fastening of rails is unacceptable) and, where applicable, with finishes and profiles specified by the Designer for use as entrance mat system as follows:

1. Surface Appearance: T-shaped blades; 3/8 by 1/8 by 1 inch size; spacing between blades not to exceed 3/16 inch making the product exterior rated and ADA compliant.
2. Recessed Frame Over Finished Surfaces: The perimeter frames shall be "Z" shape for installation over finished floor surfaces. All aluminum frames shall be pre-assembled at factory incorporating welded construction for all joints. Each grille section shall incorporate an invisible section divider integrated and welded within the frame. Frames and grilles shall be shipped fully assembled in protective wooden crating to each jobsite. For sections larger than 6 by 8 feet a mechanical joint is to be provided. A silicone joint is to be applied between the frame and the finished floor to prevent any water infiltration.

C. Recessed Aluminum Foot Grille for Vestibules: Constructed from aluminum alloy type 6061-T6 fabricated as grilles to sizes indicated with mechanically fastened rails (swedge or key lock fastening of rails is unacceptable) and, where applicable, with finishes and profiles specified by the Designer for use as entrance mat system as follows:

1. Dual Track: T-shaped blades, 1-5/16 by 1/8 by 1-1/2 inch size with Polyimide Nylon fiber inserts; combined with Y-shaped blades, 11/16 by 1/8 by 1-½ inch size with an anti-slip polymer C9065 insertion of Durometer 90/65, ¼ inch thick and locked in at each end. Spacing between blades not to exceed 3/16 inch.

2. Perimeter Frames: Angle “L” frame or inverted “T”, either “Level” or “Embedded” depending on the installation. Aluminum frames shall be pre-assembled at factory incorporating welded construction for all joints. Each grille section shall incorporate a non-visible section divider integrated and welded within the frame. Frames and grilles shall be shipped fully assembled in protective wooden crating to each jobsite. For sections larger than 6 by 8 feet a mechanical joint is to be provided.

D. Polypropylene Roll and Tile Entrance Mats for Lobby Areas: Polypropylene fibers needle punched into dimensionally stable tile backing or rubber backing for roll goods. Woven or Tufted not recommended. Insure tile are laid out in a quarter turn pattern and all seams in roll goods are not in traffic pattern and proper direction of product is observed

1. Aluminum “L”frame: Inset entrance matting flush with surrounding flooring to prevent all possible trip hazards. When pre-existing conditions do not permit all matting to have mechanically fastened or sewn-on nosing which compiles with ADA requirements. Chemically bonded or Glued on nosing is not acceptable.

2.5 FABRICATION

A. General: Verify sizes by field measurement before shop fabrication.

B. Floor Mats: Shop fabricate units to greatest extent possible in sizes as indicated. If not otherwise indicated, provide single unit for each mat installation; do not exceed manufacturer's recommended maximum sizes for units that are removed for maintenance and cleaning. Where joints in mats are necessary, space symmetrically and away from normal traffic lanes. Miter corner joints in framing elements with hairline joints or provide prefabricated corner units without joints.

C. Recessed Metal Mat Frames: Extruded aluminum of size and style to fit floor mat type specified, for permanent recessed installation, complete with corner pins or reinforcement and anchorage devices.

1. Fabricate edge-frame members in single lengths or, where frame dimensions exceed maximum available lengths, provide minimum number of pieces possible, with hairline joints equally spaced and pieces spliced together by straight connecting pins.

D. With manufacturer's standard protective coating, coat surfaces of aluminum frames that will contact cementitious material.

2.6 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

2.7 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 611.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrate for compliance with requirements for location, sizes, minimum recess depth, and other conditions affecting installation of floor mats and frames.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install recessed mat frames to comply with manufacturer's written instructions. Set mat tops at height recommended by manufacturer for most effective cleaning action; coordinate top of mat surfaces with bottom of doors that swing across mats to provide clearance between door and mat.

1. Install necessary shims, spacers, and anchorages for proper location and secure attachment of frames.
2. Install grout and fill around frames and, if required to set mat tops at proper elevations, in recesses under mats. Finish grout and fill smooth and level.

3.3 PROTECTION

A. After completing frame installation and concrete work, provide temporary filler of plywood or fiberboard in recesses and cover frames with plywood protective flooring. Maintain protection until construction traffic has ended and Project is near Substantial Completion.

B. Defer installation of floor mats until Project is near Substantial Completion.

END OF SECTION

SECTION 210001

FIRE PROTECTION

(Filed Sub-Bid Required)

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PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

B. Time, Manner and Requirements for Submitting Sub-Bids:

1. Sub-bids for work under this Section shall be for the complete work and shall be submitted through WRTA's E-Bid Room as stipulated in the WRTA Instructions to Bidders.

2. Sub-bids filed with the Division of Capital Asset Management and Maintenance shall be accompanied by BID BOND or CASH or CERTIFIED CHECK or TREASURER'S CHECK or CASHIER'S CHECK issued by a responsible bank or trust company payable to the Commonwealth of Massachusetts in the amount of five percent of the sub-bid. A sub-bid accompanied by any other form of bid deposit than those specified will be rejected.

C. Sub-Bid Requirements: Not Applicable.

D. Reference Drawings: The Work of this Filed Sub-Bid is shown on the following Contract Drawings:

NUMBER	SHEET NAME
FP-001	FIRE PROTECTION LEGEND
FPD-100	FIRE PROTECTION FIRST FLOOR DEMO PLAN
FP-100	FIRE PROTECTION FIRST FLOOR PLAN

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Replace ceiling sprinkler heads in areas with renovated ceilings. Upon completion of the construction/replacement of grid ceiling, all new sprinkler heads shall be installed in the new ceiling using flexible connections to the heads. At the completion of construction, all sprinkler heads shall be in good working order with no signs of damage and shall be in compliance with NFPA 13.

2. Firestopping for the Work of this Section, including cutting penetrations and firestopping; complying with requirements specified in Section 078413 - PENETRATION FIRESTOPPING.
3. Core drilling for the Work of this Section.
4. Certified seismic restraints to meet the Commonwealth of Massachusetts Building Code applicable at the time the building permit is issued.
5. Coordination drawings and record drawings and similar requirements.
6. Test of all piping, systems, devices and alarms.
7. Sleeves, escutcheons, hangers and supports.
8. Shop drawings and submittals.
9. Permits, fees and inspections.
10. System and equipment start-ups; instructions.
11. Vibration isolators, flexible connectors, expansion fittings.
12. Fire watches 24/7 when systems servicing existing spaces are inoperable.

B. Alternates: Not Applicable.

C. Items to be Installed Only: Not Applicable.

D. Items to Be Furnished Only: Furnish the following items for installation by the designated Sections:
   1. Section 033000 – CAST-IN-PLACE CONCRETE:
      a. Sleeves, anchors, inserts, plates and similar items for fire protection systems.
   2. Section 042000 – UNIT MASONRY:
      a. Access doors in masonry openings.
   3. Section 092116 - GYPSUM BOARD ASSEMBLIES:
      a. Access doors in gypsum board assemblies.
   4. Section 092400 – PORTLAND CEMENT PLASTERING:
      a. Access doors in plaster assemblies.
   5. Section 093000 - TILING:
      a. Access doors in tile.
   6. Section 095113 - ACOUSTICAL PANEL CEILINGS:
      a. Access doors in acoustical panel ceilings.

E. Related Work: The following items are not included in this Section and will be performed under the designated Sections.

   1. Section 078413 – PENETRATION FIRESTOPPING for coordination of floor and wall penetrations with firestopping contractor.
   2. Section 092116 – GYPSUM BOARD ASSEMBLIES for coordination with gypsum ceilings.
   3. Section 095113 – ACOUSTICAL PANEL CEILINGS for coordination with acoustical ceilings.
   4. Section 230001 – HEATING, VENTILATING AND AIR CONDITIONING for coordination with HVAC piping and ductwork.

5. Section 260001 - ELECTRICAL WORK for fire alarm devices and wiring.
6. Section 312000 – EARTH MOVING for excavation and backfilling, including compacted sand backfill to 12 inches above crown of pipe.

F. Perform work and provide material and equipment as shown on Drawings and as specified or indicated in this Section of the Specifications. Completely coordinate work of this Section with work of other trades and provide a complete and fully functional installation.

G. Drawings and Specifications form complimentary requirements; provide work specified and not shown, and work shown and not specified as though explicitly required by both. Although work is not specifically shown or specified, provide supplementary or miscellaneous items, appurtenances, devices and materials obviously necessary for a sound, secure and complete installation.

H. Give notices, file plans, obtain permits and licenses, pay fees and back charges, and obtain necessary approvals from authorities that have jurisdiction as required to perform work in accordance with all legal requirements and with Specifications, Drawings, Addenda and Change Orders, all of which are part of Contract Documents.

1.3 SUBMITTALS

A. Comply with requirements specified in Section 013300 – SUBMITTALS REQUIREMENTS.

B. Shop Drawing: Shop drawings shall include, but not be limited to, the following:

1. Sprinkler heads.
2. Piping and fittings.
3. Sleeves and sleeve seals, and escutcheons,
4. Hangers and supports.
5. Vibration isolation and flexible connections.

C. Delegated-Design Submittal: For wet-pipe sprinkler systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer licensed in the Commonwealth of Massachusetts responsible for their preparation.

D. Hanger Pull-Out Testing Submittals and Requirements: Hangers and supports will be tested for pull-out by the Independent Testing Agency designated by the WRTA Project Manager. Comply with the requirements of Section 014325 – TESTING AGENCY SERVICES and the following:

1. Contractor’s Documentation Prior to Testing:
   a. Submit manufacturer’s name and model number for each type of hanger and support proposed for use, and technical data including type, load capacity, test reports, methods for installation, and use limitations.

b. Submit a schedule for each type of hanger and support indicating where units for testing will be installed, including substrate, and materials to be supported.
c. Submit a letter from Contractor indicating supports have been installed in accordance with manufacturer's recommendations and project requirements, and are ready for testing.

2. Independent Testing Agency's Documentation Prior to Testing for Contractor's Information:
   a. Submit the methods and type of equipment which will be used to test hangers and supports.
   b. Submit loads which will be applied, and criteria for acceptance or failure of hangers and supports.
3. Quantity to Be Installed by Contractor for Testing: Two of each size of each type of hanger or support.
4. Testing Results: The Independent Testing Agency will submit reports indicating test results.
   a. Units which did not deform or fail during testing may remain in place.
   b. Units which failed during testing shall be replaced and testing repeated until satisfactory results are obtained.
   c. Cost of repeat testing will be at the expense of the Contractor.
   d. Contractor shall repair damaged substrates, if any.

E. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13. Include "Contractor's material and test certificate for aboveground piping."

F. Field quality control reports.

G. Extra Stock: Provide 10 extra of each type of sprinkler head for User Agency's ongoing maintenance.

H. Closeout submittals: Operation and maintenance data for sprinkler systems and specialties including emergency, operation, and maintenance manuals.

I. Seismic Qualification Certificates: For fire pumps, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

1.4 DEFINITIONS

A. As used in this Section, "provide" means "furnish and install" and "POS" means "Provided Under Other Sections". "Furnish" means "to purchase and deliver to the project site complete with every necessary appurtenance and support," and "Install" means "to unload at the delivery point at the site and perform every operation necessary to establish secure mounting and correct operation at the proper location in the project."

1.5 CONTRACT DOCUMENTS

A. Listing of Drawings does not limit responsibility of determining full extent of work required by Contract Documents. Refer to Architectural, HVAC, Plumbing, Fire Protection, Electrical, Structural, and other Drawings and other Sections that indicate types of construction in which work shall be installed and work of other trades with which work of this Section must be coordinated.

B. Except where modified by a specific notation to the contrary, it shall be understood that the indication and/or description of any item, in the drawings or specifications or both, carries with it the instruction to furnish and install the item, regardless of whether or not this instruction is explicitly stated as part of the indication or description.

C. Items referred to in singular number in Contract Documents shall be provided in quantities necessary to complete work.

D. Drawings are diagrammatic. They are not intended to be absolutely precise; they are not intended to specify or to show every offset, fitting, and component. The purpose of the drawings is to indicate a systems concept, the main components of the systems, and the approximate geometrical relationships. Based on the systems concept, the main components, and the approximate geometrical relationships, the contractor shall provide all other components and materials necessary to make the systems fully complete and operational.

E. Information and components shown on riser diagrams but not shown on plans, and vice versa, shall apply or be provided as if expressly required on both.

F. Data that may be furnished electronically by the Designer is diagrammatic. Such electronically furnished information is subject to the same limitation of precision as heretofore described. If furnished, such data is for convenience and generalized reference, and shall not substitute for Designer's sealed or stamped construction documents.

1.6 DISCREPANCIES IN DOCUMENTS

A. Where Drawings or Specifications conflict or are unclear, advise the Designer in writing before Award of Contract. Otherwise, Designer's interpretation of Contract Documents shall be final,

and no additional compensation shall be permitted due to discrepancies or ambiguities thus resolved.

B. Where Drawings or Specifications do not coincide with manufacturers' recommendations, or with applicable codes and standards, alert Designer in writing before installation. Otherwise, make changes in installed work as Designer requires within Contract Price.

C. If the required material, installation, or work can be interpreted differently from drawing to drawing, or between drawings and specs, this contractor shall provide that material, installation, or work which is of the higher standard.

D. It is the intent of these contract documents to have the contractor provide systems and components that are fully complete and operational and fully suitable for the intended use. There may be situations in the documents where insufficient information exists to precisely describe a certain component or subsystem, or the routing of a component. In cases such as this, where the contractor has failed to notify the Designer of the situation in accordance with the paragraph above, the contractor shall provide the specific component or subsystem with all parts necessary for the intended use, fully complete and operational, and installed in workmanlike manner either concealed or exposed per the design intent.

1. In cases covered by the paragraph above, where the contractor believes he needs engineering guidance, he shall submit a sketch identifying his proposed solution and the Designer shall review, note if necessary, and approve the sketch.

1.7 MODIFICATIONS IN LAYOUT

A. HVAC, Plumbing, Fire Protection, and Electrical Drawings are diagrammatic. They indicate general arrangements of mechanical and electrical systems and other work. They do not show all offsets required for coordination nor do they show the exact routings and locations needed to coordinate with structure and other trades and to meet architectural requirements.

B. In all spaces, prior to installation of visible material and equipment, including access panels, review Architectural Drawings for exact locations and where not definitely indicated, request information from Designer.

C. Check Contract Drawings as well as Shop Drawings of all subcontractors to verify and coordinate spaces in which work of this Section will be installed.

D. Maintain maximum headroom at all locations. All piping and associated components to be as tight to underside of structure as possible.

E. Make reasonable modifications in layout and components needed to prevent conflict with work of other trades and to coordinate according to Paragraphs A, B, C, and D above. Systems shall be run in a rectilinear fashion.

F. Where conflicts or potential conflicts exist and engineering guidance is desired, submit sketch of proposed resolution to Designer for review and approval.

1.8 SITE VISIT

A. Before submitting bid, visit and carefully examine site to identify existing conditions and difficulties that will affect work of this Section. No extra payment will be allowed for additional work caused by unfamiliarity with site conditions that are visible or readily construed by experienced observer.

1.9 DELIVERY STORAGE AND HANDLING

A. Valves:

1. Shipping:
   a. Protect internal parts against rust and corrosion.
   b. Protect threads, flange faces, and weld ends.
   c. Set valves in best position for handling. Setting valves closed prevents rattling; Setting valves open minimizes exposure of functional surfaces.
2. Storage:
   a. Maintain valve end protection.
   b. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.
3. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use operating handles or stems as lifting or rigging points.
4. Protect flanges and specialties from moisture and dirt.
5. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

1.10 EXISTING CONDITIONS AND PREPARATORY WORK

A. Before starting work in a particular area of the project, visit site and examine conditions under which work must be performed including preparatory work done under other Sections or Contracts or by the User Agency. Report conditions that might affect work adversely in writing through Contractor to Designer. Do not proceed with work until defects have been corrected and conditions are satisfactory. Commencement of work shall be construed as complete acceptance of existing conditions and preparatory work.

B. Interruption of Existing Fire-Suppression Water-Service Piping: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water-distribution service according to requirements indicated:

1. Notify the Designer or the WRTA Project Manager no fewer than two business days in advance of proposed interruption of service.
2. Do not proceed with interruption of service without Designer's or WRTA Project Manager's written permission.

1.11 CODES, STANDARDS, AUTHORITIES AND PERMITS

A. Perform work strictly as required by rules, regulations, standards, codes, ordinances, and laws of local, state, and Federal governments, and other authorities that have legal jurisdiction over the site. Materials and equipment shall be manufactured, installed and tested as specified in latest editions of applicable publications, standards, rulings and determinations of:

1. Local and state building, plumbing, mechanical, electrical, fire and health department codes.
   a. Comply with requirements of utility company supplying the water. Include tapping of water mains and backflow prevention.
   b. Comply with standards of authorities having jurisdiction for fire-suppression water-service piping, including materials, hose threads, installation, and testing.
2. National Fire Protection Association (NFPA).
   a. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   b. NFPA Compliance: Comply with NFPA 24 for materials, installations, tests, flushing, and valve and hydrant supervision for fire-suppression water-service piping.
3. American Insurance Association (A.I.A.) (formerly National Board of Fire Underwriters).
4. Occupational Safety and Health Act (OSHA).
5. Factory Mutual Association (FM).
6. Underwriters' Laboratories (UL).
7. American National Standards Institute (ANSI).

B. Material and equipment shall be listed by Underwriters' Laboratories (UL), and approved by ASME for intended service.
   1. Piping materials shall bear label, stamp, or other markings of specified testing agency.

C. When requirements cited in this Specification conflict with each other or with Contract Documents, most stringent shall govern work. Designer may relax this requirement when such relaxation does not violate ruling of authorities that have jurisdiction. Approval for such relaxation shall be obtained in writing.

D. Most recent editions of applicable specifications and publications of the following organizations form part of Contract Documents:

1. American National Standards Institute (ANSI).

2. American Society of Mechanical Engineers (ASME).
3. National Electric Manufacturers Association (NEMA).
4. American Society for Testing and Materials (ASTM).
5. American Water Works Association (AWWA).
6. Institute of Electrical and Electronics Engineers (IEEE).
7. Insulated Cable Engineers Association (ICEA).
8. National Fire Protection Association (NFPA).

E. Special attention is directed to requirements of NFPA 45, Laboratories Using Chemicals.

1.12 GUARANTEE AND 24 HOUR SERVICE

A. Guarantee Work of this Section in writing for one year from the date of Certificate of Agency Use and Occupancy. Guarantees or warranties that start at the date of shipment from the factory, or from the completion date of an individual portion of the project, are not acceptable. The guarantee shall repair or replace defective materials, equipment, workmanship and installation that develop within this period, promptly and to Designer's satisfaction and correct damage caused in making necessary repairs and replacements under guarantee within Contract Price.

B. In addition to guarantee requirements of Division 01 and of Subparagraph A above, obtain written equipment and material warranties offered in manufacturer's published data without exclusion or limitation, in User Agency's name.

C. Replace material and equipment that require excessive service during guarantee period as defined and as directed by Designer.

D. Provide 24 hour service beginning on the date the project is first occupied for public use by the User Agency, whether or not fully occupied, and lasting until the termination of the guarantee period. Service shall be at no cost to the User Agency. Service can be provided by this contractor or a separate service organization. Choice of service organization shall be subject to Designer and User Agency approval. Submit name and a phone number that will be answered on a 24 hour basis each day of the week, for the duration of the service.

E. Submit copies of equipment and material warranties to Designer before final payment.

F. At end of guarantee period, transfer manufacturers' equipment and material warranties still in force to User Agency.

G. This Article shall not be interpreted to limit User Agency's rights under applicable codes and laws and under this Contract.

H. Part 2 Paragraphs of this Specification may specify warranty requirements that exceed those of this Paragraph.

I. Use of systems provided under this Section for temporary services and facilities shall not constitute Final Acceptance of work nor beneficial use by User Agency, and shall not institute guarantee period.

J. Provide manufacturer's engineering and technical staff at site to analyze and rectify problems that develop during guarantee period immediately. If problems cannot be rectified immediately to WRTA Project Manager's satisfaction, advise Designer in writing, describe efforts to rectify situation, and provide analysis of cause of problem. Designer will suggest course of action.

1.13 RECORD DRAWINGS

A. Comply with requirements specified in Section 017700 – CONTRACT CLOSEOUT.

B. Drawings shall show record condition of details, sections, riser diagrams, control changes and corrections to schedules. Schedules shall show actual manufacturer and make and model numbers of final equipment installation.

1.14 BULLETINS, MANUALS, AND OPERATING INSTRUCTIONS, AND PROTECTION

A. Comply with requirements specified in Section 017700 – CONTRACT CLOSEOUT.

B. Obtain at time of purchase of equipment, three copies of operation, lubrication and maintenance manuals for all items. Assemble literature in coordinated manuals with additional information describing combined operation of field assembled units, including as built wiring diagrams. Manual shall contain names and addresses of manufacturers and local representatives who stock or furnish repair parts for items or equipment. Divide manuals into three sections or books as follows:

1. Directions for and sequence of operation of each item of Fire Protection systems. Sequence shall list valves, switches, and other devices used to start, stop and control system. Detail procedure to be followed in case of malfunctions.
2. Detailed maintenance and troubleshooting manuals containing data furnished by manufacturer for complete maintenance. Include copy of balancing report.
3. Lubrication instructions detailing type of lubricant, amount, and intervals recommended by manufacturer for each item of equipment. Include additional instructions necessary for implementation of first class lubrication program. Include approved summary of lubrication instructions in chart form, where appropriate.

C. Provide framed and glazed charts as follows: mount as directed by Designer.

1. Flow diagrams from first part of manual as described above.
2. Valve directory.
3. Lubrication chart from third part of manual.

D. Operating instructions: Upon completion of installation or when WRTA Project Manager accepts portions of building and equipment for operational use, instruct User Agency's operating personnel in any or all parts of various systems. Instructions shall be performed by factory trained personnel. User Agency shall determine which systems require additional instructions. Duration of instructions shall take equipment through complete cycle of operation (at least five working days). Make adjustments under operating conditions.

E. Each contractor shall be responsible for his work and equipment until finally inspected, tested, and accepted. Carefully store materials and equipment which are not immediately installed after delivery to site. Close open ends of work with temporary covers or plug during construction to prevent entry of obstructing material.

F. Each separate contractor shall protect the work and material of other trades that might be damaged by his work or workmen and make good all damage thus caused.

1.15 COORDINATION DRAWINGS

A. Refer to Section 013100 – PROJECT MANAGEMENT AND COORDINATION for coordination drawing requirements.

B. Coordination Drawings include but are not necessarily limited to:

1. Structure.
2. Partition/room layout.
3. Ceiling tile and grid.
4. Light fixtures.
5. Access panels.
6. Sheet metal, heating coils, boxes, grilles, diffusers, etc.
7. All HVAC hydronic piping and valves.
8. Smoke and fire dampers.
9. Soil, waste and vent piping.
10. Domestic water piping.
11. Compressed air piping
12. Major water and medical gases.
13. Roof drain piping.
14. Major electrical conduit runs, panelboards, feeder conduit and racks of branch conduit.
15. Above ceiling miscellaneous metal.
16. Sprinkler piping and heads.
17. Heat tracing of piping.
18. Items penetrating finished walls and ceiling including but not limited to lighting fixtures and air outlets and inlets.
19. Sizes and locations of supports, hangers, and insulation shields.
20. Clearance requirements with equipment Installer for equipment insulation application.

1.16 SPRINKLER WORKING PLANS

A. Definition: Working plans are the installation shop drawings required by NFPA Standard 13 and normally prepared by the installing sub-contractor.

B. Prepare working plans according to the requirements of NFPA Standard 13. Working plans and hydraulic calculations shall be prepared by a NICET-certified Level III or IV automatic sprinkler system engineering technician or be stamped by a professional engineer licensed in the Commonwealth of Massachusetts.

1. Working Plans shall be stamped and signed by a Professional Engineer licensed in the Commonwealth of Massachusetts when required by the approving authority at no additional cost to WRTA.

C. Submit working plans to the authorities having jurisdiction for approval, including:

1. Building Department.
2. Fire Department.
3. User Agency's Insurance Underwriter.
4. Designer.

D. Deviation from the approved plans will require re-approval by the reviewing authorities.

E. Prepare sprinkler head layout plans on reflected ceiling plans for submission to the Designer before submission of the working plans.

F. Submit working plans and hydraulic calculations to the Designer in one complete package, after review by the other authorities having jurisdiction. Plans submitted without review stamps or hydraulic calculations will be returned without review.

1.17 STARTERS AND CONTROLLERS

A. Motor driven equipment supplied under Section 210001 – FIRE PROTECTION shall be operated by starters furnished and installed under Section 260001 – ELECTRICAL WORK, except for starters integral with Plumbing equipment which shall be provided by the Plumbing Contractor.

B. The Fire Protection Contractor shall provide nameplates on all starters.

C. All motor controls shall conform to NEMA Standards and be the product of a single manufacturer; Arrow-Hart and Hageman, Allen-Brady, or Square D.

D. Auxiliary contacts shall be included in all starters, for integrally mounted starters. Auxiliary contacts shall be provided for all interlocking wiring.

E. Starters shall normally be provided with two sets of contactors; one set normally open and one set normally closed. Interface shall be provided for all starters and other devices as noted herein.

F. Starters and contactors factory-built into the control panel of packaged equipment will be considered as an integral part of the package.

G. All starters, disconnects and control devices shall be clearly labeled with black lamacoid plates with engraved white letters, to indicate identification number, function and the equipment which they control. Submit list of labels for review.

H. Enclosures for starters included with packaged equipment shall be NEMA Class 1 where installed indoors, NEMA Class IV, where installed outdoors, mechanical rooms or where indicated as weatherproof.

1.18 ELECTRICAL MOTOR CHARACTERISTICS

A. Comply with the requirements of NEMA MG 1 and IEEE 841 for severe-duty motors. Comply also with requirements of U.L., K.E.C., F.M. and NFPA suitable for load conditions, squirrel cage, 1.15 service factor, drip proof, 1750 rpm unless otherwise noted, with inherent overload protection and pressure lubricated bearings with grease fittings. Provide totally enclosed fan cooled motors as noted within the specifications. Refer to ELECTRICAL CHARACTERISTICS REQUIREMENTS of Section 260001 – ELECTRICAL WORK.

B. Motors below 2 HP shall be 120V - 1 phase. Motors that are 2 HP and greater shall be in accordance with the electrical requirements. Motors that are 40 HP and larger shall have part wound motors that are compatible with starters. All other motors shall be designed for use with across-the-line starters. Motors to be provided with overload protection. Provide two speed motors where noted on the drawings. Phase protection shall be provided on motors 2 HP and larger.

C. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet (1000 m) above sea level.

D. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

E. Temperature Rise: Match insulation rating.

F. Insulation: Class F.

G. Motor leads shall be permanently identified and supplied with connectors.

H. The minimum requirement for three phase motors shall be NEMA MG 1, Design B, Class B, insulated for a maximum 40 degree C (104 degrees F.) ambient.

I. Select motors for quiet, continuous operation to suit loads which may be imposed by equipment. Recognize that motor horsepower specified and scheduled are minimum sizes. If larger motors, starters, power wiring and additional control wiring are included in bid.

J. Submit an accurate schedule of all motors. Include for each motor, the HP, RPM, nameplate, voltage current, equipment served, location, electrical characteristics and identification number.

1.19 WELDER REQUIREMENTS

A. Before any welding is performed, Contractor shall submit three copies of the welding procedure specification for all metals included in the Work together with proof of qualifications as outlined in ANSI B31.1, ANSI B31.5 and ASME Boiler Code Section IX.

B. Before any welder or operator shall perform any welding the Contractor shall submit three copies of the Welder's Performance Qualification Record in conformance with ANSI B31.1 and ANSI B31.5, and ASME Section IX, showing that the welder was tested under the accepted procedure specification submitted by the Contractor. In addition the Contractor shall submit each welder's assigned number, letter, or symbol which shall be used to identify the work of the welder which shall be affixed immediately upon completion of the weld. Welders making defective welds after passing a qualification test shall be required to take a re-qualification test.

C. Welders failing the re-qualification tests shall not be permitted to work under this contract.

D. Welding procedures, welders, and welding operators previously qualified by test may be accepted for this contract without re-qualification provided that all the conditions specified in ANSI B31.1 and ANSI B31.5 are met before a procedure is used.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering fire protection system products which may be incorporated in the work include, but are not limited to, the following:

1. Grooved Mechanical Couplings:
   a. Stockham
   b. Victaulic
   c. Grinnell
2. Water Flow Indicators:
   a. Reliable Automatic Sprinkler Co., Inc.
   b. Star Sprinkler Corp.

c. Victaulic Company of America
d. Viking Corp.

3. Sprinkler Heads:
   a. Automatic Sprinkler Corp. Of America
   b. Central Sprinkler Corp.
   c. Firematic Sprinkler Devices, Inc.
   d. Globe Fire Equipment Co.
   e. Guardian Fire Equipment, Inc.
   f. ITT Grinnell
   g. Reliable Automatic Sprinkler Co., Inc.
   h. Star Sprinkler Corp.
   i. Viking Corp.

2.2 PIPING, FITTINGS AND JOINTS

A. Sprinkler Piping:

1. Steel: 2 inches and smaller: ASTM 135 Schedule 40 black steel with threaded joints; larger than 2 inches: ASTM 135 Schedule 10 light wall with roll grooved joints or Schedule 4O black steel with grooved or threaded joints. Sizes 1-inch through 3-inches may be Allied galvanized XL threadable light wall steel pipe with threaded joints and fittings.
2. Copper: Type L or K copper with 95-5 soldered or brazed joints in compliance with NFPA 13. Provide dielectric fittings between copper and ferrous piping.
3. NFPA 13 compliant flexible connections shall be provided at each of the new sprinkler heads. Flexible connections shall be provided with manufacturer recommended support.

B. Fittings:

1. Ductile Iron: ASTM A-536.
2. Malleable Iron: ANSI B16.3.
3. Steel: ANSI B16.11.
4. Cast Iron: ANSI B16.4. (Not for use in dry system.)

C. Grooved Fittings and Couplings:

1. Grinnell Fig. 7000, Gustin-Bacon No. 105 or Victaulic Style 75.
2. Compatibility: Couplings and fittings shall be of a single manufacturer or shall be certified as compatible by both manufacturers.

2.3 JOINING MATERIALS

A. Welding Materials: Comply, with Section II, Part C, ASME Boiler and Pressure Vessel Code for welding materials appropriate for the wall thickness and chemical analysis of the pipe being welded.

1. Brazing Filter Metals: AWS A5.8, Classification Bag1 (Silver).
2. Solder Filter Metals: ASTM B 32, 95-5 Tin Antinomy.

B. Gasket Materials: Thickness, material, and type suitable for fluid or gas to be handled, and design temperatures and pressures.

2.4 SLEEVES, INSERTS AND ESCUTCHEONS

A. All pipes passing through floors, walls, or partitions shall be provided with sleeves having an internal diameter of approximately one inch larger than the outside diameter of the pipe or insulation on covered lines.

B. Sleeves through floors and through exterior, structural and fire-rated construction shall be hot-dipped galvanized Schedule 40 steel pipe.

C. Sleeves through partitions and non-fire-rated construction shall be 25 gauge galvanized steel with lock longitudinal seams, or approved plastic pipe.

D. Provide waterproofing membrane locking devices at slab on grade floors. Provide 150 lb. Slip-on welding flanges or approved equal waterstop device at exterior wall penetrations.

E. Inserts shall be individual or strip type of pressed steel construction with accommodation for removable nuts and threaded rods up to 3/4 inch diameter, permitting lateral adjustment. Individual inserts shall have an opening at the top to allow reinforcing rods up to 2 inch diameter to be passed through the insert body. Strip inserts shall have attached rods with hooked ends to allow fastening to reinforcing rods.

F. Unless otherwise specified herein, escutcheons shall be cast brass chrome plated type and provided with a set screw to properly hold escutcheon in place.

G. Where piping passes below grade beams, provide a ductile iron sleeve three sizes larger than the pipe being served. Sleeve shall be a minimum of six feet in length.

H. The void between sleeves and piping passing through all interior above grade fire rated partitions and floor slabs shall be filled with a two hour fire rated mastic.

I. Watertight sleeves shall be required in all exterior below grade walls. Annular sleeve space between the carrier pipe and the sleeve shall be sealed by means of a confined or interlocking type rubber gasket capable of withstanding 350 psi.

2.5 AUTOMATIC SPRINKLERS

A. Sprinkler Heads: fusible link type, and style as indicated or required by the application. Unless otherwise indicated, provide heads with nominal 2 inch discharge orifice, for "Ordinary" temperature range.

B. Sprinkler Heads Finishes: Provide heads with the following finishes:

1. Upright, Pendent, and Sidewall Styles: chrome plated in finish spaces, exposed to view; rough bronze finish for heads in unfinished spaces and not exposed to view. Heads shall be wax-coated where installed exposed to acids, chemicals, or other corrosive fumes.
2. Concealed Style: rough brass, with painted white cover plate.
3. Flush Style: bright chrome, with painted white escutcheon plate.
4. Recessed Style: bright chrome, with bright chrome escutcheon plate.
5. Residential Style: dull chrome. (Quick Response)
6. Intermediate Level Style: bright chrome.

C. Sprinkler Head Cabinet and Wrench: finished steel cabinet, suitable for wall mounting, with hinged cover and space for 6 spare sprinkler heads on the project.

2.6 PIPE AND HANGER SUPPORTS

A. Provide pipe supports, sway braces, hangers, and clamps conforming to NFPA 13 and listed by UL and approved by FM. Provide protection of piping against earthquake damage in accordance with NFPA 13.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine rough-in for fire hose valves and cabinets to verify actual locations of piping connections prior to installing cabinets.

B. Examine walls for suitable conditions where cabinets are to be installed.

C. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PIPE APPLICATIONS

A. Install piping in accordance with NFPA 13 for sprinkler systems, NFPA 14 for standpipe and hose systems, and NFPA 24 for service mains.

B. Install Schedule 40 steel pipe with threaded joints and fittings for 2-inch and smaller, and with welded joints for 2-1/2 inch and larger.

C. Install Schedule 40 steel pipe with roll-grooved ends and grooved mechanical couplings for piping 2-inch and smaller.

D. Install Schedule 10 steel pipe with roll-grooved ends and grooved mechanical couplings for piping 2-1/2 inch and larger.

3.3 PIPING INSTALLATIONS

A. Locations and Arrangements: Drawings (plans, schematics, and diagrams) indicate the general location and arrangement of piping systems. So far as practical, install piping as indicated.

1. Deviations from approved "Working Plans" for sprinkler piping, require written approval of the authority having jurisdiction. Written approval shall be on file with the Designer prior to deviating for the approved "Working Plans."

B. Install sprinkler piping to provide for system drainage in accordance with NFPA 13.

C. Use approved fittings to make all changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

D. Install unions in pipes 2-inch and smaller, adjacent to each valve. Unions are not required on flanged devices or in piping installations using grooved mechanical couplings.

E. Install flanges or flange adaptors on valves, apparatus, and equipment having 2-1/2 inch and larger connections.

F. Hangers and Supports: Comply with the requirements of NFPA 13 and NFPA 14. Hanger and support spacing and locations for piping joined with grooved mechanical couplings shall be in accordance with the grooved mechanical coupling manufacturer's written instructions, for rigid systems. Provide protection from damage where subject to earthquake in accordance with NFPA 13.

G. Make connections between underground and above-ground piping using an approved transition piece strapped or fastened to prevent separation.

H. Install mechanical sleeve seal at pipe penetrations in basement and foundation walls. Refer to Section 220001 – PLUMBING.

I. Install test connections sized and located in accordance with NFPA 13 complete with shutoff valve. Test connections may also serve as drain pipes.

J. Install pressure gage on the riser or feed main at or near each test connection. Provide gage with a connection not less than 1/4 inch and having a soft metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and where they will not be subject to freezing.

3.4 PIPE JOINT CONSTRUCTION

A. Welded Joints: AWS D10.9, Level AR-3.

B. Threaded Joints: Conform to ANSI B1.20.1, tapered pipe threads for field cut threads. Join pipe, fittings, and valves as follows:

1. Note the internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint.
2. Align threads at point of assembly.
3. Apply appropriate tape or thread compound to the external pipe threads.
4. Assemble joint to appropriate thread depth. When using a wrench on valves, place the wrench on the valve end into which the pipe is being threaded.
5. Damaged Threads: Do no use pipe with threads which are corroded, or damaged. If a weld opens during cutting or threading operations, that portion of pipe shall not be used.
6. Flanged Joints: Align flanges surfaces parallel. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly to appropriate torque specified by the bolt manufacturer.
7. Mechanical Grooved Joints: Cut or roll grooves on pipe ends dimensionally compatible with the couplings.
8. Brazed Joints: Comply with the procedures contained in the AWS “Brazing Manual.”
   a. WARNING: Some filler metals contain compounds which produce highly toxic fumes when heated. Avoid breathing fumes. Provide adequate ventilation.
9. Soldered Joints: Comply with the procedures contained in the Copper Development Association “Handbook for Fire Sprinkler Systems.”
10. End Treatment: After cutting pipe lengths, remove burrs and fins from pipe ends.

3.5 SPRINKLER HEAD INSTALLATIONS

A. Use proper tools to prevent damage during installations.

3.6 FIELD QUALITY CONTROL

A. Flush, test, and inspect sprinkler systems in accordance with NFPA 13.

B. Flush, test, and inspect standpipe systems in accordance with NFPA 14.

C. Flush, test, and inspect underground fire protection piping in accordance with NFPA 24.

D. Replace piping system components which do not pass the test procedures specified, and retest repaired portion of the system.

3.7 TESTING

A. Testing and flushing of the fire protection systems shall be done at the expense of this Subcontractor and with equipment furnished by him. Testing shall be done in the presence of duly authorized inspectors and representatives of the Designer and WRTA's Project Manager within forty-eight (48) hour notice given those authorities. Prior to testing, the system shall be thoroughly flushed with clean water.

B. The system shall be repaired and retested until made perfect, without additional expense to WRTA.

C. To test piping, subject it to a three-hour hydraulic test of 200 psi, and as required by N.F.P.A. and the User Agency's Insurance Underwriter. Piping shall be repaired until such tests show no leaks. Where required, and depending on the building timing and schedule, the system may be required to be tested without final swing elbows and heads installed. In this case, a second test will be required upon installation of swing elbows and heads.

D. Material and test certificates must be signed by the WRTA's Project Manager prior to and upon completion of testing. Final test reports must be approved in writing by local authorities.

E. Results of tests shall be recorded and submitted using the forms in NFPA #13 & #14, for review by the Engineer. The Material and Test Certificate shall also be sent to the WRTA's Project Manager and User Agency's Insurance Underwriter.

F. This Subcontractor shall include in his bid proposal, the cost for the manufacturer of the fire protection equipment to adjust all 2-1/2" pressure reducing valves set so the normal hydrostatic pressure does not exceed 65 psig and the 1-1/2" valves so the pressure does not exceed 80 psig. This work shall be accomplished and attested to in writing to the Designer by the Fire Protection Subcontractor.

G. This Subcontractor shall ensure that the underground piping from the street main and service entry piping has been tested to 200 psig in accordance with NFPA 24 requirements. This shall be recorded separately from the interior piping. Coordinate this with the site water piping installer.

H. Provide all necessary and appropriate personnel to participate in and coordinate fire protection systems with all fire alarm testing, or other systems testing which may interface with fire protection system. Participation shall include all preliminary testing, walk-through testing prior to official walk-through testing and any re-testing if required.

I. Where Insurance Service Office (ISO) approval is required, the Sprinkler Contractor shall be sure that:

1. That plans and calculations are sent for review to ISO, 100 Newport Avenue, CS1700, Quincy, MA 02269, and that all required changes are made.
2. The certificate covering materials and tests is filed with ISO.
3. That ISO has been given the proper notification, and that they are present for the 2" main drain test.
4. That the underground test certificate is filed with ISO. Coordinate with the Site Contractor.

END OF SECTION

SECTION 220001

PLUMBING
(Filed Sub-Bid Required)

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PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

B. Time, Manner and Requirements for Submitting Sub-Bids:

1. Sub-bids for work under this Section shall be for the complete work and shall be submitted through WRTA’s E-Bid Room as stipulated in the WRTA Instructions to Bidders.

2. Sub-bids filed with the Division of Capital Asset Management and Maintenance shall be accompanied by BID BOND or CASH or CERTIFIED CHECK or TREASURER'S CHECK or CASHIER'S CHECK issued by a responsible bank or trust company payable to the Commonwealth of Massachusetts in the amount of five percent of the sub-bid. A sub-bid accompanied by any other form of bid deposit than those specified will be rejected.

C. Sub-Bid Requirements:

1. Sub bidder's attention is directed to Massachusetts G.L. Chapter 149 Section 44F, as amended, which provides in part as follows.
2. Each sub-bidder shall list in Paragraph E of the "Form for Sub-bids" the name and bid price of each person, firm or corporation performing each class of work or part thereof for which the Section of the Specifications for that sub trade requires such listing, provided that, in the absence of a contrary provision in the Specifications, any sub-bidder may, without listing any bid price, list his own name or part thereof and perform that work with persons on his own payroll, if such sub-bidders, after sub-bid openings, shows to the satisfaction of the Awarding Authority that he does customarily perform such class of work with persons on his own payroll and is qualified to do so. This Section of the

Specifications requires that the following classes of work shall be listed in Paragraph E under the conditions indicated herein.

CLASS OF WORK	REFERENCE SECTION
Plumbing Insulation	None required under this section.

D. Reference Drawings: The Work of this Filed Sub-Bid is shown on the following Contract Drawings:

NUMBER	SHEET NAME
P-001	PLUMBING LEGEND
PD-100	PLUMBING UNDERGROUND DEMOLITION PLAN
PD-101	PLUMBING FIRST FLOOR DEMOLITION PLAN
P-100	PLUMBING UNDERGROUND PLAN
P-101	PLUMBING FIRST FLOOR PLAN
P-401	PLUMBING SCHEDULES

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Domestic cold water system connecting to each new fixture and piece of equipment requiring domestic cold water.
2. Domestic hot water and hot water return system connecting to each new fixture and piece of equipment requiring domestic hot water. This system shall include a new water heater where indicated.
3. Sanitary waste and vent system connecting to each new fixture and piece of equipment requiring sanitary drainage.
4. Plumbing fixtures and trim.
5. Water hammer arrestors.
6. Hangers, supports and attachments.
7. Sundries.
8. Coordination drawings and record drawings and similar requirements.
9. Alterations, additions-and/or removal of existing plumbing systems and fixtures within the renovated area.
10. Valves.
11. Insulation.
12. No-hub couplings.
13. Firestopping for the Work of this Section, including cutting penetrations and firestopping; complying with requirements specified in Section 078413 - PENETRATION FIRESTOPPING.
14. Core drilling for the Work of this Section.
15. Certified seismic restraints to meet the Commonwealth of Massachusetts Building Code applicable at the time the building permit is issued.

16. Coordination drawings and record drawings and similar requirements.

B. Alternates: Not Applicable.

C. Items To Be Installed Only: Install the following items as furnished by the designated Sections:

1. Section 102813 - TOILET ACCESSORIES:
   a. Toilet room accessories.

D. Items To Be Furnished Only: Furnish the following items for installation by the designated Sections:

1. Section 042000 – UNIT MASONRY
   a. Access doors in masonry openings.
2. Section 075216 – SBS MODIFIED BITUMINOUS MEMBRANE ROOFING:
   a. Roof drain sump receivers.
3. Section 092116 - GYPSUM BOARD ASSEMBLIES:
   a. Access doors in gypsum board assemblies.
4. Section 092400 – PORTLAND CEMENT PLASTERING
   a. Access doors in plaster assemblies.
5. Section 093000 - TILING:
   a. Access doors in tile.
6. Section 095113 - ACOUSTICAL PANEL CEILINGS:
   a. Access doors in acoustical panel ceilings.
7. Section 260001 - ELECTRICAL WORK:
   a. Magnetic starters.

E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 033000 - CAST-IN-PLACE CONCRETE for cutting and patching of concrete walls.
2. Section 061000 - ROUGH CARPENTRY for blocking for toilet accessories.
3. Section 078413 – PENETRATION FIRESTOPPING for coordination of floor and wall penetrations with firestopping contractor.
4. Section 092116 – GYPSUM BOARD ASSEMBLIES for coordination with gypsum ceilings and blocking for toilet accessories.
5. Section 095113 – ACOUSTICAL PANEL CEILINGS for coordination with acoustical ceilings.
6. Section 230001 – HEATING, VENTILATING AND AIR CONDITIONING for coordination with HVAC piping and ductwork and for condensate drains.
7. Section 260001 - ELECTRICAL WORK for fire alarm devices and wiring.
8. Section 312000 – EARTH MOVING for excavation and backfilling.

F. Perform work and provide material and equipment as shown on Drawings and as specified or indicated in this Section of the Specifications. Completely coordinate work of this Section with work of other trades and provide a complete and fully functional installation.

G. Drawings and Specifications form complimentary requirements; provide work specified and not shown, and work shown and not specified as though explicitly required by both. Although work is not specifically shown or specified, provide supplementary or miscellaneous items, appurtenances, devices and materials obviously necessary for a sound, secure and complete installation.

H. Give notices, file plans, obtain permits and licenses, pay fees and back charges, and obtain necessary approvals from authorities that have jurisdiction as required to perform work in accordance with all legal requirements and with Specifications, Drawings, Addenda and Change Orders, all of which are part of Contract Documents.

1.3 SUBMITTALS

A. Comply with requirements specified in Section 013300 – SUBMITTAL REQUIREMENTS.

B. Shop Drawing: Shop drawings shall include, but not be limited to, the following:

1. Plumbing fixtures and trim.
2. Floor drains.
3. Hose bibbs and wall hydrants.
4. Piping.
    a. Domestic water distribution.
5. Sanitary piping.
6. Sleeves and sleeve seals.
7. Fittings, unions, flanges, and couplings.
8. Insulation.
9. Valves, regulators, meters and gauges.
10. Water hammer arrestors.
11. No-hub couplings.
12. Hangers, plates, and inserts.
13. Vibration isolation and flexible connections.
14. Facility sanitary sewerage.

C. Product Certificates: For each type of meter, gage, valve, pipe or pipe fitting that comes into direct contact with potable water..

1. Potable water: Certification that products comply with NSF 372.

D. Comply with NSF Standard 372 for low lead for all plumbing items in this section.

E. Hanger Pull-Out Testing Submittals and Requirements: Hangers and supports will be tested for pull-out by the Independent Testing Agency designated by the WRTA Project Manager. Comply with the requirements of Section 014325 – TESTING AGENCY SERVICES and the following:

1. Contractor’s Documentation Prior to Testing:
    a. Submit manufacturer’s name and model number for each type of hanger and support proposed for use, and technical data including type, load capacity, test reports, methods for installation, and use limitations.

b. Submit a schedule for each type of hanger and support indicating where units for testing will be installed, including substrate, and materials to be supported.
c. Submit a letter from Contractor indicating supports have been installed in accordance with manufacturer's recommendations and project requirements, and are ready for testing.

2. Independent Testing Agency's Documentation Prior to Testing for Contractor's Information:
   a. Submit the methods and type of equipment which will be used to test hangers and supports.
   b. Submit loads which will be applied, and criteria for acceptance or failure of hangers and supports.
3. Quantity to Be Installed by Contractor for Testing: Two of each size of each type of hanger or support.
4. Testing Results: The Independent Testing Agency will submit reports indicating test results.
   a. Units which did not deform or fail during testing may remain in place.
   b. Units which failed during testing shall be replaced and testing repeated until satisfactory results are obtained.
   c. Cost of repeat testing will be at the expense of the Contractor.
   d. Contractor shall repair damaged substrates, if any.

1.4 DEFINITIONS

A. As used in this Section, "provide" means "furnish and install" and "POS" means "Provided Under Other Sections". "Furnish" means "to purchase and deliver to the project site complete with every necessary appurtenance and support," and "Install" means "to unload at the delivery point at the site and perform every operation necessary to establish secure mounting and correct operation at the proper location in the project."

1.5 CONTRACT DOCUMENTS

A. Listing of Drawings does not limit responsibility of determining full extent of work required by Contract Documents. Refer to Architectural, HVAC, Plumbing, Fire Protection, Electrical, Structural, and other Drawings and other Sections that indicate types of construction in which work shall be installed and work of other trades with which work of this Section must be coordinated.

B. Except where modified by a specific notation to the contrary, it shall be understood that the indication and/or description of any item, in the drawings or specifications or both, carries with it the instruction to furnish and install the item, regardless of whether or not this instruction is explicitly stated as part of the indication or description.

C. Items referred to in singular number in Contract Documents shall be provided in quantities necessary to complete work.

D. Drawings are diagrammatic. They are not intended to be absolutely precise; they are not intended to specify or to show every offset, fitting, and component. The purpose of the drawings is to indicate a systems concept, the main components of the systems, and the

approximate geometrical relationships. Based on the systems concept, the main components, and the approximate geometrical relationships, the contractor shall provide all other components and materials necessary to make the systems fully complete and operational.

E. Information and components shown on riser diagrams but not shown on plans, and vice versa, shall apply or be provided as if expressly required on both.

F. Data that may be furnished electronically by the Designer (on computer tape, diskette, or otherwise) is diagrammatic. Such electronically furnished information is subject to the same limitation of precision as heretofore described. If furnished, such data is for convenience and generalized reference, and shall not substitute for Designer's sealed or stamped construction documents.

1.6 DISCREPANCIES IN DOCUMENTS

A. Where Drawings or Specifications conflict or are unclear, advise Designer in writing before Award of Contract. Otherwise, Designer's interpretation of Contract Documents shall be final, and no additional compensation shall be permitted due to discrepancies or ambiguities thus resolved.

B. Where Drawings or Specifications do not coincide with manufacturers' recommendations, or with applicable codes and standards, alert Designer in writing before installation. Otherwise, make changes in installed work as Designer requires within Contract Price.

C. If the required material, installation, or work can be interpreted differently from drawing to drawing, or between drawings and specs, this contractor shall provide that material, installation, or work which is of the higher standard.

D. It is the intent of these contract documents to have the contractor provide systems and components that are fully complete and operational and fully suitable for the intended use. There may be situations in the documents where insufficient information exists to precisely describe a certain component or subsystem, or the routing of a component. In cases such as this, where the contractor has failed to notify the Designer of the situation in accordance with the paragraph above, the contractor shall provide the specific component or subsystem with all parts necessary for the intended use, fully complete and operational, and installed in workmanlike manner either concealed or exposed per the design intent.

E. In cases covered by the paragraph above, where the contractor believes he needs engineering guidance, he shall submit a sketch identifying his proposed solution and the Designer shall review, note if necessary, and approve the sketch.

1.7 MODIFICATIONS IN LAYOUT

A. HVAC, Plumbing, Fire Protection, and Electrical Drawings are diagrammatic. They indicate general arrangements of mechanical and electrical systems and other work. They do not show all offsets required for coordination nor do they show the exact routings and locations needed to coordinate with structure and other trades and to meet architectural requirements.

B. In all spaces, prior to installation of visible material and equipment, including access panels, review Architectural Drawings for exact locations and where not definitely indicated, request information from Designer.

C. Check Contract Drawings as well as Shop Drawings of all subcontractors to verify and coordinate spaces in which work of this Section will be installed.

D. Maintain maximum headroom at all locations. All piping and associated components to be as tight to underside of structure as possible.

E. Make reasonable modifications in layout and components needed to prevent conflict with work of other trades and to coordinate according to Paragraphs A, B, C, and D above. Systems shall be run in a rectilinear fashion.

F. Where conflicts or potential conflicts exist and engineering guidance is desired, submit sketch of proposed resolution to Designer for review and approval.

1.8 SITE VISIT

A. Before submitting bid, visit and carefully examine site to identify existing conditions and difficulties that will affect work of this Section. No extra payment will be allowed for additional work caused by unfamiliarity with site conditions that are visible or readily construed by experienced observer.

1.9 DELIVERY STORAGE AND HANDLING

A. Valves:
   1. Shipping:
      a. Protect internal parts against rust and corrosion.
      b. Protect threads, flange faces, and soldered ends.
      c. Set valves in best position for handling. Setting valves closed prevents rattling; Setting valves open minimizes exposure of functional surfaces.
   2. Storage:
      a. Maintain valve end protection.
      b. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.
   3. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use operating handles or stems as lifting or rigging points.
   4. Protect flanges and specialties from moisture and dirt.
   5. Store plastic piping protected from direct sunlight. Support to prevent sagging and

B. Insulation: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.10 EXISTING CONDITIONS AND PREPARATORY WORK

A. Before starting work in a particular area of the project, visit site and examine conditions under which work must be performed including preparatory work done under other Sections or Contracts or by User Agency. Report conditions that might affect work adversely in writing through Contractor to Designer. Do not proceed with work until defects have been corrected and conditions are satisfactory. Commencement of work shall be construed as complete acceptance of existing conditions and preparatory work.

B. Interruption of Existing Fire-Suppression Water-Service Piping: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water-distribution service according to requirements indicated:

1. Notify the Designer or the WRTA Project Manager no fewer than two business days in advance of proposed interruption of service.
2. Do not proceed with interruption of service without Designer's or WRTA Project Manager's written permission.

C. Interruption of Existing Sanitary Waste Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify the Designer or the WRTA Project Manager no fewer than two business days in advance of proposed interruption of service.
2. Do not proceed with interruption of service without Designer's or WRTA Project Manager's written permission.

1.11 CODES, STANDARDS, AUTHORITIES AND PERMITS

A. Perform work strictly as required by rules, regulations, standards, codes, ordinances, and laws of local, state, and Federal governments, and other authorities that have legal jurisdiction over the site. Materials and equipment shall be manufactured, installed and tested as specified in latest editions of applicable publications, standards, rulings and determinations of:

1. Local and state building, plumbing, mechanical, electrical, fire and health department codes.
   a. Comply with requirements of utility company supplying the water. Include tapping of water mains and backflow prevention.
   b. Comply with standards of authorities having jurisdiction for water-service piping, including materials, hose threads, installation, and testing.
2. American Gas Association (AGA).
3. National Fire Protection Association (NFPA).
4. American Insurance Association (A.I.A.) (formerly National Board of Fire Underwriters).
5. Occupational Safety and Health Act (OSHA).
6. Factory Mutual Association (FM) if applicable to project.
7. Underwriters' Laboratories (UL).
8. American National Standards Institute (ANSI).

9. Canadian Standards Association (CSA).
10. United States Pharmacopeia (USP).

B. Material and equipment shall be listed by Underwriters' Laboratories (UL), and approved by ASME and AGA for intended service.
1. Piping materials shall bear label, stamp, or other markings of specified testing agency.

C. When requirements cited in this Specification conflict with each other or with Contract Documents, most stringent shall govern work. Designer may relax this requirement when such relaxation does not violate ruling of authorities that have jurisdiction. Approval for such relaxation shall be obtained in writing.

D. Most recent editions of applicable specifications and publications of the following organizations form part of Contract Documents:

1. American National Standards Institute (ANSI).
2. American Society of Mechanical Engineers (ASME).
3. National Electric Manufacturers Association (NEMA).
4. American Society for Testing and Materials (ASTM).
5. American Water Works Association (AWWA).
6. Thermal Insulation Manufacturers Association (TIMA).
7. Institute of Electrical and Electronics Engineers (IEEE).
8. Insulated Cable Engineers Association (ICEA).
9. National Fire Protection Association (NFPA).

E. Special attention is directed to requirements of NFPA 45, Laboratories Using Chemicals.

1.12 GUARANTEE AND 24 HOUR SERVICE

A. Guarantee Work of this Section in writing for one year from the date of Certificate of Agency Use and Occupancy. Guarantees or warranties that start at the date of shipment from the factory, or from the completion date of an individual portion of the project, are not acceptable. If the equipment is used for ventilation, temporary heat, etc. prior to the date of Certificate of Agency Use and Occupancy, the bid price shall include an extended period of warranty covering the one-year of occupancy, starting from the date of Certificate of Agency Use and Occupancy. The guarantee shall repair or replace defective materials, equipment, workmanship and installation that develop within this period, promptly and to Designer's satisfaction and correct damage caused in making necessary repairs and replacements under guarantee within Contract Price.

B. In addition to guarantee requirements of Division 01 and of Subparagraph A above, obtain written equipment and material warranties offered in manufacturer's published data without exclusion or limitation, in User Agency's name.

C. Replace material and equipment that require excessive service during guarantee period as defined and as directed by Designer.

D. Provide 24 hour service beginning on the date the project is first occupied by the User Agency, whether or not fully occupied, and lasting until the termination of the guarantee period. Service

shall be at no cost to WRTA. Service can be provided by this contractor or a separate service organization. Choice of service organization shall be subject to Designer and WRTA's Project Manager approval. Submit name and a phone number that will be answered on a 24-hour basis each day of the week, for the duration of the service.

E. Submit copies of equipment and material warranties to Designer before final payment.

F. At end of guarantee period, transfer manufacturers' equipment and material warranties still in force to User Agency.

G. This Paragraph shall not be interpreted to limit WRTA's Project Manager's rights under applicable codes and laws and under this Contract.

H. Part 2 Paragraphs of this Specification may specify warranty requirements that exceed those of this Paragraph.

I. Use of systems provided under this Section for temporary services and facilities shall not constitute Final Acceptance of work nor beneficial use by User Agency, and shall not institute guarantee period.

J. Provide manufacturer's engineering and technical staff at site to analyze and rectify problems that develop during guarantee period immediately. If problems cannot be rectified immediately to WRTA's Project Manager's satisfaction, advise Designer in writing, describe efforts to rectify situation, and provide analysis of cause of problem. Designer will suggest course of action.

1.13 RECORD DRAWINGS

A. Comply with requirements specified in Section 017700 – CONTRACT CLOSEOUT.

B. Drawings shall show record condition of details, sections, riser diagrams, control changes and corrections to schedules. Schedules shall show actual manufacturer and make and model numbers of final equipment installation.

1.14 BULLETINS, MANUALS, AND OPERATING INSTRUCTIONS, AND PROTECTION

A. Obtain at time of purchase of equipment, three copies of operation, lubrication and maintenance manuals for all items. Assemble literature in coordinated manuals with additional information describing combined operation of field-assembled units, including as built wiring diagrams. Manual shall contain names and addresses of manufacturers and local representatives who stock or furnish repair parts for items or equipment. Divide manuals into three sections or books as follows:

1. Directions for and sequence of operation of each item of Plumbing systems. Sequence shall list valves, switches, and other devices used to start, stop and control system. Include approved valve directory showing each valve number, location of each valve, and equipment or fixture controlled by valve.
2. Detailed maintenance and trouble shooting manuals containing data furnished by manufacturer for complete maintenance. Include copy of balancing report.

3. Lubrication instructions detailing type of lubricant, amount, and intervals recommended by manufacturer for each item of equipment. Include additional instructions necessary for implementation of first class lubrication program. Include approved summary of lubrication instructions in chart form, where appropriate.

B. Operating instructions: Upon completion of installation or when WRTA's Project Manager accepts portions of building and equipment for operational use, instruct User Agency's operating personnel in any or all parts of various systems. Instructions shall be performed by factory trained personnel. User Agency shall determine which systems require additional instructions. Duration of instructions shall take equipment through complete cycle of operation (at least five working days). Make adjustments under operating conditions.

C. Each contractor shall be responsible for his work and equipment until finally inspected, tested, and accepted. Carefully store materials and equipment which are not immediately installed after delivery to site. Close open ends of work with temporary covers or plug during construction to prevent entry of obstructing material.

D. Each separate contractor shall protect the work and material of other trades that might be damaged by his work or workmen and make good all damage thus caused.

1.15 MANUALS AND INSTRUCTIONS

A. Comply with requirements specified in Section 017700 – CONTRACT CLOSEOUT.

B. Operation and Maintenance Manuals: Prepare manuals in compliance with Division 01, and the additional requirements of this Section. In addition to the requirements of other Sections, each manual shall include:

1. Product data cut sheets and approved shop drawings for equipment and materials as specified in this Section.

C. Instruction Seminar: Perform systems instruction seminar and walk-through with the User Agency's representatives after the User Agency has had opportunity to review the Operation and Maintenance Manuals.

1.16 COORDINATION DRAWINGS

A. Refer to Section 013100 – PROJECT MANAGEMENT AND COORDINATION for coordination drawing requirements.

B. Coordination Drawings include but are not necessarily limited to:

1. Structure.
2. Partition/room layout.
3. Ceiling tile and grid.
4. Light fixtures.
5. Access panels.
6. Sheet metal, heating coils, boxes, grilles, diffusers, etc.

7. Plumbing piping and valves.
8. Duct insulation.
9. Smoke and fire dampers.
10. Soil, waste and vent piping.
11. Fire suppression water piping.
12. Compressed air piping.
13. Roof drain piping.
14. Major electrical conduit runs, panelboards, feeder conduit and racks of branch conduit.
15. Above ceiling miscellaneous metal.
16. Sprinkler piping and heads.
17. Heat tracing of piping.
18. Items penetrating finished walls and ceiling including but not limited to lighting fixtures and air outlets and inlets.
19. Insulation:
    a. Coordinate sizes and locations of supports, hangers, and insulation shields. Coordinate clearance requirements with equipment Installer for equipment insulation application. Coordinate installation and testing of heat tracing.

PART 2 -

PART 2 - PRODUCTS

2.1 PIPING, FITTINGS AND JOINTS

A. General:

1. Pipe and fittings shall conform to the latest ANSI, ASTM, NFPA and AWWA Standards including latest amendments.
2. Each length of pipe, each pipe fitting, trap, material and/or device used in the respective system shall have cast, stamped or indelibly marked on it, the maker's name or mark, weight and quality of the product when such marking is required by the approved standard that applies.
3. Piping and fittings shall be factory coated.
4. Pro-press type piping and fittings may be used, but shall be limited to domestic water lines, 2 inches or less in diameter.

B. Sanitary Drainage Piping Above Floor (Soil, Waste, and Vent)

1. Piping 2 in. and larger shall be no-hub service weight cast iron soil pipe except at urinals and cleanouts and joints just prior to exiting the building which shall be service weight hub and spigot with lead and oakum joints.
2. Piping 2 in. and smaller shall be type “L” copper.
    a. In lieu of soldered joints for 2 in. through 8 in. type “L” copper tubing systems, Victaulic or approved equal by Grinnell or Anvil Gruvlok grooved joint couplings and fittings may be used. Fittings shall be ASME B16.22 wrought copper or ASME B16.18 bronze casting with copper tubing sized grooved ends (flaring of tube and fitting ends to IPS dimensions is not permitted).

b. Couplings shall consist of two ductile iron housings cast with offsetting, angle-pattern bolt pads coated with copper-colored enamel, pressure-responsive, synthetic rubber gasket (Grade "T" Nitrile), and plated steel bolts and nuts. Victaulic Style 607 or approved equal by Grinnell or Anvil Gruvlok.

3. Couplings for joining no-hub cast iron soil pipe: Couplings shall have a shield constructed of corrugated 304 stainless steel and provide a shield thickness of 0.16 inches or greater. Shield shall be a minimum width of 3 inches for pipe sizes 1-1/2 inch through 4 inch, and a minimum width of 4 inches for pipe sizes 5 inch through 10 inches. Couplings with at least 4 sealing bands shall require 80 inch pounds of torque per band. Tightening screws shall be 3/8 inch hexagon head. Couplings with only 2 sealing bands on sizes 1-1/2 inch through 4 inches shall require 125 inch pound of torque per band. Gaskets shall be neoprene rubber conforming to ASTM C-564.
4. Joints in copper tubing except as otherwise specified herein shall be made according to manufacturer's specifications using sweat fitting and lead free solder and non corrosive flux.
5. Connections between earthenware of any fixture and flanges in soil and waste piping shall be made absolutely gas and watertight with closet setting compounds and gaskets which must be absolutely gas and fireproof, watertight, stainproof, containing neither oil nor asphaltum and which will not rot, harden or dry under any extreme climatic change, and must adhere on wet surfaces.

C. Sanitary Drainage Piping Below Floor (Soil, Waste and Vent)

1. Piping below floor shall be service weight cast iron hub and spigot.
2. Joints in cast iron soil piping below ground shall be code approved compression type, made with rubber gaskets conforming to ASTM Specification C564. Joints in cast iron soil pipe and fittings using a double seal, compression type molded neoprene gasket shall be provided with a modified hub as required to provide a positive seal. No hub pipe will not be allowed below ground.

D. Fire Protection Test Piping

1. Piping shall be Schedule 40 galvanized steel.
2. Fittings shall be Class 125 galvanized cast iron.
3. Piping and fittings to be joined by threaded connections.

E. Water Piping (Domestic, Non-Potable and Tempered)

1. Exterior buried water service to ten feet outside of the building wall.
   a. Pipe: Ductile iron Class 52.
   b. Fittings: Mechanical joints and retainer glands conforming to AWWA Class D.
   c. Pipe and fittings shall be cement lined on the inside and bituminous coated and encased in loose 8 mil thick polyethylene film sleeve that complies with ANSI A21.5.
   d. Change in direction shall have tie rods anchored to concrete thrust blocks.
2. Above Ground
   a. 1-1/2 inches and smaller shall be hard drawn Type L copper with push-to- connect fittings. Fittings shall be ASME B16.18 cast copper alloy or ASME B16.22 wrought copper with stainless steel teeth and EPDM synthetic rubber o-ring seal in each end (UL classified in accordance with NSF-61 for hot (+180°F) and cold

(+86°F) potable water service) with push-to-connect ends instead of solder-joint ends.

b. 2-1/2 inches and smaller shall be hard drawn Type L copper with wrought or cast copper fittings.

c. 2-1/2 inches and larger may be hard drawn Type L copper with Victaulic or approved equal by Grinnell or Anvil Gruvlok roll grooved mechanical couplings.

1) Victaulic or approved equal by Grinnell or Anvil Gruvlok grooved end fittings shall be ASME B16.22 wrought copper or ASME B16.18 bronze castings with copper tubing sized grooved ends (flaring of tube and fitting ends to IPS dimensions is not permitted).

2) Couplings shall be "Installation Ready" stab-on design for direct "stab" installation onto roll grooved copper tube without prior field disassembly and no loose parts. Coupling shall consist of two ductile iron housings cast with offsetting, angle-pattern bolt pads coated with copper-colored enamel, pressure-responsive, synthetic rubber gasket (Grade "EHP" EPDM), and plated steel bolts and nuts. Victaulic Style 607 QuickVic or approved equal by Grinnell or Anvil Gruvlok.

3) Flange adapters shall be copper tube dimensioned, ductile iron casting coated with copper-colored enamel, flat face, designed for direct connection to ANSI Class 125 and 150 flanged components. Victaulic Style 641 or approved equal by Grinnell or Anvil Gruvlok.

d. Joints in copper tubing except as otherwise specified herein shall be made according to manufacturer's specifications using sweat fitting and lead free solder and non corrosive flux.

e. Provide galvanized malleable iron unions, with bronze facings conforming to ANSI B16.39 for sizes 2 inch and smaller.

f. Provide steel flanges conforming to ANSI B16.5, standard or welding neck pattern.

F. Unions and Flanges

1. Unless otherwise specified herein, unions for copper and brass piping two inches and smaller in diameter shall be 125 SWP, bronze body brass ground joint type. Those larger than two inches in diameter shall be 150 SWP flat faced cast brass flanges conforming to ANSI Standard B16.24.
2. Where brass flanges and ferrous flanges are to be joined, ferrous flanges shall be full faced.
3. Mating of ferrous and non ferrous flanges shall be separated with rubber gaskets (1/16 inch minimum thickness) and Teflon liners installed in the bolt holes. Bolt holes shall be drilled to receive the Teflon lines. Physical contact between the ferrous and non ferrous flanges including the bolts, nuts and washers will not be permitted.
4. Unions for ferrous piping shall be of the same material as the piping to which they connect.
5. On grooved piping systems, the couplings shall act as the union
6. Grooved flange adapter Victaulic Style 641 or approved equal by Grinnell or Anvil Gruvlok for direct connection to CL 150 flanged components.

2.2 VALVES AND SUNDRIES

A. General

1. Manufacturer: Subject to compliance with requirements, provide products from one of the manufacturers listed.
2. Valve Design: Rising stem or rising outside screw and yoke stems.
3. Nonrising stem valves may be used where headroom prevents full extension of rising stems.
4. Pressure and Temperature Ratings: As scheduled and required to suit system pressures and temperatures.
5. Sizes: Same size as upstream pipe, unless otherwise indicated.
6. Operators: Provide the following special operator features:
    a. Handwheels, fastened to valve stem, for valves other than quarter turn.
    b. Lever handles, on quarter turn valves 6 inch and smaller, except for plug valves. Provide plug valves with square heads; provide one wrench for every 10 plug valves.
    c. Chain-wheel operators, for valves 2-1/2 inch and larger, install 72 inches or higher above finished floor elevation. Extend chains to an elevation of 5 ft.-0 in. above finished floor elevation.
    d. Gear drive operators, on quarter turn valves 8 inch and larger.
    e. Power actuators, on grooved end valves 2 inch and larger with electrical, hydraulic, or pneumatic activation.
7. Extended Stems: Where insulation is indicated or specified, provide extended stems arranged to receive insulation.
8. Bypass and Drain Connections: Comply with MSS SP-45 bypass and drain connections.
9. End Connections: As indicated in the valve specifications.
    a. Threads: Comply with ANSI B1.20.1.
    b. Flanges: Comply with ANSI B15.1 for cast iron, ANSI B16.5 for steel, and ANSI B16.24 for bronze valves.
    c. Grooved: Comply with ANSI/AWWA C606.
    d. Solder-Joint: Comply with ANSI B16.18.
        1) Caution: Where soldered end connections are used, use solder having a melting point below 840 deg. F for gate, globe, and check valves; below 421 deg F for ball valves.

B. Valves in the interior domestic water piping systems (cold water, hot water) and gas system:

1. Acceptable Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:
    a. Apollo.
    b. Nibco.
    c. Victaulic.
    d. Watts.
2. Ball Valves
    a. Ball Valves, 1 Inch and Smaller: Rated for 150 psi saturated steam pressure, 400 psi WOG pressure; two piece construction; with bronze body conforming to ASTM B 62, standard (or regular) port, chrome-plated brass ball, replaceable “Teflon” or “TFE” seats and seals, blowout-proof stem, and vinyl covered steel handle. Provide solder ends for domestic hot and cold water service.
    b. Ball Valves, 1-1/4 Inch and Smaller: Rated for 200 psi cold water pressure, two-piece construction; with forged brass body, full port, chrome-plated brass ball and brass stem, PTFE seat ring and packing, lever handle, push-to-connect ends for

domestic hot and cold water service. Victaulic PermaLynx 300 Series or approved equal.

c. Ball Valves, 1-1/4 Inch to 2 Inch: Rated for 150 psi saturated steam pressure, 400 psi WOG pressure; 3 piece construction; with bronze body conforming to ASTM B 62, conventional port, chrome-plated brass ball, replaceable "Teflon" or "TFE" seats and seals, blowout-proof stem, and vinyl covered steel handle. Provide solder ends for domestic hot and cold water service.

3. Butterfly Valves
   a. Butterfly Valves, 2-1/2 Inch and Larger: MSS SP-67; rated at 200 psi; cast iron body conforming to ASTM A 126, Class B. Provide valves with field replaceable EPDM sleeve, nickel-plated ductile iron disc (except aluminum bronze disc for valves installed in condenser water piping), stainless steel stem, and EPDM O ring stem seals. Provide lever operators with locks for sizes 2 through 6 inches and gear operators with position indicator for sizes 8 through 24 inches. Provide lug or wafer type as indicated. Drill and tap valves on dead end service or requiring additional body strength.
   b. Butterfly Valves, 2-1/2 Inch and Larger: Meets or exceeds the requirements of MSS SP-67, rated at 300 psi; bronze body with copper tubing sized grooved ends designed for installation with Victaulic or approved equal couplings. EPDM coated ductile iron disc and integrally cast steel stem, lever handle, gear operator with handwheel, or power actuator. Victaulic Series 608 or approved equal .
4. Check Valves
   a. In-Line, Lift-Type Check Valves, 1-1/2 Inch and Smaller: Suitable for installation in horizontal or vertical lines with upward flow, bronze body, stainless steel stem and spring, TFE disc with stainless steel disc holder, push-to-connect ends. Victaulic PermaLynx 510 Series or approved equal.
   b. Swing Check Valves, 2 Inch and Smaller: MSS SP-80; Class 125, cast bronze body and cap conforming to ASTM B 62; with horizontal swing, Y pattern, and bronze disc; and having threaded or solder ends. Provide valves capable of being reground while the valve remains in the line. Provide Class 150 valves meeting the above specifications, with threaded end connections, where system pressure requires or where Class 125 valves are not available.
   c. Swing Check Valves, 2-1/2 Inch and Larger: MSS SP-71; Class 125 (Class 175 FM approved for fire protection ping systems), cast iron body and bolted cap conforming to ASTM A 126, Class B; horizontal swing, and bronze disc or cast iron disc with bronze disc ring; and flanged ends. Provide valves capable of being refitted while the valve remains in the line.

C. Sundries

1. Acceptable Manufacturers: Chicago Faucet, T & S Brass and Bronze Works, Inc., Speakman Co., Josam Manufacturing, Jay R. Smith, Zurn Manufacturing, Precision Plumbing Products or approved equal.
2. Vacuum breakers shall be full size of line feed. All hose bibbs shall be supplied with vacuum breakers attached to hose thread portion of hose bibb unless they are integral to fixture.
3. Hose bibbs shall be equal to the following:
   a. (Toilet Rooms) Chicago No. 952 (2 in.)
   b. (Mechanical Rooms) Chicago No. 998 (3/4 in.)
   c. (Exterior wall hydrants) J.R. Smith No. 5610

4. Shock absorbers shall be of the mechanical, pre pressurized type installed where indicated and in accordance with "Standard P.D.I. WH201."
5. Combined Pressure Temperature Relief Valves: Bronze body, test lever, thermostat, complying with ANSI Z21.22 listing requirements for temperature discharge capacity. Provide temperature relief at 210 deg F, and pressure relief at 150 psi.
6. Pressure Regulating Valves: Single seated, direct operated type; having bronze body with integral strainer, and complying with requirements of ASSE Standard 1003. Select proper size for maximum flow rate and inlet and outlet pressures indicated.
7. Relief Valves: Provide proper size for relief valve, in accordance with ASME Boiler and Pressure Vessel Codes, for indicated capacity of the appliance.
8. Water meter: Compound type, conforming to AWWA Standards. Size meter and arrange piping and specialties to comply with utility company requirements.

2.3 FLOOR DRAINS

A. General

1. Floor, roof and area drains shall be Jay R. Smith, Josam, Zurn, or approved equal. Manufacturer's catalog numbers specified herein for drains are intended only as a guide for the type and quality to be furnished under this Section of the Specifications.
   a. Floor Drain "1" (FD "1" Finished Areas) shall be equal to Jay R. Smith Figure #2005-A-P.

2.4 HANGERS AND ACCESSORIES

A. General

1. Provide pipe stands, supports, hangers and other supporting appliances as necessary to support work required by Contract Documents. All components of the hanger support system shall comply with the standards set forth in MSS-SP58 and MSS-SP69 (Manufacturers Standardization Society) latest publication.
2. Manufacturers: Subject to compliance with requirements, provide hangers and supports of Carpenter and Patterson, Inc, ITT Grinnel Corp., Elecen Metal Products or approved equal.

B. Secure vertical piping to building construction to prevent sagging or swinging.

C. Space hangers for horizontal piping as follows:

Pipe Size	Rod Diameter	Maximum Spacing
2 and 3/4 A	3/8 in.	6 ft.- 0 in.
1 in. and 1-1/4 in.	3/8 in.	8 ft.-0 in.
1-1/2 and 2 in.	3/8 in.	10 ft.-0 in.
2-1/2 and 3 in.	2 in.	10 ft.-0 in.
4 and 5 in.	5/8 in.	12 ft.-0 in.
6 in.	3/4 in.	12 ft.-0 in.
8 in. and over	7/8 in.	12 ft.-0 in.

D. Friction clamps shall be equal to Figures 126 and copper plated when in direct contact with copper or brass piping.

E. Hangers for uncovered (uninsulated) copper or brass piping 2 in. and smaller shall be Carpenter & Patterson Figure 1ACT steel, copper plated band type.

F. Hangers for uncovered (uninsulated) steel or cast iron piping 2 in. and smaller shall be Carpenter & Patterson Figure 1A steel band type.

G. Hangers for uncovered (uninsulated) steel or cast iron piping 2-1/2 in. and larger shall be Carpenter & Patterson Figure 100 steel clevis type.

H. Hangers for all insulated piping shall be Carpenter & Patterson Figure 100 steel clevis type with insulation shield specified below.

I. Hangers for uncovered (uninsulated) copper or brass piping 2-1/2 in. and larger shall be factory applied copper plated steel clevis hangers, Carpenter & Patterson Fig. 100 CT. Rods and nuts used with these hangers shall also be factory applied copper plated.

J. Where three or more pipes are running parallel to each other, factory fabricated gang type hangers with pipe saddle clips, or rollers may be used in lieu of the hereinbefore specified Clevis hangers. These hangers shall be sized to provide for insulation protectors as hereinafter specified. Pipe saddle clips shall be not less than 16 gauge metal and shall be copper when installed with uninsulated copper piping. Where pipe rollers are provided for uninsulated copper or brass piping, insulation protectors shall be provided at each set of rollers and filled with a section of heavy density fiberglass pipe covering specified hereinafter. (Refer to insulation of this specification.) Fig. 342 sized to suit loading with hanger rods and nuts.

K. Extension type split ring hangers with wall plates shall be equal to Carpenter & Patterson Figures 81, 81 CT, 90 CT and 85, 85 CT plates for iron, steel and copper.

L. Hanger rods for other installations shall be sized in accordance with the recommended load capacities of ASTM Specifications Designation A 107, latest amendment.

M. Insulation protectors (shields) for horizontal piping shall be constructed of galvanized steel formed to a 180 degree arc and 12 inches long, equal to Carpenter & Patterson Figure 265P, 18 gauge type H for hangers 5 inches in size and smaller, 16 gauge for hangers larger than 5 inches in size.

N. Exposed rods, clamps and hangers shall be electrogalvanized coated.

O. Installation of hangers which permit wide lateral motions of any pipe will not be acceptable.

P. "C" clamps installed with pipe hangers or equipment hangers will not be permitted unless provided with retaining straps.

Q. All no-hub cast iron pipe 6 inches or larger in diameter shall be braced to prevent horizontal movement as required by code and recommended by the Cast Iron Soil Pipe Institute by using braces, blocking or rodding as illustrated in the CISPI Handbook, Vol. II, Specification Section 310-78.

R. All gas piping 2 in. and larger shall have seismic bracing. Refer to NFPA 13 for methods and procedures.

2.5 INSERTS AND ESCUTCHEONS

A. Inserts shall be individual or strip type of pressed steel construction with accommodation for removable nuts and threaded rods up to 3/4 inch diameter, permitting lateral adjustment. Individual inserts shall have an opening at the top to allow reinforcing rods up to 2 inch diameter to be passed through the insert body. Strip inserts shall have attached rods with hooked ends to allow fastening to reinforcing rods.

B. Unless otherwise specified herein, escutcheons shall be cast brass chrome plated type and provided with a set screw to properly hold escutcheon in place.

2.6 PIPE COVERING

A. General

1. The pipe covering specified herein for piping system shall be provided to strict accordance with the manufacturer's printed instructions, the best practice of the trade and to the full intent of this Specification.
2. Flame/Smoke Ratings: Provide complete fibrous glass pipe insulation (insulation, jackets, coverings, sealers, mastics and adhesives) with flame spread index of 25 or less, and smoke developed index of 50 or less, as tested by ASTM E 84 (NFPA 255) method.
3. Manufacturer: Subject to compliance with requirements, provide products of Armstrong World Industries, Inc., Knauf Fiber-Glass, Owens Corning or approved equal.
4. Apply insulation after systems have been tested, proved tight and approved by Designer. Remove dirt, scale, oil, rust and foreign matter prior to installation of insulation.
5. No leaks in vapor barrier or voids in insulation will be accepted.
6. Insulation and vapor barrier on piping which passes through walls or partitions shall pass continuously through sleeve, except that piping between floors and through fire walls or

smoke partitions shall have space allowed for application of approved packing between sleeves and ping, to provide firestop as required by NFPA. Seal ends to provide continuous vapor barrier where insulation is interrupted.

B. Interior Cold, Hot Water and above Ground Horizontal Storm Drainage Systems:

1. 1 in. thickness fiberglass piping insulation:
   a. ASTM E-547, Class I
2. Fire retardant foil face jackets for ping insulation: ASTM C-921, Type I for piping with temperatures below ambient, Type II for piping with temperatures above ambient. Type I may be used for all piping at installation option.
3. Encase piping fittings insulation with one piece premolded PVC fitting covers, fastened as per manufacturer's recommendations.
4. Encase exterior piping insulation with aluminum jacket with weatherproof construction.
5. Staples, Bands, Wires, and Cement: As recommended by insulation manufacturer for applications indicated.

2.7 CLEANOUTS

A. Cleanouts shall be Jay R. Smith, Josam, Zurn or approved equal.

B. Bodies of cleanout ferules in hub and spigot or no hub piping shall be standard pipe size conforming in thickness to that required for pipe and fittings, and shall extend not less than 3/4 inch above the hub of the pipe. The cleanout plug shall be of cast brass and shall be provided with a raised nut 3/4 inch high. Cleanouts in copper waste piping shall be soldered brass cleanout fittings with extra heavy brass screw plugs of the same size as the pipe line. Cleanouts in threaded waste piping shall be cast iron drainage "T" pattern 90 degree branch fittings with extra heavy brass screw plugs of the same size as the pipe.

C. Floor cleanouts shall be as follows:

1. General purpose flush finished floor cleanout with adjustable top shall be equal to Jay R. Smith Series 4026.
2. Wall cleanout with cleanout tee and square frame and cover shall be equal to Jay R. Smith Series 4558.

2.8 PLUMBING FIXTURES

A. In general, the work of this Article shall include, but not be limited to:

1. Plumbing fixtures and trim.
2. Faucets and flushometers.
3. Stops and supplies.
4. Traps and tailpieces.
5. Drain outlets.
6. Mixing valves.
7. Shower assemblies.
8. Flow controls.

9. Carriers and supports.
10. Lavatory insulators.

B. Fixtures and Trim

1. Acceptable Manufacturers: Submit manufacturers not listed below for review and approval as specified for substitutions in Article Quality Assurance in this Section.
   a. Stainless Steel: American Standard, Acorn or Kohler.
   b. Faucets: Chicago Faucet Co., Kohler or T & S Brass.
   c. Self Closing Faucets: Chicago Faucet Co., Kohler or Symmons.
   d. Sensor Faucets: Chicago Faucet Co., Hydrotek or Sloan.
   e. Stainless Steel Sinks: Elkay, Just Manufacturing or Metcraft Inc.
   f. Mop Service Basins: Crane, Fiat or Stern Williams.
   g. Carriers and Supports: Jay R. Smith, Wade, or Zur.
   h. Thermostatic Mixing Valves: Leonard Valve Co., Powers Process Controls or Symmons.
   i. Pressure Regulating Mixing Valves: Lawler Manufacturing, Leonard Valve Co Symmons.
   j. Electric Water Coolers: Filtrine, Halsey Taylor or Haws.
   k. Acrylic Showers: Aquarius, Aquabath, or Crane.
   l. Flush Valves: Sloan, Delany, or Zurn.
   m. Stops and Supplies: Chicago Faucet Co., Kohler or McGuire.
   n. P-Traps: McGuire, Sanitary-Dash, or Jameco.
   o. Security Fixtures: Acorn, Willoughby, or Metcraft.
   p. Handicap Lavatory Insulators: McGuire, TCI Products or Truebro.
2. Fixture Trim and Accessories: Provide fixtures complete with floor mounted fixture carrier supports; faucets, flushometers; drain outlets, tailpieces, P-traps and stops and supplies.
   a. Color and Finish: All trim exposed to view shall be polished chrome plated, and all fixtures and toilet seats shall be white unless specified otherwise.
   b. Drain Outlets: Provide drain outlet of the same manufacturer as the fixture or faucet trim with chrome plated 17 gauge minimum weight tailpiece.
      1) Provide 1-1/4 inch tailpiece on lavatories.
      2) Provide 1-1/2 inch tailpiece on sinks.
      3) Provide offset drain outlets on handicapped use lavatories and sinks.
3. P-Traps: Cast brass adjustable P-trap with cleanout plug, ground joint and 17 gage minimum weight extension with escutcheon.
   a. Provide McGuire No. 8090 1-1/4 inch by 1-1/2 inch on lavatories.
   b. Provide McGuire No. 8089 1-1/2 inch by 1-1/2 inch on sinks.
4. Stops and Supplies: Provide stops and supplies of the same manufacturer as the fixture or faucet trim, or provide McGuire Model 170-LK loose key angle stop with 5 inch long 2 inch nominal copper sweat extension, bell escutcheon, and 3/8 inch O.D. by 12 inch flexible riser.
5. Sinks: Seamlessly drawn, self-rimming minimum 18 gauge, type 302 (18-8) nickel bearing stainless steel with 1-3/4 inch minimum rounded corners, satin finish, and fully undercoated.
6. Faucets: Chrome plated cast brass with stainless steel seats and monel stems. Gooseneck spouts shall be interchangeable and convertible rigid/swing type. Handles shall be interchangeable with square handle broachings.

7. Flushometers: Diaphragm operated, cast-brass body, brass or copper pipe or tubing inlet with wall flange and tailpiece with spud, screwdriver check stop, vacuum breaker, and brass lever handle actuation except where other variations are specified.
8. Water Conservation: Provide water conserving fixtures and trim incompliance with the following maximum water use requirements. Provide Omni or equal variable pressure flow controls on showers, sinks, and lavatory faucets.
    a. Public lavatories: 0.5 gpm
    b. Sinks: 1.5 gpm
    c. Showers: 2 gpm
    d. Water Closets: 1.6 gallons per flush.
9. Fixture Supports: Provide floor mounted fixture support carriers for wall mounted fixtures including but not limited to: water closets, lavatories, scrub sinks, urinals, and clinical sinks.
10. Fixture carriers shall support at least 250 pounds on the front rim of the fixture for 5 minutes.
    a. Water Closets: Jay R. Smith Series 200-Y
    b. Urinals: Jay R. Smith 637.
    c. Lavatories: Jay R. Smith 700-M31.
    d. Wheel Chair Lavatories: Jay R. Smith 700-27-M31.
11. Toilet Seats: Provide extra heavy-duty, commercial/industrial type, elongated, open front, solid white injection molded plastic with integral bumpers; and self-sustaining stainless steel check hinges.
    a. Acceptable Manufacturers: Bemis, Beneke, or Church.
12. Hot Water Dispensers: ASSE 1023, instant on-off control on chrome-plated dispenser faucet with removable strainer; steel tank housing with insulated stainless steel inner tank; adjustable thermostat control for water temperature from 140 degrees F to 190 degrees F with thermal overload protection; 120 volt, and 2-gallon minimum tank capacity.
    a. Acceptable Manufacturers: Elkay, or Insinkerator.
13. Handicap Lavatory and Sink Insulators: Shall be provided on water supplies and waste piping below handicapped use lavatories and sinks.
    a. Acceptable Manufacturers: McGuire, TCI Products or Truebro.

2.9 GAUGES AND THERMOMETERS

A. General

1. Gauges and thermometers shall be as manufactured by U.S. Gauge Ashcraft, Trerice or equal.
2. The accuracy of all gauges and thermometers shall be within one percent of the scale range.
3. Thermometers shall be located at all water heater outlets and on all hot water return after immersion aquastat. Provide copper separable socket and socket wells.

B. Pressure Gauges (At Water Meter)

1. Gauges shall be installed with suitable "T" handle gauge cocks to permit servicing. Unless otherwise specified herein, all gauges shall be 5 inch diameter, dial type, stainless steel case aluminum peaker ring, phosphor bronze, bourdon tube, 1/4 inch forged brass

N.P.T. male socket connection with wrench flats, white lithographed steel dial with black numbers and graduation. Dial graduations reading in "PSIG" shall be such that the normal operating pressure shall be indicated near the middle of the scale.

C. Thermometers: (At Hot Water Heaters)

1. Thermometers shall be red mercury type. Thermometers shall be graduated to "degrees F" and shall have a range so that the normal operating temperature will be in the middle of the scale.
2. The face of the thermometer shall be large enough so it may be read from the floor.

2.10 ACCESS PANELS

A. Furnish access doors and frames for walls and ceilings to applicable trades for installation. Size as required for access and maintenance, minimum 16 by 16 inches.

B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. J. L. Industries, Inc.
2. Karp Associates, Inc.
3. Larsen's Manufacturing Company.
4. Milcor Inc.
5. Nystrom, Inc.

C. Flush Access Doors and Trimless Frames: Fabricated from steel sheet.

1. Locations: Wall and ceiling surfaces as applicable.
2. Door: Minimum 0.060-inch-thick sheet metal, set flush with surrounding finish surfaces.
3. Frame: Minimum 0.060-inch-thick sheet metal with suitable bead flange.
4. Hinges: Continuous piano.
5. Lock: Cylinder, keyed alike.

D. Fire-Rated, Insulated, Flush Access Doors and Trimless Frames: Fabricated from steel sheet.

1. Locations: Wall and ceiling surfaces as applicable.
2. Fire-Resistance Rating: Not less than that of adjacent construction.
3. Temperature Rise Rating: 250 deg F at the end of 30 minutes.
4. Door: Flush panel with a core of mineral-fiber insulation enclosed in sheet metal with a minimum thickness of 0.036 inch.
5. Frame: Minimum 0.060-inch thick sheet metal with suitable bead flange.
6. Hinges: Continuous piano.
7. Automatic Closer: Spring type.
8. Lock: Self-latching device with cylinder lock, keyed alike.

2.11 TRAP PRIMERS

A. General: The trap primer shall be as manufactured by Precision Plumbing Products, Inc., Jay R. Smith Zurn or approved equal.

B. Furnish and install trap primer units to serve one or two drains, as indicated on the drawings.

C. Units shall be Precision Plumbing Products, Inc. Model P2-500, 2 in. connections, automatic brass trap primer units which shall be activated by a drop in water pressure (minimum 3 psi) in the active cold water line in which attached. Units shall meet Code and ASSE Standard #1018. Units shall be adjustable to line pressure and desired delivery amount.

D. Units shall deliver a maximum of two ounces of water on a 15 second pressure drop and have corrosion resistant brass fittings with a copper reservoir with clear plastic inspection cover, and mounting brackets, “O” ring seals.

E. Install units one foot above the flood level of the device served for every 20 feet of primer line. Pipe according to manufacturer’s instructions, off top of supply line, and 15-1/4 in. down to bottom of distribution units.

F. Units serving multiple devices shall be furnished with #SS-8 straight supply tube and #DV-2 distribution unit.

G. Contractor shall adjust all units and cycle all primers at least six times to insure proper activity.

2.12 FIRESTOPPING

A. Work of Section 078413 – PENETRATION FIRESTOPPING.

2.13 SLEEVES AND PENETRATIONS

A. Piping penetrations through fire rated construction shall comply with a listed fire rated assembly as detailed in the UL Fire Resistance Directory. Pipe sleeves through floors, exterior walls and fire-rated construction shall be galvanized Schedule 40 steel pipe. Pipe sleeves through non-fire-rated partitions shall be 26 gauge-galvanized steel.

1. Sleeves Through Exterior Below Grade Foundation Walls and Floor Slabs on Grade: Provide galvanized Schedule 40 steel with continuous weld slop on welding flange water stop. Provide waterproof caulking assembly by Link-Seal or Sure-Seal.
2. In areas where pipe is exposed, install sleeves flush with the finish floor, except in mechanical rooms, and janitor's closets extend sleeves at least 4 inches above finish floor.
3. Annular Space Requirements: Sleeves shall be sized to provide a total clearance of approximately 1 inch around pipe including insulation cover. Annular space around fire rated through penetrations assemblies shall be in compliance with the Listed Assembly.
4. Packing between the pipe and sleeve in fire rated construction shall be a combination of listed insulation and fireproof caulk.

B. Where piping passes below grade beams and footings, provide a ductile iron sleeve three sizes larger than the pipe being served. Sleeve shall be a minimum of six feet in length.

2.14 VALVE TAGS

A. Upon completion of piping installation work provide valve tags on all valves installed under the work of the mechanical sections. Valve tags shall be at least 1-1/2 inch diameter brass or engraved plastic with 1/4 inch high lettering for service designation over 2 inch high consecutively numbered valve identification. Engraved valve tags shall be color coded as specified for piping identification. Coordinate valve tag numbers with the User Agency's facility management program. Provide service designation prefix as scheduled:

1.	Fire Protection Systems:	Prefix:
	a. Fire Line (Standpipe) Piping	FL
	b. Sprinkler Piping	SP
2.	Plumbing Systems:	Prefix:
	a. Domestic Cold Water	CW
	b. Domestic Hot Water	HW
	c. Domestic Hot Water Circulation	HWC
	d. Fuel Gas	GAS
	e. Normally Closed	NC
	f. Unsafe Water	NP

B. Valve tags on plumbing systems may be engraved laminated plastic tags color-coded to match the pipe identification marks.

C. Identify Non-Potable water outlets with permanently attached yellow color-coded marker or 4-inch high triangle tag reading: Water Unsafe.

2.15 PIPING IDENTIFICATION

A. Piping: Provide clip-on color-coded piping identification markers. Provide matching flow arrows to indicate direction of flow. Markers shall be equal to Seton Setmark. Pipe marking for outside diameters of 6 inches or greater may be springs or metal bands secured to the corners at each end of the semi-rigid plastic marker to hold each end of the marker firmly against the pipe.

1. Color coding and size of legend letters shall comply with the standards of ANSI A13.1.
2. Provide markers with legend letters sized in compliance with the following schedule:

Outside Diameter (Over Insulation)	Size of Letters:	Length of Color Code:
1-1/4 inch and smaller	2 inch	8 inches
1-1/2 inch to 2 inch	3/4 inch	8 inches
2-1/2 inches to 6 inches	1-1/4 inch	12 inches
8 inch	2-1/2 inch	24 inches
10 inch and larger	3-1/2 inch	32 inches

3. Fire Protection Systems: Provide red color-coded identification markers to identify horizontal fire line piping. Identify sprinkler piping with clip-on markers as specified or provide a 12 inch long painted red indication on the bottom half of concealed piping. Exposed sprinkler piping does not require identification markers when sprinkler heads are visible in plain view.
4. Plumbing Systems: Provide color-coded identification markers in compliance with the following schedule with contrasting legend letters.

Service	Identification	Color Code
Cold Water	Dom. Cold Water	Green
Hot Water	Dom. Hot Water	Green
Hot Water Return	Dom. Hot Water Return	Green
Soil or Waste	Sanitary	Yellow
Vent	Plumbing Vent	Yellow
Rainwater	Storm	Green
Unsafe Water	Non Potable	Yellow
Fuel Gas	Fuel Gas	Yellow

2.16 IDENTIFICATION OF EQUIPMENT

A. Equipment: Stencil equipment such as pumps, water heaters, and tanks with the name of the equipment and equipment number. Coordinate equipment numbers with the User Agency's maintenance personnel. Stencils shall be at least 6 inches high and of a color to provide a contrast with the equipment finish.

B. Equipment markings shall be prominently displayed on each normally visible side of equipment. Equipment intended for installation in finished area shall have markings located behind normally used access panels mounted so as to be readily found. Equipment identification designations shall be taken from equipment schedules as indicated on the Drawings.

PART 3 - EXECUTION

3.1 IDENTIFICATION

A. All equipment and each length of pipe fitting, trap, fixture, control panel, starter and device used in the systems shall have a permanently attached nameplate or be cast, stamped or indelibly marked with the manufacturer's mark or name, the weight, type and class. The nameplates shall be kept clean and readable at all times.

B. Painting

1. Finished field painting of designated plumbing works shall be performed under Section 099000 – PAINTING AND COATING.
2. All unpainted, non insulated, non galvanized, ferrous metal surfaces only of conduits, pipes, equipment, hangers, supports, accessories, and so forth, furnished and installed by

this Subcontractor, shall be painted as follows by this Subcontractor. Concealed and Exposed one prime coat of metal primer. Underground two coats of black asphaltum paint.

3. Surfaces which will be inaccessible for painting after installation shall be painted before installation.
4. Surfaces to be painted shall be thoroughly cleaned of all scale, rust, dirt, oil and other foreign matter and shall be completely dry before applying paint.
5. After installation, equipment and accessories with factory primed or finished surfaces shall be cleaned, and bare or marred spots refinished and/or touched up by each Subcontractor with the same type paint and process as applied at the factory.
6. Nameplates on all equipment shall be cleaned and left free of paint.
7. Materials and workmanship shall be equal to the requirements specified under Section 099000 – PAINTING AND COATING.

3.2 CROSS CONNECTION PROTECTION AND APPROVALS

A. Protect potable water piping outlets and connections to equipment or machinery against backflow with an air-gap or approved backflow preventer.

B. Backflow preventer type, application, and installation shall comply with the Commonwealth of Massachusetts, Department of Environmental Protection (DEP) Drinking Water Regulations 310 CMR 22.00.

C. Prior to installation, the Contractor shall submit through WRTA's Project Manager, a design data sheet, with plans showing the method of protecting the water system, and secure approval from the (cross connection control division) local water authority, or its designee. This shall not be done until the Contractor has secured the plumbing permit for the work, by the Inspector of Plumbing, and shop drawings have been reviewed.

D. Immediately upon installation, the Contractor shall have the backflow preventer tested by a "Certified Backflow Prevention Device Tester", and the results recorded on the water authority's forms. Within 14 days after the installation, the Contractor shall notify, through the WRTA's Project Manager, the reviewing authority to arrange inspection of the installation. Submit copies of all paperwork to the water authority and the Designer, through the WRTA's Project Manager.

E. Three (3) copies of each application and all subsequent correspondence, including the final permit, shall be forwarded to the Designer for record. Availability of final approval or permits shall be prerequisite to scheduling a final inspection of the plumbing work.

F. Mount backflow prevents horizontal at heights and with clearances as required by DEP regulations.

1. Reduced pressure backflow preventers shall be installed between 36 inches to 48 inches above the floor with a minimum of 12 inches clear space from back wall and 3 ft. - 0 in. in front.
2. Provide indirect waste piping with funnel to receive discharge from reduced pressure backflow preventer atmospheric vents and spill through air gap into floor drain.

3.3 DISINFECTION, CLEANING AND ADJUSTING

A. Disinfection

1. Each potable water system (cold and hot water) shall be cleaned and disinfected by this Contractor. Cleaning and disinfection shall be performed after all pipes, valves, fixtures and other components of the systems are installed, tested and ready for operation.
2. All hot and cold water piping shall be thoroughly flushed with clean potable water, prior to disinfection, to remove dirt and other contaminants. Screens of faucets shall be removed before flushing and re installed after completion of disinfection.
3. Disinfection shall be done using sodium hypochlorite in the following manner:
    a. A service cock shall be provided and located at the water service entrance. The disinfecting agent shall be injected into and through the system from this cock only.
    b. The disinfecting agent shall be injected by a proportioning pump or device through the service cock slowly and continuously at an even rate. During disinfection, flow of disinfecting agent into main water supply is not permitted.
    c. All sectional valves shall be opened during disinfection. All outlets shall be fully opened at least twice during injection and the residual checked with orthotolidin solution.
    d. When the chlorine residual concentration, calculated on the volume of water the piping will contain indicated not less than 50 ppm (parts per million) at all outlets, then all valves shall be closed and secured.
    e. The residual chlorine shall be retained in the piping systems for a period of not less than 24 hours.
    f. After the retention, the residual shall be not less than five parts per million. If less, then the process shall be repeated as described above.
    g. If satisfactory, then all fixtures shall be flushed with clean potable water until residual chlorine by orthotolidin tests shall be not greater than the incoming water supply. (This may be zero.)
4. All work and certification of performance shall be performed by approved applicators or qualified personnel with chemical and laboratory experience. Certification of performance shall indicate:
    a. Name and location of the job and date when disinfection was performed.
    b. Material used for disinfection.
    c. Retention period of disinfectant in piping system.
    d. ppm chlorine during retention.
    e. ppm chlorine after flushing.
    f. Statement that disinfection was performed as specified.
    g. Signature and address of company or person performing disinfection.
5. Upon completion of final flushing (after retention period) the plumbing subcontractor shall obtain a minimum of one water sample from each hot and cold water line and submit samples to a State approved laboratory. Samples shall be taken from faucets located at highest floor and furthest from meter or main water supply. The laboratory report shall show the following:
    a. Name and address of approved laboratory testing the samples.
    b. Name and location of job and date the samples were obtained.
    c. The coliform organism count. (An acceptable test shall show the absence of coliform organisms.)

6. If analysis does not satisfy the above minimum requirements, the disinfection procedure shall be repeated.
7. Before acceptance of the systems, this Contractor shall submit to WRTA's Project Manager for his review, three (3) copies of Certification of Performance as specified above.
8. Under no circumstances shall this contractor permit the use of any portion of domestic water systems until properly disinfected, flushed and certified.

B. Cleaning and Adjusting

1. At the completion of the work, all parts of the installation shall be thoroughly cleaned. All equipment, pipe, valves and fittings shall be cleaned of grease, metal cuttings and sludge which may have accumulated by operation of the system for testing.
2. Any stoppage or discoloration or other damage to parts of the building, its finish, or furnishings due to the Plumbing sub contractor's failure to properly clean the piping system shall be repaired by this Contractor at no increase in Contract costs.
3. At the completion of the work, all water systems shall be adjusted for quiet operation.
4. All automatic control devices shall be adjusted for proper operation.
5. All plumbing fixtures and exposed metal work shall be cleaned and polished. Floor drain strainers and traps shall be cleaned of all debris.
6. All items of equipment shall be thoroughly inspected. Any items dented, scratched or otherwise damaged in any manner shall be replaced or repaired and painted to match the original finish. All items so repaired and refinished shall be brought to the attention of the Designer and WRTA's Project Manager for inspection and approval.

3.4 SYSTEMS

A. Sanitary Waste and Storm Drainage System

1. The Plumbing subcontractor shall be responsible for checking each pipe for alignment, center line elevation and invert grade for underground installations.
2. At times when work is not in progress, open ends of pipe and fittings shall be securely closed to the satisfaction of the Project Manager so that no trench water, earth or other substance will enter the pipe or fittings. Any section of a building drainage system that is found defective in material, alignment, grade or joints before acceptance shall be corrected to the satisfaction of WRTA's Project Manager. Pipe laid through rock excavation shall rest on a six inch layer of well compacted sand.
3. The sanitary (soil, waste and vent), storm and basement drainage piping three inches and smaller in diameter shall pitch a minimum of 1/4 inch per foot. Piping four inches and larger in diameter shall pitch a minimum of 1/8 inch per foot.
4. The soil, waste and vent stacks shall be connected as shown and extended through the roof a minimum of 18 inches. Soil, waste and vent pipes shall be concealed unless otherwise noted.
5. Branch connections to each drainage system shall be made with "Wye" and long turn "Tee Wye" fittings. Installation of short radius 1/4 bends, common off sets, double hub fittings and saddles will not be approved. Installation of short "Tee Wye" fittings will be permitted for vertical piping only, and only where space conditions will not permit the use of long turn fittings. Only fittings conforming to the Code shall be installed.

6. The changes in direction of each drainage system shall be made with "Wye" branches and 1/8 bends. Provide long sweep bends at bottom of stacks with a vertical cleanout just above the floor at places where a "Wye" and 1/8 bends and end cleanouts cannot be installed.
7. Every fixture shall be separately trapped and the traps must be vented unless an approved battery vented system is being installed. Floor drains shall be considered as a fixture.
8. Vents shall be connected to the discharge of each trap in the sanitary system, thence carried individually to a point above the flood level of the fixture before connecting with any other vent pipes. Pitch the branch vents back to the fixture.
9. Collect individual vent pipes together in branch vent lines and connect to vent stacks. Wherever possible, vent stack offsets shall be made with 45 degree fittings. The vents passing through the roof shall be a minimum size of four inches in diameter.
10. Cleanouts shall be provided in drainage piping at changes in directions, at foot of stacks or other required points accessible for cleaning or rodding out.
11. Cleanouts shall be of the same size as the pipe installed in up to four inches in diameter and not less than four inches in diameter for piping larger than four inches in diameter.
12. The maximum horizontal distance between cleanouts in piping four inches in diameter and smaller shall not be more than 50 feet apart. In piping five inches in diameter and larger, cleanouts shall not be more than 100 feet apart.
13. Traps on sanitary piping not integral with fixtures and in accessible locations shall be provided with a brass trap screw protected by the water seal, and will be regarded as a cleanout.
14. Test tees with brass cleanout plugs shall be provided at the foot of all vertical soil, waste and storm drainage stacks and at each floor. Wherever cleanouts on vertical lines occur concealed behind finished walls, they shall be extended to back of finished wall, and a wall plate shall be provided.

B. Cold and Hot Water Piping (Including Non-Potable Cold Water)

1. Vacuum breakers shall be installed on supplies to each piece of equipment to prevent back siphonage.
2. Branch lines from water service or main lines shall be taken off the top or bottom of main, using such crossover fittings as may be required by structural or installation conditions. All water service pipes, fittings, and valves shall be kept a sufficient distance from other work to permit finished covering to be not less than 1.5 inches from other work and not less than 1.5 inches between coverings on the different services.
3. Provide shock absorbers at special equipment, tops of the risers, at each individual or each group of fixtures.
4. Water piping shall be run parallel and graded evenly to the drainage points. There shall be a 2 inch drain valve provided for each low point in the piping so that all parts of each water system can be drawn off.
5. Provide suitable means of thermal expansion for the hot water piping using swing joints, expansion loops and long turn offsets as required to suit building conditions.
6. Piping connections to equipment shall be provided with unions or flanges to permit convenient disassembly for alterations and repairs.
7. No piping shall be installed in a manner to permit back siphonage or any flow of water from sanitary or drainage systems into the water systems or their distribution piping under any conditions.
8. Air gaps, open end of funnel drains, and approved vacuum breaking devices shall be provided as specified or as indicated on the Drawings. Piping to hose end faucets or hose

end fittings, or any fixtures where water supply outlet is below the fixture overflow rim shall have vacuum breakers.

9. Where flanges are installed in the water systems, red rubber gaskets shall be installed between each pair of flanges.
10. Heating or bending of copper tubing to eliminate the installation of fittings will not be permitted.
11. Piping systems shall be kept clean during all phases of work. Open ends of incomplete piping shall be protected to prevent the entrance of foreign materials.
12. Pipe shall be cut accurately to measurements established at the site and shall be worked into place without springing or forcing.
13. Provide copper plated friction clamps on the old water supplies to each water closet and urinal flushometer. Friction clamp shall be firmly clamped to the pipe and shall be firmly attached to the adjacent wall structure.
14. Connections to Existing Systems
    a. Isolate the existing section of piping by closing the closest upstream shut-off valve. Test the valve by reducing the downstream pressure to atmospheric pressure and closing all outlets. Monitor the system pressure for at least 2 hours to detect any increase in pressure by leakage through the valve.
        1) Before testing the zone valve verify that outlets are not leaking by pressurizing the section of piping between the zone valve box and the outlets and dosing the zone valve box. The system should maintain the same system pressure without a pressure drop for at least 5 minutes.
    b. While brazing the new connection, purge the piping with nitrogen back through the new connection from the closest gas outlet downstream of the new point of connection.
    c. Pressurize the system with nitrogen to 45 psig after brazing is completed. Blow the existing piping clear from the closest downstream gas outlet out the new connection into a clean white cloth until there are no signs of discoloration or particulates.
    d. Repressurize the system with the proper system gas and purge all outlets in the system starting with the outlet closest to the source of supply. Repeatedly purge the existing system through the existing outlets into a clean white cloth at normal system working pressure to verify that no particulates remain in the system.
    e. Do not make the new connection to the new roughed-in piping system until after the 200 psi particulate blow-down has been performed.
    f. All gas outlets in the effected Section of the existing piping system shall be tested and recertified with gas detectors to verify that proper system gas is present at the correct percentages before returning the system to the User Agency for patient use.
    g. Test the new connection joint with soapy water at normal system working pressure.
15. System Start-up and Adjustments
    a. After completing installation work and equipment start-ups, perform the necessary adjustments to systems installed under this Section. Submit verification that systems are operating at the specified pressures.
    b. Schedule factory trained engineering representatives to meet with the User Agency's Engineering and Maintenance staff and perform equipment start-up and maintenance seminar.
    c. Adjust pressure regulating valves and verify that normally open or closed valves are set in accordance with the Contract Documents.

d. Perform the necessary adjustment work.

16. Alarm Testing
    a. Test and certify all medical alarms for pressure variations and all other functions as required by NFPA 99 and as specified.
17. Purity/Contamination Testing
    a. Perform the following purity/contamination testing of each positive pressure system after completion of the gas concentration testing.
    b. Particulate Testing: Perform particulate sampling testing at the most remote gas outlet in each system using a 0.45 micron filter and certify that particulate matter is less than 1 mg per cubic meter.
    c. Dewpoint Testing: Perform dewpoint testing at the most remote gas outlet and certify that the dewpoint does not exceed minus 5NC at 50 psig for oxygen, nitrogen. and nitrous oxide or 39NF at 50 psig (minus 5NF dewpoint at atmospheric pressure) for medical compressed air.

3.5 GENERAL INSTALLATION REQUIREMENTS

A. Piping Installation

1. Install piping approximately as shown on the drawings and as directed during installation by the Designer's representative.
2. Piping shall be installed as straight and direct as possible, forming right angles or parallel lines with building walls, other piping and be neatly spaced.
3. The horizontal runs of piping, except where concealed in partitions, shall be installed as high as possible.
4. Piping or other apparatus shall not be installed in such a manner as to interfere with the full swing of the doors and access to other equipment.
5. The arrangement, positions and connections of pipes, fixtures, drains, valves, and the like, indicated on the Drawings shall be followed as closely as possible.
6. It shall be possible to drain the water from all sections of each cold and hot water piping system. Pitch piping back to drain valves.
7. Screwed piping of brass or chrome plated brass shall be made up with special care to avoid marring or damaging pipe and fitting exterior and interior surfaces.
8. Small fittings shall be taper thread. Lampwick, cord, wool or any other similar material shall not be used to make up thread joints.
9. Screwed pipe and copper tubing shall be reamed smooth before installation.
10. All exposed piping in connection with fixtures shall be chrome plated. Where chrome plated piping is installed, cut and thread pipe so that no unplated pipe threads are visible when work is completed.
11. Reducing fittings, unless otherwise approved in special cases, shall be provided in making reduction in size of pipe. Bushings will not be allowed unless specifically approved.
12. Remove and replace with new materials, any copper or brass piping (chrome plated or unplated) showing visible tool marks.
13. Vertical risers shall be firmly supported by riser clamps, properly installed to relieve all weight from the fittings.
14. Any piece of pipe six inches or less in length shall be considered as a nipple.

15. All water service piping shall be kept a sufficient distance from other work to permit finished covering to be not less than 1.5 inches from other work and not less than 1.5 inches between the coverings (insulation) on the different services.
16. Grooved joint piping systems shall be installed in accordance with the manufacturer's (Victaulic or approved equal by Grinnell or Anvil Gruvlok) guidelines and recommendations. All grooved couplings, fittings, valves, and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components. The gasket style and elastomeric material (grade) shall be verified as suitable for the intended service as specified. Gaskets shall be molded and produced by Victaulic or approved equal by Grinnell or Anvil Gruvlok . Grooved end shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove for proper gasket sealing. A Victaulic or approved equal by Grinnell or Anvil Gruvlok factory-trained field representative shall provide on-site training for contractor's field personnel in the proper use of grooving tools and installation of grooved piping products. Factory-trained representative shall periodically review the product installation. Contractor shall remove and replace any improperly installed products.
17. Push-To-Connect Joints: Install in accordance with the manufacturer's latest recommendations. Follow the latest published literature as provided by Victaulic or approved equal by Grinnell or Anvil Gruvlok . Pipe ends shall be cleaned, free from indentations, projections, burrs, and foreign matter. Use a tube preparation tool as supplied by Victaulic or approved equal by Grinnell or Anvil Gruvlok to clean. Apply installation mark in accordance with Victaulic or approved equal by Grinnell or Anvil Gruvlok instructions. Push copper tube into fittings to installation depth mark, per Victaulic or approved equal by Grinnell or Anvil Gruvlok installation instructions. Keep fittings free of dirt and oil; use only on potable water or oil-free compressed air systems.

B. Hanger Installation

1. All piping shall be supported from the building structure by means of approved hangers and supports, to maintain proper grading and pitching of lines, to prevent vibration and to secure piping in place, and shall be so arranged as to provide for expansion and contraction.
    a. Maximum spacing of hangers on soil pipe shall be five feet and hangers shall be provided at all changes in direction. Vertical hanger rods to support piping from the structure or supplementary steel shall not exceed four feet in total length. Where pipe support assemblies exceed four feet in total length vertically, this Contractor shall provide factory fabricated channels and all associated accessories.
    b. Friction clamps shall be installed at the base of the plumbing risers and at each floor (above or below floor slabs). Friction clamps installed above floor slabs shall not be supported from or rest on floor sleeves.
    c. Provide hangers at a maximum distance of two feet from all changes in direction (horizontal and vertical) and on both sides of concentrated loads independent of the piping.
    d. Hangers, in general, for all horizontal piping shall be Clevis type hangers. These hangers shall be sized to fit the outside diameter of the pipe insulation and insulation protectors (sheet metal shields) specified herein. For sprinkler/stand pipe systems, hanger shall be approved black malleable iron, heavy duty pattern having two (2) parts bolted together.
    e. All vertical drops and runouts including insulated pipes shall be supported by split ring hangers with extension rods and wall plates. These hangers shall be copper

plated when used on uncovered copper tubing. Supports on insulated vertical piping shall be sized to fit the outside diameter of the pipe insulation with 360 degrees insulation protector.

f. Provide on each horizontal insulated lines, pipe covering protectors (shields) at each hanger. Each protector shall be sized to fit the outside diameter of the pipe insulation.
g. Retaining straps shall be provided with all beam clamps.
h. All supplementary steel, including factory fabricated channels, associated accessories, and 12 inch long sheet metal shields, throughout the project for this Section of the Specifications, both suspended and floor mounted, shall be provided by this Contractor and shall be subject to the approval of the Engineer.
i. Hangers shall not pierce the insulation on any insulated pipe.
j. Wire, tape or wood fastenings for shims or support of any pipe or tubing shall not be used.
k. Remove all rust from the ferrous hanger equipment (hangers, rods, and bolts) and apply one coat of red lead immediately after erection.
l. Piping at all equipment and each control valve shall be supported to prevent strains or distortions in the connected equipment and control valves. Piping at equipment shall be supported to allow for removal of equipment, valves and accessories with a minimum of dismantling and without requiring additional support after these items are removed.
m. All piping shall be independently supported from the building structure and not from the piping, ductwork, conduit or ceiling suspension systems of other systems.
n. Installation of hangers which permit wide lateral motions of any pipe will not be acceptable.
o. "C" clamps installed with pipe hangers or equipment hangers will not be permitted unless provided with retaining straps.
p. All no hub cast iron pipe 6 inches or larger in diameter shall be braced to prevent horizontal movement as recommended by the Cast Iron Soil Pipe Institute by using braces, blocking or rodding as illustrated in the CISPI Handbook, Vol. II, Specification Section 310.

C. Pipe Covering Installation

1. Before pipe covering is applied, all pressure tests shall have been performed and approved by the Local Plumbing Inspector.
2. Pipe covering shall be applied over clean, dry surfaces.
3. Pipe covering shall be continuous and shall be carefully fitted with side and end joints butted firmly and tightly together and finished as specified herein.
4. Pipe covering and auxiliaries shall be kept dry during storage and application.
5. Adhesives, cements and coatings shall not be applied when the ambient temperature is below 40 degrees Fahrenheit.
6. Valve bodies shall have covering applied up to the stem.
7. It is the intent of this Specification that all vapor barriers be sealed and be continuous throughout. Staples shall not be used on vapor barrier jackets.
8. Where pipe covering ends occur at equipment or fixtures, end caps on the covering shall be provided.
9. Adequate operating clearances shall be provided at control mechanisms.
10. Pipe covering for flanges shall overlap the adjoining pipe by a minimum of three inches on each side.

11. Pipe covering shall be provided on all piping passing through ceilings and through the interior above ground sleeves (wall and floor).
12. All voids and seams in insulation shall be filled with insulating cement and finished as specified herein.
13. End joints of each section of the installed pipe covering shall be tightly butted.

D. Installation of Sleeves, Inserts and Escutcheons

1. Sleeves in floors shall be set 1 inch above the finished floor surface or as indicated on the Architectural Drawings.
2. Sleeves through interior masonry or non masonry walls or partitions shall be set flush with the finished surfaces of the wall or partition.
3. Field drilling for inserts required for work under this Section of the Specifications shall be provided by this Contractor.
4. Each interior wall or partition sleeve shall be packed with foam or glass wool to within one inch of each face of wall, and the remaining portion of each end of sleeve to be sealed with U.L. listed fire proof caulking compound equal to the rating of the partition.
5. Escutcheons shall be installed around all exposed insulated or bare pipe, except water closet starts or bends passing through a finished floor, wall or ceiling. Escutcheons shall fit snugly around the bare pipe or insulated pipe.

E. Valve Installation

1. Location of Valves: There shall be valves where indicated on the drawings and where specified as follows:
   a. At building service entrances, foot of all supply risers, branches to groups of fixtures, branches to separate fixtures, equipment, wall hydrants, hose bibbs, connections to other systems and sectionalizing points in each system.
   b. Each fixture supply shall have a separate angle stop or straight stop finished like the pipe it services.
   c. Each piece of equipment shall have isolation valves for each service connected.
   d. At the foot of each riser, on the inlet and outlet side of control valves.
   e. At the low points of each water system including trapped sections, provide a tee with 2 inch branch and valve with 3/4 inch hose end adapter and attached chain with cap.
   f. Valves shall be located to permit easy operation, replacement or repair.

F. Installation of Gauges and Thermometers

1. Thermometers and pressure gauges shall be installed in such a manner as to cause a minimum restriction to the flow in the pipes and so that they can be easily read from the floor.
2. Thermometers shall be installed in the outlet piping from the hot water heater.
3. Pressure gauges in the cold water system shall be installed at the water meter.

G. Sewer Connections

1. Connections to the Street: Connections to the street sewers shall be in accordance with local regulations.

2. Exposure: Before any sewer work is done inside the lot lines, uncover each street sewer at each point where connection is to be made to determine the actual sewer elevation and invert.
    a. If the actual elevation of the sewer at any point of connection is such that the drainage line cannot be installed at the elevation shown, the representative of the Contracting Officer shall be advised.

H. Water Service

1. Street Connection: Connect the building water supply main to the water main in the street at the location indicated.
2. Gate Valve: A gate valve with the T handle and a cast iron extension box with cover shall be installed on the building water supply main at a point at or near the curb line. Street connection shall be in accordance with local water authority requirements.
3. Meter: The meter installation shall be in conformance with local water authority requirements.
    a. Meters installed exterior to the building at the curb or lot line shall be placed in an approved meter pit with a cover and other accessories provided in accordance with water authority requirements.
4. Main Shut Off Valve: Provide a main shutoff valve, OS&Y gate type inside the building wall with a hose nipple and 3/4 inch hose drain valve.
5. Interior Meters: If water meters are installed inside the building walls, provide a main gate shutoff valve, OS&Y type inside the building ahead of the meter.
    a. Provide a drain valve, globe type with hose nipple and vacuum breaker on the house side of the meter.

I. Drinking Water Cooling System Installation

1. General: Provide water cooler with a bracket which shall be securely anchored to the wall in a manner suitable for the wall construction and weight to be carried.

J. Floor Drain Installation

1. Install floor drains in accordance with manufacturers written instructions and in locations indicated.
2. Install floor drains at low points of surface areas to be drained, or as indicated. Set tops of drains flush with low point finished floor.
3. Trap all drains connected to the sanitary sewer.
4. Install drain flashing collar or flange so that no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes, where penetrated.
5. Position drains so that they are accessible and easy to maintain.

K. Installation of Trap Primers

1. Install trap primers with piping pitched towards drain trap, minimum of 1/8 inch per foot (1 percent). Adjust trap primer for proper flow.

L. Roof Drain Installation

1. Install roof drains at low points of roof areas, in accordance with the roof membrane manufacturer's installation instructions.
2. Install drain flashing collar or flange so that no leakage occurs between roof drain and adjoining roofing. Maintain integrity of waterproof membranes, where penetrated.
3. Position roof drains so that they are accessible and easy to maintain.

M. Blending Valve Installation

1. All piping shall be thoroughly flushed before the blending valve is installed. Insure that hot and cold water piping are connected to proper parts.
2. Follow manufacturers instructions for setting of maximum allowable temperature limits allowed by code.
3. Valve must be flowing when setting temperature.

N. Installation of Pressure Reducing Valves

1. General: Install one or more pressure reducing valves on the main water line supplying plumbing fixtures.
   a. The total capacity of each assembly shall be not less than the capacity specified.
   b. Provide each pressure reducing valve with a gate valve and union on both the inlet and outlet connections.
   c. A bypass one pipe size smaller than the main water line provided with a globe valve and union, shall be installed between the inlet and outlet sides of the pressure reducing valve assembly.
   d. Pressure gauges shall be installed at the inlet and outlet connections to the pressure reducing valve assembly. Gauges shall have T handle stops in their connections.

O. Strainer Installation

1. General: Place strainers ahead of pressure reducing valves, automatic control valves, pumps, and elsewhere as indicated on the drawings or specified.

P. Installation of Cleanouts and Ferrules

1. Riser Connection to Sewer or Drain: Where soil, waste, or roof drainage risers connect to a sewer or drain extending from the building above the lowest floor, the fitting at the base of each stack or downspout shall be a sanitary tee or a combination Y and 1/8 bend with cleanout plug in the end of the run of the main.
2. Test Tees: Each vertical soil, waste, and vent pipe and each downspout and roof drainage pipe which connects to horizontal drain piping below ground shall be fitted with a test tee above the lowest floor or ground. Where accessible, test tee may be installed in the horizontal pipe at the base of the riser.
3. Cover Plates: Where cleanouts or test tees occur on concealed pipes in finished rooms, they shall be provided with a 1/8 inch thick, machine finished, brass cover plate of sufficient diameter to cover the opening in the finished wall or partition. The cleanout plug shall have a solid head, tapped for a 1/4 inch brass screw to secure the cover plate. Where cleanout plugs extend beyond the wall finish, the cover plates shall be of machine finished brass and shall be only of sufficient depth to fit against the wall to cover plug. Cleanout cover plates shall be painted to match adjacent wall finish.

4. Cleanouts Plugs For Threaded Fittings: Cleanout plugs for threaded fittings shall be in accordance with ANSI B16.12. Except for test openings, where size must be sufficient to admit test plug, bushings will be permitted on pipes 5 inches and larger to reduce plug size to 4 inches; cleanout plugs for piping 4 inches and smaller shall be the same size as the pipe.
5. Cleanout Plugs For Hub and Spigot Fittings: Cleanout plugs for hub and spigot fittings shall be screwed into ferrules caulked into the fitting. Ferrules and plugs shall be in accordance with ANSI B16.12, except that plugs required to be flush with the floor shall have square countersunk heads in lieu of raised heads.
6. Cleanout Plugs For Copper Drainage Lines: Cleanout plugs on copper drainage lines shall be installed in solder joint fittings having threaded openings provided for the cleanout, or in solder joint fittings with threaded adapters.

Q. Installation of Plumbing Fixtures

1. General:
   a. Refer to Architectural Drawings for locations and mounting heights of all plumbing fixtures, counter sinks, water fountains and showers.
   b. Provide with all plumbing fixtures, all trim, supports, fittings, connections and all incidentals necessary to make a complete installation in accordance with plumbing codes and the Contract Documents.
   c. All visible hanger nuts and all escutcheons shall likewise be chrome plated over nickel plate.
2. Examination:
   a. Examine roughing-in for potable cold water and hot water supplies and soil, waste, and vent piping systems to verify actual locations of piping connections prior to installing fixtures.
   b. Examine walls, floors, and cabinets for suitable conditions where fixtures are to be installed.
   c. Do not proceed until unsatisfactory conditions have been corrected.
3. Fixture Roughings
   a. Install rough plumbing including fixture carriers and supports, valves and water hammer arrestors within chase tolerances. Supply roughing through finish walls and at hose bibbs and shower heads shall be secure and free of movement. Locate valves and water hammer arrestors within 12 inches of approved access panel location.
   b. Align exposed waste and supply pipe roughings with fixture connections within 1 inch tolerance. Provide flush valves in alignment with the fixture, without vertical or horizontal offsets. Obtain fixture manufacturer roughing data sheets for recommended roughing dimensions.
   c. Provide fixture templates for casework contractor for counter mounted sinks and lavatories.
      1) Rough handicapped use water closets to locate the flush valve handle on the wide side of the toilet stall.
   d. Secure fixture supports to floor slab construction with lag bolts and metal expansion shields to support at least 250 pounds on the front rim of the fixture for 5 minutes.
   e. Mounting Heights:
      1) Water Closets: 16 inches to rim.
      2) Handicapped Use Water Closets: 17 inches to rim.

3) Lavatories: 31 inches to rim.
4) Handicapped Use Lavatories: 34 inches maximum to rim with at least 29 inches from finish floor to bottom of apron.
5) Handicapped Use Urinals: 15 inches to rim.
6) Drinking Fountains: 36 inches maximum to spout outlet.

f. Provide fixture rough-in piping connections sizes in accordance with the following schedule:

	HW	CW	S or W
Water Closets	-	1 inch	4 inches
Lavatories	2 inch	2 inch	12 inches
Urinals	-	: inch	2 inches
Service Sinks	2 inch	2 inch	3 inches
Sinks	2 inch	2 inch	2 inches
Showers	2 inch	2 inch	2 inches
Drinking Fountains	-	2 inch	12 inches

4. Fixture Supports
   a. All fixtures (including drinking fountains) shall be supported and fastened to the building structure. The method of support for each type fixture shall be specified herein, except when the fixture designations on the Contract Drawings indicate modifications.
   b. Wall hung water closets shall be generally supported on combination drainage fittings and chair carriers and with foot supports fastened to the floor slab with expansion lag screws.
   c. Urinals shall be supported by floor mounted carrier with support plate, bearing plate, adjustable extension, tubular uprights, block bases and chrome plated trim.
   d. Installations shall be complete with all necessary bolts, nuts and washers, iron or brass connecting nipples between fixtures and piping system of the proper length and graphite non-asbestos gaskets for closet connections.
   e. Where wall hung fixtures are secured to masonry walls or partitions, they shall be fastened with 1/4 inch through bolts provided with nuts and washers at back. Bolt heads and nuts shall be hexagon and exposed bolts, nuts, washers and screws shall be chromium plated brass.
   f. Where secured to concrete or brick walls, they shall be fastened with brass bolts or machine screws in lead sleeve type expansion shields and shall extend at least three inches into solid concrete or brick work, except fixtures specified to be supported or chair carriers.
5. Installation of Fixtures
   a. Mount fixtures level at elevations shown on architectural drawings. Refer to toilet room elevations and casework details.
   b. Install handicapped use fixtures in accordance with the requirements to the Architectural Access Board Code and ANSI A117.1. Insulate hot water supply and waste piping under lavatories.
      1) Where urinals are provided: Install one urinal with the rim mounted 15 inches above the finish floor in compliance with the handicapped code.
   c. Grout wall and floor mounted fixtures watertight where the fixtures are in contact with walls and floors.

d. Caulk deck-mounted trim at the time of assembly, including fixture and casework mounted. Caulk self-rimming sinks installed in casework.

6. Fixture Trim:
   a. All materials specified to be chromium plated shall be thoroughly cleaned and polished before plating, and plate shall be heavily, thoroughly and evenly applied, guaranteed not to strip or peel.
   b. Where escutcheons are not furnished with plumbing fixtures, this Contractor shall supply them. Escutcheons shall be the type and material specified herein.
   c. Each fixture shall be separately trapped using the type and size of trap specified herein and required by the Plumbing Code.
   d. Unless otherwise specified, faucets and all exposed fittings shall be chromium plated. Chromium plating for brass shall be applied on a first plating of nickel.
   e. All fixtures requiring hot and cold water shall have the cold water faucet on the right hand side of the fixture and the hot water faucet on the left hand side of the fixture.
   f. All brass shall conform to brass tubing and shall be not less than No. 17 gauge.
7. Adjustments and Cleaning
   a. After completion of the installation work and equipment start-ups, perform the necessary adjustments to systems installed under this Section. Submit verification that systems are operating at the specified temperatures and pressures.
   b. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.
   c. Operate and adjust disposers, hot water dispensers, and controls. Replace damaged and malfunctioning units and controls.
   d. Adjust water pressure at drinking fountains, electric water coolers, and faucets, shower valves, and flushometers having controls, to provide proper flow and stream.
   e. Replace washers of leaking and dripping faucets and stops.
   f. Adjust flush valves, open fixture stops, and clean faucet aerators.
   g. Set aquastats on water heaters and circulation pumps.
   h. Adjust metering faucets to deliver a maximum of 1/4 gallon of hot water at a rate of 2 gpm and operate for at least 10 seconds upon activation.
   i. Temperature adjustments: Adjust pressure balanced mixing valves at showers to provide a maximum temperature of 112 degrees F. Adjust metering faucets in public toilet rooms to provide a maximum temperature of 110 degrees F.
   j. Clean fixtures, fittings, and spout and drain strainers with manufacturers' recommended cleaning methods and materials.
8. Protection
   a. Provide protective covering for installed fixtures and fittings.
   b. Do not allow use of fixtures for temporary facilities, except when approved in writing by WRTA's Project Manager.

3.6 INSPECTION AND TESTS

A. General

1. All labor, materials, instruments, devices and power required for testing shall be provided by the Plumbing Subcontractor. The tests shall be performed in the presence and to the satisfaction of the Designer and WRTA's Project Manager and such other parties as may

have legal jurisdiction. No piping in any location shall be closed up, furred in, or covered before testing and approval by the Local Plumbing Inspector and WRTA's Project Manager.

2. Where portions of piping systems are to be covered or concealed before completion of the project, those portions shall be tested separately in the manner specified herein for the respective entire system.
3. Any piping or equipment that has been left unprotected and subject to mechanical or other injury in the opinion of WRTA's Project Manager shall be retested in part or in whole as directed.
4. The Authority retains the right to request a recheck or resetting of any pump or instrument by the Plumbing Subcontractor during the guarantee period at no additional cost to the Contract or WRTA.
5. Repair, or if directed by Designer or WRTA's Project Manager, replace any defective work with new work without extra cost to WRTA. Repeat tests as directed, until the work is proven to meet the requirements specified herein.
6. Restore to its finished condition any work, provided by other Contractors, damaged or disturbed by tests. The Plumbing Subcontractor shall engage the original Contractor to do the work of restoration to the damaged or disturbed work.
7. The fixtures shall be tested for stability of support and satisfactory operation. The piping shall be tested when directed by the Designer, Local Plumbing Inspector or WRTA's Project Manager for stability of support.
8. After the fixtures are set and connected, and the piping systems to same have been tested, the Plumbing Subcontractor shall turn water on to the fixtures, equipment, fill the traps, etc., and the proper operation of all items shall be demonstrated by him in the presence of and to the satisfaction of the Designer, WRTA's Project Manager, Plumbing Inspector, or their designated representative.
9. Caulking of screwed joints or holes in piping will not be acceptable.
10. The Plumbing Subcontractor shall notify the Designer, WRTA's Project Manager and all inspectors having jurisdiction, a minimum of 48 hours in advance of making any required tests so that arrangements may be made for their presence to witness scheduled tests.

B. Specific

1. Storm and Sanitary Piping Systems:
   a. Before the installation of fixtures, equipment and insulation, each system including vents shall have all necessary openings plugged to permit the entire system to be tested in accordance with the State Plumbing Code. Each system shall hold this water without a drop in water level. Test to be witnessed by Local Plumbing Inspector and WRTA's Project Manager.
   b. Where a portion of the system is to be tested, the test shall be accomplished with a vertical stack ten feet above the highest horizontal line to be tested may be installed, and filled with water to maintain sufficient pressure. A pump may be used to supply the required pressure. The pressure shall be maintained for a minimum of four hours for sufficient time to permit inspection of all joints.
2. Cold and Hot Water Piping System:
   a. Upon completion of the roughing in and before setting fixtures and final connections to all equipment, all water piping systems shall be tested to a hydrostatic pressure of 150 pounds per square inch.

b. Each systems test shall be maintained for eight hours without a drop in pressure. These tests to be witnessed by Local Plumbing Inspector and WRTA's Project Manager.
c. After testing, provide complete adjustment of all parts of each water system until design distribution or balancing is obtained throughout.

3.7 COMMISSIONING OF EQUIPMENT AND SYSTEMS

A. The Designer will check the completed installation either sequentially as different parts are completed, or when the entire installation is complete, at the sole option of the Designer.

B. Prior to the Designer's checking a part of the installation or the entire installation, this contractor shall submit a letter signed by an officer of this contracting company or an officer of the Construction Manager stating that:

1. he is a an officer of the company,
2. he has personally inspected the installation to be checked,
3. the date of his inspection,
4. the installation is complete and tested and ready to be inspected by the Designer, and that all required test reports have been submitted.

C. This contractor shall arrange that an officer of this contracting company or of the Construction Manager, as well as WRTA's Project Manager, in addition to other test witnesses that may be specified, shall witness the below listed tests. At the conclusion of each such test this contractor shall submit a letter signed by the officer stating that:

1. he is an officer of the company,
2. he has personally witnessed the test (give the name of the test),
3. the date of testing,
4. the results of testing, as compared to specified performance,
5. listing the name, title, and company affiliation of all those witnessing the test.

D. Tests Requiring Letters:

Sprinkler:	Fire pump
Electrical:	Emergency generator
	Fire alarm
	Emergency Lighting and Power Distribution
	Fire Department Control Center
HVAC:	Smoke control
	Chiller operation and controls
	Cooling tower operation and controls
	Boiler operation and controls
	Air handler operation and controls

3.8 SPECIAL RESPONSIBILITIES

A. Coordination: Cooperate and coordinate with work of other Sections in executing work of this Section.

1. Perform work such that progress of entire project including work of other Sections shall not be interfered with or delayed.
2. Provide information as requested on items furnished under this Section which shall be installed under other Sections.
3. Obtain detailed installation information from manufacturers of equipment provided under this Section.
4. Obtain final roughing dimensions or other information as needed for complete installation of items furnished under other Sections or by User Agency.
5. Keep fully informed as to shape, size and position of openings required for material or equipment to be provided under this and other Sections. Give full information so that openings required by work of this Section may be coordinated with other work and other openings and may be provided for in advance. In case of failure to provide sufficient information in proper time, provide cutting and patching or have same done, at own expense and to full satisfaction of Designer.
6. Provide information as requested as to sizes, number and locations of concrete housekeeping pads necessary for floor mounted vibrating and rotating equipment provided under this Section.
7. Notify Designer of location and extent of existing piping, ductwork and equipment that interferes with new construction. In coordination with and with approval of Designer, relocate piping, ductwork and equipment to permit new work to be provided as required by Contract Documents. Remove non functioning and abandoned piping, ductwork and equipment as directed by Designer. Dispose of or store items as requested by Designer.

B. Installation Only Items

1. Where this contractor is required to install items which it does not purchase, it shall coordinate their delivery and be responsible for their unloading from delivery vehicles and for their safe handling and field storage up to the time of installation. This trade shall be responsible for:
   a. Any necessary field assembly and internal connections, as well as mounting in place of the items, including the purchase and installation of all dunnage supporting members and fastenings necessary to adapt them to architectural and structural conditions.
   b. Their connection to building systems including the purchase and installation of all terminating fittings necessary to adapt and connect them to the building systems.
2. This Contractor shall carefully examine such items upon delivery. Claims that any of these items have been received in such condition that their installation will require procedures beyond the reasonable scope of work of this contractor will be considered only if presented in writing within one week of their date of delivery. Unless such claims have been submitted this contractor shall be fully responsible for the complete reconditioning or replacement of the damaged items.

C. Maintenance of equipment and systems: Maintain HVAC, Plumbing and Fire Protection equipment and systems until Final Acceptance. Ensure adequate protection of equipment and material during delivery, storage, installation and shutdown and during delays pending final test

of systems and equipment because of seasonal conditions. Do not use boilers before providing water treatment where required; this includes use of boilers for temporary heat or for testing.

D. Use of premises: Use of premises shall be restricted as directed by Designer and as required below.

1. Remove and dispose of dirt and debris, and keep premises reasonably clean. Upon completion of work, remove equipment and unused material. Put building and premises in neat and clean condition, and do cleaning and washing required to provide acceptable appearance and operation of equipment, to satisfaction of Designer and as specified under CLEANING article.
2. It shall be this trade's responsibility to store his materials in a manner that will maintain an orderly clean appearance. If stored on site in open or unprotected areas, all equipment and material shall be kept off the ground by means of pallets or racks, and covered with tarpaulins.
3. Do not interfere with function of existing sewers and water and gas mains. Extreme care shall be observed to prevent debris from entering ductwork. Confer with Designer as to disruption of heating services or other utilities due to testing or connection of new work to existing. Interruption of heating services shall be performed at time of day or night deemed by Designer to provide minimal interference with normal operation. Obtain Designer's approval of the method proposed for minimizing service interruption.

E. Surveys and measurements:

1. Base measurements, both horizontal and vertical, on reference points established by Contractor and be responsible for correct laying out of work.
2. In event of discrepancy between actual measurements and those indicated, notify Designer in writing and do not proceed with work until written instructions have been issued by Designer.

3.9 MATERIALS AND WORKMANSHIP

A. Work shall be neat and rectilinear. Piping shall run concealed except in mechanical rooms and areas where no hung ceiling exists. Install material and equipment as required by manufacturers. Installation shall operate safely and without leakage, undue wear, noise, vibration, corrosion or water hammer. Work shall be properly and effectively protected, and pipe openings shall be temporarily closed to prevent obstruction and damage before completion.

B. Except as specified otherwise, material and equipment shall be new. Provide supplies, appliances and connections necessary for complete and operational installation. Provide components required or recommended by OSHA and applicable NFPA documents.

C. References to manufacturers and to catalog designation, are intended to establish standards of quality for materials and performance but imply no further limitation of competitive bidding.

D. Finish of materials, components and equipment shall be as approved by Designer and shall be resistant to corrosion and weather as necessary.

E. WRTA will not be responsible for material and equipment before testing and acceptance.

3.10 CONTINUITY OF SERVICES

A. Do not interrupt existing services without WRTA’s Project Manager's approval.

B. Schedule interruptions in advance, according to WRTA’s Project Manager's instructions. Submit, in writing, with request for interruption, methods proposed to minimize length of interruption.

C. Interruptions shall be scheduled at such times of day and work so that they have minimal impact on User Agency's operations.

3.11 ANCHORS AND INSERTS

A. Inserts shall be iron or steel of type to receive machine bolt head or nut after installation. Inserts shall permit adjustment of bolt in one horizontal direction and shall develop strength of bolt when installed in properly cured concrete.

B. Provide anchors as necessary for attachment of equipment supports and hangars.

3.12 INSTALLATION OF EQUIPMENT

A. Avoid interference with structure and with work of other trades, preserving adequate headroom and clearing doors and passageways, to satisfaction of Designer and in accordance with code requirements. Installation shall permit clearance for access to equipment for repair, servicing and replacement.

B. Install equipment so as to properly distribute equipment loads on building structural members provided for equipment support under other Sections. Roof mounted equipment shall be installed and supported on structural steel provided under other Sections.

C. Provide suspended platforms, strap hangers, brackets, shelves, stands or legs as necessary for floor, wall or ceiling mounting of equipment provided under this Section (e.g. heating and ventilating units, fans, ducts and piping) as indicated on Drawings and in Specifications.

D. Provide steel supports and hardware for proper installation of hangers, anchors, guides, etc.

E. Provide cuts, weights, and other pertinent data required for proper coordination of equipment support provisions and installation.

F. Structural steel and hardware shall conform to Standard Specifications of ASTM; use of steel and hardware shall conform to requirements of Section Five of Code of Practice of American Institute of Steel Construction.

G. Verify site conditions and dimensions of equipment to ensure access for proper installation of equipment without disassembly which will void warrantee. Report in writing to Designer, prior to purchase or shipment of equipment involved, on conditions which may prevent proper installation.

3.13 PAINTING

A. Equipment shall have shop coat of non lead gray paint. Hangers and supports shall have one coat of non lead red primer. Machinery such as pumps, fans, etc., shall be stenciled with equipment name. Stencil shall be at least 6 in. high for large equipment, 2 in. high for small equipment. Finish painting, including painting of various piping and duct systems, shall be done under other Sections.

B. Note requirement for Designer's approval invoked under Part 3 article, MATERIALS AND WORKMANSHIP regarding finish of material and equipment which are visible or subject to corrosive or atmospheric conditions.

3.14 CLEANING

A. Piping

1. Furnish pipe cleaning chemicals, chemical feed equipment, materials and labor necessary to clean piping.
2. Permanently install necessary chemical injection fittings complete with stop valves.
3. After chilled water, heating hot water, condenser water, steam and condensate piping have been pressure tested and approved for tightness, clean and flush piping specified under WATER TREATMENT Paragraph.
4. Maintain continuous blow down and make up, as required during flushing operation.

B. Equipment

1. After completion of project, clean the exterior surface of equipment included in this section, including concrete residue.

3.15 SYSTEM SHUTDOWNS

A. Coordination shutdowns of existing systems with the WRTA’s Project Manager and submit a written request at least ten working days in advance. Minimize system shut downs as much as possible. Submit a list of all effected areas, the proposed work to be performed, and the expected length of the shut-down including time for retesting.

B. Provide temporary services to maintain active system during extended shut-downs as required for demolition and construction phasing.

3.16 CORE DRILLING

A. Do not core new concrete structure without written approval from the Structural Engineer.

B. Perform all core drilling required for the proper installation of this Section. Locate all required openings and prior to coring. Coordinate the opening with the other Trades and obtain approval from the Structural Engineer.

C. Thoroughly investigate the existing conditions in the vicinity of the required opening prior to cutting. Take care so as not to disturb the existing building systems. Damage to existing conditions incurred during core drilling shall be corrected to WRTA's Project Manager's satisfaction with no additional expense to the WRTA.

END OF SECTION

SECTION 230001

HEATING, VENTILATING AND AIR CONDITIONING

(Filed Sub-Bid Required)

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

B. Time, Manner and Requirements for Submitting Sub-Bids:

1. Sub-bids for work under this Section shall be for the complete work and shall be submitted through WRTA's E-Bid Room as stipulated in the WRTA Instructions to Bidders.

2. Sub-bids filed with the Division of Capital Asset Management and Maintenance shall be accompanied by BID BOND or CASH or CERTIFIED CHECK or TREASURER'S CHECK or CASHIER'S CHECK issued by a responsible bank or trust company payable to the Commonwealth of Massachusetts in the amount of five percent of the sub-bid. A sub-bid accompanied by any other form of bid deposit than those specified will be rejected.

C. Sub Sub-Bid Requirements:

1. Sub bidder's attention is directed to Massachusetts G.L. Chapter 149 Section 44F, as amended, which provides in part as follows.
2. Each sub-bidder shall list in Paragraph E of the "Form for Sub-bids" the name and bid price of each person, firm or corporation performing each class of work or part thereof for which the Section of the Specifications for that sub trade requires such listing, provided that, in the absence of a contrary provision in the Specifications, any sub-bidder may, without listing any bid price, list his own name or part thereof and perform that work with persons on his own payroll, if such sub-bidders, after sub-bid openings, shows to the satisfaction of the Awarding Authority that he does customarily perform such class of work with persons on his own payroll and is qualified to do so. This Section of the Specifications requires that the following classes of work shall be listed in Paragraph E under the conditions indicated herein.

CLASS OF WORK	REFERENCE SECTION
HVAC Insulation	2.2, 2.4,
HVAC Ducts and Casings	2.1
Startup, Testing and Balancing	3.13
Temperature Control System	2.12, 2.13

D. Reference Drawings: The Work of this sub bid is shown on the following Contract Drawings:

NUMBER	SHEET NAME
M-001	Mechanical Legend
MD-100	Level 1 Demolition Plan
MD-110	Level 1 Piping and Controls Demolition Plan
M-100	Level 1 Floor Plan
M-110	Level 1 Piping and Controls Floor Plan
M-400	Mechanical Details – Sheet 1 of 2
M-401	Mechanical Details – Sheet 2 of 2
M-402	Mechanical Controls
M-700	Mechanical Schedules

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
1. Firestopping for the Work of this Section, including cutting penetrations and firestopping; complying with requirements specified in Section 078413 - PENETRATION FIRESTOPPING.
2. Core drilling for the Work of this Section.
3. Certified seismic restraints to meet the Commonwealth of Massachusetts Building Code applicable at the time the building permit is issued.
4. Coordination drawings and record drawings and similar requirements.
5. Disconnecting, capping and otherwise making inactive existing mechanical services in areas where demolition and removal work is required. Mechanical tradesmen will disconnect, cap, inactivate and lower to floor such items where required to be removed under Division 23 - HEATING, VENTILATING AND AIR CONDITIONING. Removal and storage of such materials shall be then done under Section 024100 - DEMOLITION.
6. Disconnect and reinstallation of HVAC equipment temporarily interrupted during construction.

B. Items to Be Furnished Only: Furnish the following items for installation by the designated Sections:
1. Section 092116 – GYPSUM BOARD ASSEMBLIES:
   a. Access doors in gypsum board openings.
   b. Pipe and duct sleeves for placement into gypsum board openings.
2. Section 095113 – ACOUSTICAL PANEL CEILINGS:
   a. Access doors in acoustical tile.

C. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
1. Section 051200 - STRUCTURAL STEEL FRAMING for structural supports necessary to distribute loading from equipment to roof or floor.

2. Section 078413 – PENETRATION FIRESTOPPING for coordination of floor and wall penetrations with firestopping contractor.
3. Section 092116 – GYPSUM BOARD ASSEMBLIES for coordination with gypsum ceilings and walls.
4. Section 095113 – ACOUSTICAL PANEL CEILINGS for coordination with acoustical ceilings.
5. Section 220001 – PLUMBING
   a. Condensate Termination points as indicated on the Drawings.
6. Section 260001 - ELECTRICAL WORK
   a. For furnishing and installing electrical disconnect switches.
   b. For electrical power to mechanical equipment as indicated on the Drawings.

D. Perform work and provide material and equipment as shown on Drawings and as specified or indicated in this Section of the Specifications. Completely coordinate work of this Section with work of other trades and provide a complete and fully functional installation.

E. Give notices, file plans, obtain permits and licenses, pay fees and back charges, and obtain necessary approvals from authorities that have jurisdiction as required to perform work in accordance with all legal requirements and with Specifications, Drawings, Addenda and Change Orders, all of which are part of Contract Documents.

1.3 SUBMITTALS

A. Comply with requirements specified in Section 013300 – SUBMITTAL REQUIREMENTS.

B. Shop Drawing: Shop drawings shall include, but not be limited to, the following:

1. VRF system indoor fan coil units (ducted ceiling concealed)
2. Fittings, valves and strainers.
3. Expansion fittings and loops.
4. Diffusers, registers, grilles, splitters, dampers and accessories.
5. ERV - Energy Recovery Ventilator
6. ERV OA pre-heat electric coil
7. Filters.
8. Sound attenuators.
9. Electric cabinet heaters.
10. Direct digital controls and instrumentation.
11. Insulation and acoustical lining.
12. Hangers, plates, and inserts.
13. Vibration isolators.
14. Pipe, pipe hangers, sleeves and inserts.
15. Equipment bases and supports.
16. Identification for pipe, duct, valves and equipment.
17. Complete ductwork shop drawings, construction details and duct construction standards.
18. Access panels.
19. Color selection charts and samples for equipment and systems in finished areas.

1.4 DEFINITIONS

A. As used in this Section, "provide" means "furnish and install" and "HVAC" means "Heating, Ventilating and Air Conditioning" and "POS" means "Provided Under Other Sections". "Furnish" means "to purchase and deliver to the project site complete with every necessary appurtenance and support," and "Install" means "to unload at the delivery point at the site and perform every operation necessary to establish secure mounting and correct operation at the proper location in the project."

1.5 CONTRACT DOCUMENTS

A. Listing of Drawings does not limit responsibility of determining full extent of work required by Contract Documents. Refer to Architectural, HVAC, Electrical, Structural, and other Drawings and other Sections that indicate types of construction in which work shall be installed and work of other trades with which work of this Section must be coordinated.

B. Except where modified by a specific notation to the contrary, it shall be understood that the indication and/or description of any item, in the Drawings or specifications or both, carries with it the instruction to furnish and install the item, regardless of whether or not this instruction is explicitly stated as part of the indication or description.

C. Items referred to in singular number in Contract Documents shall be provided in quantities necessary to complete work.

D. Drawings are diagrammatic. They are not intended to be absolutely precise; they are not intended to specify or to show every offset, fitting, and component. The purpose of the Drawings is to indicate a systems concept, the main components of the systems, and the approximate geometrical relationships. Based on the systems concept, the main components, and the approximate geometrical relationships, the contractor shall provide all other components and materials necessary to make the systems fully complete and operational.

E. Information and components shown on riser diagrams but not shown on plans, and vice versa, shall apply or be provided as if expressly required on both.

F. Data that may be furnished electronically by the Designer (on computer tape, diskette, or otherwise) is diagrammatic. Such electronically furnished information is subject to the same limitation of precision as heretofore described. If furnished, such data is for convenience and generalized reference, and shall not substitute for Designer’s sealed or stamped construction documents.

1.6 DISCREPANCIES IN DOCUMENTS

A. Where Drawings or Specifications conflict or are unclear, advise Designer in writing before Award of Contract. Otherwise, Designer’s interpretation of Contract Documents shall be final, and no additional compensation shall be permitted due to discrepancies or ambiguities thus resolved.

B. Where Drawings or Specifications do not coincide with manufacturers' recommendations, or with applicable codes and standards, alert Designer in writing before installation. Otherwise, make changes in installed work as Designer requires within Contract Price.

C. If the required material, installation, or work can be interpreted differently from drawing to drawing, or between drawings and specs, this contractor shall provide that material, installation, or work which is of the higher standard.

D. It is the intent of these contract documents to have the contractor provide systems and components that are fully complete and operational and fully suitable for the intended use. There may be situations in the documents where insufficient information exists to precisely describe a certain component or subsystem, or the routing of a component. In cases such as this, where the contractor has failed to notify the Designer of the situation in accordance with Paragraph (A) above, the contractor shall provide the specific component or subsystem with all parts necessary for the intended use, fully complete and operational, and installed in workmanlike manner either concealed or exposed per the design intent.

E. In cases covered by Paragraph (D) above, where the contractor believes he needs engineering guidance, he shall submit a sketch identifying his proposed solution and the Designer shall review, note if necessary, and approve the sketch.

1.7 MODIFICATIONS IN LAYOUT

A. HVAC, Plumbing, Fire Protection, and Electrical Drawings are diagrammatic. They indicate general arrangements of mechanical and electrical systems and other work. They do not show all offsets required for coordination nor do they show the exact routings and locations needed to coordinate with structure and other trades and to meet architectural requirements.

B. In all spaces, prior to installation of visible material and equipment, including access panels, review Architectural Drawings for exact locations and where not definitely indicated, request information from Designer.

C. Check Contract Drawings as well as Shop Drawings of all subcontractors to verify and coordinate spaces in which work of this Section will be installed.

D. Maintain maximum headroom at all locations. All piping, duct, conduit, and associated components to be as tight to underside of structure as possible.

E. Make reasonable modifications in layout and components needed to prevent conflict with work of other trades and to coordinate according to Paragraphs A, B, C, and D above. Systems shall be run in a rectilinear fashion.

F. Where conflicts or potential conflicts exist and engineering guidance is desired, submit sketch of proposed resolution to Designer for review and approval.

1.8 DELIVERY STORAGE AND HANDLING

A. All HVAC Equipment:
   1. Shipping:

a. Protect internal parts against rust and corrosion.
b. Protect threads, flange faces, and weld ends.
c. Set valves in best position for handling. Setting valves closed prevents rattling; Setting valves open minimizes exposure of functional surfaces.

2. Storage:
   a. Maintain open end protection.
   b. Store equipment and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store equipment off the ground in watertight enclosures.
3. Use sling to handle large equipment; rig sling to avoid damage to exposed parts. Do not use operating handles or stems as lifting or rigging points.
4. Protect equipment connection points and specialties from moisture and dirt.
5. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

1.9 EXISTING CONDITIONS AND PREPARATORY WORK

A. Before starting work in a particular area of the project, visit site and examine conditions under which work must be performed including preparatory work done under other Sections or Contracts. Report conditions that might affect work adversely in writing through Contractor to Designer. Do not proceed with work until defects have been corrected and conditions are satisfactory. Commencement of work shall be construed as complete acceptance of existing conditions and preparatory work.

1.10 CODES, STANDARDS, AUTHORITIES AND PERMITS

A. Perform work strictly as required by rules, regulations, standards, codes, ordinances, and laws of local, state, and Federal governments, and other authorities that have legal jurisdiction over the site. Materials and equipment shall be manufactured, installed and tested as specified in latest editions of applicable publications, standards, rulings and determinations of:

1. Local and state building, plumbing, mechanical, electrical, fire and health department codes.
2. American Gas Association (AGA).
3. National Fire Protection Association (NFPA).
4. American Insurance Association (A.I.A.) (formerly National Board of Fire Underwriters).
5. Occupational Safety and Health Act (OSHA).
6. Underwriters' Laboratories (UL).

B. Material and equipment shall be listed by Underwriters' Laboratories (UL), and approved by ASME and AGA for intended service.

C. Most recent editions of applicable specifications and publications of the following organizations form part of Contract Documents:

1. American National Standards Institute (ANSI).
2. American Society of Mechanical Engineers (ASME).
3. National Electric Manufacturers Association (NEMA).

4. American Society for Testing and Materials (ASTM).
5. American Water Works Association (AWWA).
6. American Society for Heating, Refrigerating and Air Conditioning Engineers (ASHRAE).
7. Air Moving and Conditioning Association (AMCA).
8. Sheet Metal and Air Conditioning Contractors National Association (SMACNA).
9. American Diffuser Council (ADC).
10. Air Conditioning and Refrigeration Institute (ARI).
11. Thermal Insulation Manufacturers Association (TIMA).
12. Institute of Electrical and Electronics Engineers (IEEE).
13. Insulated Cable Engineers Association (ICEA).
14. Certified Ballast Manufacturers (CMB).
15. Illuminating Engineering Society (IES).

D. Special attention is directed to requirements of NFPA 45, Laboratories Using Chemicals.

1.11 GUARANTEE AND 24-HOUR SERVICE

A. Guarantee Work of this Section in writing for one year from the date of Certificate of Agency Use and Occupancy. Guarantees or warranties that start at the date of shipment from the factory, or from the completion date of an individual portion of the project, are not acceptable. If the equipment is used for ventilation, temporary heat, etc. prior to the date of Certificate of Agency Use and Occupancy, the bid price shall include an extended period of warranty covering the one year of occupancy, starting the date of Certificate of Agency Use and Occupancy. The guarantee shall repair or replace defective materials, equipment, workmanship and installation that develop within this period, promptly and to Designer’s satisfaction and correct damage caused in making necessary repairs and replacements under guarantee within Contract Price.

B. In addition to guarantee requirements of Division 01 and of Subparagraph A above, obtain written equipment and material warranties offered in manufacturer's published data without exclusion or limitation, in WRTA’s name.

C. Replace material and equipment that require excessive service during guarantee period as defined and as directed by Designer.

D. Provide 24-hour service beginning on the date the project is first occupied for public use by the User Agency, whether or not fully occupied, and lasting until the termination of the guarantee period. Service shall be at no cost to WRTA. Service can be provided by this contractor or a separate service organization. Choice of service organization shall be subject to Designer and WRTA approval. Submit name and a phone number that will be answered on a 24-hour basis each day of the week, for the duration of the service.

E. Submit copies of equipment and material warranties to Designer before final payment.

F. At end of guarantee period, transfer manufacturers' equipment and material warranties still in force to WRTA.

G. This Paragraph shall not be interpreted to limit WRTA’s rights under applicable codes and laws and under this Contract.

H. Part 2 Paragraphs of this Specification may specify warranty requirements that exceed those of this Paragraph.

I. Use of systems provided under this Section for temporary services and facilities shall not constitute Final Acceptance of work nor beneficial use, and shall not institute guarantee period.

J. Provide manufacturer's engineering and technical staff at site to analyze and rectify problems that develop during guarantee period immediately. If problems cannot be rectified immediately to The WRTA Project Manager's satisfaction, advise Designer in writing, describe efforts to rectify situation, and provide analysis of cause of problem. Designer will suggest course of action.

1.12 RECORD DRAWINGS

A. Comply with requirements specified in Section 017700 – CONTRACT CLOSEOUT.

B. Drawings shall show record condition of details, sections, riser diagrams, control changes and corrections to schedules. Schedules shall show actual manufacturer and make and model numbers of final equipment installation.

1.13 MANUALS, AND OPERATING INSTRUCTIONS, AND PROTECTION

A. Comply with requirements specified in Section 017700 – CONTRACT CLOSEOUT and PM Procedure tabs.

B. Obtain at time of purchase of equipment, three copies of operation, lubrication and maintenance manuals for all items. Assemble literature in coordinated manuals with additional information describing combined operation of field-assembled units, including as-built wiring diagrams. Manual shall contain names and addresses of manufacturers and local representatives who stock or furnish repair parts for items or equipment. Divide manuals into three sections or books as follows:

1. Directions for and sequence of operation of each item of HVAC system, e.g. VRF equipment and ERV equipment. Sequence shall list valves, switches, and other devices used to start, stop and control system. Detail procedure to be followed in case of malfunctions. Include detailed approved flow diagrams as appropriate for systems provided.
2. Detailed maintenance and trouble shooting manuals containing data furnished by manufacturer for complete maintenance. Include copy of balancing report.
3. Lubrication instructions detailing type of lubricant, amount, and intervals recommended by manufacturer for each item of equipment. Include additional instructions necessary for implementation of first-class lubrication program. Include approved summary of lubrication instructions in chart form, where appropriate.

C. Upon completion of installation or when WRTA accepts portions of building and equipment for operational use, instruct User Agency's operating personnel in any or all parts of various systems. Instructions shall be performed by factory trained personnel. WRTA shall determine which systems require additional instructions. Duration of instructions shall take equipment

through complete cycle of operation (at least five working days). Make adjustments under operating conditions.

D. Each contractor shall be responsible for his work and equipment until finally inspected, tested, and accepted. Carefully store materials and equipment which are not immediately installed after delivery to site. Close open ends of work with temporary covers or plug during construction to prevent entry of obstructing material.

E. Each separate contractor shall protect the work and material of other trades that might be damaged by his work or workmen and make good all damage thus caused.

1.14 COORDINATION DRAWINGS

A. Refer to Section 013100 – PROJECT MANAGEMENT AND COORDINATION for coordination drawing requirements.

B. Coordination Drawings include but are not necessarily limited to:

1. Structure.
2. Partition/room layout.
3. Ceiling tile and grid.
4. Light fixtures.
5. Access panels.
6. Sheet metal, heating coils, boxes, grilles, diffusers, etc.
7. All HVAC heating piping and valves.
8. Duct insulation.
9. Roof drain piping.
10. Major electrical conduit runs, panelboards, feeder conduit and racks of branch conduit.
11. Above-ceiling miscellaneous metal.
12. Sprinkler piping and heads.
13. Heat tracing of piping.
14. Insulation.

1.15 STARTERS AND CONTROLLERS

A. Motor-driven equipment supplied under Section 230001 – HEATING VENTILATING AND AIR CONDITIONING shall be operated by starters furnished and installed under Section 260001 – ELECTRICAL WORK, except for starters integral with HVAC equipment which shall be provided by the HVAC Trade Contractor.

B. The HVAC Trade Contractor shall provide nameplates on all starters.

C. All motor controls shall conform to NEMA Standards and be the product of a single manufacturer; Arrow-Hart and Hageman, Allen-Brady, or Square D.

D. Auxiliary contacts shall be included in all starters, for integrally mounted starters. Auxiliary contacts shall be provided for all interlocking wiring.

E. Starters shall normally be provided with two sets of contactors; one set normally open and one set normally closed. Interface shall be provided for all starters and other devices as noted herein.

F. Starters and contactors factory-built into the control panel of packaged equipment will be considered as an integral part of the package.

G. All starters, disconnects and control devices shall be clearly labeled with black lamacoid plates with engraved white letters, to indicate identification number, function and the equipment which they control. Submit list of labels for review.

H. Enclosures for starters included with packaged equipment shall be NEMA Class 1 where installed indoors, NEMA Class IV, where installed outdoors, mechanical rooms or where indicated as weatherproof.

1.16 ELECTRICAL MOTOR CHARACTERISTICS

A. Comply with the requirements of NEMA MG 1 and IEEE 841 for severe-duty motors. Comply also with requirements of U.L., K.E.C., F.M. and NFPA suitable for load conditions, squirrel cage, 1.15 service factor, drip proof, 1750 rpm unless otherwise noted, with inherent overload protection and pressure lubricated bearings with grease fittings. Provide totally enclosed fan cooled motors as noted within the specifications. Refer to ELECTRICAL CHARACTERISTICS REQUIREMENTS of Section 260001 – ELECTRICAL WORK.

B. Motors below 2 HP shall be 120V - 1 phase. Motors that are 2 HP and greater shall be in accordance with the electrical requirements. Motors that are 40 HP and larger shall have part wound motors that are compatible with starters. All other motors shall be designed for use with across-the-line starters. Motors to be provided with overload protection. Provide two speed motors where noted on the drawings. Phase protection shall be provided on motors 2 HP and larger.

C. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet (1000 m) above sea level.

D. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

E. Temperature Rise: Match insulation rating.

F. Insulation: Class F.

G. Motor leads shall be permanently identified and supplied with connectors.

H. The minimum requirement for three phase motors shall be NEMA MG 1, Design B, Class B, insulated for a maximum 40 degree C (104 degrees F.) ambient.

I. Select motors for quiet, continuous operation to suit loads which may be imposed by equipment. Recognize that motor horsepowers specified and scheduled are minimum sizes. If larger motors, starters, power wiring and additional control wiring are included in bid.

J. Submit an accurate schedule of all motors. Include for each motor, the HP, RPM, nameplate, voltage current, equipment served, location, electrical characteristics and identification number.

PRODUCTS

2.1 DUCTWORK AND AIR DISTRIBUTION EQUIPMENT

A. Reference Standards: Material, construction and installation shall meet requirements of most recent editions of the following standards and references, except for more stringent requirements specified or shown on Drawings:

Standard	As Applicable To:
SMACNA HVAC Duct Construction Standards Metal and Flexible	Sheet Metal Ductwork; Duct Liners; Adhesives; Fasteners; Flexible Ductwork.
SMACNA HVAC Air Duct Leakage Test Manual	Duct Leakage Testing
SMACNA Fibrous Glass Duct Construction Standards	Fibrous Glass Ductwork; Tapes
SMACNA Ducted Electric Heat Guide for Air Handling Systems	Electric Duct Heaters
ADC and TIMA Flexible Duct Performance Standards	Flexible Ductwork
ADC Test Code 1062 R4	Ratings of Diffusers, Registers Grilles

B. General

1. Provide supporting and hanging devices necessary to attach entire HVAC system including ductwork and equipment, and to prevent vibration.
2. Provide vertical and horizontal supports as required by codes to meet minimum applicable earthquake resistance standards.
3. Ductwork shall be free from vibration under all conditions of operation. Dimensions shown on Drawings for lined ductwork are net inside dimensions. Increase ductwork to accommodate lining requirements.
4. Pipe or conduit crossing duct:
   a. No pipe, conduit, hanger, Architectural element nor structural member shall pass through duct without Designer's written approval.
   b. Where it is impossible to reroute pipe or conduit and when written approval has been obtained, increase duct size to maintain constant cross-sectional area at point of interference. Provide streamlined enclosure for pipe or conduit, as illustrated in SMACNA.

5. When making offsets and transformations necessary to accommodate structural conditions, preserve full cross-sectional area of ductwork shown on Drawings.

6. Ductwork shall have pressure velocity classifications as follow:

DUCT CONSTRUCT -ION CLASS	STATIC PRESSURE RATING	PRESSURE	SMACNA SEAL CLASS	SMACNA LEAKAGE CLASS	VELOCITY
2"	2"	Pos. or Neg.	B	12	2500 fpm or less
1"	1"	Pos. or Neg.	B	12	2500 fpm or less
½"	½"	Pos. or Neg.	B	12	2000 fpm or less

   a. Unless otherwise specified or shown on the drawings, the following pressure classifications shall be used for the types of ductwork listed below:
      1) 2" Class: All other ductwork.

7. Sealing Requirements for Class B, Leakage Class 12, Galvanized, Non-Welded Aluminum or Non-Welded Stainless Steel, Ductwork.
   a. Transverse Joints
      1) During assembly seal all flanged transverse joints with sealing tape of quality equal to Hardcast Inc. 1902-FR. Corners shall be sealed as described by SMACNA and when applicable per manufacturer's published procedures.
      2) Seal all non-flanged transverse joints with Hardcast Inc. Versa Grip 102 or approved equal.
   b. Longitudinal Seams
      1) Seal all longitudinal seams during ductwork fabrication with Hardcast Inc. Cold Seal 1001 or approved equal.
8. Support
   a. Space hangers as required by SMACNA (8 ft max) for horizontal duct on 8 ft. centers, unless concentrated loadings require closer spacing.
   b. Support vertical duct on each floor or slab it penetrates.
   c. Supports for ductwork and equipment shall be galvanized unless specified otherwise.
9. Connections
   a. Connect inlets and outlets of air handling units and fans to ductwork with flexible connections unless fan has vibration isolator mounts inside unit with flexible connections and no external vibration isolators. Exception: Do not use flex on life safety smoke exhaust fans.
   b. Indoors, flexible connections shall be neoprene coated fibrous glass fire retardant fabric, by Ventfabrics, or Durodyne. Outdoors, flexible connections shall be Dupont hypalon coated fibrous glass fire , weather , and UV resistant by Ventfabrics or Durodyne.
   c. Secure flexible connections tightly to air handlers with metal bands. Bands shall be same material as duct construction.
   d. Connections from trunk to branch ducts shall be as detailed on Drawings.
10. Construction

a. No sharp metal edges shall extend into air streams.
b. Install drive slips on air leaving side of duct with sheet metal screws on 6" centers.
c. Spin in collars shall NOT be used for branch connections in 3" or higher-pressure class ductwork.

11. Joints
    a. Longitudinal lock seams shall be double locked and flattened to make tight joints.
    b. Make transverse joints, field connections, collar attachments and flexible connections to ducts and equipment with sheet metal screws or bolts and nuts. Do not use rivets and staples.
12. Prefabricated Transverse Duct Joints
    a. Transverse joints in galvanized sheet metal ductwork may be made with galvanized gasketed frame and angle duct joint system by Ductmate, TDF, TDC or approved equal. Angles shall be at least 20 gauge. Prefabricated transverse duct joints shall not be used for duct 16 GA. and heavier, nor for duct 23 GA. or lighter.
    b. Secure angles to duct with screws (using clutched arbor) or spot welds spaced as recommended by manufacturer for duct pressure class.
13. Elbows and Bends
    a. Elbows and bends for rectangular ducts shall have centerline radius of 1 1/2 times duct width wherever possible. Elbows for grease exhaust and fume hood exhaust shall be full radius. Vanes or mitered duct are not allowed.
    b. Where centerline radius is less than 1 1/2 times duct width (on supply, return and exhaust ductwork), elbows shall be radius throat (square throat allowed when turning around column or other close objects) with radius heel. For elbows whose width is greater than 48 inches and/or where shown on plans, provide splitter vanes. Install vanes in accordance with SMACNA. Where multiple elbows are separated by less than ten duct diameters use splitter (full length) vanes.
    c. For round ductwork provide stamped elbows, with centerline radii equal to 1 1/2 times duct diameter, or gored elbows as follows:

Elbow Angle	No. of Gores
0° - 36°	2
37° - 72°	3
73° - 90°	5

    d. Elbows for flat oval ducts shall have centerline radii equal to 1 1/2 times duct diameter in plane of bend, or gored elbows with gores as specified for round ducts.
14. Access Panels/Doors
    a. Provide proper pressure and leakage rated, gasketed, duct mounted access panels/doors for the following items with minimum sizes, as indicated. Access doors shall be of double wall construction doors in insulated ducts shall be insulated. Gauges of door materials, no. of hinges, no. and type of door locks shall be as required by the SMACNA Duct Construction Standards. Hinged doors are not acceptable, screwed or bolted access panels are not acceptable. Doors shall be chained to frame with a minimum length of 6" to prevent loss of door. For seal Class A, access doors shall be leakage rated, neoprene gasketed UL 94 HF1 listed, DUCTMATE "sandwich" or approved equal. Door metal shall be the same as the attached duct material. For grease and high temperature ducts, door assembly shall be rated for 2300°F. The minimum sizes are:
        1) Automatic control dampers 6" x 6" minimum.
        2) Manual volume dampers 2 sq. ft. and larger 6" x 6" minimum.

3) Inlet side to all coils 12" x 12", or larger.
4) Suction and discharge sides of inline fans 24" x 24" minimum.
5) At additional locations indicated on drawings, or specified elsewhere 12" x 12" minimum.

b. Generally access doors are not shown on the drawings, but shall be provided in accordance with the above.

15. Extractors shall have adjusting rod and locknut on outside of duct.
16. Connections to roof fans:
    a. Shall be at least 22 ga. galvanized steel soldered watertight.
    b. Solder side seams at least 12" up from bottom.
    c. Provide suitable dielectric gaskets to join dissimilar materials.
17. Plenums and connections to louvers:
    a. Shall be 18 ga. minimum cross broken and properly reinforced with galvanized angle irons to SMACNA requirements.
    b. Shall have bottom and corner seams soldered watertight at least 12" up from bottom.
    c. Shall have neoprene gaskets or other non corrosible material to make connections to louvers watertight.
    d. Shall pitch connection back towards the louver. Provide half coupling drain connection at bottom of plenum unless noted otherwise. Pipe drain to nearest floor drain.
    e. Shall have unused portions of louvers blocked-off with sheet metal; sealed air and water tight; insulated with 2" thick 6 lb. density rigid or board insulation.
18. Duct Pressure Tests
    a. Pressure test ducts after takeoffs and wall penetrations are in place and before applying exterior insulation. Correct any leaks.
    b. Pressure and leak test 100% of medium and low-pressure duct work at 150% of duct construction class pressure. Duct shall be constructed so there is no joint or structural failure at the test pressure.
19. Duct Leakage Tests
    a. Leak testing shall be per SMACNA HVAC Air Duct Leakage Test Manual. Provide orifice assembly including straightening vanes, orifice plate mounted in straight tube with properly located pressure taps, and U tube manometer or other device as specified by SMACNA. Orifice assembly shall be calibrated accurately and shall come with calibration curve. Leakage classes shall be as previously specified. Submit leak test report (per SMACNA format) for Designer review. Drawings of ductwork tested shall also be submitted with report, indicating presence of takeoffs, wall penetrations, joints, etc.
20. Materials
    a. Sheet metal ducts shall be constructed of hot dipped galvanized sheet metal with G90 Commercial coating according to ASTM 527 unless specified otherwise.
    b. Stainless steel (SS) ductwork shall be 18 gauge for kitchen hoods; and as required by SMACNA for other ducts. Materials shall be 316/No. 4 finish for exposed duct, 304/No. 1 finish for concealed ducts. Joints and seams shall be welded as required by SMACNA Guidelines for Welding Sheetmetal.
    c. Aluminum ductwork shall be Alclad 3003 1414 or alloy 5052 H32, of thickness required by the SMACNA duct construction standards with Alloy 6061 bracing angles, and Pittsburgh lock longitudinal corner and double side seaming.
    d. Flexible Ductwork
        1) Flexible ductwork, connecting to uninsulated or unlined duct, shall be polyester core with corrosion resistant helical wire reinforcing. The

polyester core shall be minimum two ply and shall have a minimum thickness of 0.0017". Flex duct shall be U.L. rated for 6" W.C. positive pressure, 2" W.C. negative pressure with a maximum velocity of 4000 FPM. Flexduct must be listed as a Class 1 Connector according to UL 181 and shall meet the requirements of NFPA 90A maximum ASTM E 84 fire hazard rating shall be 25 flame spread, 50 fuel contributed and 50 smoke developed. Uninsulated flexible duct shall be equivalent to Wiremold, Type WB, or Flexmaster Types 2 and 4 (not type 9).

2) Flexible duct connected to insulated or lined duct shall also be insulated and shall be equivalent to Wiremold Type WK or Flexmaster Types 2 or 4 (not type 9), with 1 1/2", 3/4 lb. density fiberglass insulation and an aluminized reinforced vapor barrier.
3) Submittals shall include data on no. of polyester plies and minimum thickness of polyester core, in addition to other data listed above required to ensure that submitted product meets the requirements of these specifications.
4) If flexduct other than the model numbers of the vendors listed above is submitted, a sample of the flex shall be submitted to the Designer. The Designer shall have sole discretion in determining whether the submitted flex is equivalent to that of the named vendors above.
5) Unless otherwise indicated, flexible duct shall not exceed 5'-0" long.

e. Rigid PVC ductwork shall be thermally formed ASTM D 1784 69 Class 12454 B with 3/16" thick wall.

C. 2" and Lower Pressure Class Ductwork, Rectangular:

1. Ducts wider than 19" with more than 10 square feet of unbraced panel shall be beaded or cross broken.
2. Internal stiffening struts shall only be used upon prior written approval of the Designer.
3. Make changes in duct size with tapered connections as required by SMACNA. Changes shall NOT exceed 30°from line of air flow. Take off to the diffusers shall be 45° leading edge type or Bellmouth type.
4. Transverse joints shall be TDF/TDC or slip joints; use flat or standing seam according to SMACNA. Where duct size requires standing seam but space restrictions dictate flat seam, notify Designer prior to fabrication.

D. 2" and Lower Pressure Class Ductwork, Round:

1. Joints
   a. Longitudinal joints shall be spiral seam, butt welded, lap and seam welded, or ACME lock grooved seam. Snap lock seams shall be used on ½" w.g. pressure class duct only.
   b. Transverse joints shall be beaded sleeve joint or other approved joints listed in SMACNA. Use three or more sheet metal screws at 15" uniform intervals along circumference of joints.
2. Branch fittings shall be conical tee (Buckley or equal) or combination tee as shown in SMACNA.
   a. 3" and 4" Pressure Class Ductwork Rectangular
3. Joints
   a. Joints shall be prefabricated type by TDC, TDF or Ductmate. See Prefabricated Joints paragraph for specific requirements.

4. Duct reinforcement spacing and type shall comply with SMACNA.
5. Ductwork on both sides of transitions shall be run in same horizontal axis.
6. Diverging section slope shall be 1 1/2" per foot or less if possible.
7. Contraction section slope shall not exceed 7" per foot.
8. Takeoffs shall be 45° leading edge type except that Bellmouths (Buckley or equal) may be used for takeoffs to terminal boxes if the distance between the box and point of takeoff is less than 8 ft.
9. Ducts with an aspect ratio greater than 3:1 shall be minimum of 18 gauge unless a thicker gauge is required by SMACNA.

E. Flexible Rigid Duct

1. Flexible ductwork shall be Flexmaster Triple Lock Buck Duct Flexible Air Duct (insulated or non insulated) as manufactured by Buckley Associates or equal (617 878 5000). Flexible duct, non insulated, shall be Underwriters Laboratory Listed UL 181 Class 0 air duct and constructed in accordance with NFPA Standards 90A and 90B. It shall have a smoke/flame spread rating of 50/25.
2. Duct shall be made from a tape of dead soft aluminum sheet, spiral wound into a tube and spiral corrugated to provide strength and stability. The joint shall consist of a triple lock mechanically performed without the use of adhesives to make a durable airtight seam. A double lock is not acceptable.
3. Flexible duct connected to insulated or lined duct shall also be insulated. Flexmaster insulated flex shall have a gray Fire Retardant Polyethylene outer jacket with a ½ lb. density, 1 1/2" thick fiberglass insulation blanket, factory wrapped. Flexible Duct, insulated, shall be Underwriters Laboratory Listed and constructed in accordance with NFPA standards 90A and 90B. It shall have a smoke/flame spread rating of 50/25.
4. The flexible duct shall be supported as required.
5. Flexible duct work shall be rated at 12" positive pressure. Duct from 3 to 16" shall have a negative pressure of 12", 8" for duct work 18 and 20.
6. All flexible duct shall be individually cartoned and labeled for delivery to the job site for maximum protection.
7. Submittals shall include data on minimum thickness of aluminum core, in addition to other data listed above, required to ensure that submitted product meets the requirements of these specifications.
8. Provide sealing compound for installation. See further paragraphs in this specification and details for other installation requirements.

F. Volume Dampers

1. Provide Young Regulator manual adjustable rectangular opposed blade dampers for duct heights less than 12" with factory installed locking hand quadrants extended 2" for all dampers installed in externally insulated duct:
   a. On each supply, return and general exhaust duct take off.
   b. At each take off to register, grille or diffuser (not all are shown on Drawing).
2. Dampers are manufactured approximately 5/16" smaller in width and 1/8" smaller in height than size of duct in which they are installed; e.g., nominal damper size is 24" x 10"; actual size is approximately 23 11/16" x 9 7/8".
3. Damper frame shall be constructed of #6063 extruded aluminum reinforced channel with minimum thickness of .050". Opposed damper blades shall be #6063 extruded aluminum with minimum thickness of .050" and shall include reinforcing ribs. Each blade shall be

supported in the damper frame by individual Teflon axle bearings, and shall be driven by stainless steel connecting slide linkage controlled by 3/8" square steel control shaft.

4. Note: All required volume dampers may not be indicated on drawings but dampers shall be provided as necessary for systems balancing.
5. Dampers 12" and larger in height shall be opposed multi blade equal to Greenheck, Nailor, or Vent Products.
6. Where dampers are inaccessible, use Young Regulator locking type ceiling regulators and miter gear or worm gear for all horizontal dampers. Bearing coupling for bottom duct control may be used for shaft on vertical blade dampers. The 3/8" rod between ceiling regulator and damper shall be provided by contractor.
7. Damper blades shall be two gauges heavier than adjoining ductwork, and shall be riveted to supporting rods. Hem over edges parallel to rods.
8. Brackets shall be galvanized metal, secured to ductwork with sheet metal screw with locking quadrant arms (see seal class section for additional requirements). Provide 2" handle extension for all dampers on externally insulated ductwork.
9. Note: All required volume dampers may not be indicated on Drawings but dampers shall be provided as necessary for system balancing.

G. Automatic Dampers: Install automatic dampers furnished under Automatic Temperature Control Paragraph of this Section, as shown on Drawings, and as specified. Provide sealed wall penetrations for Seal Class A ductwork.

H. Diffusers, Registers and Grilles

1. Provide diffusers, registers and grilles for supply, return and exhaust outlets, of size, type and design shown on Drawings. Acceptable manufacturers shall be Anemostat, Krueger, Metalaire or Titus.
2. Equipment shall be tested and rated per ASHRAE 91-70.
3. Equipment shall handle air quantities at operating velocities:
   a. With maximum diffusion within space supplied or exhausted.
   b. Without objectionable air movement as determined by Designer.
   c. With sound pressure level not to exceed NC 30.
4. Supply, return and exhaust outlets shall have opposed blade volume dampers operable from front.
5. Supply registers shall have two sets of directional control blades.
6. Diffusers within same room or area shall be of same type and style to provide architectural uniformity.
7. Diffusers, registers and grilles shall be furnished with gaskets and installed with faces set level and plumb, tightly against mounting surface.
8. Finish shall be as directed by Designer.
9. Coordinate diffusers, registers and grilles with ceiling and wall construction. Refer to Architectural Drawings for exact lengths and for framing and mitering arrangements that may differ from those shown on HVAC Drawings.

I. Branch Duct Takeoff Fittings

1. Contractor shall provide Buckley Bellmouth Take offs at all branch duct locations.
2. Bellmouth Fitting shall be Model BMD with damper. In areas where sufficient duct height is not available, the contractor shall provide the Buckley Mini mouth fitting, Model M BMD with damper or the flat oval Bellmouth, Model FOBMD with damper.

3. Bellmouths shall be constructed of heavy-duty galvanized steel. Bellmouths shall include an airtight Neoprene gasket to ensure a tight fitting with minimal leakage. Pre-drilled holes shall be provided for quick mounting. Bellmouth shall be as manufactured by Buckley Associates or equal (617 878 5000).
4. Standard damper hardware to be constructed of 26 gauge galvanized material with a quadrant damper and tight fitting gasketing to ensure minimal leakage at damper pivot points.
5. Optional heavy-duty hardware shall be provided at locations of higher static pressure where shown on the drawings.
6. Ninety degree take offs are not permitted on this project.

2.2 DUCT INSULATION

A. General

1. Insulation shall be CertainTeed, Knauf, Manville or Owens Corning. Install insulation, mastics, adhesives, coatings, covers, weather protection and other work exactly as required by manufacturer's recommendations. Materials shall meet requirements of Adhesive and Sealant Council Standards and SMACNA.
2. Apply insulation after systems have been tested, proved tight and approved by Designer. Remove dirt, scale, oil, rust and other foreign matter prior to installation of insulation.
3. Leaks in vapor barrier or voids in insulation will not be accepted.
4. ASTM E 84 minimum fire hazard ratings shall be 25 flame spread, 50 fuel contributed and 50 smoke developed.
5. Where ducts are insulated, flexible connections to ducts shall be insulated.
6. Insulate standing seams with same material and thickness as duct.
7. Acoustically lined ductwork shall not be insulated externally, except as noted otherwise.
8. Return ductwork in ceiling plenums shall not be insulated.
9. Insulation shall be continuous through wall and ceiling openings and in sleeves.
10. Transmission rates of vapor barriers shall not exceed 0.02 perms.
11. Do not insulate fibrous glass duct.

B. Concealed Rectangular and Circular Ductwork

1. Insulate supply and fresh air ducts and plenum in concealed spaces and return duct not in ceiling plenum with 1 1/2" thick fibrous glass duct wrap, with foil kraft flame resistant vapor barrier.
2. Insulation density shall be 3/4 lb/cf and maximum K factor shall be 0.30 at 75°F mean temperature.
3. If insulation does not have pre cut lap, make lapped butt joints by cutting 2" strip of insulation away from vapor barrier. Apply 6" strips of approved adhesive on 16" centers and wrap duct with insulation. Staple lapped joint with outward clinching staples. Seal stapled joints air tight with approved vapor barrier mastic or pressure sensitive tape.
4. For rectangular duct 24" or larger in any dimension, augment application method specified in item 3 with approved mechanical fasteners, such as weld pins with speed washers, on 18" centers on bottom of duct.
5. Cover breaks in vapor material with patches of same material, secured with adhesive and staples. Seal staples with approved vapor barrier coating.
6. Fill voids in insulation at jacket penetrations and seal with vapor barrier coating.

7. Seal and flash terminations and punctures with fibrous glass cloth between two coats of vapor barrier coating.
8. Terminate vapor barrier and extend insulation at standoff brackets.

2.3 PIPING AND FITTINGS

A. General:

1. Pipe materials and fitting materials shall be as indicated in Schedule of Pipe and Fitting Materials.

B. Schedule of Pipe and Pipe Fitting Materials:

SERVICE	SYSTEMS DESCRIP-TION	PIPE SIZE	PIPE MATERIAL	JOINTS	FITTING MATERIAL	FITTING RATING PSI/CLASS / WEIGHT
Condensate Drain	D	All	PVC, Schedule 40 Note 1	Solvent Welded	PVC, Schedule 40	Class 150
Refrigerant	R	All	Copper, ACR	Silver Brazed	Wrought Copper	200 PSI

Note 1: Use copper for drain lines in plenums and through fire rated walls. Copper tubing must be insulated for 12' from equipment.
Note 2: #304 Stainless steel, standard weight shall be used for outdoor piping. Double wall, pre-insulated systems may be used in lieu of welded piping.

C. Connections:

1. Provide dielectric fittings at connections of dissimilar materials.
2. Provide eccentric reducing couplings to bring pipes flush on top for water service and flush on bottom for steam service.
3. Branch lines in welded piping shall be made with welding tees except that branch lines less than one half diameter of main may be made with Weld O Lets or Sock-O-Lets.
4. Nipples shall be same material, make and thickness as pipe with which they are used. Close nipples shall not be used.
5. Make piping connections 2 1/2" diameter and larger to valves and equipment with welding neck flanges, ANSI B16.5, pressure rating to match system, flat or raised face as required.
6. Make piping connections 2" dia. and smaller to valves and equipment with steel body, 300 psi brass seat unions on steel piping and with heavy semi flushed brass unions on copper tubing.
7. Fit flanged joints with Johns Manville or approved equal full face gaskets. Flanges shall be faced and drilled to ASA standards and fitted with semi finished hexagon machine bolts and nuts of proper number and size.
8. Make screw joints tight with Teflon (polytetrafluoroethylene) tape or litharge glycerin mixture applied to male threads. Use tapered threads.
9. Make fusion welded joints as required by ANSI B31.1. Make changes in direction of pipe with welded fittings only. Bevel connections before welding, mechanically or by flame cutting.

D. Grooved Piping Systems

1. Paragraph titles, service designation references, listings, descriptions, instructions, etc. in following paragraphs shall be used as a guide in establishing materials and performance standards. This shall in no way limit provisions of Contract Documents, nor change, reduce or limit Contractor's responsibility to comply fully with provisions of Contract Documents.
2. Pipe, used with grooved fittings, shall be Schedule 40 steel, or as specified in the "Piping" paragraph.

E. Products

1. Grooved Piping
   a. Grooved couplings may be used in lieu of welding, threaded or flanging on 2" and over carbon steel pipe, on water services from 30 F. to 250 F. within the manufacturer's rated working pressures. Pipe grooving shall be cut grooved and/or rolled grooved as per manufacturer's latest recommendations.
2. Piping Components
   a. Grooved couplings shall consist of two pieces of ductile iron. Coupling gaskets will be a synthetic rubber gasket with a central cavity pressure responsive design. Coupling bolts and nuts shall be heat treated carbon steel, trackhead conforming to physical properties of ASTM A 183. All grooved couplings shall be manufactured by Victaulic Co. Style 177, 77, and W77 flexible type or 107H, 07, and W07 rigid type or approved equal by Grinnell or Anvil Gruvlok. Flexible couplings may be used with the Designer’s approval as outlined in the Pipe Hanging paragraph.
   b. Victaulic or approved equal by Grinnell or Anvil Gruvlok flexible couplings may be used in lieu of flexible connectors for vibration isolation at equipment connections. Three (3) couplings, for each connector, shall be placed in close proximity to the vibration source.
3. Branch Connections
   a. For piping 2 1/2" and larger, full size branch connections shall be made with manufactured grooved end tees. Branch connections for less than full size shall be made with Victaulic hole cut or approved equal by Grinnell or Anvil Gruvlok. Branch connections with locating collar engaging into hole or outlet coupling used to join grooved pipe and to create a branch connection.
4. Gaskets
   a. All gaskets shall be Victaulic Grade “EHP” or equal EPDM compound with working temperature of -30°F to 250°F (8” and smaller) and Grade "E" or equal EPDM compound with working temperature of 30°F to 230°F (10” and larger).
5. Flanges
   a. Flanges shall be Vic Flange Style 741 and W741 (2 24") or equal for connection to ANSI class 125 and 150 flanged components, or Vic Flange Style 743 or equal (2" 12") for connection to class 300 flanged components.
6. Fittings
   a. Fittings shall be full flow cast fittings, steel fittings or segmentally welded fittings with grooves or shoulders designed to accept grooved end couplings.
   b. Standard Fittings shall be cast of ductile iron conforming to ASTM A 536 (Grade 65 45 12), painted with a rust inhibiting modified vinyl alkyd enamel or hot dip galvanized to ASTM A 153 or zinc electroplated to ASTM B 633, as required.
   c. Standard Steel Elbow Fittings (14" 24") shall be forged steel conforming to ASTM A 106 Grade B (0.375" wall) or as-cast ductile iron, painted with rust

inhibiting modified vinyl alkyd enamel or hot dip galvanized to ASTM A 153, with AGS grooved ends.

d. Standard Segmentally Welded Fittings shall be factory fabricated, by fitting manufacturer, of carbon steel pipe as follows: 3/4" 4" conforming to ASTM A 53, Type F;5" 6" Sch. 40 conforming to ASTM A 53, Type E or S, Grade B; 8" 12" Sch. 30 conforming to ASTM A 53, Type E or S, Grade B; 14" 24" O.375" wall conforming to ASTM A 53, Type E or S, Grade B, painted with rust inhibiting modified vinyl alkyd enamel or hot dip galvanized to ASTM A 153, as required.

7. Valves, Strainers, Suction Diffusers
   a. Vic 300 MasterSeal™ (2" – 12") grooved end butterfly valve or equal may be used for all services up to and including 300 PSI. Valve body shall be ductile iron with grooved ends designed to accept grooved mechanical couplings. Valves shall have an offset ductile iron disc core. Disc seal (EPDM) shall be rated for service up to 250°F.
   b. Vic 300 AGS (14" – 24") grooved end butterfly valve or equal may be used for all services up to and including 300 PSI. Valve body shall be ductile iron with AGS wedge-shaped grooved ends designed to accept Victaulic "W" series couplings or approved equal. Valves shall have a PPS coated ductile iron disc core and seat shall be PPS coated surface. Rated for service up to 230°F.
   c. Ball Valves shall be Vic Ball style 726 or equal Ball Valves, designed for 800 PSI (WOG) bubble tight working pressure.
   d. Check Valves Single Disc (2" to 3"), non-slamming, spring-loaded check valves with a plated nickel seat, ductile iron body, stainless steel disc designed for 365 PSI. Installed in the vertical and horizontal positions. Victaulic Series 716H or approved equal.
   e. Check Valves Single Disc (4" to 12"), non-slamming, spring loaded check valves with a welded in nickel seat. Ductile iron body and disc designed for 300 PSI. Installed in the vertical and horizontal positions. Style 716, 779.
   f. Check Valves Dual Disc Design (14" to 24"), spring loaded check valves with EPDM seat bonded to the valve body. Ductile iron body and stainless steel disc designed for 230 PSI. Installed in the vertical and horizontal positions. Victaulic Series W715 or approved equal.
   g. Strainer shall be Victaulic Style 732 or approved equal and W732 Wye Pattern Strainer for easy access and cleaning with grooved ends for installation in vertical down flow or horizontal flow position.
   h. Tee Pattern Strainer shall be Victaulic Style 730 and W730 or approved equal for easy access and cleaning with grooved ends for installation in vertical down flow or horizontal flow position.
   i. Suction Diffuser shall be Victaulic Style 731 and W731 or approved equal. Ductile iron body conforming to ASTM A 536. Diffuser stainless steel type 304 frame and perforated sheet with 3/16" diameter holes.
8. Expansion Fittings and Loops
   a. All piping shall be installed as to avoid strain or distortion from expansion and contraction. Expansion and contraction in grooved piping systems shall be accommodated with loops or bends consisting of (8) Victaulic or approved equal flexible couplings, (4) 90-degree elbows, and (3) grooved end pipe spools, provided in water systems up to 250 deg F, in accordance with Victaulic or approved equal recommendations for expansion compensation.
   b. Install in-line expansion joints in water piping systems that are installed in enclosures where pipe bends or loops cannot be applied.

1) 2” through 6” Sizes: Packless, gasketed, slip-type expansion joint with grooved end telescoping body for installation with Style 07 rigid couplings providing up to 3” axial end movement and working pressures up to 350 psi. Victaulic Style 150 Mover® or approved equal.
2) ¾” and Larger Sizes: Combination of grooved end short nipples and Victaulic or approved equal flexible couplings joined in tandem to provide increased expansion. Joint movement and expansion capabilities determined by number of couplings/nipples used in the joint. Pressure rating dependent on size and style of flexible couplings used. Victaulic Style 155 or approved equal.

9. Hanging and Installation
   a. All grooved components installed and requirements for hanging, supporting, anchoring, expansion and contraction shall be in accordance with the latest published manufacturer’s instructions.
   b. Pressure and temperature ratings shall be as shown in manufacturer's latest published literature for individual style of coupling and gasket. Pressure and temperature ranges for valves shall conform to those in valves paragraph in Part Two of this specification.
   c. Grooved Pipe Hanging:
      1) Rigid piping systems, using Style 107H, 07 Zero Flex or W07 couplings or equal, shall be supported as shown on drawings, as called for in Part Two of these specifications and as called for by the ASME Building Services Piping Standard B 31.9.
      2) Piping systems using Style 177,77, W77 other flexible Victaulic couplings or equal may be used if explicitly approved by Designer. The contractor shall submit a schematic piping diagram to the Designer. The diagram shall show all points of anchorage, where flexible type couplings are used and where rigid couplings are used. The diagram shall show expansion joints (if any).
   d. Grooved Piping Installation:

F. Assemble joints with coupling and gasket, lubricant, and bolts. Cut or roll grooves in ends of pipe based on pipe and coupling manufacturer's written instructions for pipe wall thickness. Use grooved-end fittings and rigid or flexible, where required, grooved-end-pipe couplings. The gasket style and elastomeric material (grade) shall be verified as suitable for the intended service as specified. Gaskets shall be molded and produced by the grooved coupling manufacturer. Grooved end shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove. A Victaulic or approved equal factory trained field representative shall provide on-site training for contractor's field personnel in the use of grooving tools, application of groove, and installation of grooved piping products. Factory trained representative shall periodically review the product installation. Contractor shall remove and replace any improperly installed products.

2.4 PIPE INSULATION

A. Insulation shall be fibrous glass insulation with factory applied fire retardant vapor barrier jacket with K factor of 0.21 at 75°F mean temperature: by Owens Corning, CertainTeed, Manville or Knauf, installed as required by manufacturer. ASTM E 84 fire hazard ratings shall be 25 flame spread, 50 smoke developed and 50 fuel contributed.

B. Apply insulation after systems have been tested, proved tight and approved by Designer. Remove dirt, scale, oil, rust and foreign matter prior to installation of insulation.

C. No leaks in vapor barrier or voids in insulation will be accepted.

D. Insulation and vapor barrier on piping which passes through walls or partitions shall pass continuously through sleeve, except that piping between floors and through fire walls or smoke partitions shall have space allowed for application of approved packing between sleeves and piping, to provide fire stop as required by NFPA. Seal ends to provide continuous vapor barrier where insulation is interrupted.

E. Insulate flexible connections to same thickness and with same material as adjoining pipe insulation.

F. Provide fibrous dual temperature insulation with factory applied vapor barrier jacket on refrigerant and condensate unless noted otherwise.

G. Drain piping other than PVC piping shall have ½" thick insulation. Insulation thickness for indoor refrigerant and condensate piping shall be as follows:

TABLE A
Insulation Thickness

PIPING SYSTEM TYPES	FLUID TEMPERATURE RANGE, ºF	1" & LESS	1-1/4" TO 2"	2-1/2" TO 4"	INSULATION CONDUCTIVITY BTUH/IN/F.HR.SF AT TEMP ºF
Refrigerant	-	1.0	1.0	1.0	0.23 @ 75°
Condensate	-	1.0	1.0	1.0	0.23 @ 75°

H. Provide longitudinal lap and 6" wide vapor barrier joint seal strips secured with approved adhesive.

I. Seal ends of pipe insulation and seal insulation to pipe with approved fire-retardant vapor barrier, at flanges, valves and fittings and at intervals of no more than 21 feet on continuous runs of piping.

J. Secure covers on concealed pipe with metal bands at least 3/4" wide and no more than 18" apart, spaced to hold ends and centers of each section.

K. Insulation on outdoor piping shall be twice the thickness listed in Table A above, but not more than 4". Waterproof with 0.016" thick aluminum jacket with 2" transverse and longitudinal lapped seams oriented to shed water. Fill seams with weatherproof adhesive. Secure jacket with 1" wide aluminum draw bands on 12" centers.

L. Do not insulate indoor condenser water systems. Provide 2" insulation on outdoor condenser water piping, only if heat traced.

M. Refrigeration Line Insulation

1. Suction lines, hot gas bypass lines, and outdoor liquid lines shall be insulated with 3/4" thick rigid closed cell foam insulation, Armstrong Rigid Armaflex, Manville, Owens Corning or Halstead/Nomaco (Insultube), except in computer room plena.
2. Installation shall meet manufacturer's recommendations. Seal butt joints with insulation manufacturers approved adhesive.
3. Outside above ground insulation shall be protected with two coats of approved vinyl lacquer coating over woven glass mesh adhered to insulation with Insulcolor or approved equal lagging adhesive, as recommended by manufacturer.
   a. All exterior piping shall be provided with a continuous, color: white, PVC jacketing covering the entirety of the system piping run from equipment to penetration.
4. Refrigerant piping in hung ceiling and underfloor supply and return plenums shall be insulated with 1" thick fibrous glass insulation that meets applicable requirements of this Paragraph.

2.5 PIPE HANGERS AND SUPPORTS

A. Provide pipe stands, supports, hangers and other supporting devices in accordance with ANSI B31.9 and MSS-69, as necessary to support work required by Contract Documents.

B. Secure vertical piping to building construction to prevent sagging or swinging.

C. Space hangers for horizontal piping as follows:

Pipe Size	Rod Diameter	Maximum Spacing
Up to 1 1/4"	3/8"	8 ft. 0"
1 1/2 and 2"	3/8"	10 ft. 0"

D. Horizontal copper tubing shall have maximum hanger spacing of 5 ft. for tubing 1 1/4" dia. and smaller and 10' for tubing 1 1/2" and larger. Maximum spacing for PVC pipe hangers shall be 4'.

E. Reduce spacing to a maximum of 10' - 0" apart, regardless of pipe size, as necessary for fittings, valves and other concentrated loads.

F. Hangers shall be by Carpenter and Patterson, F & S, or Grinnell Co. Figure numbers of Carpenter and Patterson are specified to establish standards of quality for performance and materials.

G. Provide spring hangers with travel stops as specified in Vibration Isolation Paragraph where necessary and where shown on Drawings.

H. Hangers for horizontal lines shall be vertically adjustable to obtain pitch requirements of Piping Paragraph.

2.6 SLEEVES AND PENETRATIONS

A. Pipe Sleeves

1. Sleeves through floors and through exterior, structural and fire rated construction shall be hot dipped galvanized Schedule 40 steel pipe.
2. Sleeves through partitions and non-fire rated construction shall be 26 gauge galvanized steel with lock longitudinal seams, or approved plastic pipe.
3. Provide waterproofing membrane locking devices at floors. Provide 150 lb. slip on welding flanges at exterior wall penetrations.

B. Duct Sleeves and Openings

1. Sleeves through floors, through exterior structure, through fire rated construction and through smoke partitions that require smoke dampers shall be Schedule 40 galvanized steel pipe for round duct and shall meet SMACNA Fire Damper and Heat Stop Guide for rectangular and flat oval ducts. Fireproof packing shall be applied to seal any openings between sleeve and wall. Materials shall maintain the fire rating of the wall, and shall be installed in accordance with the SMACNA Fire Damper and Heat Stop Guide.
2. Openings in walls, partitions and other fire rated construction that do not require smoke dampers shall meet NFPA 90A, Section 3 3.8.
3. Materials for prepared openings in partitions shall match construction penetrated.

C. Pipe Sleeve Packing

1. Packing between the pipe and the sleeve (or wall or slab opening) in fire rated walls or slabs shall be a combination of fireproof insulation and fireproof caulk. The combination of materials shall have the same fire rating, in hours, as the wall or slab, as tested in accordance with the latest edition of ASTME 814 (UL 1479). The combination of materials shall be classified by UL, (fill, void or cavity materials) for the fire rating required and shall be listed as a numbered system in the UL Fire Resistance Directory. Fiberglass shall not be used as the insulation material.
2. Acceptable fireproof insulation materials shall be: Kaolin (Kaowool by Babcock and Wilcox); ceramic fiber blanket (Fiberfrax by Standard Oil) or fire rated mineral wool (Thermafiber by USG). Acceptable fireproof caulks shall be: Silicone (Firestop by Dow Corning, Hilti CS240); ceramic fiber (Fyreputty by Standard Oil) or intumescent synthetic elastomer (Fire Barrier Caulk by 3M, Hilti CS2420).
3. Packing for sleeves that do not require maintenance of fire rating shall be oakum, silicate foam, ceramic fibre or mineral fibre with approved sealant. Pack or foam to within 1" of both wall surfaces. Seal penetration packing with approved caulking and paintable waterproof mastic surface finish or silicone caulking.
4. All materials must be installed in accordance with manufacturers instructions; all gaps must be sealed. Finish caulk flush with wall or slab surface if piping runs exposed.

D. Other Waterproof Pipe Penetrations

1. Modular mechanical penetration seals shall be interlocking synthetic rubber links shaped to fill annular space continuously, with galvanized carbon steel bolts, nuts and pressure plates to expand rubber seal between pipe and sleeve. Sleeve seal shall be watertight.

2. Prefabricated modular sleeves shall be Mason Industries (SWS) or approved equal stiffened galvanized steel sleeves with preformed closed cell elastomeric seal (non fire rated) or preformed mineral fiber or silicone foam seal (fire rated).
3. Provide waterproof 1" single ring set in silicone and bolted to floor or wall at chipped and drilled penetrations of existing slabs on grade and existing walls below grade.

2.7 ESCUTCHEONS AND DUCT COLLARS

A. Provide adjustable escutcheons on exposed piping that passes through finished floors, walls and ceilings. Escutcheons shall be chromium plated cast brass, sized to cover sleeve opening and to accommodate pipe and insulation.

B. Provide 4" wide 20 gauge galvanized sheet metal collars at sleeves and prepared openings, sized to cover entire duct penetration including sleeve and seal, and to accommodate duct and insulation as necessary. Edges shall have milled lips ground smooth. Paint to match finish of duct or as directed by Designer.

C. Provide #316 stainless steel/No. 4 finish collar for emergency generator exhaust piping which passes through exterior wall.

2.8 ELECTRIC WALL-MOUNT HEATERS

A. GENERAL: Provide manufacturers standard U.L. listed electric wall-mount heaters designed for recess or surface mount in standard 2” x 4” stud walls of the type, size, material, characteristics, performance and with the accessories indicated on the Drawings or specified herein.

B. CASING
1. Galvanized steel back box, 20 gauge, with power supply and control wiring knock-outs, designed for recessed rough-in (masonry or framing installation) or used in conjunction with surface mounting frame. Tamper resistant cold-rolled steel front panel, 16 gauge, welded uniform bar grille (downflow), manufacturers standard baked enamel finish with decorative satin-finish aluminum “picture” frame.

C. ELECTRIC HEATING COILS
1. Non-glowing design, 80/20 nickel-chromium resistance wire enclosed in steel sheath with copper brazed plate fins, and five (5) year manufacturers warrantee.

D. FAN MOTOR
1. Permanently lubricated totally enclosed, direct drive.

E. DISCONNECT SWITCH:
1. Provide disconnect switch meeting manufacturers requirements and code requirements.

F. FAN
1. Propeller type, statically and dynamically balanced, five-bladed aluminum construction, with direct mount to motor shaft.

G. FACTORY INSTALLED CONTROL COMPONENTS
1. Automatic reset thermal overheat protection.
2. Built-in fan delay switch for heating element warm-up and heat dissipation when de-energized, bimetallic snap-action type.
3. Built-in power disconnect switch.
4. Integral thermostat, 40°F to 90°F tamper-resistant adjustment through front bar grille, bimetallic snap-action type with enclosed contacts.
5. Provide 24-volt integral control circuit, in lieu of integral thermostat, for heaters with remote thermostats indicated on Drawings.

H. FIELD INSTALLED CONTROLS
1. When indicated on Drawings, remote 24-volt wall mount thermostat, 40°F to 90°F adjustable, with auto/off switching sub-base and locking guard cover (clear plastic).

I. ACCEPTABLE MANUFACTURERS
1. Q-Mark
2. Berko
3. Brasch

2.9 ELECTRIC BASEBOARD

A. GENERAL: Provide manufacturers standard U.L. listed electric baseboard heater(s) designed for surface or floor mount of the type, size, material, characteristics, performance and with the accessories indicated on the Drawings or specified herein.

B. CASING
1. Galvanized steel back box, 20 gauge, with power supply and control wiring knock-outs, designed surface or floor mounting. Tamper resistant cold-rolled steel front panel, 16 gauge, welded uniform bar grille, manufacturers standard baked enamel finish with decorative satin-finish aluminum frame, color by architect.

C. ELECTRIC HEATING COILS
1. Non-glowing design, 80/20 nickel-chromium resistance wire enclosed in steel sheath with copper brazed plate fins, and five (5) year manufacturers warrantee.

D. DISCONNECT SWITCH:
1. Provide disconnect switch meeting manufacturers requirements and code requirements.

E. FACTORY INSTALLED CONTROL COMPONENTS
1. Automatic reset thermal overheat protection.
2. Built-in power disconnect switch.
3. Provide 24-volt integral control circuit, in lieu of integral thermostat, for heaters with remote thermostats indicated on Drawings.

F. FIELD INSTALLED CONTROLS & LINE VOLTAGE THERMOSTAT
1. Provide line-voltage wall mounted thermostat and baseboard mounted junction box and all required accessories for line-voltage thermostat installation and operation with equipment.
    a. Remote wall mount line voltage thermostat, 40°F to 90°F adjustable, with auto/off switching sub-base and locking guard cover (clear plastic).

G. ACCEPTABLE MANUFACTURERS
1. Runtal
2. Berko
3. Brasch

2.10 EXISTING LG VRF SYSTEM – NEW CEILING CONCEALED DUCTED UNIT

A. Products
1. Overview:
a. Add a new ducted ceiling concealed indoor unit onto the existing LG VRF system to serve the new scope of work area. This unit will tie into an open spare port on an existing LG branch box in the space. Provide all required connections, fittings, controls and wiring for integration of this new indoor unit into the existing system.
1) Basis of Design:
a) Make: LG
b) Model: ARNU183MAA4
b. Provide with new IACU-1-15 all required connections, fittings, controls and accessories for complete integration into the existing LG VRF System. Provide new thermostat matching in-kind the existing to be re-used thermostats serving the existing IACUs in the scope of work area for integration into the existing LG system.
c. Thermostat being utilized shall be re-used to serve the existing to remain IACUs.
d. Provide a Tamper Proof lockable cover for each scope of work thermostat (existing to be re-used and new Thermostats).
1) Make: SAFETY TECHNOLOGY INTERNATIONAL
2) Manufacturer Part Number: STI-9110
2. General
a. This section includes the design, performance, refrigerant details, controls and installation requirements for VRV systems (Variable Refrigerant Volume).
b. All units shall be listed and rated by ANSI/AHRI Standard 1230-2010 and meet all minimum IEER performance requirements as scheduled.
c. The units shall be ANSI/UL STD 1995 listed and listed by Electrical Testing Labs (ETL) and bear the cETL label.
d. All wiring shall be in accordance with the National Electric Code (NEC).
e. The system will be produced in an ISO 9001 and ISO 14001 facility, which are standards set by the International Standard Organization (ISO). The system shall be factory tested for safety and function.
f. The system and the design shall be in compliance with ASHRAE 15 Mechanical Refrigerant Code.
g. Acceptable manufacturers:
1) LG or Equivalent.
h. Alternate manufacturers shall send approval requests to engineer of record 14 days prior to bid day, and include all information relevant to the alternate VRF system, including but not limited to: unit selections, refrigerant piping layout, refrigerant charge with ASHRAE 15 analysis, branch selector box layout and locations, heating and cooling capacities at design temperatures and including capacity losses from piping lengths, defrost cycles, and combination ratios, dimensional and weight differences, and any other aspect of the system that differs from the system specified.

3. System Description

    a. Existing LG VRF system which varies the target evaporating and condensing temperatures based on building load and weather conditions to increase part load efficiency (Variable Refrigerant Temperature).
    b. Heat Recovery
        1) Existing system permits simultaneous heating and cooling of each indoor unit. Multiple indoor units connected to a single branch selector port shall operate in the same mode (heating or cooling), similar to a two-pipe heat pump system. Refer to the controls section of this specification for any central controller and/or mode switchover sequence that may be required.

4. Startup & Warranty

    a. Installing contractor must be certified by VRF manufacturer. The bidders shall be required to submit training certification proof with bid documents and submittal documents.
    b. The manufacturer shall provide a factory-trained service technician to start-up each unit. Manufacturer shall provide instruction to the owners' personnel on proper unit operation and maintenance.
    c. The warranty period on all parts and compressors shall commence on the date of initial start-up and shall continue for a period of ten (10) years not to exceed one hundred and twenty-six (126) months from date of shipment. Proper maintenance of the equipment shall be conducted by certified technicians as per the manufacturer or manufacturer’s representative requirements. Maintenance logs shall be supplied by the owner upon request.
    d. All manufacturer warranty shall be for parts only. All diagnosis and labor warranty shall be carried out by installing contractor as per the warranty requirements of this project.

5. Refrigerant Piping

    a. Refer and comply to the refrigerant piping specifications, including the special considerations for VRF refrigerant piping section.
    b. Standard T-style joints are not acceptable for a variable refrigerant volume system. Manufacturer-specific Y joints shall be supplied by the VRF manufacturer.

6. Concealed Ceiling Ducted Unit – (IACU-1-15)

    a. Indoor unit shall be a built-in ceiling concealed fan coil unit with variable speed direct drive DC type fan and auto CFM adjustment at commissioning. Casing shall be constructed of galvanized steel. Configuration shall be horizontal discharge air with horizontal return air, with a maximum height of 9-5/8’’ and be designed to fit in tight ceiling plenums.
    b. The indoor unit’s sound pressure shall range from 28 dB(A) to 36 dB(A) at low speed measured 5 feet below the ducted unit.
    c. The indoor units shall be equipped with a condensate pan and condensate pump. The condensate pump shall provide up to 25” of lift from the center of the drain outlet and have a built-in safety shutoff and alarm.
        1) Condensate pump shall be integral and powered by the unit.

d. The fan shall have a variable speed direct drive DC motor with statically and dynamically balanced impeller with 3 user-selectable fan speeds. The automatic fan speed mode shall allow the fan to vary between 5 speeds based on space load. The unit shall have logic for automatically adjusting external static pressure settings of the fan motor (selectable during commissioning).
e. The unit shall ship from the factory in a rear return configuration and shall be field convertible to a bottom return configuration.

7. Branch Selector Box
   a. Existing Branch Box shall be utilized by new IACU equipment.

8. Central Controls

   a. Existing LG central controls shall be utilized by new IACU equipment.

9. Electrical

   a. Independent electrical power for fan coils and branch selector boxes shall be 208/230 volts, 1 phase, 60 hertz. The unit shall be capable of operating within the limits of 187 volts to 253 volts.
   b. Unless limited by local electrical codes and standards, multiple fan coils and branch selector boxes can be connected to the same breaker. Field-provided individual disconnect switches for each fan coil are required.
   c. The control voltage between the indoor and outdoor unit shall be 16VDC. The control wiring shall be communication type stranded non-shielded 18-2 AWG.
   d. Control wiring shall be installed in a daisy chain configuration between all VRF components as per Manufacturer.

2.11 VIBRATION ISOLATION (NON-SEISMIC)

A. General

1. Manufacturer Responsibility
   a. Manufacturer of vibration equipment shall have the following responsibilities:
      1) Guarantee specified isolation system deflections.
      2) Provide installation instructions, drawings and field supervision to insure proper installation and performance of systems.
2. Quality Assurance
   a. All vibration isolators shall have calibration markings or some method to determine adjustment, the actual deflection under the imposed load after installation and adjustment.
   b. All isolators shall operate within the linear position of their load vs. deflection curves. Load vs. deflection curves shall be furnished by the manufacturer and must be linear over a deflection range of not less than 50% above the design deflection.
   c. The theoretical vertical natural frequency for each support point, based upon load per isolator and isolator stiffness, shall not differ from the design objectives for the equipment as a whole by more than +10%.
   d. Substitution of internally isolated equipment in lieu of the isolation specified in this section, is acceptable provided all conditions of this section are met. The

equipment manufacturer shall provide a letter of guarantee stating that the specified noise and vibration levels will be obtained or the cost of converting to the specified external vibration isolation shall be borne by the equipment manufacturer.

e. The following specifications describe spring hangers with 30-degree misalignment feature. This requirement is mandatory. the Contractor shall replace any hangers without the 30-degree capability discovered on site at no additional cost to WRTA.

B. Products

1. Description
   a. All vibration isolation devices shall be the product of a single manufacturer. Products of other manufacturers are acceptable provided their systems strictly comply with intent, structural design, performance, and deflections of the base manufacturer.
   b. Acceptable manufacturers of vibration isolation products shall be: Mason Industries, Amber Booth Company, Peabody Noise Control, Korfund Dynamics Corporation, Vibration Mountings and Equipment, Vibration Eliminator Co., provided they meet the requirements of this specification. Mason Industries model numbers have been used in this specification to establish quality of components, but are in no way to limit competitive bidding by other manufacturers.
   c. Refer to Table A at the end of this article for application of the various types listed to appropriate equipment and efficiency level.
2. Vibration Isolation Types
   a. Vibration Isolators
      1) Type A: Spring Isolator
         a) Having a minimum OD to OH of 0.8:1.
         b) Corrosion resistance where exposed to corrosive environment with:
         c) Springs cadmium plated or electro-galvanized.
         d) Hardware cadmium plated.
         e) All other metal parts hot-dip galvanized.
         f) Reserve deflection (from loaded to solid height) of 50% of rated deflection.
         g) Minimum ¼" thick neoprene acoustical base pad on underside.
         h) Designed and installed so that ends of springs remain parallel.
         i) Non-resonant with equipment forcing frequencies or support structure natural frequency.
         j) Mason Ind. Type SLF
      2) Type C: Spring hanger rod isolator.
         a) Spring element seated on a steel washer within a neoprene cup incorporating a rod isolation bushing.
         b) Steel retainer box encasing the spring and neoprene cup.
         c) When used on ductwork, provide eyebolts for attachment to duct straps.
         d) Mason Ind. Type H5, WHS
      3) Type D: Double deflection neoprene mountings.
         a) All metal surfaces shall be neoprene covered and have friction pads top and bottom.
         b) Be capable of .035" deflection at rated load.
         c) Steel rails shall be employed to compensate for overhang on units such as small vent sets, close coupled pumps, etc.
         d) Mason Ind. Type ND or Rails Type DNR.

4) Type F: Combination spring/elastomer hanger rod isolator.
   a) Spring and neoprene elements in a steel retainer box with the features as described for Type A and E isolators.
   b) Mason Ind. Type DNHS

3. Equipment Bases
   a. General
      1) All curbs and roof rails are to be bolted or welded to the building steel or concrete deck to attain 110 mph wind resistance requirement.
   b. Type B-4: Flashable Roof Rail System
      1) Rooftop fans, condensing units, air handlers, etc., shall be mounted on continuous support piers that combines equipment support and isolation into one assembly.
      2) Rails shall incorporate Type A isolators which are adjustable, removable and interchangeable after equipment has been installed.
      3) The system shall maintain the same installed and operating height with or without the equipment load.
      4) The system shall have full plywood nailers on all four sides, designed to accept membrane waterproofing and shall be dry galvanized or plastic coated.
      5) Unit to be supplied with flashing.
      6) Curbs shall be Mason Type R-7000 having a minimum 3" rated static deflection.
      7) Roof Rail Type: TRSLR

4. Flexible Connectors
   a. All connectors shall be installed on the equipment side of shutoff valves, horizontal and parallel to shafts whenever possible.
   b. Type FC-1: Elastomer connector
      1) Manufactured of nylon tire cord and EPDM, both molded and cured in hydraulic presses.
      2) Straight connectors to have two (2) spheres reinforced with a molded-in, external ductile iron ring between the spheres.
      3) Rated at 250 psi/170°F, dropping in a straight line to 170 psi/250°F for sizes 1½" to 12".
      4) Sizes 10" and 12" at 200 psi and greater operating pressure, to employ control cables with neoprene end fittings isolated from anchor plates by means of ½" bridge bearing neoprene bushings.
      5) Connectors shall be pre-extended per manufacturer's recommendation to prevent elongation under pressure.
      6) Minimum safety factor of 3.6:1 at maximum pressure ratings shall be certified by test reports. Submittals shall also include two test reports by independent consultants showing minimum reduction of 20 Db in vibration accelerations and 10 Db in sound pressure levels at typical blade passage frequencies.
      7) Connectors bolted to Victaulic or approved equal type couplings or gate, butterfly or check valves to have a minimum 5/8" flange spacer installed between the connector and the coupling flange.
      8) Neoprene in lieu of EPDM is not acceptable.
      9) Mason Ind. Super-Flex Types: MFTNC or NFTFU.

C. Execution

1. General
   a. Isolation systems must be installed in strict accordance with the manufacturer's written instructions. Vibration isolators shall not cause any change of position of equipment resulting in stress on equipment connections.
2. Equipment Installation
   a. Equipment shall be isolated as per Table A at the end of this section.
   b. Place floor mounted equipment on 4" high concrete housekeeping pads properly doweled or expansion shielded to the deck. Mount vibration isolators and/or bases on housekeeping pads. Concrete work specified in Section 033000 – CAST-IN-PLACE CONCRETE.
   c. Additional Requirements
      1) The minimum operating clearance under inertia bases shall be 2".
      2) The minimum operating clearance under other bases shall be 1".
      3) All bases shall be placed in position and supported temporarily by blocks or shims, as appropriate, prior to the installation of the machine, isolators.
      4) The isolators shall be installed without raising the equipment.
      5) After the entire installation is complete, and under full operational load, the isolators shall be adjusted so that the load is transferred from the blocks to the isolators are properly adjusted, shall be barely free and shall be removed. Remove all debris from beneath the equipment and verify that there is no short circuits of the isolation. The equipment shall be free in all directions.
      6) Install equipment with flexibility in wiring.
3. Piping and Ductwork Isolation
   a. All piping and ductwork is included in this section.
   b. Installation
      1) Isolate piping and ductwork outside shafts as follows:
         a) All in mechanical rooms.
         b) All exposed on roof.
         c) All within 50 ft. or 100 pipe diameters (whichever is greater) from connected rotating or reciprocating equipment and pressure reducing stations.
         d) Control air piping, from compressor discharge to receiver.
      2) The isolators shall be installed with the hanger box attached to, or hung as closely as possible to the structure.
      3) The isolators shall be suspended from substantial structural members sized for 0.08" deflection at center of span, not from slab diaphragm, unless specifically permitted.
      4) Hanger rods shall not short circuit the hanger box.
      5) Horizontal suspended pipe 1¼" to 2" and all steam piping shall be suspended by Type E isolators with a minimum 3/8" deflection. Water pipe larger than 2" shall be supported by Type F isolators with a minimum 1" deflection or same deflection as equipment for the first 3 locations nearest equipment whichever is greater.
         a) Type L hangers may be substituted for the above.
      6) Ductwork shall be supported by Type C (WHS) hangers.
      7) Horizontal floor and roof supported pipe shall be the same as C.3.b.5 except use isolators Type D and Type A, respectively.
      8) Vertical riser pipe supports under 2" diameter shall utilize Type H isolation.
      9) Vertical riser guides, if required shall avoid direct contact of piping with the building.
      10) Pipe anchors or guides where required, shall utilize Type K isolators.

11) Riser sway supports, where required, shall utilize two (2) neoprene elements (Type G or H) to accommodate tension and compression forces.
12) Pipe extension and alignment connectors: Provide Type FC-2 connectors at riser takeoffs, cooling and heating coils and elsewhere as required to accommodate thermal expansion and misalignment.
13) Install Type FC-1 flexible connectors at all connections of pipe to equipment such as pumps, chillers, cooling towers and as shown on the drawings.
14) Install FC-2 type connectors at all locations which exceed temperature limitations of FC-1.
15) For control air piping, provide two flexible connectors Type FC-2 90° to each other in the compressor discharge piping to the receiver. When the receiver is remote from the compressor, isolate the piping between the compressor and receiver with Type C isolators having 3/8" deflection. The receiver shall be isolated with Type D isolators having 3/8" deflection.

4. Inspection
   a. Upon completion of installation of all vibration isolation devices, the local representative shall inspect the complete project and certify in writing to the Contractor that all systems are installed properly, or require correction. The Contractor shall submit a report to WRTA's Project Manager, including the representative's report. Certifying correctness of the installation or detailing corrective work to be done.

TABLE A

			NON-CRITICAL			CRITICAL		
EQUIPMENT	HP	MTNG	ISOL	DEFL	BASE	ISOL	DEFL	BASE
Condensate Pumps		Flr	D	.30	J	D	.30	J
Fan Coil Units		Flr Clg	D -	.30 - -	-- --	A C	.75 .75	-- --

*Used on vertically arranged units. Rails to be 1½ times the unit height.

DEFL. GUIDE	
RPM	DEFL
< 400	3.5"
< 600	2.5
> 600	1.5

5. Notes:
   a. "ISOL" and "BASE" column indicates letter type as appears in the specs.
   b. "MTNG" refers to method of support of equipment from the structure.
   c. "SEE GUIDE" indicates isolator deflection selection to be taken from RPM/DEFLECTION Guide at bottom of table.

2.12 EXISTING AUTOMATIC TEMPERATURE CONTROLS (DIRECT DIGITAL CONTROL)

A. General

1. The existing facilities BMS system is unknown; it is assumed that the existing system utilizes BACNET IP communications for monitoring and/or control of all equipment at this facility at the facilities head end but this is required to be confirmed. The roof mounted ERV serving the scope of work space is believed to be controlled by this existing BMS.

2. The existing LG VRF system at this facility is controlled by local programmable thermostats. It is believed these thermostats communicate back to a centralized LG local controller but this requires confirmation. This existing LG VRF control system will require reconfiguration to serve the new space layout as proposed as part of this project, relocate existing thermostats and control wiring as required to serve new space zone layouts.

3. New IACU-1-15 will be added onto the existing LG VRF system, provide all required controls, equipment and accessories for integration of this unit into the existing system. Provide a new thermostat matching the existing IACU thermostats in-kind.

4. Provide complete direct digital (DDC) system of automatic temperature control system with BACNET IP capability.
   a. The new DDC system must be 100% compatible and capable of seamless communication with the existing BMS system and LG local controllers.
   b. All systems shall be provided directly by the manufacturers listed above. DEALERS OR REPRESENTATIVES ARE NOT ACCEPTABLE. The manufacturer must provide full support throughout the guarantee period.
5. Provide the services of control manufacturers representative to be on site during the entire time that the startup testing and balancing procedures, detailed in Part 3 of this specification, takes place. Representative shall be part of manufacturers service organization and shall be skilled in the adjustment and calibration of all control devices as well as being capable of modifying and checking system software.

6. Certify maintenance of local office within 50-mile radius of job site, staffed with factory trained engineers capable of providing instructions to User Agency's personnel, and performing routine and emergency maintenance on ALL system components. Upon Designer's request, submit list of personnel staffing field office and their professional disciplines.
7. Provide DDC system supplier's warranty of performance of entire system required by Contract documents. Performance and components requirements are established by control sequences and diagrams on Drawings and by this Paragraph.
8. DDC components shall be capable of proportional-integral-derivative (PID) control. Pneumatic components shall be fully proportioning unless otherwise noted.
9. DDC system shall perform all sequences of operation which may be listed on control drawings or attached to this specification. Controls supplier shall provide all devices necessary to completely perform sequences whether such devices are explicitly shown on the drawings specified, or not shown or specified.
10. Refer to applicable equipment PART 2-PRODUCTS for additional control information.

B. Submittals

1. This Paragraph supplements provisions of Submittals Paragraph of this Section.
2. Materials and equipment for which Shop Drawing and Product Data submittal are required shall include but shall not be limited to:
   a. Each control system.
   b. Control components including:
      1) temperature, humidity, current and static pressure sensors,
      2) direct digital field control panels,
      3) automatic control valves,
      4) electric wiring,
      5) transducers, and
      6) solenoids and other electrical components.
   c. I/O devices (including CRT, line printer, modems, and necessary interface devices).
   d. Software.
   e. Point list.
   f. Detailed network diagram showing DDCFPs and communication links.
3. Submit the following for approval:
   a. Control drawings with detailed piping and wiring diagrams, including bills of materials and written description of operation, for each system.
   b. Panel faceplate layouts showing gauges, lights, indicators and switches with instrument ranges and nameplate inspections for local and central panels.
   c. Valve and damper schedules showing sizes, configurations, capacities, pressure drops and locations of equipment.
   d. Data sheets for control system components.
   e. Complete software information including names of software packages provided, control sequences performed including flow chart logic diagrams, complete information on user programmability (commands, language details, programming sequences, etc.), and complete description of operating system.
4. Provide initial design and as-built construction drawings to User Agency's operating personnel.
5. Provide narrative descriptions of sequences of operation. Descriptions shall not merely duplicate specified sequences of operations.

C. Provide services of control supplier's field engineer to supervise work specified in other Paragraphs of this Section:

1. Installation of automatic valves and separable wells furnished under this Paragraph.
2. Provision of necessary valved pressure taps, water drain and overflow connections and piping.
3. Provision of auxiliary contacts on magnetic starters with buttons and switches in required configurations.
4. Installation of automatic dampers.
5. Provision of blank off plates (safing) required to install dampers smaller than duct size.
6. Assembly of multiple section dampers with interconnecting linkages and extension of shafts through duct for external mounting of damper motors.
7. Provision of sheet metal baffle plates to eliminate stratification and provide air volumes specified. Locate by experimentation; affix permanently when stratification is eliminated.
8. Provision of access doors or other approved means of access through ducts for service to control equipment.

D. Guarantee control system free from defects in material and workmanship and guarantee performance of systems as required by Contract Documents for one year of normal use and service beginning on date WRTA begins to receive beneficial use of system.

2.13 SEQUENCE OF OPERATION

A. Refer to plans for equipment sequence of operations.

2.14 ACCESS DOORS

A. Provide proper access to materials and equipment that require inspection, replacement, repair or service and coordinate their delivery with the installing Trade. If proper access cannot be provided, confer with Designer as to best method of approach for minimizing effect of reduced access which may result.

B. Coordinate and prepare a location, size, and function schedule of access panels required to fully service equipment and deliver to a representative of the installing Trade. Furnish and install distinctively colored buttons (color as selected by Designer) in finished ceiling to identify all access panels.

C. Furnish access panels for installation under other Sections where fire dampers, volume dampers, controls, shut off valves, control valves, check valves, or other items installed under this Section require access and are concealed in floor, wall, furred space or above ceiling.

D. Ceilings consisting of lay-in or removable splined tiles do not require access panels and dampers, splitters, or test hole openings above ceiling shall have location marked with thumb tack on finished ceiling panel. Location shall be noted on record drawings.

E. Furnish access doors and frames for walls and ceilings to applicable trades for installation. Size as required for access and maintenance, minimum 16 by 16 inches.

F. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. J. L. Industries, Inc, Inc.
2. Karp Associates, Inc.
3. Larsen's Manufacturing Company.
4. Milcor Inc.
5. Nystrom, Inc.

G. Flush Access Doors and Trimless Frames: Fabricated from steel sheet.

1. Locations: Wall and ceiling surfaces as applicable.
2. Door: Minimum 0.060-inch-thick sheet metal, set flush with surrounding finish surfaces.
3. Frame: Minimum 0.060-inch-thick sheet metal with suitable bead flange.
4. Hinges: Continuous piano.
5. Lock: Cylinder, keyed alike.

H. Fire-Rated, Insulated, Flush Access Doors and Trimless Frames: Fabricated from steel sheet.

1. Locations: Wall and ceiling surfaces as applicable.
2. Fire-Resistance Rating: Not less than that of adjacent construction.
3. Temperature Rise Rating: 250 deg F at the end of 30 minutes.
4. Door: Flush panel with a core of mineral-fiber insulation enclosed in sheet metal with a minimum thickness of 0.036 inch.
5. Frame: Minimum 0.060-inch thick sheet metal with suitable bead flange.
6. Hinges: Continuous piano.
7. Automatic Closer: Spring type.
8. Lock: Self-latching device with cylinder lock, keyed alike.

PART 3 - EXECUTION

3.1 COMMISSIONING OF EQUIPMENT AND SYSTEMS

A. The Designer will check the completed installation either sequentially as different parts are completed, or when the entire installation is complete, at the sole option of the Designer.

B. Prior to the Designer's checking a part of the installation or the entire installation, this contractor shall submit a letter signed by an officer of this contracting company or an officer of the Construction Manager stating that:

1. he is a an officer of the company,
2. he has personally inspected the installation to be checked,
3. the date of his inspection,
4. the installation is complete and tested and ready to be inspected by the Designer, and that all required test reports have been submitted.

C. This contractor shall arrange that an officer of this contracting company or of the Construction Manager, as well as WRTA's Project Manager, in addition to other test witnesses that may be specified, shall witness the below listed tests. At the conclusion of each such test this contractor shall submit a letter signed by the officer stating that:

1. he is an officer of the company,
2. he has personally witnessed the test (give the name of the test),
3. the date of testing,
4. the results of testing, as compared to specified performance,
5. listing the name, title, and company affiliation of all those witnessing the test.

D. Tests Requiring Letters:
HVAC:

VRF System operation and controls
Electric baseboard integration with VRF system

3.2 SPECIAL RESPONSIBILITIES

A. Coordination: Cooperate and coordinate with work of other Sections in executing work of this Section.

1. Perform work such that progress of entire project including work of other Sections shall not be interfered with or delayed.
2. Provide information as requested on items furnished under this Section which shall be installed under other Sections.
3. Obtain detailed installation information from manufacturers of equipment provided under this Section.
4. Obtain final roughing dimensions or other information as needed for complete installation of items furnished under other Sections.

5. Keep fully informed as to shape, size and position of openings required for material or equipment to be provided under this and other Sections. Give full information so that openings required by work of this Section may be coordinated with other work and other openings and may be provided for in advance. In case of failure to provide sufficient information in proper time, provide cutting and patching or have same done, at own expense and to full satisfaction of Designer.
6. Provide information as requested as to sizes, number and locations of concrete housekeeping pads necessary for floor-mounted vibrating and rotating equipment provided under this Section.
7. Notify Designer of location and extent of existing piping, ductwork and equipment that interferes with new construction. In coordination with and with approval of Designer, relocate piping, ductwork and equipment to permit new work to be provided as required by Contract Documents. Remove nonfunctioning and abandoned piping, ductwork and equipment as directed by Designer. Dispose of or store items as requested by Designer.

B. Installation-only Items

1. Where this contractor is required to install items which it does not purchase, it shall coordinate their delivery and be responsible for their unloading from delivery vehicles and for their safe handling and field storage up to the time of installation. This trade shall be responsible for:
   a. Any necessary field assembly and internal connections, as well as mounting in place of the items, including the purchase and installation of all dunnage supporting members and fastenings necessary to adapt them to architectural and structural conditions.
   b. Their connection to building systems including the purchase and installation of all terminating fittings necessary to adapt and connect them to the building systems.
2. This contractor shall carefully examine such items upon delivery. Claims that any of these items have been received in such condition that their installation will require procedures beyond the reasonable scope of work of this contractor will be considered only if presented in writing within one week of their date of delivery. Unless such claims have been submitted this contractor shall be fully responsible for the complete reconditioning or replacement of the damaged items.

C. Maintenance of equipment and systems: Maintain HVAC equipment and systems until Final Acceptance. Ensure adequate protection of equipment and material during delivery, storage, installation and shutdown and during delays pending final test of systems and equipment because of seasonal conditions. Do not use boilers before providing water treatment where required; this includes use of boilers for temporary heat or for testing.

D. Use of premises: Use of premises shall be restricted as directed by Designer and as required below.

1. Remove and dispose of dirt and debris, and keep premises reasonably clean. Upon completion of work, remove equipment and unused material. Put building and premises in neat and clean condition, and do cleaning and washing required to provide acceptable appearance and operation of equipment, to satisfaction of Designer and as specified under CLEANING paragraph.
2. It shall be this trade's responsibility to store his materials in a manner that will maintain an orderly clean appearance. If stored on site in open or unprotected areas, all equipment

and material shall be kept off the ground by means of pallets or racks, and covered with tarpaulins.

3. Do not interfere with function of existing sewers and water and gas mains. Extreme care shall be observed to prevent debris from entering ductwork. Confer with Designer as to disruption of heating services or other utilities due to testing or connection of new work to existing. Interruption of heating services shall be performed at time of day or night deemed by Designer to provide minimal interference with normal operation. Obtain Designer's approval of the method proposed for minimizing service interruption.

E. Surveys and measurements:

1. Base measurements, both horizontal and vertical, on reference points established by Contractor and be responsible for correct laying out of work.
2. In event of discrepancy between actual measurements and those indicated, notify Designer in writing and do not proceed with work until written instructions have been issued by Designer.

F. Fireproofing:

1. Clips, hangers, clamps, supports and other attachments to surfaces to be fireproofed shall be installed, insofar as possible, prior to start of spray fiber work.
2. Ducts, piping and other items which would interfere with proper application of fireproofing shall be installed after completion of spray fiber work.
3. Patching and repairing of spray fireproofing due to cutting or damaging to fireproofing during course of work specified under this Section shall be performed by installer of fireproofing and paid for by trade responsible for damage and shall not constitute grounds for an extra to WRTA.

G. Gypsum Drywall Enclosures:

1. Coordinate and supervise construction of drywall and related work affecting work of this Section.
2. Work shall include but not be limited to following:
   a. Supply and return air duct enclosures on rooftop air handling units.
   b. Supply air plenums located above labs and computer rooms.
   c. Return air shafts.
3. Ensure tightness of plenums and chases used as part of air distribution system. System will not be accepted until proved tight, without leakage. Notify Designer in writing after system test for leakage, if construction and finish of plenums and ducts are not satisfactory.

H. Temporary Heat:

1. Special reference is made to Section 015000, TEMPORARY FACILITIES AND CONTROLS.

2. Coordinate work under this Section with progress of construction so that permanent heating system will be ready to provide temporary heating if permitted by Designer as soon as building is closed in.

3. Provide and direct labor required for attendance, operation and final restoration of permanent heating system if used for temporary heating purposes. Continuous direct attendance shall be provided whenever permanent system is in operation prior to acceptance of permanent heating system by WRTA's Project Manager.

3.3 MATERIALS AND WORKMANSHIP

A. Work shall be neat and rectilinear. Ductwork and piping shall run concealed except in mechanical rooms and areas where no hung ceiling exists. Install material and equipment as required by manufacturers. Installation shall operate safely and without leakage, undue wear, noise, vibration, corrosion or water hammer. Work shall be properly and effectively protected, and pipe and duct openings shall be temporarily closed to prevent obstruction and damage before completion.

B. Except as specified otherwise, material and equipment shall be new. Provide supplies, appliances and connections necessary for complete and operational installation. Provide components required or recommended by OSHA and applicable NFPA documents.

C. References to manufacturers and to catalog designation, are intended to establish standards of quality for materials and performance but imply no further limitation of competitive bidding.

D. Finish of materials, components and equipment shall be as approved by Designer and shall be resistant to corrosion and weather as necessary.

E. WRTA will not be responsible for material and equipment before testing and acceptance.

3.4 CONTINUITY OF SERVICES

A. Do not interrupt existing services without the WRTA Project Manager's approval.

B. Schedule interruptions in advance, according to the WRTA Project Manager's instructions. Submit, in writing, with request for interruption, methods proposed to minimize length of interruption.

C. Interruptions shall be scheduled at such times of day and work so that they have minimal impact on the User Agency's operations.

3.5 TAGS

A. Upon completion of work, attach engraved laminated tags to all valves (listed in the valve directory called for in the "Bulletins, Manuals and Instructions" paragraph of these specifications) and all pieces of HVAC equipment (including but not limited to pumps, fans, air handlers, coils and all other equipment listed in the HVAC schedules). Valve tags shall have black characters on white face, consecutively numbered and prefixed by letter "V". Equipment tags shall have black characters on white face, with labels corresponding to drawing schedule numbers.

B. Embossed or engraved aluminum or brass tags may be substituted if desired. Tags shall be at least 1/8" thick.

C. Valve tags shall be at least 1" in diameter with numerals at least 3/8" high and attached by "S" hooks or chains. Equipment tags shall be at least 2" diameter securely attached to apparatus.

D. Provide manufacturers equipment nameplates, catalog numbers and rating identification securely attached to electrical and mechanical equipment with screws or rivets. Adhesives or cements will not be permitted.

3.6 PIPE AND DUCT IDENTIFICATION

A. Ductwork shall be stenciled at each junction or branch takeoff, at least once in each room, and at intervals not longer than 20 ft. Stencil shall clearly identify duct service (S for supply, R for return, X for exhaust), area served by branch, and arrow indicating direction of flow.

B. Provide color coded pipe identification markers on piping installed under this Section. Pipe markers shall be snap on laminated plastic protected by clear acrylic coating. Pipe markers shall be applied after architectural painting where such is required.

C. Provide arrow marker with each pipe content marker to indicate direction of flow. If flow can be in either direction, use double headed arrow marker.

D. Mains shall be labeled at points of entrance and exit from mechanical room, adjacent to each valve, on each riser, at each tee fitting, at points of entrance and exit from building, at least once in each room, and at intervals no longer than 20 ft.

E. Size of legend letters on markers and length of color field shall be per the latest edition of ANSI A13.1.

F. Markers shall be "Setmark" by Seton Name Plate Corp. or approved equal.

G. Following color coding shall be used with names in black letters on background and white letters on green background.

Service	Legend	Background Color
Condensate	Condensate	Yellow
Refrigerant Gas Return	RGR	Yellow
Refrigerant Liquid Supply	RLS	Yellow

H. Color banding shall meet latest edition of ANSI A13.1 and OSHA.

3.7 PENETRATIONS AND SLEEVES

A. General

1. Provide pipe and duct sleeves and packing materials as specified and as shown on Drawings at penetrations of foundations, walls, slabs (except on grade), partitions and

floors. Sleeves shall meet NFPA 101 requirements and materials requirements of Part 2 of this Section.

2. Coordinate work carefully with architectural and structural work. Set sleeves in forms before concrete is poured. Provide core drilling as necessary if walls are poured, or otherwise constructed, without sleeves and a wall penetration is required. Provide core drilling as required for penetrations of existing construction. Do not penetrate structural members without Designer's approval.
3. Sleeves for insulated pipe and duct in non-fire rated construction shall accommodate continuous insulation without compression. Sleeves and/or penetrations in fire rated construction shall be packed with fire rated material which shall maintain the fire rating of the wall. Seal ends of penetrations to provide continuous vapor barrier where insulation is interrupted. See Part Two of these specifications for requirements for packing materials.
4. Sleeves through floors shall be watertight and shall extend 2" above floor surface.

B. Pipe Sleeves

1. Annular space between pipe and sleeve shall be at least 1/4".
2. Sleeves are not required for slabs on grade unless specified otherwise.
3. Sleeves and packing materials, through rated fire walls and smoke partitions shall maintain fire rating of construction penetrated.
4. Do not support piping risers on sleeves.

C. Duct Sleeves and Prepared Openings

1. Provide duct sleeves for round ducts 15" and smaller; provide prepared, framed openings for round ducts larger than 15" and for square, rectangular and flat oval ducts, except as specified otherwise. Sleeves shall meet SMACNA requirements.
2. Provide sleeves for ducts through 1, 2 or 3 hour fire rated construction and smoke partitions, regardless of size and shape of ducts. Sleeves shall maintain fire rating of construction penetrated. Sleeve and seal materials, construction and clearances shall meet requirements of SMACNA Fire Damper and Heat Stop Guide for Air Handling Systems.
3. Prepared openings shall be framed to provide 1" clearance between framing and duct or duct insulation.

D. Installation Testing, Listings and Approvals

1. Installation shall meet material manufacturer's recommendations exactly, particularly as regards safety, ventilation, removal of foreign materials and other details of installation. Dam openings as recommended. Remove flammable materials used for damming and forming seals in fire rated construction.
2. Sleeve penetration methods shall be water and gas tight and shall meet requirements of ASTM E 119 Standard Methods of Fire Tests of Building Construction and Materials.
3. Fire stop penetration seal methods and materials shall be FM approved and UL listed as applicable.
4. Inspect foamed sealants to ensure manufacturer's optimum cell structure and color ranges.

3.8 ANCHORS AND INSERTS

A. Inserts shall be iron or steel of type to receive machine bolt head or nut after installation. Inserts shall permit adjustment of bolt in one horizontal direction and shall develop strength of bolt when installed in properly cured concrete.

B. Provide anchors as necessary for attachment of equipment supports and hangars.

3.9 INSTALLATION OF EQUIPMENT

A. Avoid interference with structure and with work of other trades, preserving adequate headroom and clearing doors and passageways, to satisfaction of Designer and in accordance with code requirements. Installation shall permit clearance for access to equipment for repair, servicing and replacement.

B. Install equipment so as to properly distribute equipment loads on building structural members provided for equipment support under other Sections. Roof mounted equipment shall be installed and supported on structural steel provided under other Sections.

C. Provide suspended platforms, strap hangers, brackets, shelves, stands or legs as necessary for floor, wall or ceiling mounting of equipment provided under this Section (e.g. heating and ventilating units, fans, ducts and piping) as indicated on Drawings and in Specifications.

D. Provide steel supports and hardware for proper installation of hangers, anchors, guides, etc.

E. Provide cuts, weights, and other pertinent data required for proper coordination of equipment support provisions and installation.

F. Structural steel and hardware shall conform to Standard Specifications of ASTM; use of steel and hardware shall conform to requirements of Section Five of Code of Practice of American Institute of Steel Construction.

G. Verify site conditions and dimensions of equipment to ensure access for proper installation of equipment without disassembly which will void warrantee. Report in writing to Designer, prior to purchase or shipment of equipment involved, on conditions which may prevent proper installation.

3.10 PAINTING

A. Equipment installed under this Section shall have shop coat of non lead gray paint. Hangers and supports shall have one coat of non lead red primer. Machinery such as pumps, fans, etc., shall be stenciled with equipment name. Stencil shall be at least 6" high for large equipment, 2" high for small equipment. Finish painting, including painting of various piping and duct systems, shall be done under other Sections.

B. Note requirement for Designer’s approval invoked under Part 3 article, MATERIALS AND WORKMANSHIP regarding finish of material and equipment which are visible or subject to corrosive or atmospheric conditions.

3.11 EXPANSION PROVISIONS

A. Installation of piping must allow for expansion using offsets, loops, swing joints, expansion joints, etc. as shown and as necessary to prevent undue strain. Take offs from mains to runouts shall not have less than three elbow swing.

B. Mains and risers with loops or offsets shall be securely anchored to structure so as to impart expansion towards loops or offsets. Anchors shall be constructed of heavy forged wrought iron, secured to pipe and to structure. Provide vibration isolation as required.

C. Provide pipe alignment guides as required to guide expanding pipe to move freely from anchor points toward expansion joints, offsets, etc.

3.12 CLEANING

A. Ductwork

1. Ducts shall be thoroughly cleaned so that no dirt or dust shall be discharged from diffusers, registers or grilles, when system is operated.
2. Provide temporary connections required for cleaning. Provide cheesecloth for openings during cleaning.
3. Replace filters prior to final inspection and testing.

B. Piping

1. Furnish pipe cleaning chemicals, chemical feed equipment, materials and labor necessary to clean piping.
2. Permanently install necessary chemical injection fittings complete with stop valves.
3. Refrigerant and condensate piping have been pressure tested and approved for tightness, clean and flush piping specified under WATER TREATMENT Paragraph.
4. Maintain continuous blowdown and make up, as required during flushing operation.

C. Equipment

1. After completion of project, clean the exterior surface of equipment included in this section, including concrete residue.

3.13 STARTUP, TESTING AND BALANCING

A. General

1. Provide qualified personnel, equipment, apparatus and services for start-up, testing and balancing of mechanical systems, to performance data shown in schedules, as specified, and as required by codes, standards, regulations and authorities having jurisdiction including City Inspectors, WRTA’s Project Manager and Designer. Note that some ATC start up procedures listed below require the cooperation of the balancing contractor and the rooftop unit manufacturer's representative (if rooftop units are involved) and some balancing procedures require the cooperation of the ATC contractor and the rooftop units manufacturer representative (if appropriate). Ensure that all contractors are present on

site during the entire time that these procedures take place. Note that some procedures listed below have a distinct order of precedence, e.g., the testing of the temperature control system shall not occur until major pieces of mechanical equipment have been started up and testing is complete. Ensure that any listed orders of precedence for procedures are followed.

2. Startup, testing and balancing shall not diminish guarantee requirements.
3. Notify Designer and authorities involved at least two weeks before startup testing and balancing begins.
4. Before temperature control testing begins a meeting shall be held between the HVAC engineer, the balancing contractor, the automatic temperature control contractor and the mechanical contractor. The mechanical contractor shall present the HVAC engineer with the completed checklists (contained in this specification) certifying that equipment startup and testing has been completed. The temperature control contractor shall then present his procedures for testing the ATC system to the HVAC engineer for review and approval. Allow one full day for this meeting.
5. When the temperature control testing has been completed a second meeting shall be held. At this time the temperature control contractor shall present the HVAC engineer with the completed controls startup checklist (contained in this specification). The balancing contractor shall present HVAC engineer with certificates of calibration for balancing instruments, proposed balancing forms and proposed balancing procedures to the HVAC engineer, for review and approval. Allow one full day for this meeting.
6. If, through no fault of the Designer, the above two meetings do not take place and the temperature control startup and balancing proceeds the following shall occur.
    a. All balancing reports shall be rejected.
    b. The contractors requisition for monies covering the ENTIRE portion of the testing and balancing work will be rejected. Others will be hired to complete the work. These requirements shall be strictly enforced.

7. Do not cover or conceal work before testing and inspection and obtaining approval.
8. Instruments for testing and balancing shall have been calibrated within one month prior to testing and balancing. Calibration shall be traceable to NBS Standards. Provide Photostat of certificate of calibration to Designer's representative at meeting demonstrating balancing procedures mentioned in Paragraph 4 above.
9. Leaks, damage and defects discovered or resulting from startup, testing and balancing shall be repaired or replaced to like new condition with acceptable materials. Tests shall be continued until system operates without adjustments or repairs.
10. Report on reporting forms, submitted to Designer for approval in advance, and on forms provided by Designer.
11. For each piece of equipment, copy nameplate data and include in report.
12. Submit six copies of testing and balancing reports to Designer for approval.
13. Provide capacity and performance of equipment by field testing. Install equipment and instruments required for testing, thermo wells and gauge connections at no additional cost to WRTA.
14. Qualified representative of equipment manufacturer shall be present at test.
15. Startup, testing and balancing procedures outlined below are the minimum effort required for the project. Contractor shall use any additional procedures he feels will be necessary to properly startup, test and balance the job.

B. Equipment Startup & Retro Commissioning

1. Start up / Retro Commission the following pieces of equipment in strict accordance with manufacturers instructions and with manufacturers representative present:
   a. Existing VRF Air Cooled Condensing Unit (ACCU-1)
   b. Existing Roof Mounted makeup air unit serving space (MAU-1)
   c. Existing & New VRF Fan coil(s) – Indoor Units (Existing IACUs & New IACU)
   d. New VRF Fan coil(s) – Indoor Unit
   e. Existing VRF Branch Box(s)
   f. Complete the following checklist to certify to the Designer that startup of the above pieces of equipment has successfully been accomplished. Copy multiple checklists as required. Edit inappropriate items as required.

EQUIPMENT LIST	DATE CONFIRMED	MANUFACTURERS REPRESENTATIVE NAME AND SIGNATURE	CONSTRUCTION MANAGER REPRESENTATIVE NAME AND SIGNATURE
Roof Mounted VRF Air Cooled Condensing Unit - (E)ACCU-1 (LIST NOS. BELOW)			
Roof Mounted Existing Makeup Air & Exhaust Unit – (E)MAU-1 (LIST NOS. BELOW)			
1st Floor Existing VRF Branch Box's (LIST NOS. BELOW)			
1st Floor Existing VRF Fan coil(s) – Indoor Units – ((E)IACUs) (LIST NOS. BELOW)			
1st Electric Unit Heater and Electric Baseboard (LIST NOS. BELOW)			
1st Floor NEW VRF Fan coil – Indoor Unit (IACU-1-15) (LIST NOS. BELOW)			

C. Equipment and Piping Testing

1. Tests: No tests shall be started until systems have been cleaned as described under CLEANING Paragraph. Provide temporary piping and connections for testing, flushing or draining systems to be tested. If leaks develop, repairs shall be made and tests repeated. Tests shall be continued until systems operate without adjustments and repair

to equipment or piping. Tests are further specified under other paragraphs of this Section. Test requirement specifically includes, but is not limited to the following:

a. Existing VRF System.
b. Existing Makeup Air & Exhaust System.
c. New electric baseboard operation.
d. New electric unit heater operation.

2. Existing Refrigeration System
    1) The existing LG VRF system 1st floor IACU(S) and their associated refrigerant piping locations shall be modified as part of this work. Contractor shall drain entirety of (E)ACCU-1's refrigerant and all associated IACU(S), Branch Box(s) and piping prior to start of work. System shall be recharged with Refrigerant at completion of new work. Follow all code and manufacturer recommended guidelines.
        a) The existing LG VRF system being modified as part of this work will require a refrigerant trim charge update to accommodate the inclusion of new IACU-1-15 into the existing system. Contact: Steve Magnus of APA HVAC Technologies at PHONE: 781-805-5369 EMAIL: SMAGNUS@APAV.COM for assistance with calculating the appropriate trim charge to be used for this system.
    2) Test refrigeration systems for refrigerant and air leaks at least twice: Approximately six months after start up and at end of guarantee period.
    3) Use electronic refrigerant detector for leak detection.
    4) Leaks detected shall be properly sealed and above test repeated.
    5) Test pressures shall be 300 psi for high pressure side and 150 psi for low pressure side.
    6) Replace refrigerant and oil lost during guarantee period at no cost to WRTA.
    7) Certify condition of system in writing after test.
3. When testing is complete fill in the following checklist certifying satisfactory completion of testing. Make multiple copies of checklist as required, edit out items which are not appropriate.

EQUIPMENT AND PIPING TESTING CHECKLIST

TEST ITEM	DATE CONFIRMED	MANUFACTURERS REPRESENTATIVE NAME AND SIGNATURE	CONSTRUCTION MANAGERS REPRESENTATIVE NAME AND SIGNATURE
REFRIGERATION SYSTEM LEAK TESTS			

D. Air Balancing

1. General
   a. Provide qualified personnel, equipment and services for balancing and adjusting of mechanical systems. Submit resumes at demonstration of balancing meeting.
   b. Personnel shall be experienced and qualified to perform, record, and evaluate all procedures contained here and/or as outlined on drawings.
   c. For each air handler on job, provide, under the work of the mechanical section, one spare sheave of size to be determined after traverses are complete.
   d. Submit procedures, recording forms, and test equipment for review prior to balancing, as described in Paragraph A.4 above.
      1) Balancing procedure or sequence is contained herein.
      2) Recording forms used for balancing must be submitted to Designer for approval before balancing is started.
         a) Failure to submit forms will result in rejection of entire submittal.
         b) Submit description of balancing equipment being used.
      3) Balancing shall not begin until system has been installed complete and capable of normal operation.
         a) All grilles, dampers, fans, coils, valves and linkages shall be installed and operating prior to balancing.
         b) System shall be capable of operating under control as specified on drawings and/or contained herein.
      4) Independent balancing agency shall have the following qualifications:
         a) Agency is known to have specialized in balancing commercial HVAC system for at least 3 years.
         b) Agency shall provide proof of qualifications to Designer's satisfaction. Qualification shall include submitted at least three sample balancing reports prepared for commercial HVAC system over 100,000 ft^2 in floor area.
         c) Agency employed balancing technicians shall be qualified to balance HVAC system to Designer's satisfaction. Submit resume of technician.
         d) At least one balancing technician shall remain on from start to acceptance of final balance report.
         e) Agency shall be approved by Designer.
         f) Balancing shall be performed by one of the following agencies:
            - Airflow Associates
            - E. Barrett
            - John Coffey and Associates
            - Leonhardt
            - Scott TBA Inc. (Manchester, NH)
            - Wings Air Balance (Brandford, CT)
2. Air System Balancing
   a. Testing agency shall balance, adjust and test motors, systems, air moving equipment and distribution, supply, return and exhaust systems, as follows:
      1) Adjust blower rpm to design requirements and record. Test and record motor full load amperes.
      2) Make pitot tube traverse of main supply, return and exhaust and obtain design cfm at fans.
      3) Test and record system static pressure, suction and discharge.
      4) Test and record entering air temperatures.

5) Balance and adjust supply air systems in finished areas of building:
   a) Balance and adjust as required to deliver volume of air at each air outlet within 10% of design flow shown on Drawings.
   b) Readjust air volumes after occupancy, as required to properly balance heating and cooling loads throughout conditioned areas.
6) Balance supply air systems in unfinished areas:
   a) Supply air systems shall be balanced after installation of items related to same systems with exception of duct taps to air diffusers in interior zones.
   b) Balance as required to deliver air volume at outlets within 10% of design flow shown on Drawings.
   c) Provide sufficient temporary openings in interior zone duct systems to adjust interior zone air volumes.
   d) Readjust air volumes after completion and occupancy, as required to properly balance heating and cooling loads throughout conditioned areas.
7) Adjust toilet exhaust and relief air systems as required to deliver air volumes at inlets within 10% of design flow.
8) Adjust miscellaneous ventilation systems as required to deliver air volumes at inlets and outlets within 10% of design flow.

b. Compile test data and submit to Designer for approval.
c. If questions arise, tests or portions of tests shall be repeated in presence of Designer.

3. Air System Balancing:

a. Visually inspect all fire, smoke and volume dampers on branch take offs to each floor to ensure that they are fully open.
b. Verify with straight edge that fan and motor shafts are parallel and that sheaves are in proper alignment. Use Browning belt tensioner to confirm belts are at proper tension. Refer to deflection tables appropriate for installed belts.
c. Start fans, verify that fan rotation is correct. If not, coordinate with electrical contractor to switch power leads such that the fan rotates correctly.
d. Verify that fan belts are tight on one side and have slight bow on other side when fan is operating with no excessive squeal at startup. If not correct, adjust sheaves or motor base accordingly.
e. Check nameplate voltage on motor, compare to scheduled voltage. Notify Designer immediately of any discrepancies. Measure and record actual voltage across all power leads. Notify Designer of discrepancies immediately.
f. For each variable volume air handling unit do the following:
   1) Add total cfm of all volume boxes shown on approved shop drawings.
   2) Divide this total by the maximum cfm scheduled for the unit to get diversity factor. For example, if total box cfm is 50,000 and AHU is scheduled for 40,000 cfm diversity is 40,000/50,0000 = 80%.
   3) Open (by setting local stats to call for maximum cooling) number of volume boxes necessary to approximate diversity, i.e., in the above example, open 80% of the volume boxes.
g. Check motor nameplates full load amps, measure and record amperage across all power leads. If there are marked discrepancies in amperage draws between legs, notify Designer immediately.
h. Measure and record fan and motor rpm. Check that motor rpm agrees with nameplate and scheduled rpm.

i. Perform static pressure profile as follows: Record all results and submit to Designer.
   1) Determine static pressure across supply and return fans as follows:
      a) Measure static or total pressure at fan suction.
      b) Measure static pressure at fan discharge.
      c) Differential is total static pressure developed by fan.
   2) Determine static pressure:
      a) In discharge ductwork after smoke damper.
      b) Across each filter section.
      c) Across each coil.
      d) Across fire and volume dampers at branch take offs to each floor.
      e) At up to 25 points, in system shown on drawings or to be selected by Designer to be determined when ductwork shop drawings are approved.
   3) Determine the correct causes of any excessively high readings, i.e. open throttled dampers, clean dirty coils, etc. Cover all holes when measurements are complete.

j. Add 1/2" of static pressure to the system, to simulate the effect of dirty filters. Static may be added by throttling branch volume dampers, blanking off portions of the filter section, covering filter section with cheesecloth or other suitable means. Confirm 1/2" static has been added with new static pressure reading across fan. Open dampers, remove cheesecloth, etc. after traverses are complete.

k. Perform pitot tube traverse of supply ducts downstream from AHU discharges and return ducts. Summing CFM totals from diffusers is not an acceptable method of determining total airflow from AHU's. At Designer's request, show Designer holes where traverses were taken. Perform traverses in accordance with procedures outlined in latest edition of the SMACNA HVAC Testing. Adjusting and Balancing Manual, except that if recommended lengths of straight duct before and after traverse points are not available, increase number of measuring points by 50%. If a 24 point traverse would be called for given the duct cross section area measure 36 points, for example.

l. Measure amperage at each power leg after traverse is complete. If an overload condition exists with measured CFM equal to scheduled CFM, notify Designer immediately.

m. For economizer systems with ATC contractors presence and assistance, adjust minimum and maximum outdoor air CFM to quantities shown on schedules. Place outdoor air dampers in minimum position as adjusted by ATC contractor. Measure temperature in mixed air plenum, temperature of outdoor air and by proportioning determine % of outdoor air being supplied. Place outdoor air damper in maximum open position or fully open variable outside air damper and repeat above measurements.

n. For systems with variable volume boxes or constant volume boxes do the following, with ATC Contractor present for necessary coordination:
   1) At static pressure probe location in field with number of stats necessary to approximate installed diversity calling for full cooling, measure static pressure with manometer and compare with reading registering at DDC system field panel or CRT. The "most critical" volume box shall be determined by the Designer from approved sheet metal shop drawings submittals. Typically the pressure drop from the supply fan outlet to this box inlet is greater than for any other box. Observe damper linkage, at this box, instruct ATC contractor to vary static pressure setpoint as required so

that with stats calling for full cooling, most critical box damper is 75% open. (Score line on damper linkage and mark full open and closed positions of box damper. Using protractor mark 75% position open position on volume box.)

2) At each variable volume box, confirm that thermostat and box controller are of the same type (i.e., direct acting or reverse acting). At each variable box and constant volume box disconnect the actuator's pneumatic air line and confirm that box damper fails to position called for on control drawings.

3) At each variable volume box, set thermostat serving box for no cooling. At box test ports take differential pressure reading with magnehelic gauge. Note the magnehelic must be calibrated against a manometer before use. Adjust box minimum position at controller so that differential pressure reading corresponds to box minimum primary air CFM shown on schedules. Place thermostat controlling box to full cooling position. Using magnehelic gauge adjust box controller maximum position setting to produce differential pressure corresponding to box maximum primary air as shown on schedules. Measure CFM's from all diffusers served by box. Confirm total agrees with scheduled box cfm. If box has a reheat coil set start to call for full heating and confirm that box diverting relay switches to heating operation at proper thermostat pressure. With magnehelic gauge confirm differential pressure corresponding to heating CFM. Confirm that P/E's controlling electric heating coils (if any) stage properly. Confirm that hot water control valve modulates open.

4) At each fan box, set thermostat serving box for full heating. At box test ports take differential pressure rating the magnehelic gauge. Adjust box minimum position at controller so that differential pressure reading corresponds to box minimum primary air CFM shown on schedules. With stats continuing to call for full heating, confirm that fan is operating. Measure CFM's or all diffusers that the box serves and adjust fan speed controller, and/or inlet damper to produce CFM for box as shown on schedules. Place thermostat controlling box to full cooling position. Using magnehelic gauge adjust box controller maximum position setting to produce differential pressure corresponding o box maximum primary air as shown on schedules.

5) At each constant volume box, use magnehelic gauge to adjust setpoint of box controller to differential pressure corresponding to velocity (airflow) scheduled for box.

o. Balance each diffuser on each floor to within 10% of scheduled values. Follow procedures in SMACNA manual referenced above.

p. For constant volume systems, perform pitot tube traverses for branch ducts on each floor. Adjust volume dampers to produce design CFM for each branch.

q. Traverse all exhaust ducts. By sheave adjustment or damper throttling balance fans to +10% airflow scheduled on drawings.

r. Balance supply air systems in unfinished areas:

1) Supply air systems shall be balanced after installation of items related to same systems with exception of duct taps to air diffusers in interior zones.

2) Balance as required to deliver air volume at outlets within 10% of design flow shown on Drawings.

3) Provide sufficient temporary openings in interior zone duct systems to adjust interior zone air volumes.

4) Readjust air volumes after completion and occupancy, as required to properly balance heating and cooling loads throughout conditioned areas.

SECTION 260001

ELECTRICAL WORK

(Filed Sub-Bid Required)

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PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 1 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

B. Time, Manner and Requirements for Submitting Sub-bids:

1. Sub-bids for work under this Section shall be for the complete work and shall be submitted through WRTA's E-Bid Room as stipulated in the WRTA Instruction to Bidders.

2. Sub-bids filed with the Division of Capital Asset Management and Maintenance shall be accompanied by BID BOND or CASH or CERTIFIED CHECK or TREASURER'S CHECK or CASHIER'S CHECK issued by a responsible bank or trust company payable to the Commonwealth of Massachusetts in the amount of five percent of the sub-bid. A sub-bid accompanied by any other form of bid deposit than those specified will be rejected.

C. Sub Sub-Bid Requirements:

1. For the classes of work listed below, the Sub-bid Contractor's attention is directed to Massachusetts G.L. 149A Section 8(g)(6) and the Sub-bid Contractor's Bid Form part E. as amended, which provides in part as follows:
2. The names of all persons, firms and corporations furnishing to the undersigned labor or labor and materials for the classes or part thereof of work for which the provisions of the section of the Specifications for this sub-bid require listing in this paragraph, including the undersigned if customarily furnished by persons on his own payroll, and in the absence of a customary provision in the Specifications, the name of each class of work or part thereof and the bid price for such class of work or part thereof are:

CLASS OF WORK	REFERENCE SECTION
Fire Alarm System	2.12
Communication Systems	Specification 270001 – Communication Systems

D. Reference Drawings: The Work of this Filed Sub-Bid is shown on the following Contract Drawings: ((When issuing for bidding, insert a list of the drawings applicable to the work of this section, including drawing number and title.))

NUMBER	SHEET NAME
E-001	LEGEND, NOTES, & ABBREVIATIONS
ED-101	DEMOLITION LEVEL 1 POWER & FIRE ALARM PLAN
ED-102	DEMO LEVEL 1 SECURITY, COMMS,& DATA PLAN
ED-201	DEMOLITION LEVEL 1 LIGHTING PLAN
ED-601	EXISTING SINGLE LINE DIAGRAM
ED-701	DEMOLITION FA & CAMERA ONE LINE & SCHEDULE
ED-901	EXISTING PANEL SCHEDULES (SHEET 1 OF 2)
ED-902	EXISTING PANEL SCHEDULE (SHEET 2 OF 2)
E-101	LEVEL 1 POWER & FIRE ALARM PLAN
E-102	LEVEL 1 SECURITY, COMMS, & DATA PLAN
E-201	LEVEL 1 LIGHTING PLAN
E-701	FIRE ALARM RISER & MATRIX
E-901	PANEL SCHEDULES (SHEET 1 OF 2)
E-902	PANEL SCHEDULES (SHEET 2 OF 2)
E-903	NEW SCHEDULES

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
1. All lighting systems (indoor and outdoor, normal, night, emergency and exit) including all fixtures, lamps, mounting accessories, switches, controls, outlets, wiring, raceways, and all other components and fittings required for a complete lighting system.
2. Grounding and bonding of all electrical systems and equipment.
3. Existing fire alarm system modifications complete with all devices and wiring..
4. Wiring devices (switches and receptacles) complete with associated wall plates.
5. Power wiring to HVAC, plumbing and fire protection equipment.
6. Wiring, conduit & boxes for all camera's shown on the plans. Cameras furnished and installed by the WRTA security contractor.

7. Wiring, conduit, and boxes for all security devices shown on the plans. Devices furnished and installed by the WRTA security contractor.
8. Conduit, boxes, and wiring, for the data/communication system devices shown on the plans. Wiring and installation of all data/communication devices Final connections to the WRTA data/communication system by WRTA's data/communication system contractor.
9. Testing of all electrical systems.
10. Coordination between electrical and other trades.
11. Lighting control and dimming system as shown on the plans.
12. Cable/media and TV systems wiring, conduits, and boxes as shown on the plans.
13. All other systems hereinafter specified or indicated on the Contract Drawings, complete, leaving ready an electrical system in perfect operating condition.
14. Hoisting equipment for the Work of this Section.
15. Coordination with General Contractor for use of staging, planking and scaffolding, interior and exterior, which is the responsibility of the General Contractor as specified in Section 015000 - TEMPORARY FACILITIES AND CONTROLS.
16. Firestopping for the Work of this Section, including cutting penetrations and firestopping; complying with requirements specified in Section 078413 - PENETRATION FIRESTOPPING.
17. Core drilling for the Work of this Section.
18. Certified seismic restraints to meet the Commonwealth of Massachusetts Building Code applicable at the time the building permit is issued.
19. Coordination drawings and record drawings and similar requirements.
20. BIM modeling as specified in this Section and in Section 013129 - BIM COORDINATION.
21. Commissioning for electrical trade as specified in Section 019100 – COMMISSIONING

B. Alternates: Not Applicable.

C. Items to Be Installed Only: Install the following items as furnished by the designated Sections:
   1. Section 220001 - PLUMBING:
      a. Power connections for water heaters.
   2. Section 230001 - HEATING, VENTILATING AND AIR CONDITIONING:
      a. Power connections for DDC control panels, pumps, fans, electric unit heaters.

D. Items to Be Furnished Only: Furnish the following items for installation by the designated Sections:

   1. Section 033000 - CAST-IN-PLACE CONCRETE:
      a. Lintels, sleeves, anchors, inserts, plates and similar items for electrical systems.
   2. Section 042000 – UNIT MASONRY:
      a.
      b. Access doors in masonry openings.
   3. Section 092400 – PORTLAND CEMENT PLASTERING:
      a. Access doors in plaster assemblies.
   4. Section 092116 - GYPSUM BOARD ASSEMBLIES:
      a. Access doors in gypsum board assemblies.
   5. Section 093000 - TILING:
      a. Access doors in tile.
   6. Section 095113 – ACOUSTICAL PANEL CEILINGS:
      a. Access doors in acoustical tile.
   7. Section 230001 - HEATING, VENTILATING AND AIR CONDITIONING:

a. Duct smoke detectors and sampling tubes.

E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 033000 - CAST-IN-PLACE CONCRETE for interior concrete equipment pads and installation of backboxes and conduit for electrical devices and light fixtures.
2. Section 051200 - STRUCTURAL STEEL FRAMING for structural supports necessary to distribute loading from equipment to roof or floor.
3. Section 061000 - ROUGH CARPENTRY for plywood packing panels.
4. Section 087100 - DOOR HARDWARE for coordination with electrified door hardware.
5. Section 092116 – GYPSUM BOARD ASSEMBLIES for coordination with gypsum ceilings.
6. Section 095113 – ACOUSTICAL PANEL CEILINGS for coordination with acoustical ceilings.
7. Section 230001 – HEATING, VENTILATING AND AIR CONDITIONING for coordination with HVAC piping and ductwork, motors, and DDC wiring except 120 VAC power to control panel as indicated on the Drawings

F. The Electrical Contractor shall be responsible for filing all documents, payment of all fees, and securing of all inspections and approvals necessary for the electrical work.

G. The Electrical Contractor shall carry in the bid price all Utility Company and Municipal backcharges for all materials furnished and work performed by them in conjunction with this Contract and pay same to the respective agency upon demand. The Electrical Contractor shall not be entitled to additional compensation after the submittal of his bid price should he fail, for any reason, to obtain the total backcharge costs to be incurred by the local utility companies or municipal agencies.

1.3 SUBMITTALS

A. Comply with requirements specified in Section 013300 – SUBMITTAL REQUIREMENTS.

B. Shop Drawing: Shop drawings shall include, but not be limited to, the following:

1. Light fixtures, including exterior pole base foundations.
2. Overcurrent and switching devices.
3. Wiring devices and wall plates.
4. Fire alarm system with wiring diagram and schedule.
5. .
6. CCTV system with wiring diagram and schedules.
7. Data communications system including wiring diagram.
8. Sound systems with wiring diagrams.
9. Hangers and supports.
10. Wiring and cables.
11. Grounding and bonding.
12. Conduit.
13. Boxes and fittings.
14. Safety switches.
15. Lighting control system.

16. Cable/TV Media TV system including wiring diagram.

C. Hanger Pull-Out Testing Submittals and Requirements: Hangers and supports will be tested for pull-out by the Independent Testing Agency designated by the WRTA Project Manager. Comply with the requirements of Section 014325 – TESTING AGENCY SERVICES and the following:

1. Contractor's Documentation Prior to Testing:
   a. Submit manufacturer's name and model number for each type of hanger and support proposed for use, and technical data including type, load capacity, test reports, methods for installation, and use limitations.
   b. Submit a schedule for each type of hanger and support indicating where units for testing will be installed, including substrate, and materials to be supported.
   c. Submit a letter from Contractor indicating supports have been installed in accordance with manufacturer's recommendations and project requirements, and are ready for testing.
2. Independent Testing Agency's Documentation Prior to Testing for Contractor's Information:
   a. Submit the methods and type of equipment which will be used to test hangers and supports.
   b. Submit loads which will be applied, and criteria for acceptance or failure of hangers and supports.
3. Quantity to Be Installed by Contractor for Testing: Two of each size of each type of hanger or support.
4. Testing Results: The Independent Testing Agency will submit reports indicating test results.
   a. Units which did not deform or fail during testing may remain in place.
   b. Units which failed during testing shall be replaced and testing repeated until satisfactory results are obtained.
   c. Cost of repeat testing will be at the expense of the Contractor.
   d. Contractor shall repair damaged substrates, if any.

D. Delegated-Design Submittal: For seismic restraints.

1. Seismic-Restraint Details: Signed and sealed by a qualified Massachusetts registered professional engineer.
2. Design Calculations: Include design calculations and details for selecting seismic restraints complying with performance requirements, design criteria, and analysis data signed and sealed by the qualified professional engineer licensed in the Commonwealth of Massachusetts responsible for their preparation.

   a. Coordinate design calculations with wind load calculations required for equipment mounted outdoors. Comply with requirements in other Sections for equipment mounted outdoors.

3. Detail fabrication, including anchorages and attachments to structure and to supported equipment including raceways and cable trays.
4. Seismic and Wind Restraint Details:

   a. Design Analysis: To support selection and arrangement of seismic and wind restraints. Include calculations of combined tensile and shear loads.

b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to the restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.
c. Coordinate seismic-restraint and vibration isolation details with wind-restraint details required for equipment mounted outdoors. Comply with requirements in other Sections for equipment mounted outdoors.
d. Preapproval and Evaluation Documentation: By an evaluation service member of ICC-ES, OSHPD, or an agency acceptable to authorities having jurisdiction, showing maximum ratings of restraint items and the basis for approval (tests or calculations).

1.4 REFERENCES

A. Except where modified by a specific notation to the contrary, it shall be understood that the indication and/or description of any electrical item in the drawings or specifications for electrical work carries with it the instruction to furnish, install and connect the item as part of the electrical work, regardless of whether or not this instruction is explicitly stated.

B. It shall be understood that the specifications and drawings for electrical work are complimentary and are to be taken together for a complete interpretation of the electrical work except that indications on the drawings, which refer to an individual element of work, take precedence over the specifications where they conflict with same.

1.5 REGULATORY REQUIREMENTS

A. Comply with all applicable federal and state laws, and all local codes, by-laws and ordinances.

B. Where provisions of the Contract Documents conflict with any codes, rules or regulations, the latter shall govern. Where the contract requirements are in excess of applicable codes, rules or regulations, the contract provisions shall govern unless the Designer rules otherwise.

C. Request inspections from authorities having jurisdiction, obtain all permits and pay for all fees and inspection certificates as applicable and/or required. All permits and certificates shall be turned over to the WRTA’s Project Manager s at the completion of the work. Copies of permits shall be given to the resident engineer prior to the start of work.

D. Unless otherwise specified or indicated, materials and workmanship and equipment performance shall conform with the latest edition of the following standards, codes, specifications, requirements and regulations:

1. State Building Code
2. State Electrical Code
3. National Fire Protection Association (NFPA)
4. Local Town Regulations and By-laws
5. Underwriter's Laboratories, Inc. (UL)
6. National Electrical Manufacturer's Association (NEMA)
7. American National Standards Institute (ANSI)

E. All electrical work shall meet or exceed any other state and local codes and/or authorities having jurisdiction including all other standards indicated herein.

1.6 SURVEYS AND MEASUREMENTS

A. Base all required measurements, both horizontal and vertical, on reference points established and be responsible for the correct laying out of the electrical work.

1.7 COORDINATION

A. HVAC, Plumbing, Fire Protection, Fire Alarm, and Electrical Drawings are diagrammatic. They indicate general arrangements of mechanical and electrical systems and other work. They do not show all offsets required for coordination nor do they show the exact routings and locations needed to coordinate with structure and other trades and to meet architectural requirements.

B. Work shall be performed in cooperation with other trades on the project and so scheduled as to allow speedy and efficient completion of the work.

C. Furnish to other trades advance information on locations and sizes of all frames, boxes, sleeves and openings needed for their work, and also furnish information and shop drawings necessary to permit trades affected by the work to install same properly and without delay.

D. In all spaces, prior to installation of visible material and equipment, including access panels, review Architectural Drawings for exact locations and where not definitely indicated, request information from Designer. Where the electrical work shall interfere with the work of other trades, assist in working out the space conditions to make satisfactory adjustments before installation. Without extra cost to WRTA, make reasonable modifications to the work as required by normal structural interferences. Maintain maximum headroom at all locations. All piping, duct, conduit, and associated components to be as tight to underside of structure as possible.

E. If any electrical work has been installed before coordination with other trades so as to cause interference with the work of such trades, all necessary adjustments and corrections shall be made by the electrical trades involved without extra cost to WRTA.

F. Where conflicts or potential conflicts exist and engineering guidance is desired, submit sketch of proposed resolution to Designer for review and approval.

G. Protect all materials and work of other trades from damage which may be caused by the electrical work, and repair all damages without extra cost to WRTA.

1.8 MECHANICAL AND ELECTRICAL COORDINATION

A. Heating and Ventilating Contractor shall furnish and install various electrical items relating to the heating and ventilating equipment and control apparatus. The Electrical Contractor shall be required to connect power wiring to this equipment unless noted otherwise.

B. The Heating and Ventilating and Electrical Contractors shall coordinate their respective portions of the work, as well as the electrical characteristics of the heating and ventilating equipment.

C. All power wiring and local disconnect switches will be provided by the Electrical Contractor for the line voltage power. All control and interlocking wiring shall be the responsibility of the Heating and Ventilating Contractor.

D. 120V and above power wiring sources extended and connected to heating and ventilating control panels, transformers and switches shall be the responsibility of the Electrical Contractor. All low voltage thermostat, zone valve and any switch wiring shall be the responsibility of the Heating and Ventilating Contractor.

E. Temperature control and equipment wiring shall be installed by the Heating and Ventilating Contractor.

F. Pipe Tracing shall be furnished and installed by the specified Contractor. Power connections shall be by the Electrical Contractor.

G. The Electrical Contractor will provide all magnetic starters except those furnished as an integral part of packaged equipment.

1.9 MECHANICAL AND ELECTRICAL COORDINATION DRAWINGS

A. Refer to Section 013100 – PROJECT MANAGEMENT AND COORDINATION for coordination drawing requirements

1.10 INSTALLATION REQUIREMENTS

A. The arrangement of all electrical work shown on the drawings is diagrammatic only and indicates the minimum requirements of the work. Conditions at the building including actual measurements shall determine the details of the installation. All work shall be laid out and installed so as to require the least amount of cutting and patching.

B. Check the architectural plans and specifications before ordering any material and equipment. Any discrepancies shall be brought to the attention of the Designer for his determination prior to proceeding with the work.

1.11 TYPICAL DETAILS

A. Typical details where shown on the drawings shall apply to each and every item of the project where such items are applicable. They are not repeated in full on the drawings, which in many cases are diagrammatic only, but with the intention that such details shall be incorporated in full. Any alternate method proposed for use by the Contractor shall have the prior approval of the Designer.

1.12 SLEEVES, INSERTS

A. Furnish and install all sleeves, inserts, anchor bolts and similar items to be set into masonry or concrete, as required for mechanical and electrical work. Internal diameter of sleeve shall be 2" larger than the outside diameter of the pipe or insulation covered line passing through it.

1.13 ACCESSIBILITY

A. Install all work such that parts requiring periodic inspection, operation, maintenance and repair are readily accessible.

B. Furnish all access panels appropriate to particular conditions, to be installed by trades having responsibility for the construction of actual walls, floors or ceilings at required locations.

1.14 SUPPLEMENTARY SUPPORTING STEEL

A. Provide all supplementary steelwork required for mounting or supporting equipment and materials.

B. Steelwork shall be firmly connected to building construction as required.

C. Steelwork shall be of sufficient strength to allow only minimum deflection in conformity with manufacturer's published requirements.

D. All supplementary steelwork shall be installed in a neat and workmanlike manner parallel to floor, wall and ceiling construction; all turns shall be made at forty-five and ninety degrees, and/or as dictated by construction and installation conditions.

E. All manufactured steel parts and fittings shall be galvanized.

1.15 TOOLS AND EQUIPMENT

A. Provide all tools and equipment required for the fabrication and installation of the mechanical and electrical equipment at the site.

1.16 PORTABLE AND DETACHABLE PARTS

A. Contractors shall retain in their possession all portable and/or detachable parts and portions of materials, devices, equipment etc. necessary for the proper operation and maintenance of the mechanical and electrical systems until final completion of the work, at which time they shall be handed over to WRTA’s Project Manager.

1.17 RECORD DRAWINGS, PROJECT CLOSEOUT

A. Comply with requirements specified in Section 017700 – CONTRACT CLOSEOUT.

B. This trade shall submit the record set for approval by the fire and building departments in a form acceptable to the departments, when required by the jurisdiction.

C. Drawings shall show record condition of details, sections, riser diagrams, control changes and corrections to schedules. Schedules shall show actual manufacturer and make and model numbers of final equipment installation.

1.18 GUARANTEE/WARRANTY

A. Guarantee Work of this Section in writing for one year from the date of Certificate of Agency Use and Occupancy. Guarantees or warranties that start at the date of shipment from the factory, or from the completion date of an individual portion of the project, are not acceptable. The guarantee shall repair or replace defective materials, equipment, workmanship and installation that develop within this period, promptly and to Designer's satisfaction and correct damage caused in making necessary repairs and replacements under guarantee within Contract Price.

B. In addition to guarantee requirements of Division 01 and of Subparagraph A above, obtain written equipment and material warranties offered in manufacturer's published data without exclusion or limitation, in User Agency's name.

1. Upon receipt of notice from WRTA’s Project Manager of failure of any part of the systems or equipment during the warranty period, the affected part or parts shall be replaced by this Contractor without any reimbursement.
2. At nine months into the one-year guarantee period, the contractor shall perform a 100% test of all installed equipment. Any device and/or part found to be defective shall be repaired and/or replaced at no cost to WRTA. The Contractor shall notify the fire department one month in advance of the 100% test.
3. Replace material and equipment that require excessive service during guarantee period as defined and as directed by Designer.
4. Provide 24 hour service beginning on the date the project is accepted by WRTA, whether or not fully occupied, and lasting until the termination of the guarantee period. Service shall be at no cost to WRTA. Service can be provided by this contractor or a separate service organization. Choice of service organization shall be subject to Designer and WRTA’s Project Manager’s approval. Submit name and a phone number that will be answered on a 24-hour basis each day of the week, for the duration of the service.
5. Submit copies of equipment and material warranties to Designer before final payment.
6. At end of guarantee period, transfer manufacturers' equipment and material warranties still in force to User Agency.
7. This Paragraph shall not be interpreted to limit WRTA's rights under applicable codes and laws and under this Contract.
8. Part 2 Paragraphs of this Specification may specify warranty requirements that exceed those of this Paragraph. Those paragraphs will govern.
9. Use of systems provided under this Section for temporary services and facilities shall not constitute Final Acceptance of work by WRTA’s Project Manager, and shall not initiate the guarantee period.
10. Non-durable items, such as electric lamps, shall be replaced up to the date of acceptance, such that they shall have had no more than 100 hours use prior to this date.
11. Provide manufacturer's engineering and technical staff at site to analyze and rectify problems that develop during guarantee period immediately. If problems cannot be

rectified immediately to WRTA's Project Manager's satisfaction, advise Designer in writing, describe efforts to rectify situation, and provide analysis of cause of problem. Designer will direct course of action.

1.19 OPERATING, INSTRUCTION AND MAINTENANCE MANUALS

A. Comply with requirements specified in Section 017700 – CONTRACT CLOSEOUT, including CAMIS spreadsheet data collection for Equipment Template and PM Procedure tabs.

B. Each copy of the approved operating and maintenance manual shall contain copies of approved shop drawings, equipment literature, cuts, bulletins, details, equipment and engineering data sheets and typewritten instructions relative to the care and maintenance for the operation of the equipment, all properly indexed. Each manual shall have the following minimum contents:

1. TABLE OF CONTENTS
2. Introduction
    a. Explanation of manual and its purpose and use.
    b. Description of the electrical systems.
    c. Safety precautions necessary for equipment.
    d. Illustrations, schematics and diagrams.
    e. Installation drawing.
3. Maintenance
    a. Maintenance and lubricating instructions.
    b. Replacement charts.
    c. Trouble shooting charts for equipment components.
    d. Testing instructions for each typical component.
    e. Two typed sets of instructions for ordering spare parts. Each set shall include name, price, telephone number and address of where they may be obtained.
4. Manufacturer's Literature
    a. The equipment for which shop drawings have been submitted and approved.
    b. Power Monitoring: Software and Firmware Operational Documentation:
        1) Software operating and upgrade manuals.
        2) Software licenses.
        3) Software service agreement.
        4) PC installation and operating documentation, manuals, and software for the PC and all installed peripherals. Provide separately for each PC.
        5) Hard copies of manufacturer's specification sheets, operating specifications, design guides, user's guides for software and hardware, and PDF files on compact disk or portable storage device with a USB interface of the hard-copy submittal.
        6) Program Software Backup: On compact disk or portable storage device with a USB interface, complete with data files.
        7) Device address list.
        8) Printout of software application and graphic screens.

1.20 SERVICE CHARACTERISTICS

A. Primary Utility Voltage: Information is not available on existing as-built drawings, but expected to be 13.8kVSecondary Building Voltage – 208/120 V High Level:

B. All equipment and wiring shall be suitable for the applied voltage.

1.21 QUALITY ASSURANCE

A. The requirements of the State Building Code and local regulations establish the minimum acceptable quality of workmanship and materials, and all work shall conform thereto unless more stringent requirements are indicated or specified herein.

B. All work shall comply with the latest editions of the codes as referenced herein.

C. Follow manufacturer's directions for articles furnished, in addition to directions shown on drawings or specified herein.

D. Protect all work, materials, and equipment from damage during process of work. Replace all damaged or defective work, materials and equipment without additional cost to WRTA.

E. All equipment and materials for permanent installation shall be the products of recognized manufacturers and shall be new.

F. Equipment and materials shall:

1. Where normally subject to Underwriters Laboratory Inc. listing or labeling services, be so listed or labeled.
2. Be without blemish or defect.
3. Not be used for temporary light and power purposes.
4. Be in accordance with the latest applicable NEMA standards.
5. Be products which will meet with the acceptance of all authorities having jurisdiction over the work. Where such acceptance is contingent upon having the products examined, tested and certified by Underwriters or other recognized testing laboratory, the product shall be so examined, tested and certified.

G. Except for conduit, conduit fittings, outlet boxes, wire and cable, all items of equipment or material of one generic type shall be the product of one manufacturer throughout.

H. For items which are to be installed but not purchased as part of the electrical work, the electrical work shall include:

1. The coordination of their delivery.
2. Their unloading from delivery trucks driven into any point on the property line at grade level.
3. Their safe handling and field storage up to the time of permanent placement in the project.
4. The correction of any damage, defacement or corrosion to which they may have been subjected. Replacement if necessary shall be coordinated with Contractor who originally purchased the item.
5. Their field make up and internal wiring as may be necessary for their proper operation.
6. Their mounting in place including the purchase and installation of all dunnage, supporting members, and fastenings necessary to adapt them to architectural and structural conditions.

7. Their connection to building wiring including the purchase and installation of all termination junction boxes necessary to adapt and connect them to this wiring. Included also shall be the purchase and installation of any substitute lugs or other wiring terminations as may be necessary to adapt their terminals to the building wiring as called for and to the connection methods set forth in these specifications.

I. Items which are to be installed but not purchased as part of the electric work shall be carefully examined upon delivery to the project. Claims that any of these items have been received in such condition that their installation will require procedures beyond the reasonable scope of the electric work will be considered only if presented in writing within one week of the date of delivery to the project of the items in question. The electric work includes all procedures, regardless of how extensive, necessary to put into satisfactory operation, all items for which no claims have been submitted as outlined above.

1.22 DELIVERY, STORAGE AND HANDLING

A. All materials for the work of this section shall be delivered, stored and handled so as to preclude damage of any nature. Manufactured materials shall be delivered and stored in their original containers, plainly marked with the products' and manufacturer's name. Materials in broken containers or in packages showing watermarks or other evidence of damage, shall not be used and shall be removed from the site.
1. .

1.23 TEMPORARY POWER AND LIGHTING

A. The Electrical Contractor shall furnish and install feeders of sufficient size from the Utility Company's power lines for the electric light and power requirements for the building while under construction and until the permanent feeders and related equipment have been installed and are in operation. Temporary lighting shall be based on a minimum of one watt per square foot covering each and every square foot of floor area in the building. Sufficient wiring, lamps, and outlets shall be installed to insure proper lighting in all rooms, space, stairwells, and corridors. Minimum sized lamp used shall be 100 watt. Where higher lighting intensities are required by Federal or State Standards of Laws or otherwise specified, the above specified wattage shall be increased to provide these increased intensities.

B. All necessary transformers, meters, cables, panelboards, switches, temporary lamp replacements and accessories required for the temporary light and power installation shall be provided by the Electrical Contractor.

C. The Electrical Contractor shall provide and maintain on each floor of the building, a feeder or feeders of sufficient capacity for the requirements of the entire floor and he shall provide a sufficient number of outlets, located at convenient points, so that extension cords of not over 50 ft. in length will reach all work requiring temporary light or power.

D. All temporary electrical work shall meet the requirements of the National Electrical Code Article 305 Temporary Wiring, the Local Utility Company, and all Federal Standards and Laws.

E. All temporary wiring and accessories thereto installed by the Electrical Contractor shall be removed after their purposes have been served.

F. All lamps installed in permanent lighting fixtures and used for lighting during construction shall be replaced by the Electrical Trade Contractor just prior to date of Use and Occupancy or Final Acceptance.

G. Provide all temporary lighting and power required above during the normal working hours of the project or a total of ten (10) hours per normal working day; Saturdays, Sundays and legal holidays are excluded. The ten hours per day shall include manning the temporary power and lighting 2 hour before and 2 hour after a normal eight (8) hour working day. In addition to the above, provide and maintain, to the satisfaction of the local authorities having jurisdiction, all temporary lighting and power that may be required for safety purposes.

1.24 HOISTING, STAGING AND SCAFFOLDING

A. The work to be done under this Section of the Specifications shall include the furnishing, set-up and maintenance of all hoisting machinery, cranes, scaffolds, staging and planking as required for the work.

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1.25 CUTTING AND PATCHING

A. Include all coring, cutting, patching, and fireproofing necessary for the execution of the work of this Section. Structural elements shall not be cut without written approval of the Architect. Be responsible for taking all precautions required to identify hidden piping, conduits, etc. before any core drilling and/or cutting of slabs commences, including X-raying the affected slabs. Provide fire stopping to maintain the fire rating of the fire resistance-rated assembly. All penetrations and associated fire stopping shall be installed in accordance with the fire stopping manufacturer’s listed installation details and be listed by UL or FM.

B. All work shall be fully coordinated with all phases of construction, in order to minimize the requirements for cutting and patching.

C. Form all chases or openings for the installation of the work of this Section of the specifications, or cut the same in existing work and see that all sleeves or forms are in the work and properly set in ample time to prevent delays. Be responsible that all such chases, openings, and sleeves are located accurately and are of the proper size and shape and consult with the WRTA Project Manager and all sub-contractors concerned in reference to this work. Confine the cutting to the smallest extent possible consistent with the work to be done. In no case shall piers or structural members be cut without the approval of the WRTA Project Manager.

D. Fit around, close up, repair, patch, and point around the work specified herein to match the existing adjacent surfaces and to the satisfaction of the WRTA Project Manager.

E. Fill and patch all openings or holes left in the existing structures by the removal of existing equipment that is part of this Section of the Specifications.

F. All of this work shall be carefully done by workmen qualified to do such work and with the proper and smallest tools applicable.

G. When, in order to accommodate the work required under this Section of the specifications, finished materials of other trades must be cut or fitted, furnish the necessary drawings and information to the trades whose materials must be cut or fitted.

1.26 EXTRA MATERIALS

A. Furnish extra materials described in following product specification sections that match products installed, are packaged with protective covering for storage, and are identified with labels clearly describing contents.

1.27 PHASING, DEMOLITION AND MAINTAINING EXISTING SERVICES

A. During the execution of the work, required relocation, etc., of existing equipment and systems in the existing building areas where new work is to be installed or new connections are scheduled to be made, shall be performed by the Electrical Trade Contractor, as required by job conditions and as determined by the Designer in the field, to facilitate the installation of the new system, while demolition, relocation work or new tie ins will be performed. Outages required for construction purposes shall be scheduled for the shortest practical periods of time, in coordination with the User Agency's designated representative, for specified, mutually agreeable periods of time, after each of which the interruption shall cease and the service shall be restored. This procedure shall be repeated to suit the User Agency's working schedule, as many times as required until all work is completed. Any outages of service shall be approved by WRTA's Project Manager, prior to commencing the work. No outages or shutdowns of service shall occur without the written authorization of the WRTA's Project Manager prior to commencing the work. Give notice of any scheduled shutdowns, a minimum of weeks in advance. User Agency shall make their best efforts to meet this request without adversely affecting the electric service to the existing building.

B. Prior to any deactivation and relocation or demolition work, consult the drawings and arrange a conference with the Designer and the WRTA's Project Manager in the field to inspect each of the items to be deactivated, removed or relocated. Care shall be taken to protect all equipment designated to be relocated and reused or to remain in operation and be integrated with the new systems.

C. All deactivation, relocation and temporary tie ins of electrical systems and equipment shall be provided by the Electrical Trade Contractor. All demolition and removal of electrical systems and equipment designed to be demolished shall be provided by the Electrical Trade Contractor. Place all demolished electrical materials except hazardous materials (PCB lighting ballasts, fluorescent lamps, etc.) As determined by the Authority having jurisdiction in the correct

dumpster. All hazardous electrical materials shall be legally disposed by the Electrical Contractor.

D. WRTA's Project Manager reserves the right to inspect the material scheduled for removal and salvage any items he deems usable as spare parts.

E. Phasing:

1. The Electrical Trade Contractor shall construct the subject project in phases as directed by the Designer to suit the project progress schedule, as well as the completion date of the project.
2. For additional information related to phasing, review the General Conditions and Supplementary Conditions and the architectural drawings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Product specifications are written in such a manner so as to specify what materials may be used in a particular location or application and therefore do not indicate what is not acceptable or suitable for a particular location or application. As an example: non-metallic sheathed cable is not specified; therefore, it is not acceptable.

B. For purpose of establishing a standard of quality and not for purpose of limiting competition, the basis of this Specification is upon specified models and types of equipment and materials, as manufactured by specified manufacturers.

C. In all cases, standard cataloged materials and systems have been selected. Materials such as lighting fixtures specially manufactured for this particular project and not part of a manufacturers' standard product line will not be acceptable. In the case of systems, the system components shall be from a single source regularly engaged in supplying such systems. A proposed system made up of a collection of various manufacturers products will be unacceptable.

D. Where Specifications list manufacturer's names and/or "as approved" or "approved equal" by Designer, other manufacturers equipment will be considered if equipment meets Specification requirements and has all features of the specified items as are considered essential by Designer.

E. All materials shall be new and shall be UL listed.
   1. as recommended in the power system study

2.2 RACEWAYS AND FITTINGS

A. Raceways - General:

   1. Except for floor boxes, no conduit shall be allowed in elevated floor slabs. When connecting to a floor box, that conduit raceway shall take the shortest run in the floor slab.
   2. No raceway shall be used smaller than 3/4" diameter. No conduit shall have more than three (3) 90o bends in any one run, and where necessary, pull boxes shall be provided. Intermediate metal conduit is not allowed.
   3. Rigid metal conduit conforming to, and installed in accordance with, Article 346 of NFPA 70 shall be heavy wall zinc coated steel conforming to American Standard Specifications C80-1 and may be used for service work, exterior work, slab work, and below grade level slab, wet locations, and in mechanical rooms and where raceway may be subject to mechanical damage, i.e., loading docks, workshops, etc.
   4. Thin wall conduit (EMT), conforming to, and installed in accordance with, Article 346 of NFPA 70 shall be zinc coated steel, conforming to industry standards, may be used in

masonry block walls, stud partitions, above furred ceilings where exposed but not subject to mechanical damage, and shall be used for fire alarm work.

5. Flexible metal conduit shall be used for connections to recessed lighting fixtures and motors. Liquid tight flexible metal conduit shall be used for the above connections which are located in moist locations. All flexible connections shall include a grounding conductor.
6. Rigid non-metallic conduit may be used at the contractors' option for underground electric and telephone services outside the foundation wall and shall be polyvinyl chloride (PVC) schedule 40, 90°C for concrete encased conduit and schedule 80, 90°C for non concrete encased conduit. If option of rigid non-metallic conduit is exercised, underground runs outside the foundation wall shall be concrete encased at contractor's expense.
7. PVC Schedule 40 may also be used for below slab circuits within building confines. Below slab rigid non-metallic conduits do not require concrete encasement. Rigid non-metallic conduits shall not be used in slabs. Rigid steel elbows or stubs shall be used for penetrations from below slab or through exterior walls into building. PVC shall not be installed within building. Raceways and fittings shall be produced by same manufacturer.
8. PVC coated rigid metal conduit shall be used where indicated and conform to the following:
    a. Prior to application of the PVC coatings, all conduit shall conform to Federal Specification WW-C-581 E, ANSI Standard C80.1, UL Standard #6 and shall be hot dip galvanized.
    b. The PVC exterior coating shall have a nominal thickness of 40 mils and shall be applied using a fluidized bed process.
    c. Interior conduit, interior fitting surfaces and all threads shall all be protected by a two part 2 mil urethane coating.
    d. Interior and exterior coatings on conduit shall have sufficient flexibility to permit field bending without damage.
9. Acceptable Manufacturers:
    a. Pittsburgh Standard Conduit Company
    b. Republic Steel and Tube
    c. Youngstown Sheet Tube Company
    d. Carlon
    e. Perma-Cote Supreme
10. Fittings:
    a. Provide insulated bushings on all raceways 1 inch diameter or larger.
    b. Manufacturer's standard fittings shall be used for raceway supports.
    c. Expansion Fittings: Expansion fittings shall be used where structural and concrete expansion joints occur and shall include a ground strap.
    d. Couplings for rigid metal conduit shall be threaded type.
    e. Thread-less fittings for EMT shall be watertight compression type. Set-screw type fittings are not acceptable. All fittings shall be concrete tight. No diecast fittings allowed except for raceways larger than 1 inch diameter.
    f. Cable supports in vertical raceways shall be of the split wedge type. Armored cable supports for vertical runs to be of wire mesh basket design.
    g. Wall entrance seals shall be equal to O.Z. Gedney type "WSK".
    h. Couplings, elbows and other fittings used with rigid nonmetallic raceways shall be of the solvent cemented type to secure a waterproof installation.
    i. Acceptable Manufacturers:

1) O.Z.
2) Crouse Hinds
3) Appleton
4) EFCOR
5) Steel City

2.3 WIRING MATERIALS- 600V OR LESS SYSTEMS

A. Building Wire and Cable shall be copper with 600V insulation, THWN for branch circuitry and XHHW for feeders.

B. Conductors shall be of soft drawn 98% minimum conductivity properly refined copper, solid construction where No. 10 AWG and smaller, stranded construction where No. 8 AWG and larger.

C. Exterior of wires shall bear repetitive markings along their entire length indicating conductor size, insulation type and voltage rating.

D. Exterior of wires shall be color coded, so as to indicate a clear differentiation between each phase and between each phase and neutral. In all cases, grounded neutral wires and cables shall be identified by the colors white or gray. In sizes and insulation types where factory applied colors are not available, wires and cables shall be color coded by the application of colored plastic tapes in overlapping turns at all terminal points, and in all boxes in which splices are made. Colored tape shall be applied for a distance of 6 inches along the wires and cables, or along their entire extensions beyond raceway ends, whichever is less.

E. Final connections to motors shall be made with 18" of neoprene sheathed flexible conduit.

F. Minimum branch circuit conductor size shall be No. 12 AWG installed in conduit. Motor control circuit wiring shall be minimum No. 14 AWG installed in conduit.

G. Fire alarm and security system wiring shall be No. 16 twisted non-shielded pairs for alarm and trouble circuits and a minimum of #14 AWG for device power, control and alarm annunciation circuits.

H. Other wires and cables required for the various systems described elsewhere in this section of the Specifications shall be as specified herein, as shown on the Contract Drawings, or as recommended by the manufacturer of the specific equipment for which they are used, all installed in conduit.

I. Metal Clad sheathed cable NFPA 70, type MC may be used for branch circuitry where shown and where run concealed and not subject to physical damage. All branch circuits shall be run in conduit from the panelboard to the first outlet. All type MC cables used shall contain a full size insulated ground conductor. All conductors shall be copper. All type MC cable insulation used shall have voltage rating of 600 volts, shall have a temperature rating of 75° C. and shall be thermoplastic material. Armor material shall be steel and armor design shall be interlocked metal tape. Fire alarm rated MC cables may be used for fire alarm work where concealed.

J. Mineral-Insulated Metal-Sheathed Fire-Resistive Cables (Type MI) - Cables shall consist of a factory assembly of one or more solid copper conductors insulated with highly-compressed

magnesium oxide and enclosed in a seamless, liquid-and -gas-tight continuous copper sheath. Cables shall be rated for 600 volts. Cable shall comply with Article 330 of the National Electrical Code. Cables shall be classified by Underwriters Laboratories, Inc. as having a 2-hour fire resistive rating. Cable terminations shall be made with UL listed mineral-insulated cable fittings. Cables shall be as manufactured by Pyrotenax USA, Inc. or approved equal.

K. Wiring materials except MI cable shall be manufactured by Triangle, Essex, General Cable or equal.

2.4 OUTLET, JUNCTION, PULL BOXES, AND WIRING TROUGHS FOR ALL SYSTEMS

A. Outlets:

1. Each outlet in wiring or raceway systems shall be provided with an outlet box to suit conditions encountered. Boxes installed in normally wet locations shall be of cast-metal type having hubs. Concealed boxes shall be cadmium plated or zinc coated sheet metal type. Old work boxes with Madison clamps not allowed in new construction.
2. Each box shall have sufficient volume to accommodate number of conductors in accordance with requirements of NFPA 70. Boxes shall not be less than 1-1/2" deep unless shallower boxes are required by structural conditions and are specifically approved by Designer. Ceiling and bracket outlet boxes shall not be less than 4" octagonal except that smaller boxes may be used where required by particular fixture to be installed. Flush or recessed fixtures shall be provided with separate junction boxes when required by fixture terminal temperature requirements. Switch and receptacle boxes shall be 4" square or of comparable volume.
3. Acceptable Manufacturers:
   a. Appleton
   b. Crouse Hinds
   c. Steel City
   d. RACO

B. Pull and Junction Boxes: Where necessary to terminate, tap off, or redirect multiple raceway runs or to facilitate conductor installation, furnish, and install appropriately designed boxes. Boxes shall be fabricated from code gauge steel assembled with corrosion resistant machine screws. Box size shall be as required by Code. Where intermediate cable supports are necessary because of box dimensions, provide insulated removable core brackets to support conductors. Junction boxes are to be equipped with barriers to separate circuits. Where splices are to be made, boxes shall be large enough to provide ample work space. All conductors in boxes are to be clearly tagged to indicate characteristics. Boxes shall be supported independently of raceways. Junction boxes in moist or wet areas shall be galvanized type. Boxes larger than 4 inches square shall have hinged covers. Boxes larger than 12 inches in one dimension will be allowed to have screw fastened covers, if a hinged cover would not be capable of being opened a full 90 degrees due to installation location.

2.5 WIRING DEVICES

A. Provide wiring device type plates for all wall mounted devices. All wall plates shall be smooth high impact nylon for all public areas, offices, classrooms, etc. Color as directed by the Designer. Provide galvanized steel for all Utility, Electric and Mechanical Rooms.

B. Wiring devices standard for the project (i.e., with no specific type indicated) shall conform to the following:

1. Visible part colors of wiring devices shall be as directed by the Designer for all public areas, offices, classrooms etc. Provide brown devices for all Utility, Electrical and Mechanical Rooms.
2. Exclude compact or "despard" type devices.

C. Wiring device switches shall be toggle type, A.C. specification grade, 20 amps on 120 volt circuits. Switches shall be mounted 48" to center line above finished floor unless noted otherwise.

1. Single pole switch shall be equal to Hubbell No. HBL1221.
2. Double pole switch shall be equal to Hubbell No. HBL1222.
3. Three-way switch shall be equal to Hubbell No. HBL1223.
4. Four-way switch shall be equal to Hubbell No. HBL1224.
5. Single pole pilot light switch shall be equal to Hubbell No. HBL1221PL.
6. Equivalent 277 volt 20 amp switches shall be used where required.

D. Standard duplex convenience receptacles shall be 125 volt, 20 amps, three wire (two circuit wires plus ground), "U bar" ground NEMA slot configuration 5 20R, specification grade with a one-piece ground assembly. Receptacles shall be mounted 18" to center line above finished floor unless noted otherwise.

1. Equal to Hubbell No. HBL5362.
2. Where indicated on plans provide receptacles with ground fault current interrupters, UL class A, 20A, 125V to be equal to Hubbell No. GF5352.

E. Nonstandard convenience receptacles and special purpose power supply receptacles shall be as listed on plans.

F. For unfinished spaces, plates for surface mounted wall devices which are not integrally equipped with same, shall be galvanized sheet steel, formed raised type which does not overlap box. Where for switches, such plates shall have toggle guards.

G. Where more than one wiring device is indicated in the same location, the devices shall be mounted in gangs under a common wall plate.

H. Mount duplex convenience and power receptacles vertically with grounding posts at top of device unless otherwise indicated. Locate grounding post to left when horizontal mounting is indicated.

I. Wiring devices and associated hardware shall be manufactured by Arrow Hart, Leviton, or Pass and Seymour.

J. Dimmer Controls

1. All devices shall be UL listed specifically for the required loads (i.e., incandescent, fluorescent, magnetic low voltage, electronic low voltage). Manufacturer shall provide file card upon request. Universal dimmers are not acceptable.

2. All dimmers and switches shall incorporate an air gap switch. The air gap switch shall be capable of meeting all applicable requirements of UL 20 for air gap switches in incandescent dimmers.
3. All dimmers and switches shall provide power failure memory. Should power be interrupted and subsequently returned, the lights will come back on to the same levels set prior to the power interruption. Restoration to some other default level is not acceptable.
4. Dimmers and switches shall meet ANSI/IEEE Std. C62.41-1980, tested to withstand voltage surges of up to 6000V and current surges of up to 200A without damage.
5. Dimmers and switches shall meet the UL 20 limited short circuit test requirement for snap switches.
6. Dimmer shall provide a smooth and continuous Square Law dimming curve.
7. Dimmers shall be voltage regulated so that + 10% variation in line voltage shall cause not more than + 5% variation in load voltage when dimmer is operating at 40V (5% light output).
8. Dimmers shall be 2000 watt equal to Leviton Monet. Single pole dimmers shall be "slide to off" type. Three way dimmers shall be "preset" type used with appropriate 3 or 4 way linear slide switches.

2.6 GROUNDING REQUIREMENTS

A. Ground all systems and equipment in accordance with best industry practice, the requirements of NFPA 70 and the following:

B. Each bonding connection shall consist of insulated conductors run in conduit.

C. Provide grounding bonds between all metallic conduits of the light and power system which enter and leave cable chambers or other non- metallic cable pulling and splicing boxes. Accomplish this by equipping the conduits with bushings of the grounding type individually cross connected.

D. Bond metallic conduits containing grounding electrode conductors and main bonding conductors to the ground bus service enclosure and/or grounding electrode at both ends of each run utilizing grounding bushings and jumpers.

E. Provide grounding bonds for all metallic conduits of the light and power system which terminate in pits below equipment for which a ground bus is specified. Accomplish this by equipping the conduits with bushings of the grounding type connected individually to the ground bus.

F. Provide supplementary ground bonding where metallic conduits terminate at metal clad equipment (or at the metal pull box of equipment) for which a ground bus is specified. Accomplish this by equipping the conduits with bushings of the grounding type connected individually by means of jumpers to the ground bus. Exclude the jumpers where directed. This exclusion will be required where an isolated ground for electronic equipment is to be maintained.

G. Each grounding type bushing shall have the maximum ground wire accommodation available in standard manufacture for the particular conduit size. Connection to bushing shall be with wire of this maximum size.

H. The central equipment for the fire protective alarm system and telephone system shall have its grounding terminal connected to the grounding electrode by means of a No. 6 green coded insulated conductor, run in 3/4" conduit. Utilize a ground clamp of a type specifically manufactured for the purpose.

2.7 PHASING AND COLOR CODING

A. The insulation or covering of each wire or cable shall be color coded so as to provide for circuit identification as specified below.

120/208 V Circuits	277/480V	Phase Circuits
Black	Brown	A
Red	Orange	B
Blue	Yellow	C
White	Grey	Neutral
Green	Green with Yellow Tracer	Equipment Ground

B. Color coding shall be achieved by one of the following methods:

1. The insulation or covering shall be coded during manufacture by use of one of the following methods:
   a. Colored compounds.
   b. Colored coatings.
2. In sizes and insulation types where factory applied colors are not available, wires and cables shall be color coded by the application of colored plastic tapes in overlapping turns at all terminal points, and in all boxes in which splices are made.

C. The same colored cable shall be connected to the same phase throughout the project.

D. In general, building load centers and panelboards shall be phased "A", "B", "C", left to right. The neutral, although it may be in different locations for different equipment, shall be identified.

2.8 SURGE PROTECTION DEVICES

A. Description: This section describes the materials and installation requirements for integrated surge protection devices (SPD) in switchboards, panelboards, and motor control centers.

B. Approved Vendors: Square D Company XTE/XHP/CX for service entrance, and XTE/XGA for distribution and/or motor control center applications.

2.9 ENCLOSURES FOR INDIVIDUALLY MOUNTED OVERCURRENT AND SWITCHING DEVICES

A. Construction shall be NEMA Class I, where installed indoors.

B. Construction shall be NEMA Class IV, where installed outdoors, in mechanical rooms, in locations defined as damp or wet by NFPA 70 or where indicated as weatherproof.

C. Operating handles shall be front or side type to accommodate hand access space and flush or surface mounting requirements.

D. Each shall be equipped with padlock for locking operating handle in the open position.

2.10 LIGHTING FIXTURES

A. Lighting fixtures shall be in accordance with identifications on the drawings and the following.

B. Finishes shall be as selected by the Designer or as indicated on the plans.

C. Any additional appurtenances required for installation and operation, where same are not covered by the identification used on the drawings, shall be included.

D. Recessed fixtures shall be coordinated with ceiling construction.

E. Exact location of all fixtures shall be confirmed with Designer prior to rough-in.

F. Recessed fixtures throughout shall have their components, wiring and external connections coordinated for use in ceilings utilized as air handling plenums.

G. Fixtures for use outdoors or in areas designated as damp locations shall be suitably gasketed and U.L. listed for such applications.

H. In-line fuses shall be provided for all ballast and transformers.

I. All fixtures shall be UL approved with labels attesting thereto.

J. All fixtures shall not be manufactured using PCB's.

K. The Contractor shall obtain all information relative to the exact type of hung ceilings and suspension systems to be installed before ordering any recessed fixtures. This Contractor shall furnish the proper type fixtures applicable to the ceiling framing system. If, other than the type of fixtures specified are required for installation due to the type of ceiling construction, this Contractor shall furnish and install the proper type fixtures and mounting appurtenances required at no extra charge.

L. The Contractor shall coordinate the exact locations of all lighting fixtures with the ceiling pattern during the Construction Period and before installation of the fixtures. Interferences between lighting fixtures, and other equipment, shall be brought to the attention of the WRTA Project manager and the Architect.

M. Include the aiming and/or adjustments of all lighting fixtures requiring same in accordance with instructions issued by the Designer in the field.

N. Lighting fixtures shall be supported from building structure only, not from hung or suspended ceiling, by means of chains or threaded rods. The use of tie wire will not be allowed.

O. All fixtures shall include seismic clips and shall be supported to comply with seismic regulations.

P. Exit Signs: Code compliant, including the International Symbol of Accessibility at accessible exit doors. Provide Telesis Universal Mount Edgelit LED Exit Signs by Evenlite or approved equal, fabricated with 6 inch exit letters and 6 inch accessibility symbol; aluminum housing,

Q. Contractor must comply with all federal, state, and local guidelines or laws concerning the disposal and removal of mercury installed as part of the new or removed as part of the existing building lighting system.

2.11 LIGHTING CONTROL AND DIMMING SYSTEM

A. Scope: The Electrical Sub-Contractor, as part of the work of this section, shall coordinate, receive, mount, connect and place into operation all equipment. The Electrical Sub-Contractor shall furnish all conduit, wire, connectors, hardware, and other incidental items necessary for the complete and properly functioning lighting control and dimming system as described herein and shown on the plans. Equipment includes:

1. Indoor occupancy and vacancy sensors
2. Switchbox-mounted occupancy sensors

B. Related Documents

1. Conduit
2. Wire and Cable

C. Manufacturer's Services

1. Shop drawings shall be submitted for approval within 30 days after receipt of contract. No fabrication of equipment is to proceed prior to approval of these drawings. Submittal package shall contain six (6) sets of the following:
   a. Complete bill of materials.
   b. Sets of catalog cut sheets for standard equipment.
   c. Sets of shop drawings detailing all mechanical and electrical equipment including one line diagrams, wire counts, internal wiring, and physical dimensions of each item. Marked up catalog cut sheets are unacceptable.
2. Upon completion of all line, load and interconnection wiring, and after all fixtures are installed and lamped, a qualified factory representative shall completely check the installation prior to energizing the system. At the time of checkout and testing, the User Agency's representative shall be thoroughly instructed in the proper operation to the system.
3. Within two weeks after the system turn-on is completed, the manufacturer is to provide three (3) sets of as built drawings and three (3) sets of operations and maintenance manuals for the dimming system.

D. Quality Assurance

1. Manufacturer's products shall be listed by Underwriters Laboratories, Inc. (U.L.) and comply with the National Electrical Code (NEC) and local building codes that apply.

2. The equipment specified herein shall be the coordinated product of a single manufacturer. All dimmer and cabinet fabrication must take place in the manufacturer's plant. The use of subcontracted component assemblers is not acceptable.
3. The manufacturer shall be one who has been continuously engaged in the manufacture of architectural lighting controls and dimmers for a minimum of ten years.
4. All equipment shall be 100% tested as a complete system. Manufacturers using sample testing methods are not acceptable.

E. Warranty

1. All equipment shall be warranted free of defects in materials and workmanship for a period of one year from date of turn-on.

F. Manufacturer

1. Manufacturer capable of meeting the specifications shall be Lutron.

G. Equipment

1. Indoor Occupancy and Vacancy Sensors
   a. Wall, Ceiling-mounted, solid-state indoor occupancy and vacancy sensors.
   b. Dual technology.
   c. Integrated power pack.
   d. Low voltage CAT5 or CAT6 connection to local room controller
   e. Listed and labeled by UL, by a qualified testing agency, and marked for intended location and application.
   f. Power: Low voltage.
   g. Mounting:
      1) Sensor: Suitable for mounting in any position on a standard outlet box.
   h. Sensors Failure: In case of failure the sensor is required to fail in the ON position
   i. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc; must communicate to lighting control system to dim or turn off selected fixtures within that area
   j. Must comply with Green Seal GC-12.
2. Dual-Technology Type: Wall or Ceiling mounted; detect occupants in coverage area using PIR and ultrasonic detection methods. The particular technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.
   a. Sensitivity Adjustment: Separate for each sensing technology.
   b. Detector Sensitivity: Detect occurrences of 6-inch-minimum movement of any portion of a human body that presents a target of not less than 36 sq. in., and detect a person of average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.
   c. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch-high ceiling.
   d. Detection Coverage (Room, Wall Mounted): Detect occupancy anywhere within a 180-degree pattern centered on the sensor over an area of 1000 square feet when mounted 48 inches above finished floor.

H. Switchbox-Mounted Occupancy Sensors

1. Sensors: Automatic-wall mounted switch dual technology occupancy sensor with manual on-off switch, suitable for mounting in a single gang switchbox, with provisions for connection to lighting control system using CAT5 or CAT6 connection.
2. Listed and labeled by UL, by a qualified testing agency, and marked for intended location and application.

I. Installation

1. It shall be the responsibility of the Electrical Contractor to receive and store the necessary materials and equipment for the lighting control system. It is the intent of these specifications and plans to include everything required for proper and complete installation and operation of the control system, even though every item may not be specifically mentioned. The contractor shall timely deliver to other trades any equipment that must be installed during construction.
2. The Electrical Contractor shall be responsible for field measurements and coordinating the physical size of all equipment with the architectural requirements of the spaces into which they are to be installed.
3. The Electrical Contractor shall install all lighting controlequipment in accordance with manufacturer's shop drawings.
4. All branch load circuits shall be live tested by the Electrical Sub-Contractor before connecting the loads to the dimmer system load terminals.

J. Manufacturer's Services

1. Upon completion of the installation including testing of load circuits, the contractor shall notify the dimming system manufacturer that the system is available for formal checkout. This notification is to be given in writing two weeks prior to the time factory trained personnel are needed on the job site. At the manufacturer's discretion, formal turn on can be waived. No power is to be applied to the dimming system unless specifically authorized by written instructions from the manufacturer.

2.12 FIRE ALARM SYSTEM

A. Scope

1. Provide new devices and wiring as shown on the plans to connect into the existing fire alarm system within the existing building. Fire alarm systems shall be operational during construction, and updated/reprogrammed after completion of the fire alarm work on Level 1.
2. Final connections, testing, and adjusting of the system shall be done under the direct supervision of the system supplier. Provide NICET certified and factory trained technicians to demonstrate the system to the satisfaction of WRTA’s Project Manager, and make all additional adjustments to the system operation as required by the WRTAWRTA’s Project Manager.
3. Provide equipment manufactured by the existing fire alarm system manufacturer. This constitutes the quality and performance of the equipment and system to be furnished.
4. The system design and installation shall conform to the following standards:
   a. All equipment shall be UL listed for its intended purpose.
   b. NFPA standards 70, 72, 90A, 92A, and 101.
   c. BOCA Basic Building Code - Latest Edition.

d. Current State Building Code.
e. The Americans with Disabilities Act (ADA).
f. All requirements of all local authorities having jurisdiction.

5. Conform to all UL standards for testing (and provide certification) of the completed installation by a UL approved testing company.
6. The equipment supplier shall conduct the initial programming of the system and a complete rack/test of hardware panels prior to delivery to the installing contractor.
7. Provide verification that all room names and numbers on the construction drawings will be coordinated with final room names and numbers as designated by the school. Update all risers and drawings accordingly for Operating & Maintenance manuals at the completion of the project. Addresses shall be programmed using final room names and numbers.
8. Provide copies of Operating & Maintenance manuals with the request for final inspection. O & M Manuals shall include the following:
   a. All of the information submitted in the shop drawings.
   b. As-built documentation which incorporates all modifications to the system, whether made as a field change or by a change order.
   c. Include a copy of the final test report, [UL certificate] and test contract.

B. General Requirements

1. The fire alarm system shall be designed and UL and FM approved for Fire, Audio Evacuation and Security applications. The system operational characteristics shall be stored in non-volatile EEPROM memory, shall be field programmable and capable of being edited with no factory involvement.
2. The system shall utilize broadcast polling techniques and microprocessor-based detectors to minimize the required response time and possible false alarms. Individual initiating and control devices shall retain pre-programmed response characteristics, history logging, and support electronic addressing. A system-wide response (alarm sequence) to an alarm condition shall take place within 3 seconds.
3. The system shall support analog sensing techniques to monitor individual devices which enables the user to set sensitivity parameters. All inputs shall be subject to multi-level alarm verification. The system shall be capable of reporting the status and sensitivity of each device and vectoring this information to a printer. The system shall automatically identify any detector which becomes dirty (maintenance alert), prior to false alarming.
4. The existing system is supported by standby batteries. The contractor shall test the existing batteries to confirm the battery capacity/condition to confirm the batteries can support 60 hours of full supervisory operation followed by 15 minutes of alarm. The contractor will submit the report to the engineer for review of the runtime data.
5. The system shall be capable of nine levels of alarm prioritization, and allow control by event, and may include cross zoning, stepping, and/or logic statement inputs.
6. All equipment shall be new and unused. All components and systems shall be designed for uninterrupted duty. All equipment, materials and accessories covered by these requirements shall be provided by a single manufacturer, or if provided by different manufacturers recognized as compatible by both manufacturers.
7. Circuiting Guidelines. Each initiating device and indicating circuit shall be electronically supervised and individually addressable. All wiring shall be as follows:
   a. Individual addressable modules shall be used to monitor water flow, tamper, and status conditions from any related systems or conventional devices.
   b. Addressable control modules or relays shall provide auxiliary control functions.

c. Addressable loop wiring shall support all devices shown and allow for a minimum of 25% spare capacity and be wired in a Class A, Style 7 fashion.
d. As a minimum, power supplies, amplifiers and notification appliance circuits shall operate all devices shown plus 25% spare capacity, and be wired in a Class A, Style Z fashion.
e. Audio and visual signals shall be circuited separately to allow continued operation of the visual signal in the event of a silencing of the audible signal.

C. System Components:
1. Intelligent System Devices: Each device shall retain operating characteristics in non-volatile memory and conduct algorithms to distinguish real fire conditions from unwanted nuisance alarms. All analog devices shall provide dual LED indicators, a green LED shall flash to denote active communication, and a red LED shall flash to denote an alarm condition. Devices shall be interchangeable with twist-lock bases which may include a supervised remote LED output, fault isolation circuitry, or an auxiliary relay contact. In the event of an addressable loop communications failure, devices shall remain capable of initiating an alarm sequence.
a. Multi-sensing Smoke Detector: Provide multi sensing analog smoke detectors areas where shown and required. Each detector shall employ photoelectric, ionization and thermal sensing principles.
b. Photoelectric Smoke Detector: Provide analog photoelectric smoke detectors where shown and required.
c. Analog Heat Detectors: Provide Analog Heat Detectors, for fixed temperature operation, or for combined fixed temperature/rate-of-rise operation, as required. Analog heat detectors shall be rated for 70 foot spacing and will cause an alarm when the temperature reaches 65 degrees above ambient. The fixed temperature rating shall be 135 degrees and the rate of rise shall be rated for 15 degrees per minute. Where otherwise required, provide conventional heat detectors in lieu of analog heat detectors. Each conventional heat detector shall be individually addressable via an intelligent input module.
d. Intelligent Manual Pull Stations: Provide intelligent addressable manual stations where shown. The station shall be double action type with screw terminals, toggle switch, and integral addressable electronics. The station shall be constructed of red Lexan with white raised letters and a key reset switch. The station shall be keyed alike to the FACP.
e. Monitor Module: Provide addressable input monitor modules to monitor related systems or integrate conventional initiating devices onto the addressable loop.
f. Control Module: Provide addressable output control modules to supervise and control conventional devices (indicating circuits, AHUs, door holders, etc.) over the addressable loop. Control modules shall provide a supervised output rated for 1 or 2 amps @ 24VDC, as required.
g. Isolation Modules: Provide Isolator Modules to protect circuit integrity in the event of a wiring fault. Provide a minimum of one module per floor/zone, or one for every 25 devices; whichever is greater.
2. Primary Notification Appliances: Flush mounted combination horn/strobe Audio/Visual signaling appliances where practical. Stand alone devices may be used to augment combination units when necessary. Specific audible and visual characteristics shall be as follows:
a. Visual Signals: Furnish and install self-synchronizing xenon strobes in compliance with NFPA 72 chapter 6. Strobes shall an effective intensity rating of

15 candela in corridors and other areas up to 20' x 20', 30 candela in areas up to 30' x 30' and 110 candela in areas up to 50' x 50'.

b. Audible Signals: Provide multi-tapped speakers. Each speaker shall have selective 3, 2, 1, or 2 watt taps to produce a minimum sound output of 87dbA at 10'. Provide re-entrant speakers in high ambient noise areas or where weatherproof devices are required.

3. System Accessories
   a. Sprinkler System Devices: The electrical contractor shall coordinate the following to ensure that the required installation and wiring of all water flow and tamper switches is accomplished in a manner that will result in a complete operable and tested sprinkler system. Each device shall be monitored as a separate and distinct point.
      1) Waterflow will activate the alarm sequence.
      2) Tamper OSY U2A will activate a supervisory trouble.
   b. Remote Alarm Indicators: Provide remote LED indicators for sensors located behind locked doors. Provide a permanent label on each indicator identifying the device type and actual location.
   c. Auxiliary Power Supplies: Where the power requirements exceed that which is supplied by the FACP, auxiliary power supplies may be used. Each auxiliary power supply shall be supervised for loss of AC power and Battery Fail, and each notification circuit served shall be individually supervised.
   d. Door Holders: Provide 24VDC magnetic door holders where shown and required. Door holders shall be powered by system power, but are not required to operate under standby battery.
   e. Key Repository: Provide an approved key repository where shown and required in accordance with local requirements.

D. Installation

1. Installation shall be supervised and tested by the system supplier. The work shall be performed by skilled technicians under the direction of experienced engineers, all of whom are properly trained and qualified.

E. Wiring

1. All wiring for the system shall be in accordance with Articles 760, 725, and 800 of the National Electrical Code and local electrical codes.
2. Provide complete wiring and conduit between all equipment. All devices shall be mounted upon and splices made in UL listed boxes. Wiring splices and transposing or changing of colors will not be permitted.
3. All junction boxes shall be painted red and labeled as 'Fire Alarm System' with decal or approved markings
4. Fire Alarm control systems and equipment shall be connected to separate dedicated branch circuits, sized as required for proper service. Circuits shall be labeled 'FIRE ALARM'.

F. Final Tests / Warranty

1. The system shall be fully tested by a UL certified testing company, in accordance with UL guidelines and NFPA standards. Each and every device shall be tested.

2. A copy of the final test report [and UL certificate] shall be submitted indicating proper functioning of the system and conformance to the specifications. The test shall be performed by UL certified and factory-trained qualified technicians. Each and every device shall be tested, and standalone operation of remote panels shall be verified. Final testing [and UL certification] shall be performed by the same company that will hold and execute the Test and Inspection contract.
3. The manufacturer shall guarantee all system equipment for a period of three (3) years from the date of final acceptance.
4. The contractor shall guarantee all raceways and wiring to be free from inherent mechanical or electrical defects for one (1) year from the date of final acceptance of the system.

G. Training

1. The contractor shall provide the services of the manufacturer's representative for a period of 4 hours, during normal business hours, to instruct the User Agency's designated personnel and fire department response teams on the operation of the system.

2.13 ACCESS PANELS

A. Furnish access doors and frames for walls and ceilings to applicable trades for installation. Size as required for access and maintenance, minimum 16 by 16 inches.

B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. J. L. Industries, Inc, Inc.
2. Karp Associates, Inc.
3. Larsen's Manufacturing Company.
4. Milcor Inc.
5. Nystrom, Inc.

C. Flush Access Doors and Trimless Frames: Fabricated from steel sheet.

1. Locations: Wall and ceiling surfaces as applicable.
2. Door: Minimum 0.060-inch-thick sheet metal, set flush with surrounding finish surfaces.
3. Frame: Minimum 0.060-inch-thick sheet metal with suitable bead flange.
4. Hinges: Continuous piano.
5. Lock: Cylinder, keyed alike.

D. Fire-Rated, Insulated, Flush Access Doors and Trimless Frames: Fabricated from steel sheet.

1. Locations: Wall and ceiling surfaces as applicable.
2. Fire-Resistance Rating: Not less than that of adjacent construction.
3. Temperature Rise Rating: 250 deg F at the end of 30 minutes.
4. Door: Flush panel with a core of mineral-fiber insulation enclosed in sheet metal with a minimum thickness of 0.036 inch.
5. Frame: Minimum 0.060-inch thick sheet metal with suitable bead flange.
6. Hinges: Continuous piano.
7. Automatic Closer: Spring type.

8. Lock: Self-latching device with cylinder lock, keyed alike.

2.14 EQUIPMENT GROUNDING REQUIREMENTS

A. Equipment ground all systems and equipment in accordance with best industry practice.

B. All separately derived sources (i.e., transformers) shall be grounded per code.

C. Provide grounding bonds between all metallic conduits of the light and power system which enter and leave cable chambers or other non-metallic cable pulling and splicing boxes. Accomplish this by equipping the conduits with bushings of the grounding type individually cross connected.

D. Bond metallic conduits containing grounding electrode conductors and main bonding conductors to the ground bus service enclosure and/or grounding electrode at both ends of each run utilizing grounding bushings and jumpers.

E. Provide grounding bonds for all metallic conduits of the light and power system which terminate in pits below equipment for which a ground bus is specified. Accomplish this by equipping the conduits with bushings of the grounding type connected individually to the ground bus.

F. Provide supplementary ground bonding where metallic conduits terminate at metal clad equipment (or at the metal pull box of equipment) for which a ground bus is specified. Accomplish this by equipping the conduits with bushings of the grounding type connected individually by means of jumpers to the ground bus. Exclude the jumpers where directed. This exclusion will be required where an isolated ground for electronic equipment is to be maintained.

G. Each grounding type bushing shall have the maximum ground wire accommodation available in standard manufacture for the particular conduit size. Connection to bushing shall be with wire of this maximum size.

H. Bonding conductors on the load size of the service device and equipment grounding conductors shall be sized in relation to the fuses or trip size of the overcurrent device supplying the circuit.

I. Each branch circuit and feeder shall have a dedicated equipment grounding conductor, minimum # 12 AWG. Shared or tapped equipment grounding conductor shall not be acceptable.

2.15 RACEWAYS AND OUTLETS SYSTEM FOR VOICE/DATA, AND VIDEO (TV)

A. The Electrical Subcontractor shall furnish and install outlets including conduit, cable, outlet box, outlet cover plate, fittings, and all other appurtenances required, leaving the entire installation ready for installation of future equipment by others.

B. In general, each voice/data and each video outlets are shown on the Drawings. Each outlet location shall be a minimum 4"x 4" square outlet box with a single gang trim and blank coverplate. Depth of the outlet box shall be minimum 2-1/2".

C. The Electrical Subcontractor shall furnishand install the CAT6 cable for all new devices shown on the plan. Additional cable requirements for all access control/security devices should be coordinated with the WRTA's communications and security contractors.

D. All blank wall plates shall be furnished by the Electrical Subcontractor and be of the same finish and by the manufacturer furnishing all other wiring device and switch plates installed.

E. Provide capped off sleeves between corridor space to rooms as indicated on the drawings.

F. Firestop and seal all penetrations as required to maintain fire separations as indicated on the Architectural Drawings.

2.16 EMPTY RACEWAYS AND JUNCTION BOX/OUTLETS SYSTEM FOR AUDIO/VISUAL SYSTEM

A. The Electrical Subcontractor shall furnish and install outlets including cable, conduit, outlet box, outlet cover plate, fittings, and all other appurtenances required, leaving the entire installation ready for installation of future equipment by others.

B. Refer to the symbol list for audio/visual junction box/outlets and associated sizes.

C. The Electrical Subcontractor shall furnish a nylon pull cord in each conduit to facilitate the pulling of cables in the future.

D. All blank wall plates shall be furnished by the Electrical Subcontractor and be of the same finish and by the manufacturer furnishing all other wiring device and switch plates installed.

E. Provide capped off sleeves between corridor space to rooms as indicated on the drawings.

F. Firestop and seal all penetrations as required to maintain fire separations as indicated on the Architectural Drawings.

2.17 SEISMIC RESTRAINT AND VIBRATION ISOLATION DEVICES

A. Devices

1. All seismic devices described in this section shall be the product of a single manufacturer. Mason Industries is the base manufacturer of these specifications; products of other manufacturers are acceptable provided their systems strictly comply with intent, structural design, performance and deflections of the Base Manufacturer. The devices shall be identified by the manufacturer to be suitable for the particular seismic application(s) and also be listed with California OSHPD to ensure product seismic capability
2. The manufacturer of the seismic restraint devices shall certify that the devices are capable of accepting, without failure, the seismic forces as determined by the Part 2 "SEISMIC RESTRAINT STUDIES" section of these specifications. The manufacturer shall select the appropriate seismic restraint device type, quantities, locations, installation instructions, drawings and field supervision to insure proper installation and performance of system, consistent with the "SEISMIC RESTRAINT STUDIES".

3. Corrosion protection for outdoor applications shall be as follows:
   a. Springs cadmium plated, zinc electroplated, or powder coat
   b. Hardware cadmium plated
   c. All other metal parts hot spray or hot dipped galvanized
4. All seismic restraint devices:
   a. Shall maintain the equipment in a captive position and not short circuit isolation devices during normal operating conditions.
   b. Shall have provisions for bolting and/or welding to the structure.
5. Welding of springs to isolator housing, base plates, etc., is strictly prohibited.
6. Contractor shall provide restraint attachment plates cast into housekeeping pads, concrete inserts, double sided beam clamps, etc. in accordance with the requirements of the Part 2 “Seismic Restraint Studies”.
7. The same manufacturer shall provide vibration isolation devices for transformers suitable to maintain minimum deflection as stated in the Part 2 "SEISMIC RESTRAINT STUDIES".

B. Seismic Restraint Types

1. TYPE I: Same as TYPE B. Cast or aluminum housing, (except ductile iron) are not acceptable.
   a. Mason Industries TYPE SLR
2. TYPE II: Where required, each corner or side of equipment base shall incorporate a seismic restraint snubber having an all directional resilient pad limit stop. Restraints shall be fabricated of plate, structural members or square metal tubing. Angle bumpers are not acceptable.
   a. Mason Industries Type Z-1225 / Z-1011
3. TYPE III: Restraints for suspended systems
   a. Vibration isolated systems shall be braced with multiple 7 x 19 strand galvanized cable rope.
      1) Mason Industries Type SCB
   b. Non-isolated systems shall be braced with structural steel strut type with approved fastening devices to equipment and structure.
      1) Mason Industries Type SSB
   c. Steel angles (by contractor) shall be provided to prevent rod bending of hung equipment where indicated by the Seismic Restraint vendor’s submittals. Steel angles shall be attached to the rods with a minimum of three ductile iron clamps at each restraint location. Welding of support rods to angles is not acceptable. Rod clamp assemblies shall have Anchorage Preapproval “R” number from California OSHPD.
      1) Mason Ind. Model “SRC”.
   d. Pipe clevis cross braces are required at all restraint locations. They shall be special purpose preformed channels deep enough to be held in place by bolts passing over the clevis cross bolt. Clevis cross braces shall have Anchorage Preapproval “R” number from California OSHPD.
      1) Mason Ind. Model “CCB”.
4. TYPE IV: Double deflection neoprene isolator encased in ductile iron or steel casing.
   a. Mountings shall have Anchorage Preapproval “R” number from California OSHPD, certifying the horizontal and vertical seismic load ratings.
      1) Mason Industries Type RC or BR
5. TYPE V: Rigid attachment to structure utilizing wedge type expansion anchors for bolting and steel plates, either cast-in or anchored with wedge type expansion bolts, for

welding. Powder shots are not acceptable. Concrete anchor bolt spacing shall be in accordance with manufacturer's published standards.

C. Vibration Isolator Types

1. TYPE A: Spring Isolator - Free Standing
   a. Spring shall have a minimum outer diameter to overall height ratio of 0.8: 1 at rated deflection.
   b. Reserve deflection (from published load ratings to solid height) of 50% of the rated deflection.
   c. Ductile top cup with adjusting bolt tapped for equipment attachment locking cap screw.
   d. Minimum 1/4" thick neoprene acoustical base pad or cup on underside, unless designated otherwise.
      1) Mason Industries Type SLF
2. TYPE B: Spring Isolator - Restrained
   a. Shall be the same as TYPE A with the following additional features.
      1) Integral restraining bolts with elastomeric cushions preventing metal-to-metal contact.
      2) Internal spring adjusting nut or bolt with leveling capability.
      3) Built-in all-directional limit stops with minimum 1/4" clearance under normal operation.
      4) Mountings shall have Anchorage Preapproval "R" number from California OSHPD, certifying the horizontal and vertical seismic load ratings.
         a) Mason Industries Type SLR, SSLFH
3. TYPE D: Double deflection neoprene isolator encased in ductile iron or steel casing.
   a. Mountings shall have Anchorage Preapproval "R" number from California OSHPD, certifying the horizontal and vertical seismic load ratings.
      1) Mason Industries Type RC or BR
4. TYPE E: Elastomer Hanger Isolator
   a. Molded neoprene element with an integral bushing to insulate lower support rod from the hanger box.
   b. Steel hanger box shall withstand three times the rated load without failure.
      1) Mason Industries Type HD

D. Submittal Requirements

1. Catalog cuts or data sheets on specific seismic restraint devices restraints to be utilized detailing compliance with the Part 2 "SEISMIC RESTRAINT STUDIES" specification. Reference seismic restraint types per section of this specification. An itemized list of all isolated and non-isolated equipment. Detailed schedules showing seismic restraints proposed for each piece of equipment, referencing material and seismic calculation drawing numbers. Provide specific details of seismic restraints and anchors; include number, size and locations for each piece of equipment.
2. When walls and slabs are used as seismic restraint locations, details of acceptable methods must be included.
3. Coordinated drawings shall be marked-up with the specific locations and types of restraints shown for all electrical systems including but not limited to, conduit, cable tray. Rod bracing at various installation angles and assigned load at each restraint location shall be clearly delineated. Any and all tributary loads shall be considered for proper restraint sizing.

4. For ceiling suspended equipment provide minimum/maximum installation angle allowed for restraint system as well as braced and unbraced rod lengths at each allowable installation condition.

E. Related Work

1. The electrical subcontractor shall coordinate with the appropriate contractor for all concrete pads and all attachments. Coordinate with the seismic restraint manufacturer for edge distance of pads, but shall be as minimum 10 bolt diameters of clearance all around the outermost anchor bolt to allow for the use of full anchor ratings.
   a. Coordinate to ensure that the concrete pad is restrained itself to the structure to resist the seismic forces.

F. Supplementary Support Steel

1. Contractor shall supply supplementary support steel and connections for all equipment and piping as required.

2.18

PART 3 - EXECUTION

3.1 BASIC REQUIREMENTS

A. Adhere to best industry practice and the following.

B. All work shall be concealed.

C. Route circuitry runs embedded in concrete to coordinate with structural requirements.

D. Equip each raceway intended for the future installation of wire or cable with a nylon pulling cord 3/16 inch in diameter and clearly identify both ends of the raceway.

E. Provide all outlet boxes, junction boxes, and pull boxes for proper wire pulling and device installation. Include those omitted from the drawings due to symbolic methods of notation.

F. Provide all sleeves through fireproof and waterproof slabs, walls, etc. required for electric work.

1. Provide waterproof sealing for the sleeves through waterproof slabs, walls, etc.
2. Provide fireproof sealing for the sleeves through fireproof walls, slabs, etc.
3. Provide fireproof sealing for the openings in fireproof walls, slabs, etc., resulting from removal of existing electrical sleeves, conduits, poke-throughs, etc.

G. No splicing of wires will be permitted in Fire Alarm System.

H. Bundle wiring passing through pull boxes and panel boards in a neat and orderly manner with plastic cable ties. Cable ties shall by Ty-Raps as manufactured by Thomas & Betts, Holub Industries Inc., Quick Wrap, Bundy Unirap or equal.

I. Turn branch circuits and auxiliary system wiring out of wiring gutters at 90 degrees to circuit breakers and terminal lugs.

3.2 TESTING REQUIREMENTS AND INSTRUCTIONS

A. The Electrical Subcontractor shall provide supervision, labor, materials, tools, test instruments and all other equipment or services and expenses required to test, adjust, set, calibrate, and operationally check work and components of the electrical systems and circuitry throughout the work.

B. The Electrical Subcontractor shall pay for all tests specified in this Section, including expenses incident to retests occasioned by defects and failures of equipment to meet specifications, at no additional cost to WRTA. Any defects or deficiencies discovered in any of the electrical work shall be corrected.

C. At any stage of construction and when observed, any electrical equipment or system determined to be damaged, or faulty, is to be reported to the engineer. Corrective action by the Contractor requires prior engineer approval, retesting, and inspection.

D. Prior to testing and start-up, equipment and wiring shall be properly and permanently identified with nameplates, and other identification as specified in this Section. Check and tighten terminals and connection points, remove shipping blocks and thoroughly clean equipment, repair damaged or scratched finishes, inspect for broken and missing parts and review and collect manufacturer's drawings and instructions for delivery to the engineer. Make routine checks and tests as the job progresses to ensure that wiring and equipment is properly installed.

E. Testing and checkout work is to be performed with fully qualified personnel skilled in the particular tests being conducted. Personnel are to have at least five years of experience with tests of same type and size as specified:

F. Inspections and tests shall be in accordance with the following applicable codes and standards as amended to date, unless otherwise specified.

1. National Electrical Manufacturer's Association - NEMA.
2. American Society for Testing and Materials - ASTM.
3. Institute of Electrical and Electronic Engineers -IEEE.
4. National Electrical Testing Association - NETA.
5. American National Standards Institute - ANSI.
    a. C2: National Electrical Safety Code.
    b. Z244-1: American National Standard for Personnel Protection.
6. Insulated Cable Engineers Association - ICEA.
7. Association of Edison Illuminating Companies - AEIC.
8. Occupational Safety and health Administration.
    a. OSHA Part 1910; Subpart S, 1910.308.
    b. OSHA Part 1926; Subpart V, 1926.950 through 1926.960.
9. National Fire Protection Association - NFPA.

a. 70B: Electrical Equipment Maintenance.
b. 70E: Electrical Safety Requirements for Employer Workplaces.
c. 70: National Electrical Code.
d. 78: Lightning Protection Code.
e. 101: Life Safety Code.

10. Inspections and tests shall utilize the following references:
    a. Contract Drawings and Specifications.
    b. Contractor's Short Circuit and Coordination Study.
    c. Manufacturer's printed test procedures for respective equipment.

G. Test Equipment:

1. Test equipment used by the Contractor is to be inspected and calibrated.
2. Perform calibration and setting checks with calibrated test instruments of at least twice that of that of the accuracy of the equipment, device, relay or meter under test. Dated calibration labels shall be visible on test equipment. Calibrations over 6 months old are not acceptable on field test instruments. Inspect test instruments for proper operation prior to proceeding with the tests. Record serial and model numbers of the instruments used on the test forms.

H. Test Procedures:

1. The Electrical Subcontractor is responsible for the preparation of the procedures and schedules for the work specified herein. This work is to be coordinated and compatible with both the work and schedule of the other crafts. Sequence the tests and checks so that the equipment can be energized immediately after the completion of the application tests.
2. Submit proposed testing and check out forms. The procedures shall provide specific instructions for the checking and testing of each electrical component of each system. Schedule tests and inspections as the job progresses. Test procedures submitted shall include job safety rules.

I. After each electrical system installation is complete, perform the tests to determine that the entire system is in proper working order and in accordance with applicable codes, manufacturer's instructions, drawings, and specifications. Tests are in addition to shop tests of individual items at the manufacturer's plant. Perform insulation and ground resistance tests before operating tests.

J. Perform insulation tests on electrical equipment, apparatus, cables, motors, generators, transformers, circuit breakers and switches, switchgear, motor control centers, and similar electrical equipment, at the following times and conditions:

1. Prior to energization and/or placing into service.
2. When damage to the insulation is suspected or known to exist.
3. After repairs or modifications to the equipment affecting the insulation.
4. Where lightning or other surge conditions are known to have existed on the circuit.

K. Make openings in circuits for test instruments and place and connect instruments, equipment, and devices, required for the tests. Upon completion of tests, remove instruments and instrument connections and restore circuits to permanent condition.

L. List each circuit and measured resistance as test data. Maintain record of insulation resistance values. Identify conductor, or equipment, date that value was taken and resistance value. Arrange information in tabular form and submit to Engineer.

M. Report inspections, tests, and calibrations in writing on engineer-approved reports/forms. The recorded data form shall have the signatures of the persons conducting the tests, authorized witnesses, and the engineer. The forms shall serve as the test and inspection checklist.

N. When the electrical tests and inspections specified or required within this Section are completed and results reported, reviewed, and approved by the engineer, the Contractor may consider that portion of the electrical equipment system or installation electrically complete. The Contractor will then affix appropriate, approved, and dated completion or calibration labels to the tested equipment and notify the engineer of electrical completion. If the engineer finds completed work unacceptable, he will notify the Contractor in writing of the unfinished or deficient work, with the reason for his rejection, to be corrected by the Contractor. The Contractor will notify the engineer in writing when exceptions have been corrected. The Contractor will prepare a "Notification of Substantial Electrical Completion" for approval by the engineer following engineer's acceptance of electrical completion. If later in-service operation or further testing identifies problems attributable to the Contractor, these will be corrected by the Contractor, at no additional cost to the Authority.

O. Specific Tests:

1. Perform the following specific tests. De-energize and isolate equipment and cable prior to performing the tests.
    a. Low Voltage Systems: Including, but not limited to the following: Master time clock system, communication/ telephone, sound systems, cable/media TV system, "Area of Rescue" system.
        1) Visually inspect all components for physical damage, dents, scratches and missing hardware.
        2) Check all wiring for proper identification numbering and/or color coding.
        3) Thoroughly clean all components.
        4) Inspect all wiring for tightness of connections.
        5) Operate and perform each of the system components and functions to verify system operation per plans and specs.
    b. The following systems shall adhere to the general requirements of this section in addition to complying with the specific test requirements outlined in the respective sections listed:
        1) Fire Alarm System.
        2) Lighting Control and Dimming System.
        3) Intrusion Alarm System.
    c. Operating Instructions: Furnish operating instructions to User Agency's designated representative with respect to operations, functions and maintenance procedures for equipment and systems installed. Cost of such instruction up to a full five (5) days of Electrical Subcontractor's time shall be included in contract. Cost of providing a manufacturer's representative at site for instructional purposes shall also be included.

3.3 BRANCH CIRCUITRY

A. For all lighting and appliance branch circuitry, raceway sizes shall conform to industry standard maximum permissible occupancy requirements except where these are exceeded by other requirements specified elsewhere.

B. Circuits shall be balanced on phases at their supply as evenly as possible.

C. Feeder connections shall be in the phase rotation which establishes proper operation for all equipment supplied.

D. Reduced size conductors indicated for any feeders shall be taken as their grounding conductors.

E. Feeders consisting of multiple cables and raceways shall be arranged such that each raceway of the feeder contains one cable for each leg and one neutral cable, if any.

F. For circuitry indicated as being protected at 20 Amps or less, abide by the following:
   1. Minimum conductor size shall be No. 12 A.W.G. copper.
   2. Conductors operating at 120 volts extending in excess of 100 Ft., or at 277 volts extending in excess of 200 ft., or the last outlet or fixture tap shall be No. 10 A.W.G. copper throughout.
   3. Lighting fixtures and receptacles shall not be connected to the same circuit.
   4. Circuits shall be balanced on phases at their supply point as evenly as possible.

G. Type MC Cable Installation:

   1. Where cable is permitted under the products section, the installation of same shall be done in accordance with code and the following:
      a. Cable shall be supported in accordance with code. Tie wire is not an acceptable means of support. Cable supports such as Caddy WMX-6, MX-3, and clamps such as Caddy 449 shall be used. Where cables are supported by the structure and only need securing in place, then ty-raps will be acceptable. Ty-raps are not acceptable as a means of support. All fittings, hangers, and clamps for support and termination of cables shall be of types specifically designed for use with cable, i.e., Romex connectors not acceptable.
      b. Armor of cable shall be removed with rotary cutter device equal to roto-split by Seatek co., not with hacksaw.
      c. Use split "insuliner" sleeves at terminations.

3.4 REQUIREMENTS GOVERNING ELECTRICAL WORK IN DAMP OR WET LOCATIONS

A. Outlets and outlet size boxes shall be of galvanized cast ferrous metal only.

B. The finish of threaded steel conduit shall be galvanized only.

C. Wires for pulling into raceways for lighting and appliance branch circuitry shall be limited to "THWN".

D. Wires for pulling into raceways for feeders shall be limited to "THWN".

E. Plates for toggle switches and receptacles shall have gasketed snap shut covers suitable for wet locations while in use.

F. Final connections of flexible conduit shall be neoprene sheathed.

G. Apply one layer of half looped plastic electric insulating tape over wire nuts used for joining the conductors of wires.

H. Enclosures, junction boxes, pull boxes, cabinets, cabinet trims, wiring troughs and the like, shall be fabricated of galvanized sheet metal, shall conform to the following:

1. They shall be constructed with continuously welded joints and seams.
2. Their edges and weld spots shall be factory treated with cold galvanizing compound.
3. Their connection to circuitry shall be by means of watertight hub connectors with sealing rings.

I. Enclosures for individually mounted switching and overcurrent devices shall be NEMA Class IV weatherproof construction.

J. The covers, doors and plates and trims used in conjunction with all enclosures, pull boxes, outlet boxes, junction boxes, cabinets and the like shall be equipped with gaskets.

K. Panels shall be equipped with doors without exception.

L. The following shall be interpreted as damp or wet locations within building confines:

1. Spaces where any designations indicating weatherproof (WP) or vaporproof appear on the drawings.
2. Below waterproofing in slabs applied directly on grade.
3. Spaces defined as wet or damp locations by article 100 of the National Electric Code.

3.5 IDENTIFICATION AND TAGGING

A. Identify individually:

1. Each transformer.
2. Each panelboard.
3. Each switch and circuit breaker.
4. Each feeder, wire or cable of all systems.
5. Each switchboard.
6. Each end of nylon pullwire in empty conduit.

B. Each wire or cable in a feeder shall be identified at its terminal points of connection and in each pullbox, junction box and panel gutter through which it passes.

C. The nomenclature used to identify panelboards or load center shall designate the numbers assigned to them.

D. The nomenclature used to identify switches or circuit breakers shall:

1. Where they disconnect mains or services designate this fact.
2. Where they control feeders, designate the feeder number and the name of the load supplied.
3. Where they control lighting and appliance branch circuitry, designate the name of the space and the load supplied.

E. The nomenclature used to identify feeder wires and cables shall designate the feeder number.

F. Identification for panelboards or load centers shall be by means of engraved lamacoid nameplates showing 1/4" high white lettering on a black background fastened to the outside face of the front.

G. Identification for switches or circuit breakers shall be by means of the following:

1. Where individually enclosed engraved lamacoid nameplates showing 1/8" high white lettering on a black background fastened on the outside front face of the enclosure.
2. Where in panelboards or load centers without doors same as for individually enclosed.
3. Where in panelboards or load centers with doors typewritten directories mounted behind transparent plastic covers, in metal frames fastened on the inside face of the doors.

H. Identification for wires and cables shall be by means of wrap around "brady" type labels.

I. Device plates for local toggle switches, toggle switch type motor starters, pilot lights and the like, whose function is not readily apparent shall be engraved with 1/8" high letters suitably describing the equipment controlled or indicated.

J. Phase identification letters shall be stamped into the metal of the bus bars of each phase of the main busses of each switchboard and each panelboard. The letters shall be visible from at least one "normal posture" location without having to demount any current carrying or supporting elements.

K. Equip the front face of all switchboard pull boxes junction boxes and the like containing cables, busing or devices operating in excess of 600 volts with enameled sheet metal "red on white" signs reading "DANGER HIGH VOLTAGE."

L. Equip all electric closets and the like with enameled sheet metal "red on white" signs reading "Electrical Equipment Room No Storage Permitted." Signs shall be mounted at clearly visible locations within the rooms.

M. Provide a sign at the service entrance equipment room indicating the type and location of all on site emergency or standby power sources.

N. Identify each outlet box, junction box, and cabinet used in conjunction with empty raceway for wires of a future system by means of indelible markings on the inside denoting the system.

O. Prior to installing identifying tags and nameplates, submit their nomenclature for approval. Conform to all revisions issued by the Designer.

3.6 LIMITING NOISE PRODUCED BY ELECTRICAL INSTALLATION

A. Perform the following work, in accordance with field instructions issued by the Designer to assure that minimal noise is produced by electrical installations due to equipment furnished as part of the electrical work.

B. Check and tighten the fastenings of sheet metal plates, covers, doors and trims used in the enclosures of electrical equipment.

C. Remove and replace any individual device containing one or more magnetic flux path metallic cores (e.g., discharge lamp ballast, transformer, reactor, dimmer, solenoid) which is found to have a noise output exceeding that of other identical devices installed at the project.

3.7 SUPPORTS AND FASTENINGS

A. Support work in accordance with best industry standards, Mass. Electric Code and the following:

B. Include supporting frames or racks for equipment, intended for vertical surface mounting, which is required in a free standing position.

C. Supporting frames or racks shall be of standard angle, standard channel or specialty support system steel members. They shall be rigidly bolted or welded together and adequately braced to form a substantial structure. Racks shall be of ample size to assure a workmanlike arrangement of all equipment mounted on them.

D. No work intended for exposed installation shall be mounted directly on any building surface. In such locations, flat bar members or spacers shall be used to create a minimum of 1/4" air space between the building surfaces and the work. Provide 3/4" thick exterior grade plywood painted with two coats of fire-retardant grey paint for mounting of panelboards.

E. Nothing (including outlet, pull and junction boxes and fittings) shall depend on electric conduits, raceways or cables for support.

F. Nothing shall rest on, or depend for support on, suspended ceiling media.

G. Support less than 2" trade size, vertically run, conduits at intervals no greater than 8 Ft. Support such conduits, 2-1/2" trade size or larger, at intervals no greater than the story height, or 15 Ft, whichever is smaller.

H. Where they are not embedded in concrete, support less than 1" trade size, horizontally run, conduits at intervals no greater than 7 ft. Support such conduits, 1" trade size or larger, at intervals no greater than 10 ft.

I. Support all lighting fixtures directly from structural slab, deck or framing member.

J. Where fixtures and ceilings are such as to require fixture support from ceiling openings frames, include in the electric work the members necessary to tie back the ceiling opening frames to ceiling suspension members or slabs so as to provide actual support for the fixtures noted above.

K. As a minimum procedure, in suspended ceilings support small runs of circuitry (e.g., conduit not in excess of 1 inch trade size) from ceiling suspension members as defined above. Support larger runs of circuitry directly from structural slabs, decks or framing members.

L. Fasten electric work to building structure in accordance with the best industry practice.

M. Floor mounted equipment shall not be held in place solely by its own dead weight. Include floor anchor fastenings in all cases.

N. For items which are shown as being ceiling mounted at locations where fastenings to the building construction element above is not possible, provide suitable auxiliary channel or angle iron bridging tying to building structural elements.

O. As a minimum procedure, where weight applied to the attachment points is 100 lbs. or less, fasten to concrete and solid masonry with bolts and expansion shields.

P. As a minimum procedure, where weight applied to building attachment points exceeds 100 lbs., but is 300 lbs. or less, conform to the following:

1. At field poured concrete slabs, utilize inserts with 20' minimum length slip-through steel rods, set transverse to reinforcing steel.

3.8 SPLICING AND TERMINATING WIRES AND CABLES

A. Maintain all splices and joints in removable cover boxes or cabinets where they may be easily inspected.

B. Locate each completed conductor splice or joint in the outlet box, junction box, or pull box containing it, so that it is accessible from the removal cover side of the box.

C. Join solid conductors No. 8 AWG and smaller by securely twisting them together and soldering, or by using insulated coiled steel spring "wire nut" type connectors. Exclude "wire nuts" employing non expandable springs. Terminate conductors No. 8 AWG and smaller by means of a neat and fast holding application of the conductors directly to the binding screws or terminals of the equipment or devices to be connected.

D. Join, tap and terminate stranded conductors No. 6 AWG and larger by means of solder sleeves, taps; and lugs with applied solder or by means of bolted saddle type or pressure indent type connectors, taps and lugs. Exclude connectors and lugs of the types which apply set screws directly to conductors. Where equipment or devices are equipped with set screw type terminals which are impossible to change, replace the factory supplied set screws with a type having a ball bearing tip. Apply pressure indent type connectors, taps and lugs utilizing tools manufactured specifically for the purpose and having features preventing their release until the full pressure has been exerted on the lug or connector.

E. Except where wire nuts are used, build up insulation over conductor joints to a value, equal both in thickness and dielectric strength, to that of the factory applied conductor insulation. Insulation of conductor taps and joints shall be by means of half lapped layers of rubber tape, with an outer layer of friction tape; by means of half lapped layers of approved plastic electric insulating tape; or by means of split insulating casings manufactured specifically to insulate the

particular connector and conductor, and fastened with stainless steel or non metallic snaps or clips.

F. Exclude splicing procedures for neutral conductors in lighting and appliance branch circuitry which utilize device terminals as the splicing points.

G. Exclude joints or terminations utilizing solder in any conductors used for grounding or bonding purposes.

H. Exclude all but solder or pressure indent type joints in conductors used for signaling or communications purposes.

I. Lugs for conductors used to make phase leg connections on the line side of the main service overcurrent and switching device shall be of the limiter type.

3.9 PULLING WIRES INTO CONDUITS AND RACEWAYS

A. Delay pulling wires or cables in until the project has progressed to a point when general construction procedures are not liable to injure wires and cables, and when moisture is excluded from raceways.

B. Utilize nylon snakes or metallic fish tapes with ball type heads to set up for pulling. In raceways 2" trade size and larger, utilize a pulling assembly ahead of wires consisting of a suitable brush followed by an 3 1/2" diameter ball mandrel.

C. Leave sufficient slack on all runs of wire and cable to permit the secure connection of devices and equipment.

D. Include circular wedge type cable supports for wires and cables at the top of any vertical raceway longer than 20 feet. Also include additional supports spaced at intervals which are no greater than 10'. Supports shall be located in accessible pull boxes. Supports shall be of a nondeteriorating insulating material manufactured specifically for the purpose.

E. Pulling lubricants shall be used. They shall be products manufactured specifically for the purpose.

F. Slack on wires and cables located in cabinets and pull boxes shall be formed and set in place in groupings corresponding to their occupancy of raceways. They shall also be arranged, with insulators and supports provided where necessary, such that cable shims or other such temporary expedients do not have to be left permanently in place to prevent the wires and cables from shifting when covers or trims are removed.

3.10 REQUIREMENTS FOR THE INSTALLATION OF JUNCTION BOXES, OUTLET BOXES AND PULL BOXES

A. Flush wall mounted outlet boxes shall not be set back to back but shall be offset at least 12" horizontally regardless of any indication on the drawings.

B. Locate all boxes so that their removable covers are accessible without necessitating the removal of parts of permanent building structure, including piping, ductwork, and other permanent mechanical elements.

C. In conjunction with concealed circuitry, abide by one of the following instructions (as may be applicable to the conditions) in order to assure the aforementioned accessibility. (Not required for circuitry concealed by removable suspended ceiling tiles.)

1. For a small (outlet size) box on circuitry concealed in a partition or wall, locate box or fitting so that its removable cover side (or the face of any applied raised cover) penetrates through to within 1/8" a of the exposed surface of the building materials concealing the circuitry and apply a blank or device plate to suit the functional requirements.
2. For a large box on circuitry concealed in a partition, suspended ceiling, or wall, locate box totally hidden but with its removable cover directly behind an architectural access door or panel (included for the purpose, separate from the electric work) in the building construction which conceals the circuitry.
3. For a small (outlet size) box on circuitry concealed above and intended as an outlet for a surface mounted lighting fixture or other such electrical item, locate box so that its removable cover side penetrates through to the exposed surface of the building materials concealing the circuitry. Arrange the mounting of the lighting fixture or other item so that it completely covers the opening in the building construction caused by the box.
4. For a small (outlet size) box on circuitry concealed in a suspended ceiling, and intended as an outlet for a non demountable type of recessed lighting fixtures or other such electrical items, locate box totally hidden but with its removable cover not more than one foot away from the building construction opening occupied by the demountable items.

D. Apply junction and pull boxes in accordance with the following:

1. Include pull boxes in long straight runs of raceway to assure that cables are not damaged when they are pulled in.
2. Include junction and pull boxes to assure a neat and workmanlike installation of raceways.
3. Include junction and pull boxes to fulfill requirements pertaining to the limitations to the number of bends permitted in raceway between cable access points, the accessibility of cable joints and splices, and the application of cable supports.
4. Include all required junction and pull boxes regardless of indications on the drawings (which, due to symbolic methods of notation, may omit to show some of them).

E. Apply outlet boxes in accordance with the following:

1. Unless noted below or otherwise specifically indicated, include a separate outlet box for each individual wiring device, lighting fixture and signal or communication system outlet component. Outlet boxes supplied attached to lighting fixtures shall not be used as replacements for the boxes specified herein.
2. A continuous row of fixtures of the end to end channel type, designed for "through wiring," and wired in accordance with the specification hereinafter pertaining to circuitry through a series of lighting fixtures, may be supplied through a single outlet box.
3. A series of separate fixtures, designed for "through wiring," spaced not more than 4' apart, and inter connected with conduit or raceway and circuitry which is in accordance with the specifications hereinafter pertaining to circuitry through a series of lighting fixtures, may be supplied through a single outlet box.

4. Connection to recessed ceiling fixtures supplied with pigtails may be arranged so that more than one, but not more than four, such fixtures are connected into a single outlet box. When adopting this procedure:
   a. Utilize an outlet box no smaller than 5" square by 2 1/2" deep.
   b. Allow no fixture to be supplied from an outlet box in another room.
5. Multiple local switches indicated at a single location shall be gang mounted in a single outlet box.
6. Include all required outlet boxes regardless of indications on the drawings (which due to symbolic methods of notation, may omit to show some of them).

F. Install junction boxes, pull boxes and outlet boxes in accordance with the following:

1. Exclude surface mounted outlet boxes in conjunction with concealed circuitry.
2. Exclude unused circuitry openings in junction and pull boxes. In larger boxes each such opening shall be closed with a galvanized sheet steel plate fastened with a continuous weld all around. In small outlet type boxes, utilize plugs as specified for such boxes.
3. Close up all unused circuitry openings in outlet boxes. Unused openings in cast boxes shall be closed with approved cast metal threaded plugs. Unused openings in sheet metal boxes shall be closed with sheet metal knock out plugs.
4. Outlet boxes for switches shall be located at the strike side of doors. Indicated door swings are subject to field change. Outlet boxes shall be located on the basis of final door swing arrangements.
5. Boxes and plaster covers for duplex receptacles shall be arranged for vertical mounting of the receptacle.
6. Equip outlet boxes used for devices which are connected to wires of systems supplied by more than one set of voltage characteristics with barriers to separate the different systems.

G. Barriers in junction and pull boxes of outlet size shall be of the same metal as the box.

H. Barriers in junction and pull boxes which are larger than outlet size shall be of the polyester resin fiberglass of adequate thickness for mechanical strength, but in no case less than 1/4" thick. Each barrier shall be mounted, without fastenings, between angle iron guides so that they may be readily removed.

3.11 LOCATING AND ROUTING OF CIRCUITRY

A. In general, all circuitry shall be run concealed except that it shall be run exposed where the following conditions occur:

1. Horizontally at the ceiling of permanently unfinished spaces which are not assigned to mechanical or electrical equipment.
2. Horizontally and vertically in mechanical equipment spaces.
3. Horizontally and vertically in electric equipment rooms.

B. Concealed circuitry shall be so located that building construction materials can be applied over its thickest elements without being subject to spalling or cracking.

C. All circuitry and raceways shall not be run within slabs. If for field conditions requires raceways to be embedded in field poured structural building construction concrete fill or slab shall conform to the following:

1. All proposed embedded raceways shall be indicated on plan and elevation and submitted to the Designer and Structural Engineer for review and written approval prior to installation. Any costs associated with the review and approval shall be borne by the Electrical Subcontractor.
2. They shall be run "single layer" with their outside surface no closer than 1" to any surface of the structural concrete.
3. They shall not be located in any configuration which places the outside surface of one closer than 3" to the outside surface of another, except at tees, crosses or other single level wide angle junction points.
4. Where crossovers or close grouping are unavoidable, circuitry shall be carefully field coordinated so as not to cause structural weakness.
5. Where turned up or down into a wall or partition they shall, before entering same, be routed parallel for a long enough distance to assure that no relocation of the wall or partition will be necessary to conceal the required bend.
6. They shall be routed in such a manner as to coordinate with the structural requirements of the building.
7. They shall be routed in accordance with field instructions issued by the Designer where such instructions differ from specifications set forth herein.

D. Circuitry run exposed shall be routed parallel to building walls and column lines.

E. Exposed circuitry located overhead shall be run in a completely accessible manner on the underside of all piping and ductwork.

F. Circuitry run in suspended ceilings shall be routed parallel to building walls, column lines, etc.

G. Circuitry shall be routed so as to prevent electric conductors from being subject to high ambient temperature. Minimum clearances from heated lines or surfaces shall be maintained as follows:

1.	Crossing where uninsulated	3"
2.	Crossing where insulated	1"
3.	Running parallel where uninsulated	36"
4.	Running parallel where insulated	6"

H. Circuitry shall not be run in elevator shafts, hoistways, and the like. Where outlets for trail cables, pit lights, run be level lights, and the like, are involved, only the "final connection" outlet boxes themselves shall be located within or open into, the confines of the shaft.

I. Circuitry for miscellaneous systems indicated without notation as to location and routing shall be run as per the requirements and notations governing the adjacent light and power circuitry.

3.12 INSTALLING CIRCUITRY

A. The outside surface of circuitry which is to be embedded in cinder concrete shall be coated with asphaltum paint.

B. In runs of conduit or raceway including flexible limit the number of bends between cable access points to a total which does not exceed the maximum specified for the particular system. Where no such maximum is specified, limit the number to four right angle bends or the equivalent thereof.

C. In each conduit or raceway assigned for the future pulling in of wires, include a nylon drag cord. In raceways 2" trade size and larger, the cord shall be pulled in utilizing a suitable brush, followed by an 85% diameter ball mandrel ahead of the cord in the pulling assembly. In the event that obstructions are encountered, which will not permit the drag cord to be installed, the blocked section of raceway shall be replaced and any cutting and patching of the structure involved in such replacement shall be included as part of the electric work.

D. Circuitry shall be arranged such that conductors of one feeder or circuitry carrying "going" current are not separated from conductors of the same feeder or circuitry carrying "return" current by any ferrous or other metal. Where not within raceways, all "going" and "return" current conductors of one feeder or circuit shall be laces together so as to minimize induction heating of adjacent metal components.

E. Sleeves used where circuitry is to penetrate waterproof slabs, decks and walls, shall be of a type selected to suite the water condition encountered in the field.

3.13 FIRESTOPPING

A. Install firestopping assembly at locations shown and as specified in accordance with UL FRD systems or FM P7825 designs, and as recommended by manufacturer. Do not cover or enclose firestopped areas until approved by the WRTA Project Manager.

B. Delete inapplicable requirements and add any other requirements not covered. "Other locations" would refer to areas such as plenums and furred spaces. Location of firestopping in plenums should be indicated on floor or by notes without specific location.

1. Completely fill openings around penetrating items with firestopping material to prevent spread of fire in the following locations:
2. Around duct, cable, conduit, piping, and their supports that penetrate fire-rated above grade floor slabs, interior partitions, and exterior walls.
3. Around openings and penetrations through fire-rated ceiling assemblies.
4. Around penetration of vertical fire-rated service shafts.
5. Around openings and penetrations through fire-rated enclosures.
6. Other locations indicated.
7. At all air barrier penetrations as defined in the State’s Energy Code.

C. Provide construction details for large openings not suitable for manufactured, filler type firestopping covered by this specification.

D. Completely fill voids flush with the surface; the depth of material shall be in accordance with UL FRD or FM P7825. Firestopping for filling voids in floors in which smallest dimension of a

void is 4 inches or more shall support the floor design load or be protected by a permanent barrier. Damaged, disrupted, or removed firestoppings shall be replaced with new firestoppings as specified in this section.

E. Wall and Floor Penetration by wiring and conduits: A 2 hour fire resistive chase enclosure shall be maintained by encasing the pipe in an 18 inch steel sleeve and penetrating the chase at a 45 degree downward angle. Chases shall be firestopped at each floor.

END OF SECTION

SECTION 270000

COMMUNICATIONS SYSTEMS

(Part of work of Section 260001 - ELECTRICAL WORK, Filed Sub Bid Required)

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS, which are hereby made a part of this Section.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Wiring and conduit between the device locations and the data room, as shown on the design drawings. Final wiring connections of all data, voice, and access control equipment and installation of said devices by WRTA.
2. Field quality control.
3. Coordination drawings and record drawings and similar requirements.
4. Photographs of above ceiling conditions related to project scope are shown in Section 013100 – PROJECT MANAGEMENT AND COORDINATION – Appendix A.

B. Alternates: Not Applicable.

C. Items to Be Installed Only: Not Applicable.

D. Items to Be Furnished Only: Not Applicable.

1.3 SUBMITTALS

A. Comply with requirements specified in Section 013300 – SUBMITTAL REQUIREMENTS.

B. Product Data: For all Work of this Section.

C. Shop Drawings: For all Work of this Section.

D. Prior to purchasing any equipment or materials, a complete list of components, including the names of the manufacturers shall be submitted for review.

E. Prior to assembling or installing the telecommunications work, the following shall be submitted for review:

1. Catalog information, factory assembly drawings and field installation drawings as required for a complete explanation and description of all items of equipment.

F. Documents will not be accepted for review unless:

1. They include complete information pertaining to appurtenances and accessories.
2. They are submitted as a package where they pertain to related items.
3. They are properly marked with specific service or function, and intended location of use within the project (i.e., voice IC and MC terminations).
4. They are clearly identified or highlighted to indicate all items that are applicable.
5. They indicate the project name and address along with the contractor's name, address and phone number.
6. They are properly marked with external connection identification as related to the project where they consist of standard factory assembly or field installation drawings.

G. Shop Drawing Review:

1. The purpose of the review of shop drawings is to maintain the integrity of the design. Unless the Contractor clearly points out changes, substitutions, deletions or any other differences between the submission and the Contract Documents in writing on the Contractor's letterhead, approval by the Designer does not constitute acceptance. It is not to be assumed that the Designer has read the text nor reviewed the technical data of a manufactured item and its components except where the Vendor has pointed out differences between his product and the specified model.
2. Confirm all dimensions, quantities, and the coordination of materials and products supplied by him with other trades. Approval of shop drawings containing errors does not relieve the Contractor from making corrections at their expense.
3. Substitutions of equipment, systems, materials, must be coordinated with their own or other trades which may be involved with the item, such as, but not limited to, equipment substitutions which change telecommunications or electrical requirements, or hanging or support weights or dimensions.
4. Any extra charges or credits which may be generated by other trades due to substitutions will not be accepted unless the Contractor has an agreement in writing with the WRTA Project Manager.
5. Substitutions of equipment, systems, etc. requiring approval of local authorities must comply with such regulations and be filed at the expense of the Contractor (should filing be necessary). Substitutions are subject to approval or disapproval by the Designer. The Contractor in offering substitutions shall hold WRTA and the Designer harmless if the substituted item is an infringement of patent held by the specified item.

H. Include in the telecommunications work the issuing of operating instructions for the following specialized equipment:

1. All electronic equipment provided or installed as part of the telecommunications work.

Hanger Pull-Out Testing Submittals and Requirements: Hangers and supports will be tested for pull-out by the Independent Testing Agency designated by the WRTA Project Manager. Comply with the requirements of Section 014325 – TESTING AGENCY SERVICES and the following:

2. Contractor’s Documentation Prior to Testing:

a. Submit manufacturer's name and model number for each type of hanger and support proposed for use, and technical data including type, load capacity, test reports, methods for installation, and use limitations.
b. Submit a schedule for each type of hanger and support indicating where units for testing will be installed, including substrate, and materials to be supported.
c. Submit a letter from Trade Contractor indicating supports have been installed in accordance with manufacturer's recommendations and project requirements, and are ready for testing.

3. Independent Testing Agency's Documentation Prior to Testing for Trade Contractor's Information:
   a. Submit the methods and type of equipment which will be used to test hangers and supports.
   b. Submit loads which will be applied, and criteria for acceptance or failure of hangers and supports.
4. Quantity to Be Installed by Trade Contractor for Testing: Two of each size of each type of hanger or support.
5. Testing Results: The Independent Testing Agency will submit reports indicating test results.
   a. Units which did not deform or fail during testing may remain in place.
   b. Units which failed during testing shall be replaced and testing repeated until satisfactory results are obtained.
   c. Cost of repeat testing will be at the expense of the Trade Contractor.
   d. Contractor shall repair damaged substrates, if any.

I. Manufacturer's Seismic Qualification Certification (if applicable): Submit certification that distribution racks and their components will withstand seismic forces defined in Section 260001 – ELECTRICAL WORK. Include the following:

1. Basis for Certification: Base certification on the maximum number of components capable of being mounted in each rack type. Identify components on which certification is based. Indicate whether withstand certification is based on actual test of assembled components or on calculation.
   a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
   b. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
2. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

J. Acceptable Manufacturers: Submit and install the Acceptable Manufactures (unless "approved equals" are allowed) specified herein and the substitutions of the products will not be accepted. If substitutions are implemented without prior approval of the Designer or WRTA Project Manager, be responsible for any consequences resulting from the substitutions.

1.4 REFERENCES

A. ANSI/NFPA-70 - National Electrical Code.

B. ANSI/TIA/EIA-568-C.0 – Generic Telecommunications Cabling for Customer Premises.

1. ANSI/TIA-568-C.1 - Commercial Building Telecommunications Cabling Standard.
2. ANSI/TIA 568-C.2 - Balanced Twisted-Pair Telecommunications Cabling and Components Standard.
3. ANSI/TIA 568-C.3 - Optical Fiber Cabling Components Standards.
4. ANSI/TIA-570-B – Residential Telecommunications Infrastructure Standard.
5. ANSI/TIA-758-A – Customer-Owned Outside Plant Telecommunications Infrastructure Standard.
6. ANSI/TIA-862-A – Building Automation Systems Cabling Standard for Commercial Buildings.
7. ANSI/TIA-942 – Telecommunications Infrastructure Standard for Data Centers.
8. ANSI/TIA-1005 – Telecommunications Infrastructure Standard for Industrial Premises.

C. ANSI/TIA/EIA-606-B - Administration Standard for the Telecommunications Infrastructure of Commercial Buildings.

D. J-STD-607-A – (Formally TIA/EIA-607) Commercial Building Grounding and Bonding Requirements for Telecommunications.

E. BICSI Telecommunications Distribution Methods Manual (TDMM).

1.5 DEFINITIONS

A. Regardless of their usage in codes or other industry standards, certain words as used in the drawings or specifications for the telecommunications, work shall be understood to have the specific meanings ascribed to them in the following list:

1. "Accessible Corridor" - A common horizontal pathway which can be approached or entered easily in which telecommunications cables are run until they branch out to individual workstation terminations.
2. "Assembly" A defined set of elements of telecommunications work.
3. “Category 3” -- Cables/connectivity with transmission characteristics rated for 16 MHz as defined in TIA/EIA-568.C and all related addendums or bulletins.
4. “Category 5e” -- Cables/connectivity with transmission characteristics rated for 100 MHz that has been optimized for applications that use 4 pairs as defined in TIA/EIA-568.C.2 and all related addendums or bulletins.
5. “Category 6” -- Cables/connectivity with transmission characteristics rated for 200 MHz as defined in TIA/EIA-568.C.2 and all related addendums or bulletins.
6. “Augmented Category 6 or Category 6A” -- Cables/connectivity with transmission characteristics rated for 500 MHz as defined in TIA/EIA-568.C.2 and all related addendums (addendum 10 draft) or bulletins.
7. "Circuit" -- An electrical or optical path used for communications between two devices.
8. “Communications Plenum cable (CMP)” -- Cable listed as being suitable for use in ducts, plenums, and other air-handling spaces.
9. “Communications Riser cable (CMR)” -- Cable listed as being suitable for use in a vertical shaft or from floor to floor.
10. "Telecommunications Room” (TR) -- An enclosed area or space specifically designated for the routing, termination and/or cross-connecting of telecommunications cable (i.e., riser cable) to other telecommunications cable and/or equipment (i.e., workstation cables or concentrators). This may also be referred to as the telephone or communications closet.

11. "Telecommunications Infrastructure" -- Any telecommunications work which consists of wires, cables, raceways, and/or specialty wiring method assemblies taken all together complete with associated junction boxes, pull boxes, outlet boxes, joints, couplings, splices and connections except where limited to a lesser meaning by specific description.
12. "Telecommunications Work" -- All telecommunications work as defined by the telecommunications drawings and specifications.
13. "Electromagnetic Interference (EMI)" – An undesirable effect on electronic equipment or signals, created by radiated or conducted electromagnetic energy.
14. "Entrance Point" -- Point at which telecommunications cabling enters the building. Where cable enters in conduit that is buried in a concrete floor, the point at which the conduit emerges from the floor is considered the entrance point.
15. "Horizontal Cross-connect (HC) -- A floor or area-serving group of connectors that allows backbone and horizontal cabling, equipment, systems and subsystems to be cross-connected or interconnected using patch cords or jumpers.
16. "Horizontal Cabling" -- Distribution media that connects the telecommunications outlet or connector in the work area to a consolidation point or horizontal connection point or to the first piece of connecting equipment in the horizontal cross-connect.
17. "Intermediate Cross-Connect (IC)" -- A group of connectors between the first and second level backbone that allows equipment, systems and subsystems to be cross-connected.
18. "Insulation displacement connector (IDC)" – Wire termination where the insulation around a conductor is displaced at the point of connection.
19. "Intermediate Distribution Frame (IDF)" – See Horizontal Cross-connect and Intermediate Cross-connect.
20. "Local area network (LAN)" – A computer network that encompasses a relatively small area, floor, group of floors, building or campus.
21. "Low Voltage" -- Below 50 volts.
22. "Main Distribution Frame (MDF)" -- See Main Cross-Connect.
23. Main Cross-connect (MC) -- A group of connectors, sequentially arranged as a patch panel on a rack or as a block on the wall, normally located in the (main) equipment room, that allows the cross-connection and interconnection of entrance cabling, first-level backbone, horizontal cabling, equipment, systems and subsystems.
24. "Patch Panel" -- A system of terminal blocks, patch cords, and backboards that facilitates administration of cross-connect fields for moves and rearrangements.
25. "Plenum" -- A building space that forms part of the air distribution system for heating, ventilation or air conditioning.
26. Polyvinyl Chloride (PVC)" A general purpose, water-resistant thermoplastic use as a jacketing and insulation material for wire and cable.
27. "Raceway" -- Any pipe, duct, extended enclosure, or conduit (as specified for a particular system) which is used to contain wires or cables.
28. "Riser" -- 1. The space used for cable to pass from floor-to-floor. 2. Vertical sections of cable.,
29. "Station Cable" -- See Horizontal Cabling.
30. "UnShielded/Screened Twisted-Pair (ScTP)" -- Multiple twisted copper pair cable with an additional metallic shield covering each individual pair.
31. "Telecommunications Outlet/Connector (TO)" – A connecting device in the work area upon which horizontal cabling terminates and into which the work area cable (cord) is connected.
32. "Unshielded Twisted-Pair (UTP)" -- One or more pairs of twisted copper conductors with no metallic shielding.

33. “Voice over Internet Protocol (VoIP)” -- Hardware or software that enables the Internet to be used as the transmission medium for telephone calls by sending voice data in packets using IP rather than by traditional circuit transmissions of the public switched telephone network.
34. "Work Area” or “Work Station” -- The location where end users interact with telecommunications or network equipment.

B. Reference to Standards:

1. "U.L. (Materials Construction) Standards" shall mean the "Standards for Safety," published by Underwriters Laboratories, Inc.
2. "NEMA Standards" shall mean the "Approved Standards" published by the National Electrical Manufacturers Association.
3. "ANSI Standards" shall mean the standards published by the American National Standards Institute.
4. "EIA/TIA Standards" shall mean the standards published by the Telecommunications Industry Association which represents the communications sector of the Electronic Industries Alliance (EIA.
5. "IEEE Standards" shall mean the standards published by the Institute of Electrical and Electronics Engineers.
6. "BICSI Standards" shall mean the guidelines and methods described in the Telecommunications Distribution Methods Manual (TDMM), along with the Information Transport Systems Installation Manual published by the Building Industries Consulting Service International (BICSI.
7. "RUS Standards" shall mean the standards published by the Rural Utilities Services.
8. "Bell Standards" shall mean the standards published by Telcordia Technologies, formerly Bell Communications Research, Incorporated (Bellcore).
9. “NRTL” shall mean any of the laboratories listed in OSHA’s Nationally Recognized Testing Laboratory program.
10. “BICSI ITSIMM” shall mean the Information Transport Systems Installation Methods Manual (ITSIMM), published by the Building Industries Consulting Service International (BICSI).

C. Items and installation methods as described in any drawings and specifications provided for telecommunications work are to be used only under normal work conditions as hereinafter described unless there are specific notations to the contrary.

D. Except where modified by a specific notation to the contrary, it shall be understood that the indication and/or description of any telecommunications item in the drawings and specifications for telecommunications work carries with it the instruction to furnish, install and connect the item as part of the telecommunications work regardless of whether or not this instruction is explicitly stated.

E. It shall be understood that any specifications and drawings are complementary and are to be taken together for a complete interpretation of the telecommunications work. Where there are conflicts between the drawings and specifications or within the specifications or drawings themselves, the items of higher standard shall govern.

F. To the extent that they govern the basic work, the specifications also govern change order work if any.

G. No exclusion from or limitation in, the symbolism used on the drawings for telecommunications work or the language used in the specifications for telecommunications work shall be interpreted as a reason for omitting the appurtenances or accessories necessary to complete any required system or item of equipment.

H. Any drawings for telecommunications work utilize symbols and schematic diagrams that have no dimensional significance. The telecommunications work shall, therefore, be installed to fulfill the diagrammatic intent expressed on telecommunications drawings, but in conformity with the dimensions indicated on the final working drawings, field layouts and shop drawings of all trades.

I. Certain details appear on drawings for telecommunications work that are specific with regard to the dimensioning and positioning of the telecommunications work. These are intended only for general information purposes. They do not obviate field coordination for individual items of the indicated work.

J. Information as to general construction and architectural general construction and architectural features and finishes shall be derived from structural and architectural drawings and specifications only.

K. The use of words in the singular shall not be considered as limiting where other indications denote that more than one item is referred to.

L. Ratings of devices, materials and equipment specified without reference to specific performance criteria shall be understood to be nominal or nameplate ratings established by means of industry standard procedures.

M. It is the intent of drawings and/or specifications to provide a complete operating telecommunications system. All telecommunications work necessary to provide such a system shall be performed. Any discrepancies shall be brought to the attention of the Designer.

N. The work called for under this Contract shall be carried on simultaneously with the work of other trades and WRTA functions in such a manner as to not delay the overall progress of the construction project.

O. When directed by the WRTA Project Manager, make reasonable, minor modifications in the layout of hardware as needed to prevent conflict with work of other trades, WRTA functions or for proper execution of the work.

P. Be responsible for providing adequate protection of equipment before and after installation.

Q. Be responsible for clean-up of debris on a daily basis and cost of clean-up unless otherwise specified.

R. All telecommunications drawings, elevations, details and riser diagrams shall be considered diagrammatic. Be responsible for all quantities and sizes in order to provide a fully operational system.

1.6 HORIZONTAL CABLING DESCRIPTION

A. Horizontal cable and its connecting hardware provide the means of transporting signals between the telecommunications outlet/connector and the horizontal cross-connect located in the communications equipment room. This cabling and its connecting hardware are called "permanent link," a term that is used in the testing protocols.

1. ANSI/TIA/EIA-568-C.0 – Generic Telecommunications Cabling for Customer Premises.
    a. ANSI/TIA-568-C.1- Commercial Building Telecommunications Cabling Standard.
    b. ANSI/TIA 568-C.2- Balanced Twisted-Pair Telecommunications Cabling and Components Standard.
    c. ANSI/TIA 568-C.3- Optical Fiber Cabling Components Standards.
    d. ANSI/TIA-758-B – Customer-Owned Outside Plant Telecommunications Infrastructure Standard.
    e. ANSI/TIA-862-A – Building Automation Systems Cabling Standard for Commercial Buildings.
    f. ANSI/TIA-1005 – Telecommunications Infrastructure Standard for Industrial Premises.
    g. Pending ANSI/TIA-1152-Balanced Twisted-Pair Field Testing.
2. Horizontal cabling shall contain no more than one transition point or consolidation point between the horizontal cross-connect and the telecommunications outlet/connector.
3. Bridged taps and splices shall not be installed in the horizontal cabling.
4. Splitters shall not be installed as part of the optical fiber cabling.

B. A work area is approximately 100 sq. ft., and includes the components that extend from the telecommunications outlet/connectors to the station equipment.

C. The maximum allowable horizontal cable length is 295 feet. This maximum allowable length does not include an allowance for the length of 16 feet to the workstation equipment. The maximum allowable length does not include an allowance for the length of 16 feet in the horizontal cross-connect.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: System installer must have on staff a Registered Communication Distribution Designer (RCDD) certified by Building Industry Consulting Service International (BICSI).

B. Testing Agency Qualifications: An independent testing agency, with the experience and capability to conduct the testing indicated, that is a member company of the International Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

1. Testing Agency's Field Supervisor: Person currently certified by the International Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.

C. Source Limitations: Obtain all products except twisted-pair and fiber-optic cables through one source from a single manufacturer.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

E. Comply with NFPA 70.

F. All equipment and materials for permanent installation shall be the products of recognized manufacturers and shall be new.

G. New equipment and materials shall:

1. Be Underwriters Laboratories, Inc. (U.L.) labeled and/or listed or Interteck/Semko (ETL) labeled and/or listed where specifically called for or where normally subject to such U.L. or ETL labeling and/or listing services for electrical transmission performance specification compliance.
2. Be clearly labeled identifying the transmission parameters specified (specifically with reference to Category 5E and Category 6 or higher ratings).
3. Be without blemish or defect.
4. Be in accordance with the latest applicable standards.
5. Be products that meet with the acceptance of the agency inspecting the telecommunications work.

H. It is the intent of these specifications that wherever a manufacturer of a product is specified, and the terms "other approved" or "or approved equal" or "equal" are used, the substituted item must conform in all respects to the specified item. Consideration will not be given to claims that the substituted item meets the performance requirements with lesser construction. Performance as delineated in schedules and in the specifications shall be interpreted as minimum performance.

I. Substituted equipment or optional equipment where permitted and approved, must conform to space requirements. Any substituted equipment that cannot meet space requirements, whether approved or not, shall be replaced at no additional expense to WRTA. Any modifications of related systems as a result of substitutions shall be made no additional expense to WRTA.

J. Note that the approval of shop drawings, or other information submitted in accordance with the requirements hereinbefore specified, does not assure that the Designer, or the WRTA Project Manager, attests to the dimensional accuracy or dimensional suitability of the material or equipment involved or the ability of the material or equipment involved or the mechanical performance of equipment. Approval of Shop Drawings does not invalidate the plans and specifications if in conflict; unless a letter requesting such change is submitted and approved on the Designer's letterhead.

K. Substitutions of Telecommunications Equipment for that shown on the schedules or designated by model number in the specifications will not be considered if the item is not a regular cataloged item shown in the current catalog of the manufacturer.

L. Manufacturer's Recommendations: Where installation procedures of any part thereof are required to be in accordance with the recommendations of the manufacturer of the material being installed, printed copies of these recommendations shall be furnished prior to installation. Installation of the item will not be allowed to proceed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the material.

M. Telecommunications Pathways and Spaces: Comply with TIA/EIA-569-B.

N. Grounding: Comply with ANSI-J-STD-607-A.

O. Grounding and Bonding: Comply with NFPA 70 (NEC) 2008 Articles 250 and 800.

P. Installation Experience: At least five years experience installing and servicing telecommunication systems.

1.8 CODES, PERMITS AND INSPECTIONS

A. All telecommunications work shall meet or exceed the latest requirements of all national, state, county, municipal, and other authorities exercising jurisdiction over the telecommunications work and the project.

B. All required permits and inspection certificates shall be obtained, paid for, and made available at the completion of the telecommunications work. In the event that no official authority exists which will issue a certificate attesting to the safety of the electrical installations, such a certificate shall be acquired from an independent agency acceptable to the WRTA Project Manager. Inspection and certification fees levied by this agency shall be paid for as part of the telecommunications work.

C. Any portion of the telecommunications work which is not subject to the requirements of an electric code published by a specific authority having jurisdiction (AHJ) shall be governed by the National Electrical Code and other applicable Sections of the National Fire Code, as published by the National Fire Protection Association.

D. In the event the authority having jurisdiction does not require a permit for this scope of work, obtain that information, in writing, from the AHJ and provide to the WRTA Project Manager, prior to the start of the work.

E. Installation procedures, methods and conditions shall comply with the latest requirements of the Federal Occupational Safety and Health Administration (OSHA).

1.9 GUARANTEES AND CERTIFICATIONS

A. All telecommunications work shall be guaranteed to be free from defects. Any defective materials or workmanship, as well as damage to the telecommunications work of all trades resulting from same, shall be replaced or repaired as directed for the duration of stipulated guarantee periods.

B. The duration of guarantee periods following the date of acceptance of the telecommunications work shall be:

1. For work not otherwise specified: One year.

C. The date of acceptance shall be the date of the final payment for the telecommunications work or the date of a formal notice of acceptance, whichever is earlier.

D. Non-durable items shall be replaced up to the date of acceptance, such that they shall have had no use prior to this date.

E. Certification shall be submitted attesting to the fact that specified performance and other criteria are met by all items of telecommunications work for which such certification is required.

1.10 COORDINATION

A. Coordinate layout and installation of voice and data communication cabling with WRTA's telecommunications and LAN equipment suppliers. Coordinate service entrance arrangement with local exchange carrier.

B. Record agreements reached in meetings and distribute to other participants.

C. Review coordination drawings produced by other trades to make sure proper clearances are maintained and cable routing and space layouts are coordinated. Any problems shall be brought to the attention of the Designer.

D. Coordinate the exact location of the telecommunications outlets along with their associated power receptacles with the Designer and Electrical Contractor. Refer to Electrical and Architectural drawings for additional information.

E. Coordinate with all trades that impact any of the telecommunication rooms. Any alteration within or around the telecommunication rooms that effects the protection of the telecommunication cables and equipment shall be brought to the attention of the Designer and Contractor.

1.11 RECORD DRAWINGS

A. As part of the required telecommunications work, a complete set of "as-built" telecommunications drawings shall be made up and delivered to the Designer. Refer to Section 017700 – CONTRACT CLOSEOUT for additional requirements.
   1. Plans showing as-built locations of grounding and bonding infrastructure, including ground rods, ground and roof rings, BCT, TMGB, TGBs, and routing of their bonding conductors.

B. The Drawings shall show:

   1. All telecommunications work installed exactly in accordance with the original design and/or the specification.
   2. All telecommunications work installed as a modification or addition to the original design and/or the specification.
   3. The dimensional information necessary to delineate the exact location of all circuitry and wiring runs which are concealed as to be untraceable by inspection through the regular means of access established for inspection and maintenance.
   4. The numbering information necessary to correlate all telecommunications items (or outlets for same) to the patch panel, end user or head end device to which they are connected.

C. Establish cable records during the installation. Cable records will be maintained on a MS Excel or equivalent program. These records shall correlate the workstation ID number, distribution cable number, punch down block or frame assignments, conduit or duct path and station location. These records shall be updated as the project progresses to reflect any required changes made either in the field or as a result of design changes. As-built Records/Drawings will be furnished as specified after the completion of installation and acceptance of the space by the Designer. The database format (i.e., field and record descriptions) shall be submitted to the Designer for approval prior to beginning work.

PART 2 - PRODUCTS

2.1 PATHWAYS

A. General Requirements: Comply with TIA/EIA-569-B.

B. Cable Support: NRTL labeled for support of Category 6 cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.

1. Support brackets with cable tie slots for fastening cable ties to brackets.
2. Lacing bars, spools, J-hooks, and D-rings.
   a. Multi-tiered j-hooks shall be used in all areas where cable tray cannot be installed.
   b. J-hook bundle size (per hook) shall be not larger than 3” in diameter.
3. Straps and other devices.
4. Comply with TIA-569-D.

C. Cable Trays:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the work include, but are not limited to, the following:
   a. Chatsworth.
   b. Cablofil Inc.
   c. Cooper B-Line, Inc.
   d. GS Metals Corp.
   e. WBT.
   f. Panduit.
2. Ladder Cable Tray
   a. Description:
      1) Configuration: Two longitudinal side rails with transverse rungs swaged or welded to side rails, complying with NEMA VE 1.
      2) Width: unless otherwise indicated on Drawings.
      3) Minimum Usable Load Depth: 4 inches.
      4) Straight Section Lengths: 12 feet, except where shorter lengths are required to facilitate tray assembly.
      5) Rung Spacing: 9 inches o.c.
      6) Radius-Fitting Rung Spacing: 9 inches at center of tray's width.

7) Minimum Cable-Bearing Surface for Rungs: 7/8-inch width with radius edges.
8) No portion of the rungs shall protrude below the bottom plane of side rails.
9) Structural Performance of Each Rung: Capable of supporting a maximum cable load, with a safety factor of 1.5, plus a 200-lb concentrated load, when tested according to NEMA VE 1.
10) Fitting Minimum Radius: 12 inches.
11) Class Designation: Comply with NEMA VE 1, Class 8A.
12) Splicing Assemblies: Bolted type using serrated flange locknuts.
13) Splice-Plate Capacity: Splices located within support span shall not diminish rated loading capacity of cable tray.

b. Materials and Finishes:
1) Aluminum:
2) Materials: Alloy 6063-T6 according to ANSI H35.1/H 35.1M for extruded components, and Alloy 5052-H32 according to ANSI H35.1/H 35.1M for fabricated parts.
3) Hardware: Chromium-zinc-plated steel, ASTM F 1136.

3. Wire Mesh Cable Tray
a. Description:
1) Configuration: Galvanized steel wire mesh, complying with NEMA VE 1.
2) Width: as indicated on Drawings.
3) Minimum Usable Load Depth: 4 inches.
4) Straight Section Lengths: 12 feet, except where shorter lengths are required to facilitate tray assembly.
5) Structural Performance: Capable of supporting a maximum cable load, with a safety factor of 1.5, plus a 200-lb concentrated load, when tested according to NEMA VE 1.
6) Class Designation: Comply with NEMA VE 1, Class 8A.
7) Splicing Assemblies: Bolted type using serrated flange locknuts.
8) Splice-Plate Capacity: Splices located within support span shall not diminish rated loading capacity of cable tray.

4. Materials and Finishes:
a. Steel:
1) Straight Sections and Fittings: Steel complies with the minimum mechanical properties of ASTM A 1008/A 1008M, Grade 33, Type 2.
2) Steel Tray Splice Plates: ASTM A 1011/A 1011M, HSLAS, Grade 50, Class 1.
3) Fasteners: Steel complies with the minimum mechanical properties of ASTM A 510/A 510M, Grade 1008.
4) Finish: Hot-dip galvanized after fabrication, complying with ASTM A123/A123 M, Class B2.
a) Hardware: Galvanized, ASTM B 633.
5) Finish: Hot-dip galvanized after fabrication, complying with ASTM A 653/A 653M, G90 (Z275).
a) Hardware: Galvanized, ASTM B 633.

5. Cable Tray Accessories
a. Fittings: Tees, crosses, risers, elbows, and other fittings as indicated, of same materials and finishes as cable tray.
b. Barrier Strips: Same materials and finishes as for cable tray.

c. Cable tray supports and connectors, including bonding jumpers, as recommended by cable tray manufacturer.

6. Warning Signs
   a. Comply with requirements for identification in Section 270553 "Identification for Communications Systems."
   b. Lettering: 1-1/2-inch- high, black letters on yellow background with legend "Warning! Not To Be Used as Walkway, Ladder, or Support for Ladders or Personnel."

D. Conduit and Boxes: Comply with requirements in Section 260001 – ELECTRICAL WORK.
1. General Requirements for Metal Conduits and Fittings:
   a. Listed and labeled as defined in NFPA 70, by a nationally recognized testing laboratory, and marked for intended location and application.
   b. Comply with TIA-569-D.
2. GRC: Comply with ANSI C80.1 and UL 6.
3. IMC: Comply with ANSI C80.6 and UL 1242.
4. EMT: Comply with ANSI C80.3 and UL 797.
5. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
   a. Fittings for EMT:
      1) Material: Steel or die cast.
      2) Type: compression.

6. Expansion Fittings: PVC or steel to match conduit type, complying with UL-467, rated for environmental conditions where installed, and including flexible external bonding jumper.
7. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.
8. Fittings: Comply with NEMA TC 3; match to conduit or tubing type and material.
9. Solvents and Adhesives: As recommended by conduit manufacturer.
10. Outlet boxes shall be a double gang box with a single gang reducer bracket, unless otherwise noted. Verify depth requirements such as 3 inch for 6A UTP and ScTP .
11. Each telecommunication outlet shall have a 1 inch conduit stubbed up with pull string to the nearest accessible ceiling and/or cable tray.
12. Comply with TIA-569-D.
13. Boxes, enclosures, and cabinets installed in wet locations shall be listed and labeled as defined in NFPA 70, by an NRTL, and marked for use in wet locations.
14. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
15. Device Box Dimensions: 4 inches square by 2-1/8 inches deep.
16. Gangable boxes are prohibited.
17. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
18. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.
19. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
20. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, galvanized, cast iron with gasketed cover.
21. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1, Type 3R, or Type 4, with continuous-hinge cover with flush latch unless otherwise indicated.

a. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
b. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

2.2 SLEEVES

A. Wall Sleeves:

1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.

B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

C. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

D. Sleeves for Rectangular Openings:

1. Material: Galvanized-steel sheet.
2. Minimum Metal Thickness:

a. For sleeve cross-section rectangle perimeter less than 50 inches and with no side larger than 16 inches, thickness shall be 0.052 inch.
b. For sleeve cross-section rectangle perimeter 50 inches or more and one or more sides larger than 16 inches, thickness shall be 0.138 inch.

2.3 SLEEVE-SEAL SYSTEMS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and pathway or cable.
1. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Carbon steel.
3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.4 SLEEVE-SEAL FITTINGS

A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.

2.5 GROUT

A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

2.6 SILICONE SEALANTS

A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.

B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

2.7 UTP CABLE (HORIZONTAL)

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the work include, but are not limited to, the following:

1. Belden CDT Inc.; Electronics Division.
2. General Cable.
3. TE Connectivity.

B. Description: Four-pair, balanced-twisted pair cable, with internal spline, certified to meet transmission characteristics of Category 6 cable at frequencies up to 250MHz.

C. Standard: Comply with NEMA WC 66/ICEA S-116-732 and TIA-568-C.2 for Category 6 cables.

D. Conductors: 100-ohm, 23 AWG solid copper.

E. Shielding/Screening: Unshielded twisted pairs (UTP)

F. Cable Rating: Plenum.

G. Jacket: Blue thermoplastic.

2.8 UTP CABLE HARDWARE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the work include, but are not limited to, the following:

1. Belden CDT Inc.; Electronics Division.
2. Panduit Corp.
3. TE Connectivity.

B. Description: Hardware designed to connect, splice, and terminate twisted pair copper communications cable.

C. General Requirements for Twisted Pair Cable Hardware:

1. Comply with the performance requirements of Category 6.
2. Comply with TIA-568-C.2, IDC type, with modules designed for punch-down caps or tools.
3. Cables shall be terminated with connecting hardware of same category or higher.

D. Source Limitations: Obtain twisted pair cable hardware from single source from single manufacturer. Cable manufacturer must be affiliated with the provided cable termination hardware and be eligible for an extended warranty upon a contractor secured application, cable plant registration and manufacturer certification.

E. Patch Panel: Modular panels housing numbered jack units with IDC-type connectors at each jack location for permanent termination of pair groups of installed cables.

1. Features:

a. Universal T568A and T568B wiring labels.
b. Labeling areas adjacent to conductors.
c. Replaceable connectors.
d. 24 and 48 ports.

2. Construction: 16-gauge steel and mountable on 19-inch equipment racks.
3. Number of Jacks per Field: One for each four-pair cable indicated plus 25% spare capacity.

F. Patch Cords: Factory-made, four-pair cables in 36-inch lengths; terminated with an eight-position modular plug at each end. Provide one patch cable for each category 6 horizontal cable.

1. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure performance. Patch cords shall have latch guards to protect against snagging.
2. Patch cords shall have color-coded boots for circuit identification.

2.9 TELECOMMUNICATIONS OUTLET/CONNECTORS

A. Workstation Cabling:

1. Standard workstations may be described as one of the following:
   a. Standard voice/data workstation shall be as follows:
   b. Voice/Data #1, & Voice/Data #2.
   c. Standard Telephone Only Workstation.
   d. Standard Data Only Workstation.
2. A Standard Voice/Data Workstation shall consist of the following:
   a. One individual 4-pair Category 6 cable for Voice/Data 1 and
      One individual 4-pair Category 6 cable for Voice/Data 2
   b. 4 individual 4-pair Category 6 cables for Voice/ Data 1, 2, 3 and 4.
3. A Standard Telephone Only Workstation shall consist of the following:
   a. One individual 4-pair Category 6 cable.
   b. For Wall Phone Outlets, a faceplate shall be used that can accept a wall mounted telephone.
4. Horizontal Voice/Data 1 cabling shall be White in color (jacket), (ivory outlets) Horizontal Voice/Data 2 cabling shall be Blue in color (jacket), (blue outlets). All voice/data cables shall be run to the same Cat 6 patch panels.

2.10 GROUNDING

A. Comply with requirements in Section 260001 – ELECTRICAL WORK for grounding conductors and connectors.

B. Comply with ANSI-J-STD-607-A.

C. Comply with NEC Article 250 and Article 800

D. Insulated Conductors utilized for grounding and bonding shall not be less than #6 AWG stranded copper wire and shall have type THHN or better insulation, color coded green, 600V, and complying with UL 83.

E. All ground wire connections to ground bars, racks, ladder racks, etc shall be made using a crimp style, 2 bolt, UL listed grounding lugs.

F. Connectors
   1. Irreversible connectors listed for the purpose. Listed by an NRTL as complying with NFPA 70 for specific types, sizes, and combinations of conductors and other items connected. Comply with UL 486A-486B.
   2. Compression Wire Connectors: Crimp-and-compress connectors that bond to the conductor when the connector is compressed around the conductor. Comply with UL 467.
      a. Electroplated tinned copper, C and H shaped.
   3. Busbar Connectors: Cast silicon bronze, solderless compression-type, mechanical connector; with a long barrel and two holes spaced on 5/8- or 1-inch (15.8- or 25.4-mm) centers for a two-bolt connection to the busbar.
   4. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.11 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Conduit and Cable Support Devices: Steel and malleable-iron clamps, hangers, and associated fittings, designed for types and sizes of raceway or cable to be supported.

B. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored communications conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be made of malleable iron.

C. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Mechanical-Expansion Anchors: Insert-wedge-type zinc-coated steel for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

2. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
3. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
4. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
5. Toggle Bolts: All-steel springhead type.

2.12 Hanger Rods: Threaded steel.

2.13 IDENTIFICATION PRODUCTS

A. Comply with TIA/EIA-606-A and UL 969 for labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

B. Labels
1. Vinyl Wraparound Labels: Preprinted, flexible labels laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.
2. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameters sized to suit diameters of raceway or cable they identify, that stay in place by gripping action.
3. Self-Adhesive Wraparound Labels: Preprinted, 3-mil- thick, vinyl flexible labels with acrylic pressure-sensitive adhesive.
    a. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating protective shields over the legend. Labels sized such that the clear shield overlaps the entire printed legend.
    b. Marker for Labels: Machine-printed, permanent, waterproof black ink recommended by printer manufacturer.
4. Self-Adhesive Labels: Vinyl, thermal, transfer-printed, 3-mil- thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.

a. Minimum Nominal Size:
   1) 1-1/2 by 6 inches for raceway and conductors.
   2) 3-1/2 by 5 inches for equipment.
   3) As required by authorities having jurisdiction.

C. Bands And Tubes
1. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeves, 2 inches long, with diameters sized to suit diameters of raceway or cable they identify, that stay in place by gripping action.

D. Cable Ties
1. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.
   a. Minimum Width: 3/16 inch.
   b. Tensile Strength at 73 deg F according to ASTM D 638: 12,000 psi.
   c. Temperature Range: Minus 40 to plus 185 deg F.
   d. Color: Black, except where used for color-coding.

2. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.
   a. Minimum Width: 3/16 inch .
   b. Tensile Strength at 73 deg F according to ASTM D 638: 12,000 psi .
   c. Temperature Range: Minus 40 to plus 185 deg F.
   d. Color: Black.
3. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, and self-locking.
   a. Minimum Width: 3/16 inch.
   b. Tensile Strength at 73 deg F according to ASTM D 638: 7000 psi.
   c. UL 94 Flame Rating: 94V-0.
   d. Temperature Range: Minus 50 to plus 284 deg F.
   e. Color: Black.

E. Miscellaneous Identification Products
1. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).
2. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

2.14 SOURCE QUALITY CONTROL

A. Factory test UTP and optical fiber cables on reels according to TIA/EIA-568-C.2 & ANSI/TIA-1152.

B. Factory test UTP cables according to TIA/EIA-568-C.2 & ANSI/TIA-1152.

C. Cable will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 WIRING METHODS

A. Wiring Method: Install cables in raceways and cable trays except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces, in attics, and in gypsum board partitions where unenclosed wiring method may be used. Conceal raceway and cables except in unfinished spaces.

1. Install plenum cable in environmental air spaces, including plenum ceilings.
2. Comply with requirements for raceways and boxes specified in Section 260001 – ELECTRICAL WORK.
3. At the final device locations provide enough extra cable for termination of the devices by the WRTA. For all cables starting at the Communications Room coil enough cable to reach the final equipment plus 20’. Label the cable, coil the cable within the ceiling or leave in agreed upon location with the WRTA IT department.

B. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

C. Wiring within Enclosures: Bundle, lace, and train cables to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

3.2 INSTALLATION OF PATHWAYS

A. Cable Trays: Comply with NEMA VE 2 and TIA/EIA-569-A-7.

B. Comply with requirements for demarcation point, pathways, cabinets, and racks. Drawings indicate general arrangement of pathways and fittings.

C. Comply with TIA/EIA-569-A for pull-box sizing and length of conduit and number of bends between pull points.

1. Pull boxes are required every 100 feet or 180 degrees of conduit bends.
2. All conduits shall be bushed and reamed and free of any sharp edges that can cause damage to the cables.

D. Comply with requirements in Section 260001 – ELECTRICAL WORK for installation of conduits and wireways.

E. Install manufactured conduit sweeps and long-radius elbows whenever possible.

F. Indoors: Apply pathway products as specified below unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed, Not Subject to Severe Physical Damage: EMT.
3. Exposed and Subject to Severe Physical Damage: GRC. Pathway locations include the following:

a. Mechanical rooms.

4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
5. Damp or Wet Locations: GRC.
6. Pathways for Optical-Fiber or Communications Cable in Spaces Used for Environmental Air: Plenum-type, optical-fiber-cable pathway or Plenum-type, communications-cable pathway.
7. Pathways for Optical-Fiber or Communications-Cable Risers in Vertical Shafts: EMT.
8. Pathways for Concealed General-Purpose Distribution of Optical-Fiber or Communications Cable: Plenum-type, optical-fiber-cable pathway.
9. Boxes and Enclosures: NEMA 250, Type 1.

G. Minimum Pathway Size: 3/4-inch trade size for copper and aluminum cables, and 1 inch for optical-fiber cables.

H. Pathway Fittings: Compatible with pathways and suitable for use and location.

1. Rigid Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. EMT: Use compression, steel fittings. Comply with NEMA FB 2.10.

I. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.

J. Comply with the following standards for installation requirements except where requirements on Drawings or in this Section are stricter:

1. NECA 1.
2. NECA/BICSI 568.
3. TIA-569-D.
4. NECA 101
5. NECA 111.

K. Comply with NFPA 70 limitations for types of pathways allowed in specific occupancies and number of floors.

L. Keep pathways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal pathway runs above water and steam piping.

M. Complete pathway installation before starting conductor installation.

N. Arrange stub-ups so curved portions of bends are not visible above finished slab.

O. Conceal rigid conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

P. Support conduit within 12 inches of enclosures to which attached.

Q. Stub-ups to Above Recessed Ceilings:

1. Use EMT, IMC, or RMC for pathways.

2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

R. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of pathway and fittings before making up joints. Follow compound manufacturer's written instructions.

S. Install pathways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus one additional quarter-turn.

T. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure, to assure a continuous ground path.

U. Cut conduit perpendicular to the length. For conduits of 2-inch trade size and larger, use roll cutter or a guide to ensure cut is straight and perpendicular to the length.

V. Install pull wires in empty pathways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Secure pull wire, so it cannot fall into conduit. Cap pathways designated as spare alongside pathways in use.

W. Surface Pathways:
1. Install surface pathway with a minimum 2-inch (50-mm) radius control at bend points.
2. Secure surface pathway with screws or other anchor-type devices at intervals not exceeding 48 inches (1200 mm) and with no less than two supports per straight pathway section. Support surface pathway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.

X. Pathways for Optical-Fiber and Communications Cable: Install pathways, as follows:

1. 3/4-Inch Trade Size and Smaller: Install pathways in maximum lengths of 50 feet.
2. 1-Inch Trade Size and Larger: Install pathways in maximum lengths of 75 feet.
3. Install with a maximum of two 90-degree bends or equivalent for each length of pathway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.

Y. Install pathway-sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed pathways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install pathway-sealing fittings according to NFPA 70.

Z. Install devices to seal pathway interiors at accessible locations. Locate seals, so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all pathways at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where an underground service pathway enters a building or structure.
3. Where otherwise required by NFPA 70.

AA. Hooks:

1. Size to allow a minimum of 25 percent future capacity without exceeding design capacity limits.
2. Shall be supported by dedicated support wires. Do not use ceiling grid support wire or support rods.
3. Hook spacing shall allow no more than 6 inches of slack. The lowest point of the cables shall be no less than 6 inches adjacent to ceilings, mechanical ductwork and fittings, luminaires, power conduits, power and telecommunications outlets, and other electrical and communications equipment.
4. Space hooks no more than 5 feet o.c.
5. Provide a hook at each change in direction.

BB. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.

CC. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surface to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.

DD. Horizontally separate boxes mounted on opposite sides of walls, so they are not in the same vertical channel.

EE. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

FF. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

3.3 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

A. Comply with NECA 1.

B. Comply with NEMA VE 2 for cable tray and cable penetrations.

C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:

1. Interior Penetrations of Non-Fire-Rated Walls and Floors:

   a. Seal annular space between sleeve and pathway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Joint Sealants."
   b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.

2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and pathway or cable unless sleeve seal is to be installed.
4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches above finished floor level. Install sleeves during erection of floors.

D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:

1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.

E. Roof-Penetration Sleeves: Seal penetration of individual pathways and cables with flexible boot-type flashing units applied in coordination with roofing work.

F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

3.4 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal the space around outside of sleeve-seal fittings.

3.5 SUPPORTS

A. Comply with the following standards for application and installation requirements of hangers and supports, except where requirements on Drawings or in this Section are stricter:

1. NECA 1.
2. NECA/BICSI 568.
3. TIA-569-D.
4. NECA 101
5. NECA 111.

B. Include supporting cabinets to floor in telecommunications closets and main equipment room.

C. Supporting cables, cable hangers and threaded rod are the responsibility of the work of this Section.

D. Nothing (including outlet, pull and junction boxes and fittings) shall depend on conduits, raceways or cables for support.

E. Nothing shall rest on, or depend for support on, suspended ceiling media (tiles, lath, plaster, as well as splines, runners, bars and the like in the plane of the ceiling). Vertical members which suspend the ceiling (together with their horizontal bracing which occurs above the ceiling), however, may be used for support.

F. As a minimum procedure, in suspended ceilings support small runs of circuitry from ceiling suspension members as defined above. Support larger runs of circuitry directly from structural slabs, decks or framing members.

G. Where support members must of necessity penetrate air ducts, include, in accordance with instructions issued in the field, airtight sealing provisions which allow for a relative movement between the support members and the duct walls.

H. Include in the telecommunications work channel sills or skids for leveling and support of all floor mounted telecommunications equipment.

I. Where permitted loading is exceeded by direct application of telecommunications equipment to a slab or deck, include in the telecommunications work proper dunnage as required to distribute the weight in a safe manner.

J. Fire-resistant Velcro cable ties shall be used for securing riser cables. The cable ties shall be laced through the strands of the messenger and secured to the cable to be supported.

K. All cable ties used to support telecommunications cabling shall be of the fire-resistant Velcro type. The support rating of the cable ties used shall be a minimum of twice that of the weight per unit of the cable(s) to be supported. Nylon cable ties shall not be used during any part of the installation of the cabling system, even during the pulling of cabling.

L. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMTs, IMCs, and RMCs as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.

M. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

1. Secure raceways and cables to these supports with two-bolt conduit clamps.

N. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

O. Raceway Support Methods: In addition to methods described in NECA 1, EMT and RMC may be supported by openings through structure members, according to NFPA 70.

P. Strength of Support Assemblies: Where not indicated, select sizes of components, so strength will be adequate to carry present and future static loads within specified loading limits.

Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

Q. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten communications items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Use approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Use expansion anchor fasteners.
5. To Steel: Beam clamps (MSS SP-58, Type 19, 21, 23, 25, or 27), complying with MSS SP-69.
6. To Light Steel: Sheet metal screws.
7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.

R. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

3.6 INSTALLATION OF CABLES

A. Comply with NECA 1.

B. General Requirements for Cabling:

1. Comply with TIA/EIA-568-C.0.
2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
3. Install 110-style IDC termination hardware unless otherwise indicated.
4. MUTOA shall not be used as a cross-connect point.
5. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
6. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
7. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Install lacing bars and distribution spools.
8. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
9. Cold-Weather Installation: Bring cable to room temperature (above 32 degrees Fahrenheit for 48 hours) before dereeling. Heat lamps shall not be used for heating.
10. In the communications equipment room, install a 10-foot-long service loop at the telecom room and 12 inch service loop at the workstation end, located at the nearest accessible ceiling.
11. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions. Follow manufacturer’s recommendation for pulling tension.

12. All telecommunication cables shall be carry a fire rating (i.e. plenum-CMP) to match the environment of that space.

C. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend UTP cable not in a wireway or pathway a minimum of 8 inches above ceilings by cable supports not more than 60 inches apart.
3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

D. Group connecting hardware for cables into separate logical fields.

E. Separation from EMI Sources:

1. Comply with BICSI TDMM and TIA/EIA-569-A for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
   a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.
   b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
   c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.
3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
   a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
   b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
   c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.
4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
   a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
   b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.
   c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.
5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches.
6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches.

F. Mounting Heights:

1. Heights of all wall mounted outlets shall be in accordance with the following list. (Dimensions are above finished floor unless noted.)
   a. Telecommunications outlet in field constructed wall, partition or column unless otherwise specified below -- 18" to centerline.
   b. Telecommunications outlet in factory fabricated wall or partition, unless otherwise specified below -- Dimension determined by wall or partition construction.
   c. Telecommunications outlet in telecommunications closets, mechanical spaces, electric switchboard rooms electric closets -- 5'-0" to centerline.

2. Heights of all wall mounted outlets shall be in accordance with the architectural drawings and details. Equipment mounting heights shall be in accordance with telecommunications details. Any discrepancies shall be brought to the Designer's attention.
3. Architectural drawings and field instructions issued by the Designer take precedence over the above list and shall be adhered to.

G. Cable Installation in Cable Trays:
1. Install cables only when each cable tray run has been completed and inspected.
2. Fasten cables on horizontal runs with cable clamps or cable ties according to NEMA VE 2. Tighten clamps only enough to secure the cable, without indenting the cable jacket. Install cable ties with a tool that includes an automatic pressure-limiting device.
3. Fasten cables on vertical runs to cable trays every 18 inches.
4. Fasten and support cables that pass from one cable tray to another or drop from cable trays to equipment enclosures. Fasten cables to the cable tray at the point of exit and support cables independent of the enclosure. The cable length between cable trays or between cable tray and enclosure shall be no more than 72 inches (1800 mm).

3.7 APPLICATION OF GROUNDING

A. Grounding and Bonding Conductors:

1. Install in the straightest and shortest route between the origination and termination point, and no longer than required. The bend radius shall not be smaller than eight times the diameter of the conductor. No one bend may exceed 90 degrees.
2. Install without splices.
3. Support at not more than 36-inch intervals.
4. Install grounding and bonding conductors in 3/4-inch PVC conduit until conduit enters a telecommunications room. The grounding and bonding conductor pathway through a plenum shall be in EMT. Conductors shall not be installed in EMT unless otherwise indicated.

    a. If a grounding and bonding conductor is installed in ferrous metallic conduit, bond the conductor to the conduit using a grounding bushing that complies with requirements in Section 270528 "Pathways for Communications Systems," and bond both ends of the conduit to a TGB.

3.8 FIRESTOPPING

A. Comply with requirements in Division 07 Section "Penetration Firestopping."

B. Comply with TIA/EIA-569-A, Annex A, "Firestopping."

C. Comply with BICSI TDMM, "Firestopping Systems" Article.

D. Firestopping shall be provided for all penetrations of conduit, wireways, bus ducts, cable trays, etc., through fire-rated walls and floors and other fire-rated separations as follows:

1. Excess space in framed openings through structural floors between conduits and concrete shall be grouted in with concrete to a depth of at least the thickness of the slab plus 2" minimum above the slab.
2. Conduit penetration through poured concrete or masonry walls shall be grouted in with concrete and provided with tight fitting escutcheon plates on both sides.
3. Conduit penetrations through fire-rated dry walls shall be with sleeves through the wall fitted with escutcheon plates on both sides with excess openings filled with fire stop material specifically manufactured for the purpose.
4. Excess space within conduit sleeves or stubs through floor slabs or walls where low voltage/telecommunications cables pass through shall be filled with firestopping material specifically manufactured for the purpose.
5. Utilize fire-rated fittings, as specified elsewhere for penetrations through floor slabs for supplying floor outlets.

E. All conduits/sleeves used for vertical cable passage shall be sealed utilizing suitable material after the installation of cables as follows:

1. The material shall be non-corrosive to the cable jacket or insulation that it applies to.
2. The material shall provide for a minimum of three hour fire rating.
3. The material shall be non-shrinking, waterproof and smoke tight.
4. The material shall remain flexible and non-hardening.
5. The material shall be of the type that when installed will not slip through the openings, will stick to the surfaces of the openings and the cable and will not require any pressure to be applied to the cable in order to keep it in place.
6. The material shall be installed in a neat and workmanlike manner and the final installation shall be smooth finished to the top of the sleeve or conduit.
7. The material shall be easily removable without damaging the cables after being set or cured for at least one week.

F. All horizontal cable penetrations through rated walls shall be sealed in a manner that will provide a fire rating equal to the wall construction.

G. All materials used for firestopping shall be approved for the purpose and the rating of the wall or floor and all methods employed shall meet with the approval of the local authorities.

H. Refer to architectural drawings and specifications for all locations of fire rated walls and floors.

3.9 GROUNDING

A. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.

B. Comply with ANSI-J-STD-607-A.

C. Telecommunications Grounding Busbars to be provided by the Electrical Contractor.

D. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

E. Ground all systems and equipment in accordance with best industry practice and the following:

1. Furnish and install ground connections in the Main Comm Room (MC) and each IC room from every cabinet, rack, conduit, sleeve, cable shield, etc. to the ground bars provided for that purpose.
2. All metal panels, enclosures, boxes, racks, raceways, conduits, ladder rack etc. in computer rooms, telecommunications equipment rooms and closets shall be grounded with an individual ground wire back to bus bar. No daisy-chaining will be permitted.
3. All ground wire connections to ground bars, racks, ladder rack, etc. shall be made using crimp-style, 2 bolt, UL-listed grounding lugs.

F. Cable Tray Grounding:
1. Ground cable trays according to NFPA 70 unless additional grounding is specified.
2. Cable trays shall be bonded together with splice plates listed for grounding purposes or with listed bonding jumpers.
3. Cable trays with single-conductor power conductors shall be bonded together with a grounding conductor run in the tray along with the power conductors and bonded to the tray at 72-inch intervals. The grounding conductor shall be sized according to NFPA 70, Article 250.122, "Size of Equipment Grounding Conductors," and Article 392, "Cable Trays."
4. When using epoxy- or powder-coat painted cable trays as a grounding conductor, completely remove coating at all splice contact points or ground connector attachment. After completing splice-to-grounding bolt attachment, repair the coated surfaces with coating materials recommended by cable tray manufacturer.
5. Bond cable trays to power source for cables contained within with bonding conductors sized according to NFPA 70, Article 250.122, "Size of Equipment Grounding Conductors."

3.10 CABLE TRAY CONNECTIONS

A. Remove paint from all connection points before making connections. Repair paint after the connections are completed.

B. Connect pathways to cable trays according to requirements in NEMA VE 2 and NEMA FG 1.

3.11 IDENTIFICATION

A. Identify individually:

1. Each and every telecommunications cable.
2. Each outlet (and each port).
3. Each termination block and patch panel (and each termination).
4. Each equipment termination frame and cabinet.
5. Each junction box used for telecommunications wiring.
6. Each system (i.e., voice, LAN, etc.) as identified by the Designer.
7. Other items as directed.

B. The nomenclature used to identify cables, blocks, equipment, etc. shall be as specified on the drawings or elsewhere in this specification. Missing or unclear nomenclature criteria for the items specified above shall not be construed as a reason not to identify the items and shall be brought to the Designers attention.

C. Provide all materials required for labeling. All labels shall be permanently adhered, easily visible and shall be smudge-proof. All text shall be typed (not handwritten). All cables shall be labeled at both ends minimum.

D. Identification for the wires and cables shall be by means of wrap around "Brady" type labels at both ends.

E. Labels for cables, wires, , cover plates, etc., shall be provided with textual descriptions.

F. Identify each outlet box, junction box, and cabinet used in conjunction with empty raceway for wires of a future system by means of indelible markings on the inside denoting the system.

G. Prior to installing identifying tags and nameplates, submit their nomenclature for approval. Conform to all revisions issued by the Designer.

H. Junction boxes used for telecommunications wiring and located in unfinished spaces (i.e., hung ceilings, equipment rooms, etc.) shall be clearly identified on the outside as "COMM."

I. All identification products and methods shall comply with ANSI/EIA/TIA-606.

3.12 PAINTING

A. Touchup: Comply with requirements in Section 099000 "Painting and Coatings" for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas, and apply galvanizing-repair paint to comply with ASTM A 780.

3.13 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Visually inspect UTP cable jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA/EIA-568-C.1 & ANSI/TIA-1152.
2. Visually confirm Category 6, marking of outlets, cover plates, outlet/connectors, and patch panels.
3. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.

4. After installing cable trays and after electrical circuitry has been energized, survey for compliance with requirements.
5. Visually inspect cable insulation for damage. Correct sharp corners, protuberances in cable trays, vibrations, and thermal expansion and contraction conditions, which may cause or have caused damage.

6. Verify that the number, size, and voltage of cables in cable trays do not exceed that permitted by NFPA 70. Verify that communications or data-processing circuits are separated from power circuits by barriers or are installed in separate cable trays.
7. Verify that there are no intruding items such as pipes, hangers, or other equipment in the cable tray.
8. Remove dust deposits, industrial process materials, trash of any description, and any blockage of tray ventilation.
9. Visually inspect each cable tray joint and each ground connection for mechanical continuity. Check bolted connections between sections for corrosion. Clean and retorque in suspect areas.
10. Check for improperly sized or installed bonding jumpers.
11. Check for missing, incorrect, or damaged bolts, bolt heads, or nuts. When found, replace with specified hardware.
12. Perform visual and mechanical checks for adequacy of cable tray grounding; verify that all takeoff raceways are bonded to cable trays. Test entire cable tray system for continuity. Maximum allowable resistance is 1 ohm.

B. Tests and Inspections for Grounding:

1. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
2. Test the bonding connections of the system using an ac earth ground-resistance tester, taking two-point bonding measurements in each telecommunications equipment room containing a TMGB and a TGB and using the process recommended by BICSI TDMM. Conduct tests with the facility in operation.
.

C. End-to-end cabling will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports as described in section 3.09.

3.14 RECORD OF TEST RESULTS

A. A record of all required tests shall be provided to the Designer and WRTA Project Manager. The information shall be maintained as permanent record for the purposes of maintenance and restoration.

B. A brief description outlining the test equipment used and a single line diagram indicating the test setup shall be provided to the Designer for his review. The level of description should be sufficient enough to allow an individual who is not familiar with the specific test equipment to recreate any portion of the test.

C. Test results to be provided shall contain the following minimum information:

1. For all similar cable runs include:
   a. Project name
   b. Description of test (i.e., voice riser, workstation cable, etc.)
   c. Cable origin
   d. Cable destination

e. Cable ID
f. Cable pair/strand
g. Test date
h. Tester (individual responsible for conduct of the test)
i. Page __ of __

2. For copper cables:
   a. No shorts, no crosses, no breaks.
   b. For the indicated pairs of the cables include:
      1) Wire Map
      2) Length
      3) Insertion Loss
      4) NEXT Loss, Pair-to-pair
      5) PSNEXT Loss
      6) ELFEXT Loss, Pair-to-pair
      7) PSELFEXT Loss
      8) Return Loss
      9) ACR
      10) PSACR
      11) Propagation Delay
      12) Delay Skew
      13) Test equipment settings

D. Submitted test results shall be direct output from the tester. Provide a copy of the required viewing software for the WRTA Project Manager to review the results.

E. Provide a summary sheet indicating the cables tested and summary results.

F. All test results shall be provided in the following formats:

1. Printed (one bound copy)
2. Disk (CD Rom or other approved electronic media) in the tester's native format.

G. A copy of the test results in both electronic and printed formats shall be provided to the Designer for his review and the WRTA Project Manager for his records.

H. Document data for each measurement. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.

3.15 EQUIPMENT INSTALLATION AND TESTING

A. Be available during equipment installation and testing to help isolate faults which may exist in the cabling or LAN system installation.

B. Coordinate with other vendors where necessary to resolve any discrepancies between the cabling system and the vendors cabling or equipment.

3.16 PROTECTION

A. Protect installed cable trays and cables.

1. Install temporary protection for cables in open trays to safeguard exposed cables against falling objects or debris during construction. Temporary protection for cables and cable tray can be constructed of wood or metal materials and shall remain in place until the risk of damage is over.
2. Repair damage to galvanized finishes with zinc-rich paint recommended by cable tray manufacturer.
3. Repair damage to paint finishes with matching touchup coating recommended by cable tray manufacturer.

3.17 CORRECTIVE ACTION

A. Any defects or deficiencies discovered in any of the telecommunications work shall be indicated on the test report and be corrected.

B. Upon completion of testing and problem resolution, all connections tested are to be 100% error free.

C. Any connections determined to be not correctable shall be indicated at each end of the termination as "bad" (in red).

3.18 CLEANING

A. Clean all equipment prior to acceptance and turn over the installation clean and dust-free.

END OF SECTION

ATTACHMENT B

100% DESIGN DRAWINGS

(Next Page)

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WORCESTER REGIONAL TRANSIT AUTHORIITY

60 FOSTER ST, WORCESTER, MA 01608

PROJECT NO. 4022461

MAIN LOBBY RENOVATION
100% CONSTRUCTION DRAWINGS

ISSUE DATE: FEB. 10TH, 2025

INDEX OF DRAWINGS

GENERAL

SHEET NO.	SHEET NAME
G-000	COVER SHEET
G-001	CODE SUMMARY, NOTES AND SYMBOLS
G-002	ARCHITECTURAL ABBREVIATIONS

ARCHITECTURE

SHEET NO.	SHEET NAME
AD-101	DEMOLITION LEVEL 1 FLOOR PLAN
AD-111	DEMOLITION LEVEL 1 RCP
AD-401	DETAILS OF DEMOLITION
A-101	LEVEL1 FLOOR PLAN
A-111	LEVEL 1 RCP
A-201	INTERIOR ELEVATIONS @ WAITING AREA
A-202	ENLARGED VESTIBULE PLAN & ELEVATIONS
A-203	ENLARGED RESTROOM PLANS & ELEVATIONS
A-301	WALL SECTIONS AND ENLARGED ELEVATIONS
A-401	PARTITION TYPES & DETAILS
A-402	PLAN DETAILS
A-403	SECTION DETAILS - PART 1 OF 2
A-404	SECTION DETAILS - PART 2 OF 2
A-501	LEVEL 1 FLOOR FINISH PLAN & SCHEDULE
A-502	FURNITURE AND EQUIPMENT SCHEDULE
A-601	DOOR, WINDOW SCHEDULE AND DETAILS
A-701	ROOM FINISH SCHEDULE AND DETAILS
A-801	REFERENCE PHOTOS

STRUCTURE

SHEET NO.	SHEET NAME
S-101	SLAB ON GRADE DEMO
S-102	CURTAIN WALL REPLACEMENT
S-103	ENTRY DOOR REPLACEMENT

MECHANICAL

SHEET NO.	SHEET NAME
M-001	MECHANICAL LEGEND
MD-100	LEVEL 1 DEMOLITION PLAN
MD-110	LEVEL 1 PIPING AND CONTROLS DEMOLITION PLAN
M-100	LEVEL 1 FLOOR PLAN
M-110	LEVEL 1 PIPING AND CONTROLS FLOOR PLAN
M-400	MECHANICAL DETAILS 1 OF 2
M-401	MECHANICAL DETAILS 2 OF 2
M-402	MECHANICAL CONTROLS
M-700	MECHANICAL SCHEDULES

ELECTRICAL

SHEET NO.	SHEET NAME
E-001	LEGEND, NOTES, & ABBREVIATIONS
ED-101	DEMOLITION LEVEL 1 POWER & FIRE ALARM PLAN
ED-102	DEMO LEVEL 1 SECURITY, COMMS, & DATA PLAN
ED-201	DEMOLITION LEVEL 1 LIGHTING PLAN
ED-601	EXISTING SINGLE LINE DIAGRAM
ED-701	DEMOLITION FA & CAMERA ONE LINE & SCHEDULE
ED-901	EXISTING PANEL SCHEDULES (SHEET 1 OF 2)
ED-902	EXISTING PANEL SCHEDULES (SHEET 2 OF 2)
E-101	LEVEL 1 POWER & FIRE ALARM PLAN
E-102	LEVEL 1 SECURITY, COMMS, & DATA PLAN
E-201	LEVEL 1 LIGHTING PLAN
E-701	FIRE ALARM RISER & MATRIX
E-901	PANEL SCHEDULES (SHEET 1 OF 2)
E-902	PANEL SCHEDULES (SHEET 2 OF 2)
E-903	NEW SCHEDULES

PLUMBING

SHEET NO.	SHEET NAME
P-001	PLUMBING LEGEND
PD-100	PLUMBING UNDERGROUND DEMOLITION PLAN
PD-101	PLUMBING FIRST FLOOR DEMOLITION PLAN
P-100	PLUMBING UNDERGROUND PLAN
P-101	PLUMBING FIRST FLOOR PLAN
P-401	PLUMBING SCHEDULES

FIRE PROTECTION

SHEET NO.	SHEET NAME
FP-001	FIRE PROTECTION LEGEND
FPD-100	FIRE PROTECTION FIRST FLOOR DEMO PLAN
FP-100	FIRE PROTECTION FIRST FLOOR PLAN



G-000

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CODE SUMMARY

PROJECT DESCRIPTION

THE PROPOSED WORCESTER REGIONAL TRANSIT AUTHORITY (WRTA) IS AN ALTERATION OF AN EXISTING SPACE WITHIN THE WRTA FACILITY. THE PURPOSE OF THIS PROJECT IS TO REORGANIZE EXISTING SPACE ON THE LEVEL TO PROVIDE BETTER EXPERIENCE FOR THE CUSTOMERS AND STAFFS. WORK PROPOSED WITHIN THE PROJECT FALLS UNDER LEVEL 2 ALTERATION. GENERAL SCOPE ITEMS ARE OUTLINED BELOW:

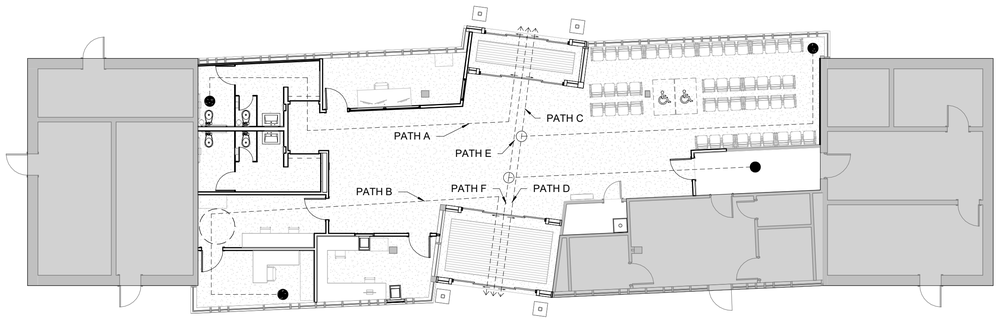
- DEMOLITION OF INTERIOR DOORS AND PARTITIONS
- CONSTRUCTION OF NEW DOORWAYS AND PARTITIONS
- INSTALLATION OF NEW CEILING, INCLUDING UPDATED LIGHT FIXTURES
- ASSOCIATED PAINTING AND FINISH ENHANCEMENTS
- FLOORING REPAIRS AND NEW FINISH APPLICATIONS
- MEP/FP (MECHANICAL, ELECTRICAL, PLUMBING, AND FIRE PROTECTION) UPGRADES AND ADDITIONS TO SUPPORT THE RECONFIGURED SPACE

THE PROPOSED ALTERATIONS WILL NOT IMPACT THE EXISTING BUILDING ENVELOPE OR STAIRWAYS. HOWEVER, EGRESS WITHIN THE WORK AREA WILL BE RECONFIGURED TO MEET APPLICABLE STANDARDS.

BUILDING AREA: 2,700 SF
OCCUPANCY TYPE: WORK AREA NON-SEPARATED MIXED USES:
- A-3 (WAITING AREA WITH > 49 O.C.C.)
- B (OFFICE, BREAK ROOM WITH < 49 O.C.C.)

BUILDING CONSTRUCTION TYPE:
THE PROJECT SCOPE DOES NOT INCLUDE ANY ALTERATIONS THAT TRIGGER COMPLIANCE WITH THE MINIMUM CONSTRUCTION TYPE OR HEIGHT AND AREA LIMITATIONS SUCH AS AN ADDITION OR CHANGE OF USE. THEREFORE, THE NEW WORK IS ONLY REQUIRED TO BE CONSISTENT WITH THE EXISTING CONSTRUCTION TYPE AND MATERIALS.

CODE TYPE	APPLICABLE CODE
BUILDING	780 CMR: MASSACHUSETTS STATE BUILDING CODE, 9TH EDITION (AMENDED 2015 INTERNATIONAL BUILDING CODE (IBC)) (AMENDED 2015 INTERNATIONAL EXISTING BUILDING CODE (IEBC))
FIRE PROTECTION	527 CMR 1: MASSACHUSETTS FIRE PREVENTION REGULATIONS (AMENDED 2015 NFPA 1) M.G.L. CHAPTER 148 SECTION 26G – SPRINKLER PROTECTION
ACCESSIBILITY	521 CMR: 521 CMR: MASSACHUSETTS ARCHITECTURAL ACCESS BOARD REGULATIONS
ELECTRICAL	527 CMR 12: MASSACHUSETTS ELECTRICAL CODE (AMENDED 2023 NATIONAL ELECTRICAL CODE)
MECHANICAL	2015 INTERNATIONAL MECHANICAL CODE (IMC)
PLUMBING	248 CMR: MASSACHUSETTS PLUMBING CODE
ENERGY CONSERVATION	225 CMR: MASSACHUSETTES STRETCH ENGERGY CODE (AMENDED 2021 INTERNATIONAL ENERGY CONSERVATION CODE (IECC))



LEVEL 1 LIFE SAFETY PLAN

3/32" = 1'-0"

0 6' 12' 24'

LEGEND

- START OF TRAVEL PATH
- POINT OF DECISION
- TRAVEL PATH

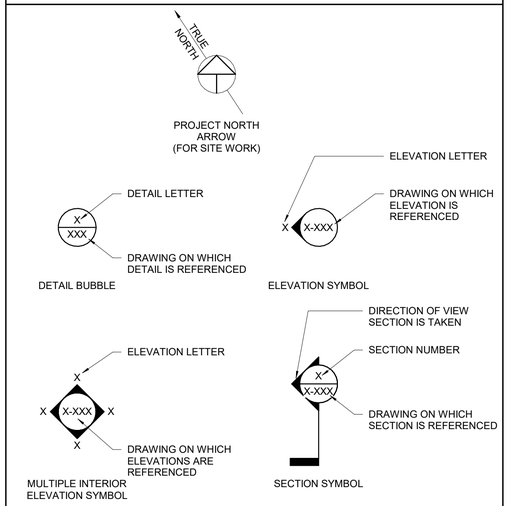
TRAVEL PATH SCHEDULE

TRAVEL PATH ID	TRAVEL PATH DISTANCE	COMMOM PATH OF TRAVEL MAX. ALLOWABLE	CODE COMPLIANT
PATH A	66' - 5"	100' - 0"	YES
PATH B	76' - 8"	100' - 0"	YES
PATH C	73' - 8"	100' - 0"	YES
PATH D	66' - 2"	100' - 0"	YES
PATH E	50' - 9"	100' - 0"	YES
PATH F	55' - 3"	100' - 0"	YES

GENERAL ARCHITECTURAL NOTES

1. CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING WORK WITH ALL SUB-CONTRACTORS AND APPLICABLE TRADES.
2. ALL WORK SHALL BE IN ACCORDANCE WITH MANUFACTURER'S LATEST STANDARD RECOMMENDATIONS AND ALL APPLICABLE CODES.
3. FOR LEGEND AND ABBREVIATIONS SEE DRAWING G-002 AND THIS DRAWING.
4. COORDINATE OPENING LOCATIONS AND SIZES THROUGH PARTITIONS ABOVE THE CEILINGS REQUIRED PENETRATIONS WITH MEP AND PROCESS DRAWINGS.
5. CONTRACTOR SHALL COORDINATE LOCATIONS OF LIGHT FIXTURES, SPRINKLER HEADS, REGISTERS, ETC. WITH THE ELECTRICAL, MECHANICAL, PLUMBING, AND SPRINKLER DRAWINGS. ALL SPRINKLER HEADS, DIFFUSERS AND REGISTERS SHALL BE CENTERED IN SUSPENDED ACOUSTICAL PANELS, UNLESS OTHER WISE NOTED ON DRAWINGS.
6. CONTRACTOR SHALL FILL ALL VOIDS IN MASONRY AND CONCRETE AROUND ALL PENETRATIONS WITH CONSTRUCTION TO MATCH SURROUNDING CONDITIONS.
7. CONTRACTOR IS RESPONSIBLE FOR PAINTING ALL EXPOSED STEEL, DECKING, PIPING, CONDUIT, SPRINKLER PIPING AND DUCTS WHICH ARE EXPOSED IN AREAS WITH NO CEILINGS AND SCHEDULED TO RECEIVE PAINT FINISH AS INDICATED ON INTERIOR FINISH NOTES.
8. THE ABBREVIATION "AFF" STANDS FOR "ABOVE FINISHED FLOOR". THIS IS MEANT TO INDICATE THE DIMENSION ABOVE THE FINAL FLOOR FINISH (I.E. CARPET, CT, VCT, ETC.) THE GENERAL CONTRACTOR MUST REVIEW AND COORDINATE ANY REQUIRED FINAL FLOOR FINISH WITH ANY HEIGHTS REQUIRED BEFORE THE INSTALLATION OF THE FLOOR FINISH.
9. ALL INTERIOR DIMENSIONS ARE TO FACE OF METAL STUD UNLESS OTHERWISE NOTED ON DRAWINGS. ALL EXTERIOR DIMENSIONS ARE TO FACE OF PRECAST CONCRETE.
10. INTERIOR PARTITIONS ARE DIMENSIONED TO NOMINAL THICKNESS ON FLOOR PLANS. SEE PARTITION TYPES ON SHEET A-401 FOR ACTUAL THICKNESS.

GENERAL SYMBOLS



Room name

101 — ROOM IDENTIFIER, NAME AND NUMBER

NEW CONSTRUCTION

EXISTING CONSTRUCTION TO REMAIN

EXISTING CONSTRUCTION TO BE REMOVED

X — DEMOLITION / PLAN NOTE

DATUM ELEVATION

X — REVISION TAG

101 — DOOR NUMBER

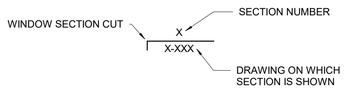
1t — PARTITION TYPE

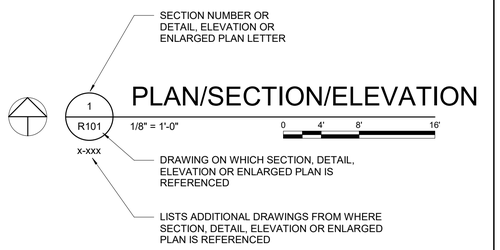
1t — WINDOW NUMBER

INTERNATIONAL SYMBOL OF ACCESSIBILITY

FE — FIRE EXTINGUISHER - SURFACE MOUNTED

X — SIGN NUMBER





PLAN/SECTION/ELEVATION

WORCESTER REGIONAL TRANSIT AUTHORITY
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CONSULTANTS

SEALS

PROJECT IDENTIFICATION

WORCESTER REGIONAL TRANSIT AUTHORITY

MAIN LOBBY RENOVATION

MARK	DATE	DESCRIPTION	BY

ISSUE BLOCK

PROJECT NO.:	4022461
DESIGNED BY:	WX
DRAWN BY:	AA
CHECKED BY:	SC
APPROVED BY:	RR
DATE:	02/10/2025

SHEET TITLE

CODE SUMMARY, NOTES AND SYMBOLS

G-001

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ABBREVIATIONS - ARCHITECTURE

AB	ANCHOR BOLT
ABAN	ABANDON
A/C	AIR CONDITION
A/C UNIT	AIR CONDITIONING UNIT
ACS DR	ACCESS DOOR
ACS PNL	ACCESS PANEL
ACST	ACOUSTIC
ACT	ACOUSTICAL CEILING TILE
AD	AREA DRAIN
ADA	AMERICANS WITH DISABILITIES ACT
ADDL	ADDITIONAL
ADDM	ADDENDUM
ADJ	ADJUSTABLE
AFF	ABOVE FINISHED FLOOR
AGGR	AGGREGATE
AHJ	AUTHORITY HAVING JURISDICTION
AHU	AIR HANDLING UNIT
ALM	ALARM
ALT	ALTERNATE
ALUM	ALUMINUM
ANN	ANNUNCIATOR
APPD	APPROVED
APPROX	APPROXIMATE
AR	AS REQUIRED
ARCH	ARCHITECT
ASPH	ASPHALT
ASSY	ASSEMBLY
ASTM	AMERICAN SOCIETY FOR TESTING MATERIALS
AUTO	AUTOMATIC
AUX	AUXILIARY
AVG	AVERAGE
AWT	ACOUSTICAL WALL TREATMENT
BC	BOLT CIRCLE, BOOKCASE
BD	BOARD
BF	BOTH FACES
BFP	BACKFLOW PREVENTER
BITUM	BITUMINOUS
BL	BASE LINE
BLDG	BUILDING
BLKT	BLANKET
BLT	BORROWED LIGHT
BLW	BELOW
BM	BEAM, BENCHMARK
BOS	BOTTOM OF STEEL
BOT	BOTTOM
B PL	BASE PLATE
BR	BEDROOM
BRZ	BRONZE
BS	BOTH SIDES
BSMT	BASEMENT
BTWN	BETWEEN
BUR	BUILT-UP ROOF
C	CHANNEL
CAB	CABINET
CB	CERAMIC BASE
CCTV	CLOSED CIRCUIT TELEVISION
CCW	COUNTERCLOCKWISE
CEM	CEMENT
CER	CERAMIC
CF/CI	CONTRACTOR FURNISHED / CONTR INSTALLED
CFE	CONTRACTOR FURNISHED EQUIP
CFM	CUBIC FOOT (FEET) PER MINUTE
CF/OI	CONTRACTOR FURNISHED / OWNER INSTALLED
CFS	CUBIC FOOT (FEET) PER SECOND
CG	CORNER GUARD
CHB	CHALKBOARD
CHFR	CHAMFER
CHK	CHECK
CIR	CIRCLE
CJ	CONTROL JOINT
CKT	CIRCUIT
CKT BRKR	CIRCUIT BREAKER
CL	CENTER LINE, CLASS
CLG	CEILING
CLG HT	CEILING HEIGHT
CLO	CLOSET
CLR	CLEAR
CLRM	CLASSROOM
CMU	CONCRETE MASONRY UNIT
CNTR	COUNTER
CO	CLEAN OUT, COMPANY
COL	COLUMN
CONC	CONCRETE
CONC FL	CONCRETE FLOOR
CONF	CONFERENCE
CONN	CONNECT
CONSTR	CONSTRUCTION
CONT	CONTINUE
CONTR	CONTRACT, CONTRACTOR
COORD	COORDINATE
CORR	CORRIDOR
CPT	CARPET
CSK	COUNTERSUNK
CT	CERAMIC TILE
CTB	CERAMIC TILE BASE
CTD	COATED
CTG	COATING
CTR	CENTER
CTRL	CONTROL
CU FT	CUBIC FOOT (FEET)
CU IN	CUBIC INCH
CUR	CURRENT
CU YD	CUBIC YARD
CW	COLD WATER PIPING
CYL	CYLINDER
D	DEEP, DEPTH
DBL	DOUBLE
DEG	DEGREE
DEL	DELETE
DEPT	DEPARTMENT
DET	DETAIL
DEV	DEVELOPMENT
DF	DRINKING FOUNTAIN
DIA	DIAMETER
DIAG	DIAGRAM
DIFF	DIFFERENCE, DIFFUSER
DIM	DIMENSION
DIR	DIRECTION
DISC	DISCONNECT
DISP	DISPENSER
DIST	DISTANCE
DIV	DIVISION
DMPR	DAMPER
DOM	DOMESTIC
DOZ	DOZEN
DR	DOOR, DRAIN, DRIVE
DS	DOWNSPOUT
DW	DISHWASHER
DWG	DRAWING
E	EXISTING / EAST
EA	EACH
EFF	EFFICIENCY
EJ	EXPANSION JOINT
EL	ELEVATION
ELEC	ELECTRIC
ELEV	ELEVATOR
EMER	EMERGENCY
ENCL	ENCLOSURE
ENGR	ENGINEER
ENTR	ENTRANCE
EOS	EDGE OF SLAB
EPA	ENVIRONMENTAL PROTECTION AGENCY
EQ	EQUAL
EQL SP	EQUALLY SPACED
EQUIP	EQUIPMENT
EQUIV	EQUIVALENT
ESC	ESCAPE
ETC	AND SO FORTH
EVAP	EVAPORATE
EW	EACH WAY
EWC	ELECTRIC WATER COOLER
EWH	ELECTRIC WATER HEATER
EX	EXAMPLE
EXH	EXHAUST
EXHV	EXHAUST VENT
EXIST	EXISTING
EXP	EXPANSION
EXT	EXTERIOR, EXTERNAL, EXTINGUISHER
F	FARENHEIT, FEMALE
FA	FIRE ALARM, FRESH AIR
FAB	FABRIC
FACP	FIRE ALARM CONTROL PANEL
FAI	FRESH AIR INLET
FC	FILE CABINET, FOOT CANDLE
FCO	FLOOR CLEANOUT
FCTY	FACTORY
FCU	FAN COIL UNIT
FD	FLOOR DRAIN
FDTN	FOUNDATION
FE	FIRE EXTINGUISHER
FEC	FIRE EXTINGUISHER W/CABINET
FED	FEDERAL
FF	FINISH FACE
FF BATT	FOIL BACKED BATT INSULATION
FF&E	FURNITURE, FIXTURE & EQUIPMENT
F/F	FACE TO FACE
FGT	FIBER GLASS TILE
FH	FIRE HOSE
FHR	FIRE HOSE RACK
FIG	FIGURE
FIL	FILLET
FIN	FINISH
FIN BS	FINISH BOTH SIDES
FIN FLR	FINISHED FLOOR
FIXT	FIXTURE
FLEX	FLEXIBLE
FLMT	FLUSH MOUNT
FLR	FLOOR
FLR SK	FLOOR SINK
FLUOR	FLUORESCENT
FN	FENCE
FP	FIREPROOF, FLAGPOLE
FPM	FOOT (FEET) PER MINUTE
FPS	FOOT (FEET) PER SECOND
FR	FRAME
FRP	FIBER GLASS REINFORCED PANEL
FT	FOOT, FEET
FURN	FURNISH, FURNITURE
FUT	FUTURE
FWC	FABRIC WALL COVERING
G	GROUND
GA	GAGE
GAL	GALLON
GALV	GALVANIZED
GALV STL	GALVANIZED STEEL
GC	GENERAL CONTRACTOR
GCV	GAS VENT
GD	GUARD
GEN	GENERAL
GFCI	GROUND FAULT CIRCUIT INTERRUPTER
GFRG	GLASS FIBER REINFORCED GYPSUM
GL	GLASS
GLZ	GLAZING
GOVT	GOVERNMENT
GP	GROUP
GPD	GALLONS PER DAY
GPH	GALLONS PER HOUR
GPM	GALLONS PER MINUTE
GPS	GALLONS PER SECOND
GR FL	GROUND FLOOR
GR WT	GROSS WEIGHT
GRAN	GRANITE
GRTG	GRATING
GSU	GLAZED STRUCTURAL UNIT
GVL	GRAVEL
GWB	GYPSUM WALL BOARD
GYP BD	GYPSUM BOARD
GYP	GYPSUM
H	HATCH (ROOF), HIGH
HAZ	HAZARD
HB	HOSE BIBB
HC	HOLLOW CORE
HCMU	HOLLOW CONCRETE MASONRY UNIT
HCP	HANDICAPPED
HD	HEAD
HDBD	HARDBOARD
HDPE	HIGH DENSITY POLYETHYLENE
HDW	HARDWARE
HDWD	HARDWOOD
HDWL	HEADWALL
HEX	HEXAGON
HGR	HANGER
HH	HANDHOLE
HM	HOLLOW METAL
HNDRL	HAND RAIL
HORIZ	HORIZONTAL
HP	HIGH POINT
HPS	HIGH PRESSURE SODIUM
HPL	HIGH-PRESSURE LAMINATE
HS	HIGH STRENGTH
HT	HEIGHT
HVAC	HEATING, VENTILATING & AIR CONDITIONING
HW	HOT WATER
HWP	HOT WATER PUMP
Hz	HERTZ
ID	INSIDE DIAMETER, INSIDE DIMENSION
ID NO	IDENTIFICATION NUMBER
IF	INSIDE FACE
INCAND	INCANDESCENT
INCL	INCLUDED
INFO	INFORMATION
INSTR	INSTRUMENT
INSUL	INSULATION
INT	INTERIOR
INTL	INTERNATIONAL
IR	INSIDE RADIUS
J-BOX	JUNCTION BOX
JAN	JANITOR
JAN CLO	JANITOR'S CLOSET
KB	KNEE BRACE
KIT	KITCHEN
L	ANGLE
LA	LIGHTNING ARRESTER
LAB	LABORATORY
LAD	LADDER
LAM	LAMINATE
LAM GL	LAMINATED GLASS
LAV	LAVATORY
LB	POUND
LF	LINEAR FEET
LH	LEFT HAND
LHS	LEFT HAND SIDE
LIN	LINEAR
LINO	LINOLEUM
LIQ	LIQUID
LL	LIVE LOAD
LLH	LONG LEG HORIZONTAL
LLV	LONG LEG VERTICAL
LNG	LONGITUDE
LP	LOW PRESSURE, LIGHT POLE
LPT	LOW POINT
LRA	LOCKED ROTOR AMPS
LS	LUMP SUM
LT	LIGHT
LTG	LIGHTING
LT WT	LIGHT WEIGHT
LVR	LOUVER
MACH	MACHINE
MACH RM	MACHINE ROOM
MAINT	MAINTENANCE
MANF	MANUFACTURER
MAS	MASONARY
MATL	MATERIAL
MAX	MAXIMUM
MB	MAIL BOX, MIXING BOX
MECH	MECHANICAL
MECH RM	MECHANICAL ROOM
MEMB	MEMBRANE
MEZZ	MEZZANINE
MFD	MANUFACTURED
MFG	MANUFACTURING
MFR	MANUFACTURER
MFR REC	MANUFACTURER'S RECOMMENDATION
MGT	MANAGEMENT
MH	MANHOLE
MIC	MICROPHONE
MIN	MINIMUM
MIR	MIRROR
MISC	MISCELLANEOUS
MO	MASONRY OPENING
MOD	MODEL, MODIFY
MOD BIT	MODIFIED BITUMEN
MON	MONUMENT
MPH	MILE(S) PER HOUR
MR	MOISTURE RESISTANT
MRT	MARBLE THRESHOLD
MS	MOP SINK
MTD	MOUNTED
MTG	MOUNTING
MTL	METAL
N	NEW / NORTH
NA	NOT APPLICABLE
NATL	NATIONAL
NEG	NEGATIVE
NEUT	NEUTRAL
NIC	NOT IN CONTRACT
NO	NUMBER
NOM	NOMINAL
NON STD	NONSTANDARD
NORM	NORMAL
NTS	NOT TO SCALE
NT WT	NET WEIGHT
OA	OVERALL
OC	ON CENTER
OCC	OCCUPY
OD	OUTSIDE DIAMETER/ OVERFLOW DRAIN
OF/CI	OWNER FURNISHED / CONTRACTOR INSTALLED
OFF	OFFICE
OF/OI	OWNER FURNISHED / OWNER INSTALLED
OH	OVERHANG
OPH	OPPOSITE HAND
OPNG	OPENING
OPP	OPPOSITE
OPT	OPTIONAL
OR	OUTSIDE RADIUS
ORIG	ORIGINAL
OVFL	OVERFLOW
OZ	OUNCE
PARA	PARAGRAPH
PAT	PATTERN
PB	PULL BOX
PC	PIECE, POINT OF CURVE, PORTLAND CEMENT
PCT	PERCENT
PED	PEDESTAL
PERF	PERFORATED
PERIM	PERIMETER
PERM	PERMANENT
PERP	PERPENDICULAR
PH	PHASE
PI	POINT OF INTERSECTION
PIV	POST INDICATOR VALVE
PL	PROPERTY LINE
PLAM	PLASTIC LAMINATE
PLAS	PLASTER
PLAT	PLATFORM
PLBG	PLUMBING
PLC	PLACE
PLF	POUNDS PER LINEAR FOOT
PLYWD	PLYWOOD
PN	PART NUMBER
PNEU	PNEUMATIC
PNL	PANEL
POB	POINT OF BEGINNING
PORC	PORCELAIN
POS	POSITION, POSITIVE
PP	POLYPROPYLENE
PR	PAIR
PREFAB	PREFABRICATE
PRELIM	PRELIMINARY
PRESS	PRESSURE
PREV	PREVIOUS
PRI	PRIMARY
PRKG	PARKING
PROJ	PROJECT
PSF	POUND PER SQUARE FOOT
PSI	POUND PER SQUARE INCH
PT	PAINT, PRESSURE TREATED
PTN	PARTITION
PVC	POLYVINYL CHLORIDE
PVG	PAVING
PWR	POWER
QA	QUALITY ASSURANCE
QC	QUALITY CONTROL
QT	QUARRY TILE
QTB	QUARRY TILE BASE
QTR	QUARTER
QTY	QUANTITY
QUAD	QUADRANT
R	RADIUS, RISER
RA	RETURN AIR
RAD	RADIAN, RADIATOR
RC	REINFORCED CONCRETE
RCP	REFLECTED CEILING PLAN
RCPTN	RECEPTION
RCVR	RECEIVER
RD	ROOF DRAIN
RDC	REDUCER
REC	RECESSED
RECPT	RECEPTACLE
RECT	RECTANGLE
REF	REFERENCE, REFRIGERATION
REFL	REFLECT
REINF	REINFORCE
REM	REMOVABLE
REPL	REPLACE
REQD	REQUIRED
RET	RETAINING, RETURN
REV	REVISION
RFI	REQUEST FOR INFORMATION
RH	RIGHT HAND
RM	ROOM
RND	ROUND
RO	ROUGH OPENING
RT	RIGHT
RTF	RUBBER TILE FLOOR
RWL	RAIN WATER LEADER
S	SOUTH
SAN	SANITARY
SAFB	SOUND ATTENUATION FIBERBOARD
SATC	SUSPENDED ACOUSTICAL TILE CEILING
SB	SPLASH BLOCK
SC	SOLID CORE
SCHED	SCHEDULE
SCHEM	SCHEMATIC
SCMU	SOLID CONCRETE MASONRY UNITS
SCP	SCUPPER
SD	STORM DRAIN
SDL	SADDLE
SECT	SECTION
SEP	SEPARATOR, SEPARATE
SF	SQUARE FOOT (FEET)
SHR	SHOWER
SHT	SHEET
SIM	SIMILAR
SLNT	SEALANT
SLV	SLEEVE
SP	STANDPIPE
SPEC	SPECIFICATION
SPKLR	SPRINKLER
SPKR	SPEAKER
SPLY	SUPPLY
SPRT	SUPPORT
SQ	SQUARE
SQ IN	SQUARE INCH
SQ YD	SQUARE YARD
SSP	STAINLESS STEEL PIPE
SST	STAINLESS STEEL
SSUR	SOLID SURFACE
STD	STANDARD
STIF	STIFFENER
STM	STEAM
STOR	STORAGE
STRUCT	STRUCTURAL
SUM	SUMMARY
SUPT	SUPPORT
SURF	SURFACE
SUSP	SUSPEND
SVCE	SERVICE
SW	SIDEWALK
SWDR	SWING DOOR
SYM	SYMBOL
SYMM	SYMMETRICAL
SYS	SYSTEM
T	TREAD
TAN	TANGENT
T&B	TOP AND BOTTOM
TC	TERRA COTTA
TD	TRENCH DRAIN
TDH	TOTAL DYNAMIC HEAD
TEL	TELEPHONE
TEMP	TEMPERATURE, TEMPORARY
TER	TERRAZZO
T&G	TONGUE AND GROOVE
THD	THREAD
THK	THICKNESS
THRES	THRESHOLD
THRU	THROUGH
TO	TOP OF _____
TOC	TOP OF CONCRETE, TOP OF CURB
TOF	TOP OF FOOTING
TOL	TOLERANCE
TOM	TOP OF MASONRY
TOPO	TOPOGRAPHY
TOW	TOP OF WALL
TOS	TOP OF SLAB, TOP OF STEEL
TP	TELEPHONE POLE
TS	TUBE STEEL
TSTAT	THERMOSTAT
TV	TELEVISION
TYP	TYPICAL
UGND	UNDERGROUND
UL	UNDERWRITERS LABORATORIES
UN	UNLESS NOTED
UNO	UNLESS NOTED OTHERWISE
UR	URINAL
UTIL	UTILITY
VAC	VACUUM
VAN	VANITY
VAR	VARIATION, VARIES
VB	VINYL BASE
VCT	VINYL COMPOSITION TILE
VERT	VERTICAL
VEST	VESTIBULE
VIF	VERIFY IN FIELD
VOL	VOLUME
VR	VAPOR RETARDER
VTR	VENT THRU ROOF
VWC	VINYL WALL COVERING
W	WASTE, WEST, WIDE
W/	WITH
WC	WATER CLOSET
WCO	WALL CLEANOUT
WD	WOOD, WOOD DOOR
WDW	WINDOW
WF	WIDE FLANGE
WGL	WIRED GLASS
WH	WALL HYDRANT
WI	WROUGHT IRON
WM	WIRE MESH
W/O	WITHOUT
WP	WATER PROOFING, WEATHERPROOF
WT	WEIGHT
WTR	WATER
XFMR	TRANSFORMER
X SECT	CROSS SECTION
YD	YARD, YARD DRAIN
YH	YARD HYDRANT
YR	YEAR

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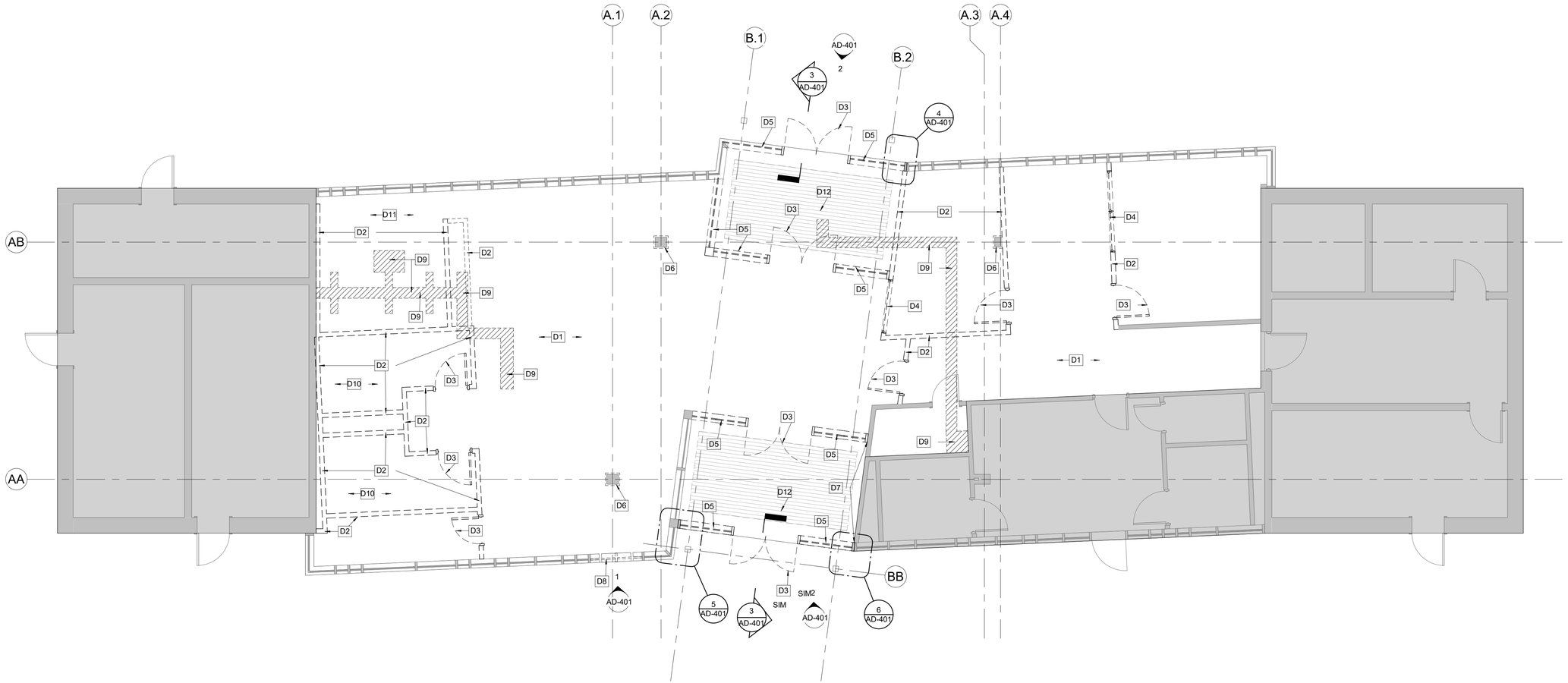
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DRAWN BY:	AA
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SHEET TITLE

ARCHITECTURAL ABBREVIATIONS

G-002

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DEMOLITION LEVEL 1 FLOOR PLAN

3/16" = 1'-0"

0 4' 8' 12'

DEMOLITION GENERAL NOTES

1. ALL DRAWINGS LISTED ON "DRAWING LIST" LOCATED ON THE COVER SHEET MUST BE READ IN CONJUNCTION WITH THIS DRAWING FOR COMPLETE PROJECT SCOPE.
2. READ THIS DRAWING IN CONJUNCTION WITH THE PROJECT SPECIFICATIONS.
3. CONTRACTOR SHALL VERIFY CONSTRUCTION DOCUMENTS WITH ACTUAL FIELD CONDITIONS PRIOR TO CONSTRUCTION. CONTRACTOR SHALL NOTIFY THE DESIGN TEAM OF ANY DISCREPANCIES AND/OR CONFLICTS PRIOR TO THE START OF CONSTRUCTION.
4. CONTRACTOR SHALL IDENTIFY ALL EXISTING SCOPE ITEMS SCHEDULED TO REMAIN AND/ OR BE SALVAGED FOR REUSE AS NOTED WITHIN THE CONTRACT DOCUMENTS. ITEMS LISTED AS "SALVAGED" ARE TO BE REMOVED WITH CARE, STORED AND PROTECTED FROM DAMAGE UNTIL REINSTALLATION AND / OR BEING TURNED OVER TO WRTA. CONTRACTOR TO REPLACE AND / OR RESTORE ALL ITEMS DAMAGED DURING CONSTRUCTION.
5. CONTRACTOR SHALL PROVIDE DUST AND NOISE CONTROL TO SEPARATE WORKING AREAS FROM OCCUPIED SPACES. CONTRACTOR SHALL OBTAIN DESIGN TEAM/WRTA APPROVAL OF DUST AND NOISE CONTROL SEPARATIONS PRIOR TO BEGINNING CONSTRUCTION. CONTRACTOR SHALL PROVIDE TEMPORARY PROTECTION FOR ALL AREAS WHERE CONSTRUCTION WORK IS OCCURRING.
6. IF CIRCUIT IS IN DEMOLITION SCOPE ON ELECTRICAL DRAWINGS; PATCH, REPAIR AND REPAINT AREA OF WALL WHERE OUTLET / SWITCH / COVER PLATE WERE EXISTING WAS / IS. BLANK COVERPLATES ARE NOT ACCEPTABLE AS A REPAIR UNLESS APPROVED BY WRTA.
7. THE GC SHALL, IN THE WORK OF ALL TRADES, PERFORM ANY AND ALL WORK AS SHOWN IN THE CONTRACT DOCUMENTS AND RESTORE ANY DAMAGE OR AFFECTED AREAS RESULTING FROM WORK OF THIS CONTRACT BOTH INSIDE AND OUTSIDE THE AREA OF WORK.

DEMOLITION LEGEND

- EXISTING WALL TO BE REMOVED
- EXISTING DOOR TO BE REMOVED
- EXISTING WALL TO BE REMOVED
- EXISTING WINDOW TO BE REMOVED
- EXISTING ALUMINUM CURTAINWALL MULLION TO BE REMOVED
- EXISTING ALUMINUM CURTAINWALL GLAZING TO BE REMOVED
- EXISTING WALL TO REMAIN
- EXISTING DOOR TO REMAIN
- EXISTING ALUMINUM CURTAINWALL MULLION TO REMAIN
- EXISTING ALUMINUM CURTAINWALL GLAZING TO REMAIN
- AREA OF WORK NOT IN SCOPE
- SELECTIVE DEMOLITION OF FLOOR SLAB - REFER TO STRUCTURAL PLUMBING DRAWINGS
- EXISTING CANOPY COLUMN TO REMAIN

DEMOLITION KEYNOTES

- D1 REMOVE EXISTING SEATINGS, CHAIRS AND ANY OTHER MOVABLE FURNITURE. CLEAN EXISTING FLOORING AND PREPARE FOR NEW FINISHES.
- D2 REMOVE EXISTING WALL. CLEAN AND PATCH IMPACTED AREAS ON EXISTING FLOOR AND WALL FOR NEW FINISHES.
- D3 REMOVE EXISTING DOOR.
- D4 REMOVE EXISTING WINDOW.
- D5 REMOVE EXISTING ALUMINUM CURTAINWALL SYSTEM. PATCH AND CLEAN IMPACTED AREAS FOR NEW CURTAINWALL INSTALLATION. FOR DEMOLITION OF THE EXISTING CURTAINWALL @ THE NORTH / SOUTH ENTRY, REFER TO STRUCTURAL DRAWINGS.
- D6 REMOVE EXISTING FINISH ON EXISTING STRUCTURAL COLUMN. PATCH AND CLEAN SUBSTRATE FOR NEW FINISH.
- D7 REMOVE EXISTING ADA PUSH BUTTONS, MONITOR AND OTHER EQUIPMENT. REMOVE EXISTING WALL FINISH. PATCH AND CLEAN SUBSTRATE FOR NEW FINISH.
- D8 REMOVE EXISTING ALUMINUM CURTAINWALL MULLION AND GLAZING AS NECESSARY TO ACCOMMODATE NEW TICKETING WINDOW INSTALLATION. REFER TO STRUCTURAL DRAWINGS.
- D9 DEMOLISH EXISTING FLOOR SLAB AS REQUIRED TO ACCOMMODATE NEW PLUMBING FIXTURE / PIPES. REFER TO STRUCTURE AND PLUMBING DRAWINGS.
- D10 REMOVE EXISTING FLOOR TILES. PATCH, CLEAN AND LEVEL SUBSTRATE FOR NEW FINISH.
- D11 REMOVE EXISTING FLOOR TILES. PATCH, CLEAN AND FORM SLOPE OF SUBSTRATE FOR NEW FINISH.
- D12 REMOVE EXISTING WALK-OFF MAT. FILL, PATCH AND CLEAN SUBSTRATE FOR NEW WALK-OFF MAT. REFER TO NEW WALK-OFF MAT SIZE ON THE SHEET A-202.

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MAIN LOBBY RENOVATION

MARK	DATE	DESCRIPTION	BY

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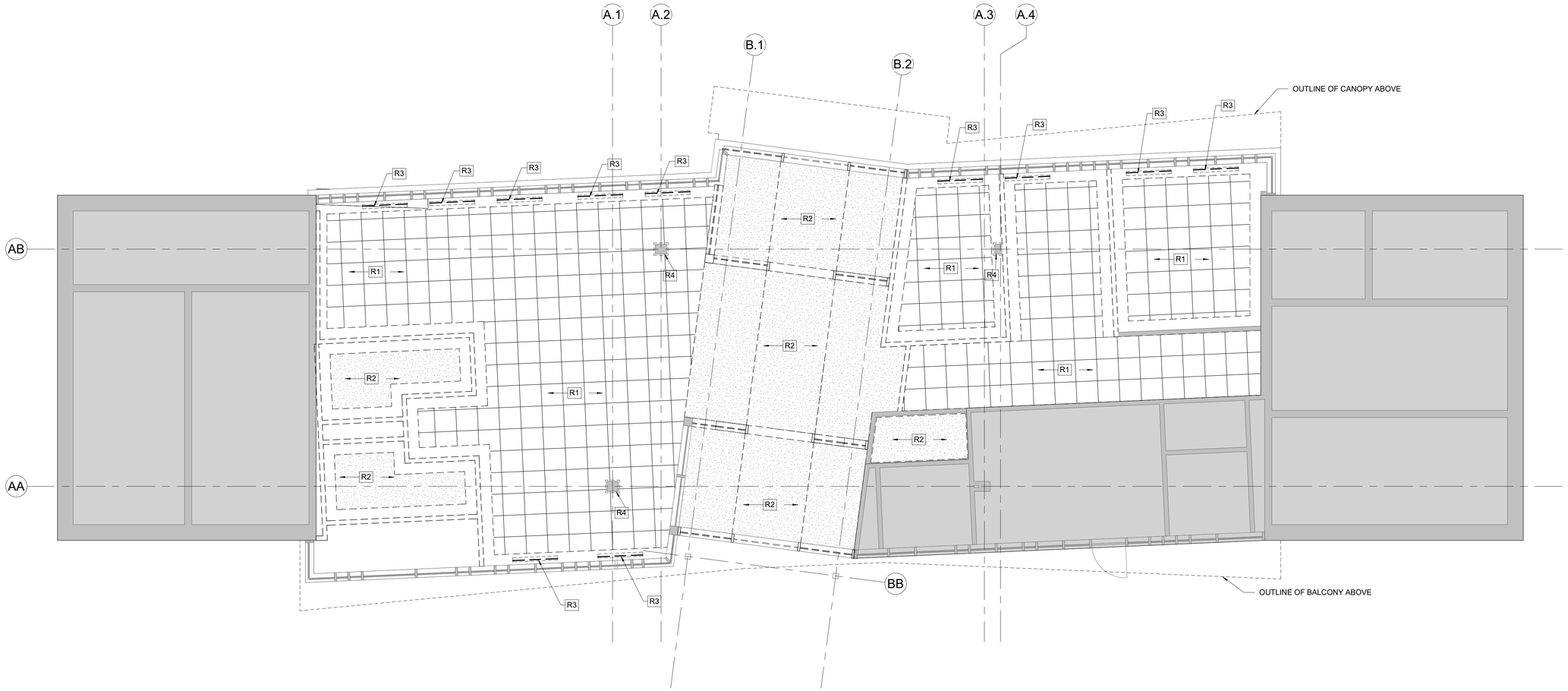
PROJECT NO.:	4022461
DESIGNED BY:	WX
DRAWN BY:	AA
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SHEET TITLE

DEMOLITION LEVEL 1 FLOOR PLAN

AD-101

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DEMOLITION LEVEL 1 RCP

3/16" = 1'-0"

0 4' 8' 12'

DEMOLITION GENERAL NOTES

1. ALL DRAWINGS LISTED ON "DRAWING LIST" LOCATED ON THE COVER SHEET MUST BE READ IN CONJUNCTION WITH THIS DRAWING FOR COMPLETE PROJECT SCOPE.
2. READ THIS DRAWING IN CONJUNCTION WITH THE PROJECT SPECIFICATIONS.
3. CONTRACTOR SHALL VERIFY CONSTRUCTION DOCUMENTS WITH ACTUAL FIELD CONDITIONS PRIOR TO CONSTRUCTION. CONTRACTOR SHALL NOTIFY THE DESIGN TEAM OF ANY DISCREPANCIES AND/OR CONFLICTS PRIOR TO THE START OF CONSTRUCTION.
4. CONTRACTOR SHALL IDENTIFY ALL EXISTING SCOPE ITEMS SCHEDULED TO REMAIN AND/ OR BE SALVAGED FOR REUSE AS NOTED WITHIN THE CONTRACT DOCUMENTS. ITEMS LISTED AS "SALVAGED" ARE TO BE REMOVED WITH CARE, STORED AND PROTECTED FROM DAMAGE UNTIL REINSTALLATION AND / OR BEING TURNED OVER TO WRTA. CONTRACTOR TO REPLACE AND / OR RESTORE ALL ITEMS DAMAGED DURING CONSTRUCTION.
5. CONTRACTOR SHALL PROVIDE DUST AND NOISE CONTROL TO SEPARATE WORKING AREAS FROM OCCUPIED SPACES. CONTRACTOR SHALL OBTAIN DESIGN TEAM/WRTA APPROVAL OF DUST AND NOISE CONTROL SEPARATIONS PRIOR TO BEGINNING CONSTRUCTION. CONTRACTOR SHALL PROVIDE TEMPORARY PROTECTION FOR ALL AREAS WHERE CONSTRUCTION WORK IS OCCURRING.
6. IF CIRCUIT IS IN DEMOLITION SCOPE ON ELECTRICAL DRAWINGS; PATCH, REPAIR AND REPAINT AREA OF WALL WHERE OUTLET / SWITCH / COVER PLATE WERE EXISTING WAS / IS. BLANK COVERPLATES ARE NOT ACCEPTABLE AS A REPAIR UNLESS APPROVED BY WRTA.
7. THE GC SHALL, IN THE WORK OF ALL TRADES, PERFORM ANY AND ALL WORK AS SHOWN IN THE CONTRACT DOCUMENTS AND RESTORE ANY DAMAGE OR AFFECTED AREAS RESULTING FROM WORK OF THIS CONTRACT BOTH INSIDE AND OUTSIDE THE AREA OF WORK.

DEMOLITION LEGEND - RCP

- EXISTING WALL TO BE REMOVED
- EXISTING ACT CEILING TO BE REMOVED
- EXISTING GYPSUM CEILING TO BE REMOVED
- AREA OF WORK NOT IN SCOPE
- EXISTING ROLLER WINDOW SHADE TO BE REMOVED OFF EXISTING ALLUMINUM CURTAINWALL SYSTEM.

DEMOLITION KEYNOTES - RCP

- R1 REMOVE EXISTING ACT CEILING AND ASSOCIATED ACCESSORIES. REFER TO MECHANICAL DRAWINGS FOR MECHANICAL EQUIPMENT REMOVAL. REFER TO ELECTRICAL DRAWINGS FOR LIGHT FIXTURE REMOVAL.
- R2 REMOVE EXISTING GYPSUM CEILING AND ASSOCIATED ACCESSORIES. REFER TO MECHANICAL DRAWINGS FOR MECHANICAL EQUIPMENT REMOVAL. REFER TO ELECTRICAL DRAWINGS FOR LIGHT FIXTURE REMOVAL.
- R3 REMOVE EXISTING ROLLER WINDOW SHADE OFF EXISTING ALLUMINUM CURTAINWALL SYSTEM, TYP.
- R4 REMOVE EXISTING FINISH ON EXISTING STRUCTURAL COLUMN. PATCH AND CLEAN SUBSTRATE FOR NEW FINISH.

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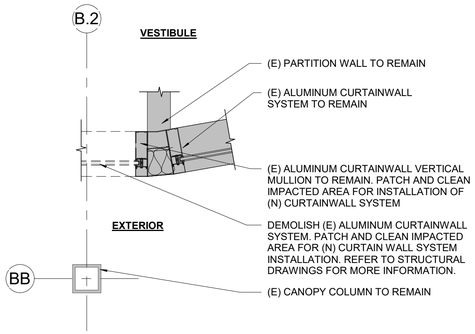
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DEMOLITION LEVEL 1 RCP

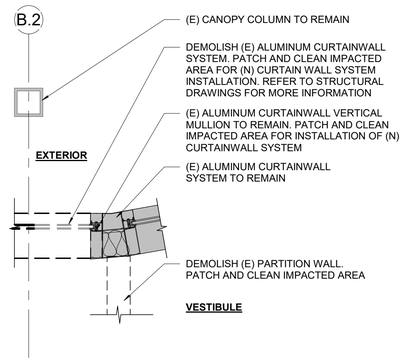
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6 AD-101 DEMOLITION DETAIL @ V JAMB 2

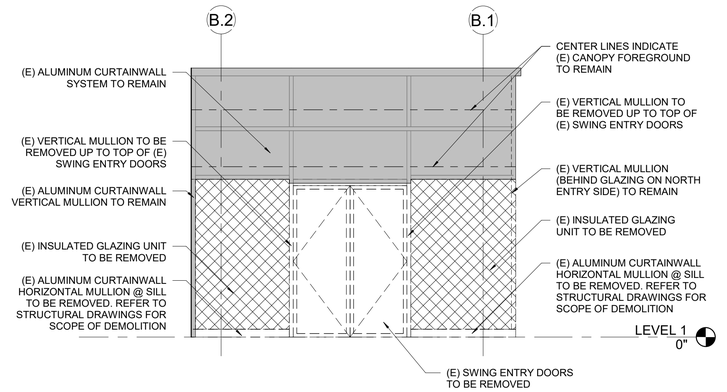
3/4" = 1'-0"



4 AD-101 DEMOLITION DETAIL @ V JAMB 1

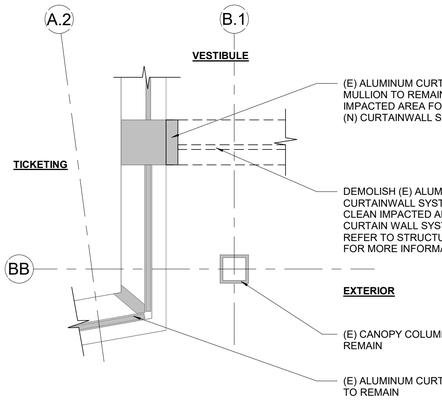
3/4" = 1'-0"

NOTE: REFER TO STRUCTURAL DRAWINGS FOR EXISTING CURTAINWALL FRAME AND GLAZING DEMOLITION DETAILS AND ASSOCIATED INFORMATION.



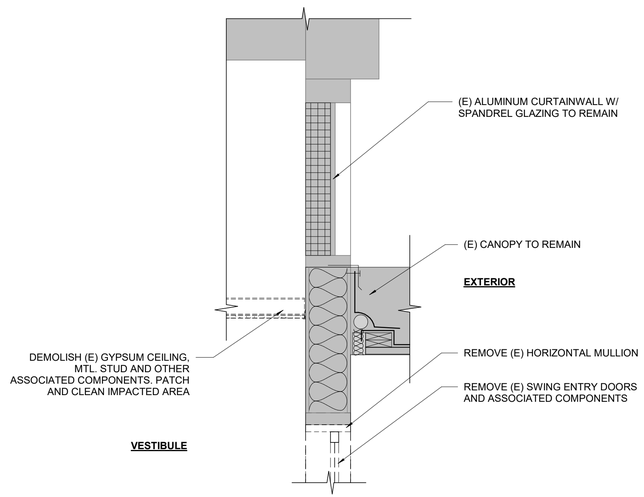
2 AD-101 DEMOLITION ELEVATION @ NORTH / SOUTH ENTRY

1/4" = 1'-0"



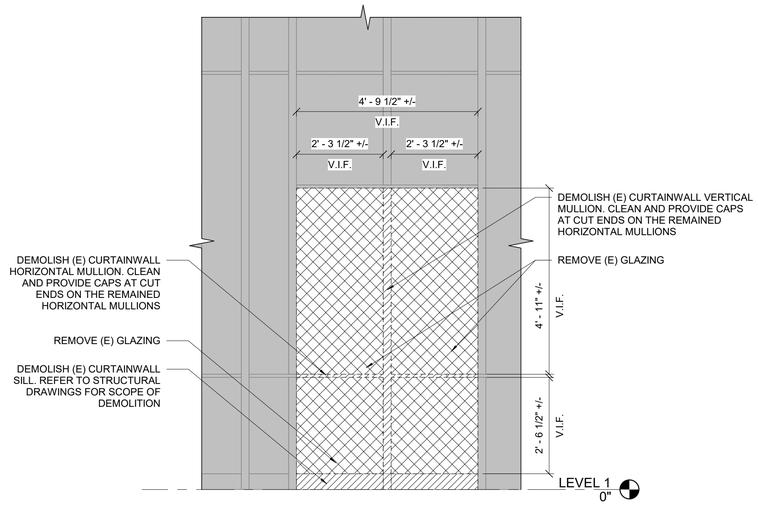
5 AD-101 DEMOLITION DETAIL @ T JAMB

3/4" = 1'-0"



3 AD-101 DEMOLITION SECTION @ VESTIBULE

3/4" = 1'-0"



1 AD-101 PARTIAL DEMO ELEV. @ CURTAINWALL

1/2" = 1'-0"

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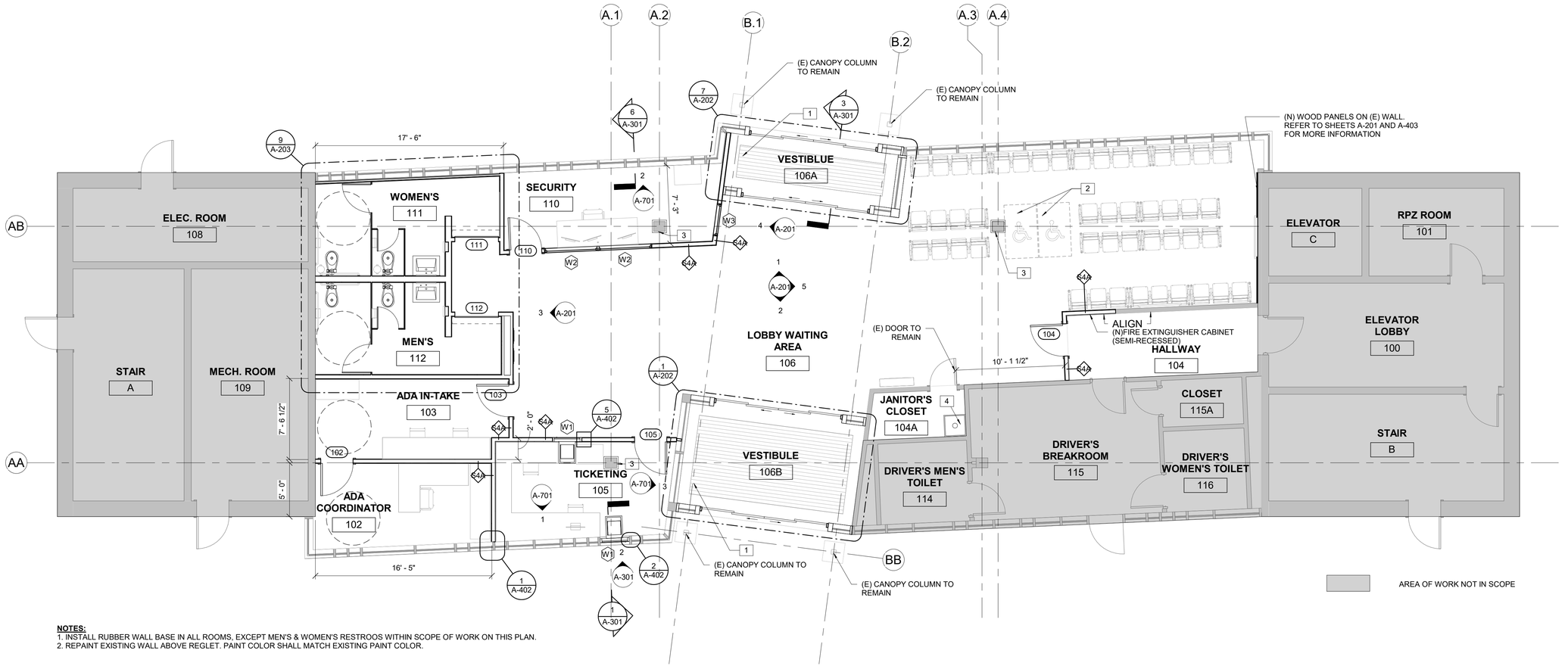
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DETAILS OF DEMOLITION

AD-401

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NOTES:
1. INSTALL RUBBER WALL BASE IN ALL ROOMS, EXCEPT MEN'S & WOMEN'S RESTROOS WITHIN SCOPE OF WORK ON THIS PLAN.
2. REPAINT EXISTING WALL ABOVE REGLET. PAINT COLOR SHALL MATCH EXISTING PAINT COLOR.

LEVEL 1 FLOOR PLAN

3/16" = 1'-0"

0 4' 8' 12'

FLOOR PLAN GENERAL NOTES

1. ALL DRAWINGS LISTED ON "DRAWING LIST" LOCATED ON THE COVER SHEET MUST BE READ IN CONJUNCTION WITH THIS DRAWING FOR COMPLETE PROJECT SCOPE.
2. READ THIS DRAWING IN CONJUNCTION WITH THE PROJECT SPECIFICATIONS.
3. ALL NEW WALLS AND DOORS SHALL BE PAINTED TO MATCH EXISTING DOORS / WALL FINISH, COLOR TO BE DETERMINED BY ARCHITECT / WRTA, AND CONTRACTOR SHALL PROVIDE FINISH SAMPLES.
4. CONTRACTOR SHALL PATCH AND REPAIR WALLS DAMAGED DURING CONSTRUCTION TO MATCH EXISTING, TYP.
5. PRIOR TO CONSTRUCTION CONTRACTOR SHALL COORDINATE WITH MEP/FP DRAWINGS FOR ALL SCOPE.
6. THE GC SHALL, IN THE WORK OF ALL TRADES, PERFORM ANY AND ALL WORK AS SHOWN IN THE CONTRACT DOCUMENTS AND RESTORE ANY DAMAGE OR AFFECTED AREAS RESULTING FROM WORK OF THIS CONTRACT BOTH INSIDE AND OUTSIDE THE AREA OF WORK.
7. ALL DOORS NOTED AS "EXISTING TO REMAIN" SHALL BE CLEANED AND PAINTED TO MATCH.

KEYNOTES

1. WALK-OFF MAT
2. 3' x 5' WHEELCHAIR SPACE
3. GWB ON COLUMN
4. MOP SINK, REFER TO PLUMBING DRAWINGS

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SEALS

PROJECT IDENTIFICATION

WORCESTER REGIONAL TRANSIT AUTHORITY

MAIN LOBBY RENOVATION

MARK	DATE	DESCRIPTION	BY

ISSUE BLOCK

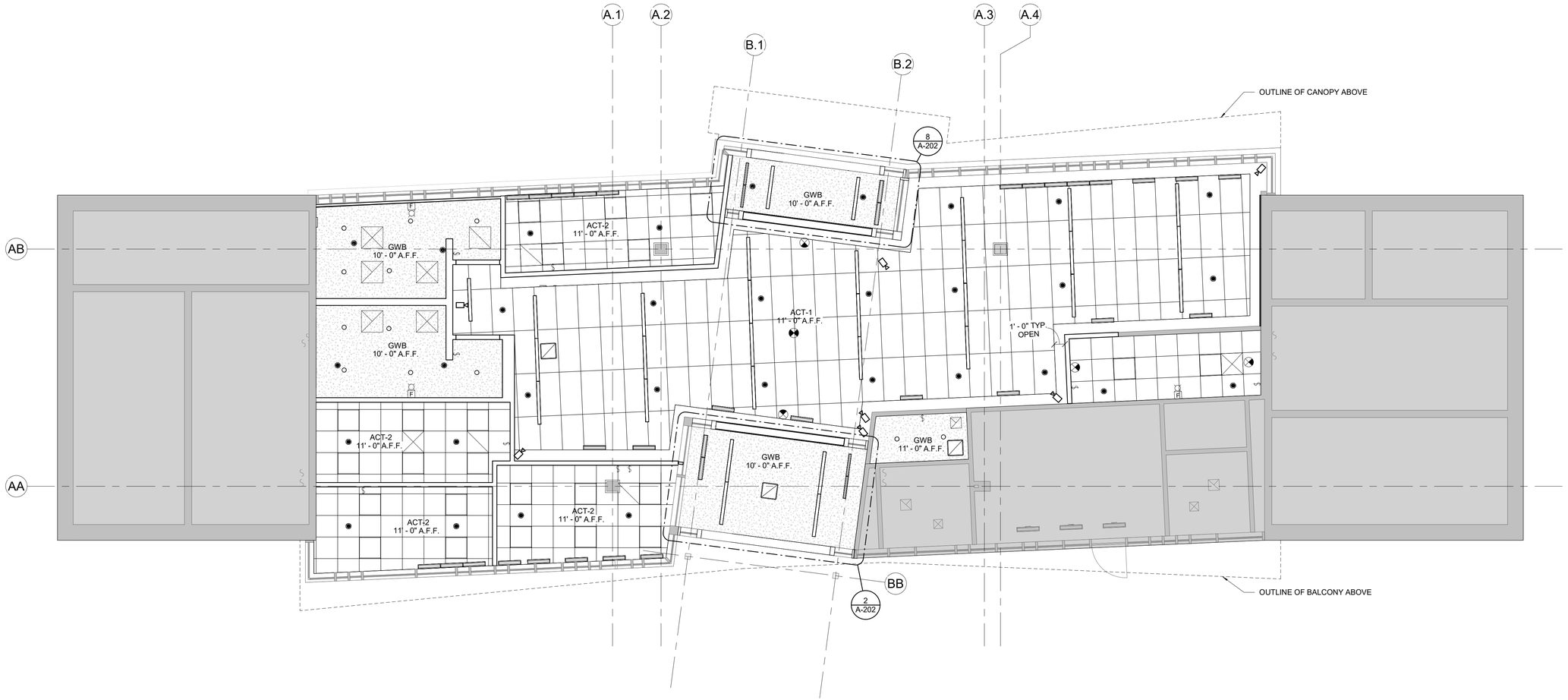
PROJECT NO.:	4022461
DESIGNED BY:	WX
DRAWN BY:	AA
CHECKED BY:	SC
APPROVED BY:	RR
DATE:	02/10/2025

SHEET TITLE

LEVEL1 FLOOR PLAN

A-101

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LEVEL 1 RCP

3/16" = 1'-0"

0 4' 8' 12'

REFLECTED CEILING PLAN GENERAL NOTES

1. COORDINATE ALL DEVICE LOCATIONS WITH HVAC, ELECTRICAL & FIRE PROTECTION DRAWINGS.
2. ALL FIXTURES SHALL BE CENTERED IN EACH CEILING TILE OF SUSPENDED ACT CEILING SYSTEM UNLESS OTHERWISE INDICATED.
3. ALL CEILING GRIDS SHALL BE CENTERED IN EACH DIRECTION IN ALL ROOMS UNLESS OTHERWISE INDICATED.
4. PROVIDE ACCESS PANELS, MINIMUM 24" x 24", OR OF SIZES REQUIRED, WHERE PLUMBING AND HEATING VALVES, WATER SWITCHES, VENTILATION SPLITTER DAMPERS, ETC. ARE SHOWN ON PLUMBING, HEATING, AND VENTILATION DRAWINGS. SUCH ACCESS PANELS SHALL BE INSTALLED IN THE FOLLOWING:
   A. METAL STUD OR MASONRY PARTITION
   B. SUSPENDED GYPSUM WALLBOARD CEILINGS

LEGEND - RCP

XXX — SOFFIT / CEILING TYPE
X' - Y" A.F.F. — SOFFIT / CEILING HEIGHT ABOVE FINISHED FLOOR

GYPSUM WALLBOARD CEILING

2' X 2' ACT CEILING

2' X 4' ACT CEILING

AREA OF WORK NOT IN SCOPE

2' x 2' ACCESS PANEL. FINAL LOCATION SHALL BE COORDINATED IN FIELD WITH EQUIPMENT

SUPPLY DIFFUSER - REFER TO MECHANICAL DRAWINGS

EXHAUST DIFFUSER - REFER TO MECHANICAL DRAWINGS

RETURN DIFFUSER - REFER TO MECHANICAL DRAWINGS

SUPPLY DIFFUSER WITH PLANUM - REFER TO MECHANICAL DRAWINGS

CEILING MOUNTED SPRINKLER HEAD - REFER TO FIRE PROTECTION DRAWINGS

F — FIRE ALARM
REFER TO ELECTRICAL DRAWINGS

LIGHT SWITCH
REFER TO ELECTRICAL DRAWINGS

CAMERA
REFER TO ELECTRICAL DRAWINGS

RECESSED LIGHT FIXTURE - REFER TO ELECTRICAL DRAWINGS

RECESSED LINEAR LIGHT FIXTURE - REFER TO ELECTRICAL DRAWINGS

RECESSED DOWNLIGHT - REFER TO ELECTRICAL DRAWINGS

EXIT SIGN - SINGLE SIDED REFER TO ELECTRICAL DRAWINGS

EXIT SIGN - DOUBLE SIDED REFER TO ELECTRICAL DRAWINGS

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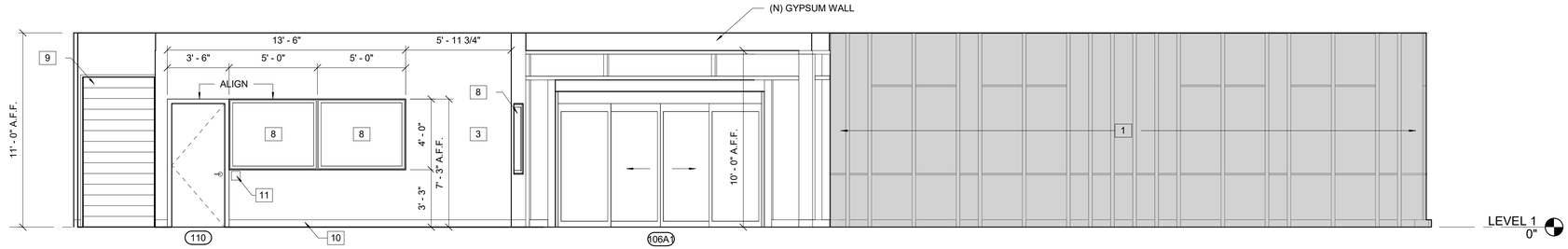
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SHEET TITLE

LEVEL 1 RCP

A-111

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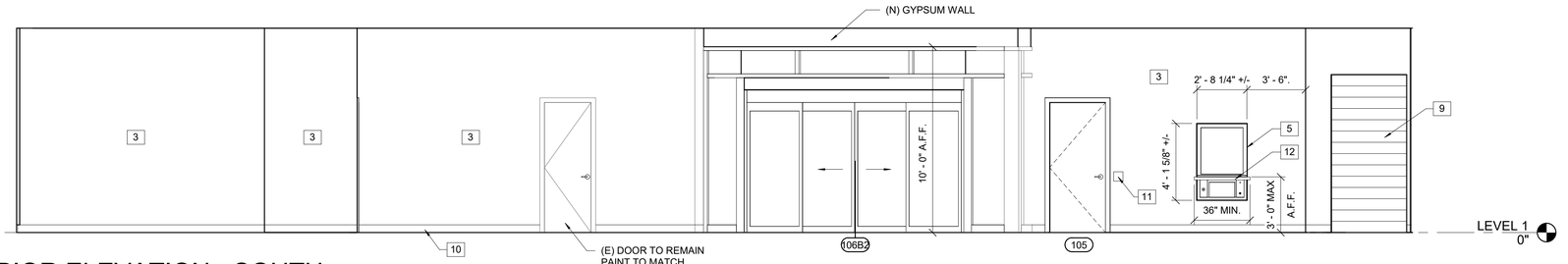
1 / A-101 INTERIOR ELEVATION - NORTH

1/4" = 1'-0"

0 2' 4' 8'

INTERIOR ELEVATION KEYNOTES - WAITING AREA

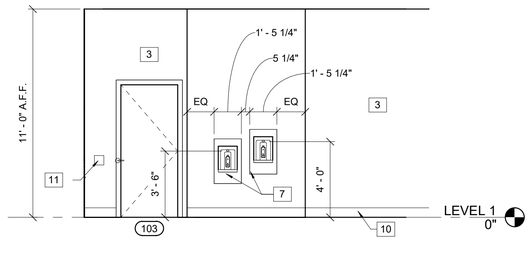
1. EXISTING CURTAINWALL - N.I.C.
2. WOOD PANEL
3. GYPSUM FINISH
4. MAPPING KIOSK, OF/CI
5. TICKETING WINDOW
6. WALL-MOUNTED MONITOR, OF/CI
7. RECESSED BOTTLE FILLER
8. WINDOW
9. CURTAIN GRATE
10. RUBBER WALL BASE
11. CARD READER
12. TICKETING WINDOW COUNTERTOP



2 / A-101 INTERIOR ELEVATION - SOUTH

1/4" = 1'-0"

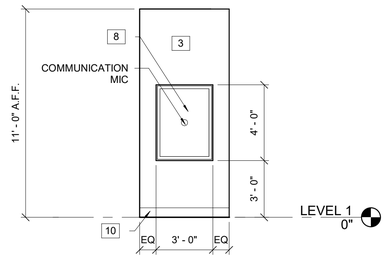
0 2' 4' 8'



3 / A-101 INTERIOR ELEVATION - WEST A

1/4" = 1'-0"

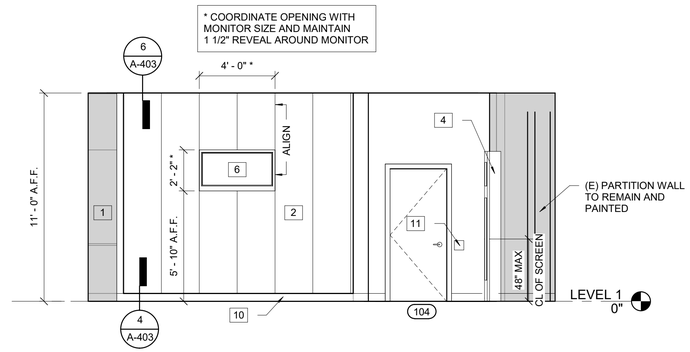
0 2' 4' 8'



4 / A-101 INTERIOR ELEVATION - WEST B

1/4" = 1'-0"

0 2' 4' 8'



5 / A-101 INTERIOR ELEVATION - EAST

1/4" = 1'-0"

0 2' 4' 8'

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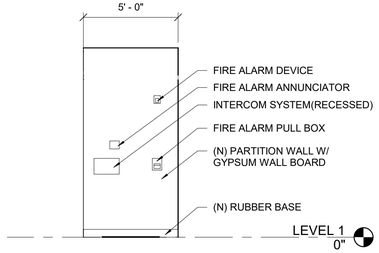
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INTERIOR ELEVATIONS @ WAITING AREA

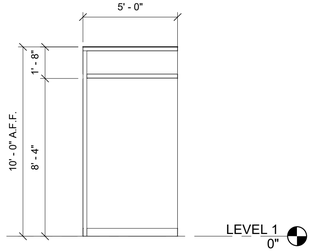
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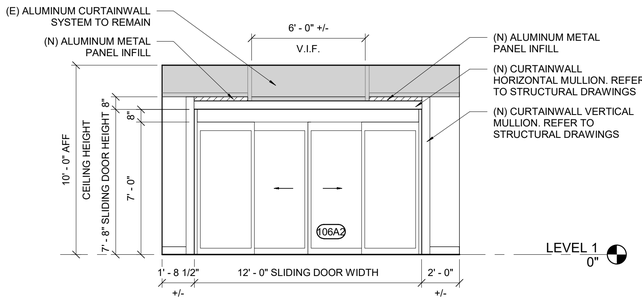
12 A-202 — 1/4" = 1'-0"

WEST ELEVATION @ NORTH VESTIBULE



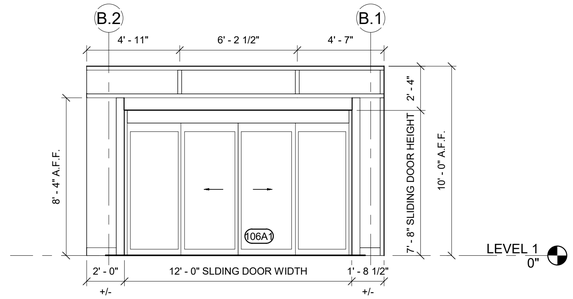
10 A-202 — 1/4" = 1'-0"

EAST ELEVATION @ NORTH VESTIBULE



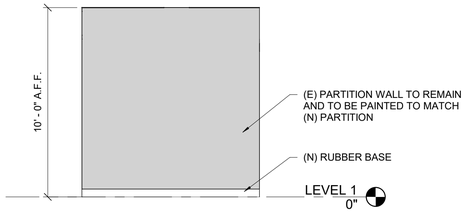
11 A-202 — 1/4" = 1'-0"

NORTH ELEVATION @ NORTH VESTIBULE



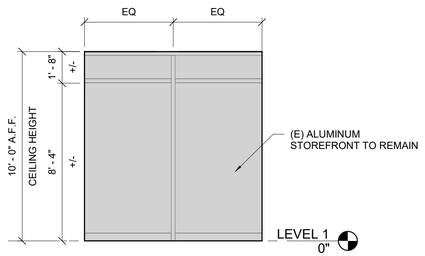
9 A-202 — 1/4" = 1'-0"

SOUTH ELEVATION @ NORTH VESTIBULE



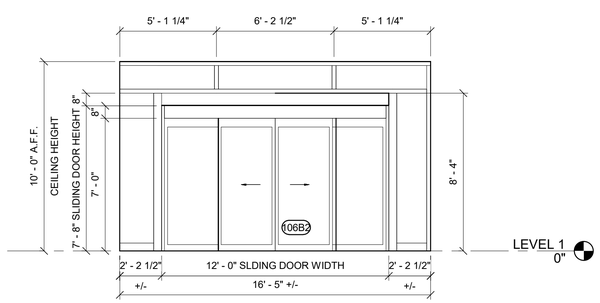
6 A-202 — 1/4" = 1'-0"

EAST ELEVATION @ SOUTH VESTIBULE



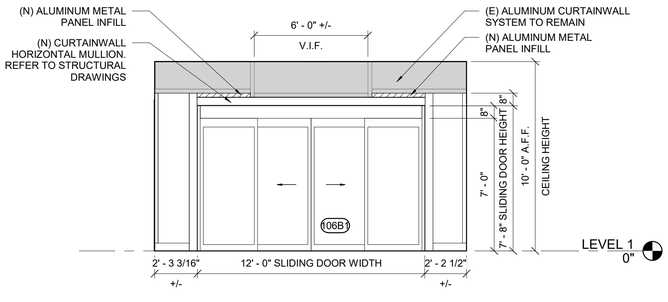
4 A-202 — 1/4" = 1'-0"

WEST ELEVATION @ SOUTH VESTIBULE



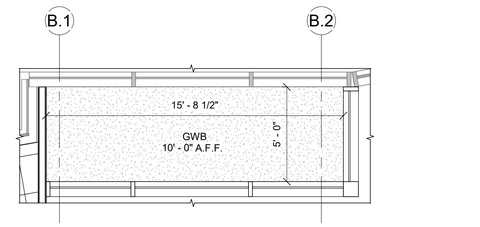
5 A-202 — 1/4" = 1'-0"

NORTH ELEVATION @ SOUTH VESTIBULE



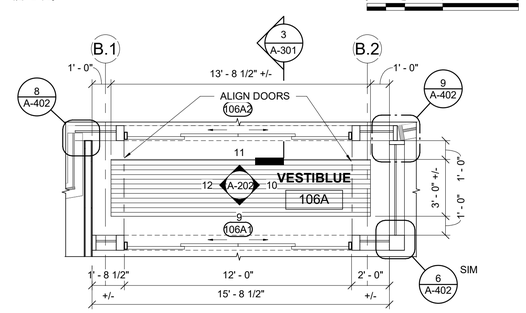
3 A-202 — 1/4" = 1'-0"

SOUTH ELEVATION @ SOUTH VESTIBULE



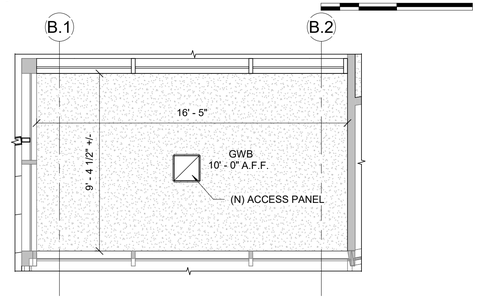
8 A-111 — 1/4" = 1'-0"

ENLARGED RCP @ NORTH VESTIBULE



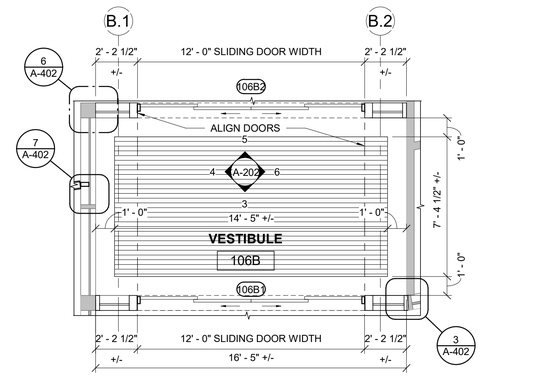
7 A-101 — 1/4" = 1'-0"

ENLARGED PLAN @ NORTH VESTIBULE



2 A-111 — 1/4" = 1'-0"

ENLARGED RCP @ SOUTH VESTIBULE



1 A-101 — 1/4" = 1'-0"

ENLARGED PLAN @ SOUTH VESTIBULE

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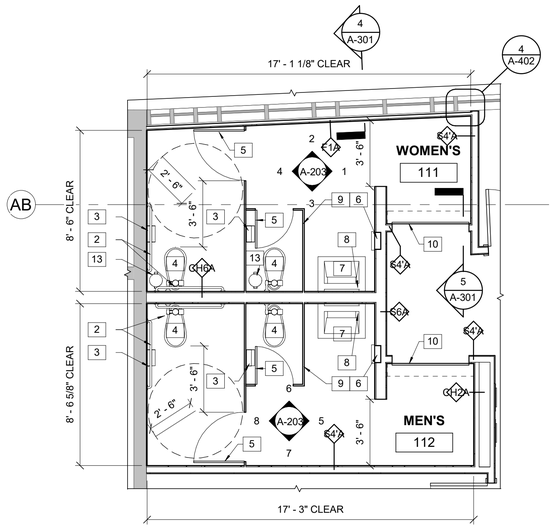
PROJECT NO.:	4022461
DESIGNED BY:	WX
DRAWN BY:	AA
CHECKED BY:	SC
APPROVED BY:	RR
DATE:	02/10/2025

SHEET TITLE

ENLARGED VESTIBULE PLAN & ELEVATIONS

A-202

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ENLARGED RESTROOMS FLOOR PLAN

9 / A-101 — 1/4" = 1'-0" — 0 2' 4' 8'

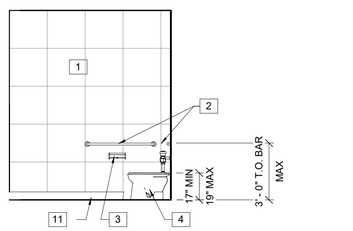
INTERIOR ELEVATION KEYNOTES - RESTROOMS

1. FIBER GLASS PANEL W/ 24" x 24" PATTERN
2. 42" GRAB BAR
3. TOILET PAPER DISPENSER
4. WATER CLOSET
5. GARMENT HOOK (MOUNTED AT 60" A.F.F. AND AT 48" A.F.F. FOR ADA STALLS)
6. ELECTRIC HAND DRYER
7. SINK W/ DRILLED HOLE FOR SOAP DISPENSER
8. MIRROR
9. CEILING HUNG / WALL MOUNTED PARTITION
10. CURTAIN GRATE. REFER TO DOOR SCHEDULE
11. EPOXY COVE BASE

NOTE: REFER TO A-502 FOR RESTROOM ACCESSORY MANUFACTURERS AND MODELS INFORMATION.

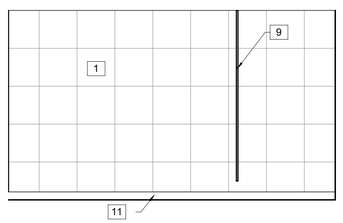
GENERAL NOTES:

1. U.N.O. ALL DIMENSIONS ARE TAKEN FROM FACE OF STUD. WHERE THE TERM "CLEAR" IS IDENTIFIED ON DIMENSION STRING, THIS INDICATES FACE OF FINISHED SURFACE.
2. REFER TO THE INTERIOR ELEVATIONS FOR RESTROOM ACCESSORIES MOUNTING HEIGHTS AND OTHER DIMENSION FOR ADA COMPLIANCE.
3. PROVIDE CONCEALED BLOCKING/SUPPORT BEHIND ALL WALL MOUNTED EQUIPMENT AND/OR ACCESSORIES (EX. GRAB BARS, SINK/LAVS, TOILET PARTITIONS, ETC.)



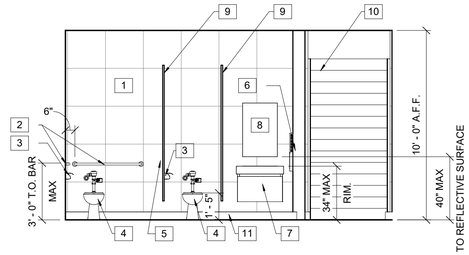
WEST ELEVATION - MEN'S

8 / A-203 — 1/4" = 1'-0" — 0 2' 4' 8'



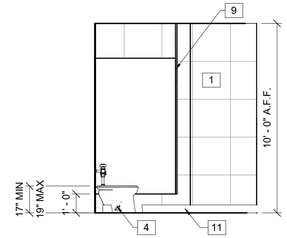
SOUTH ELEVATION - MEN'S

7 / A-203 — 1/4" = 1'-0" — 0 2' 4' 8'



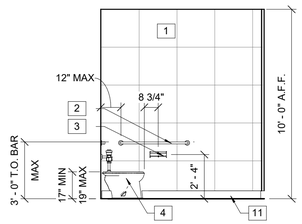
NORTH ELEVATION - MEN'S

6 / A-203 — 1/4" = 1'-0" — 0 2' 4' 8'



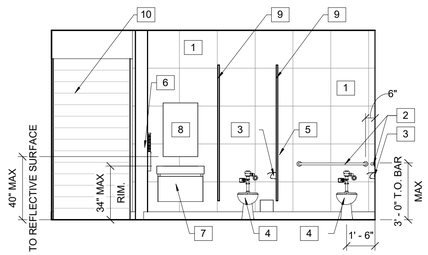
EAST ELEVATION - MEN'S

5 / A-203 — 1/4" = 1'-0" — 0 2' 4' 8'



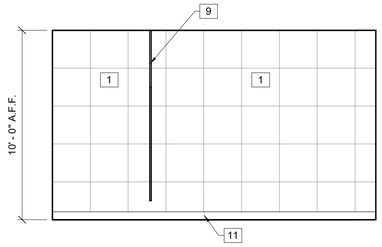
WEST ELEVATION - WOMEN'S

4 / A-203 — 1/4" = 1'-0" — 0 2' 4' 8'



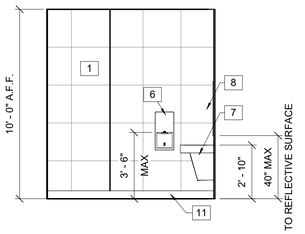
SOUTH ELEVATION - WOMEN'S

3 / A-203 — 1/4" = 1'-0" — 0 2' 4' 8'



NORTH ELEVATION - WOMEN'S

2 / A-203 — 1/4" = 1'-0" — 0 2' 4' 8'



EAST ELEVATION - WOMEN'S

1 / A-203 — 1/4" = 1'-0" — 0 2' 4' 8'

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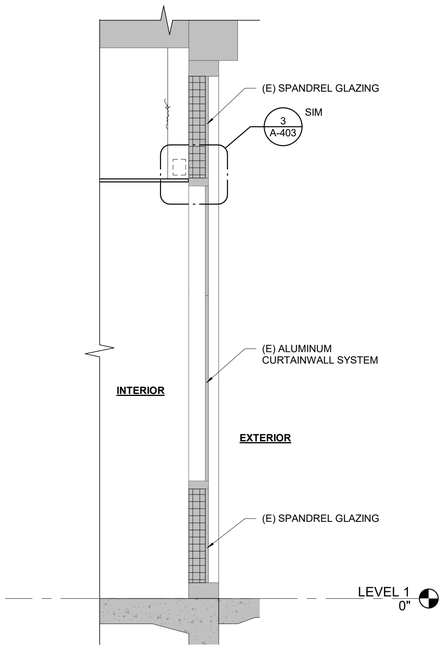
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SHEET TITLE

ENLARGED RESTROOM PLANS & ELEVATIONS

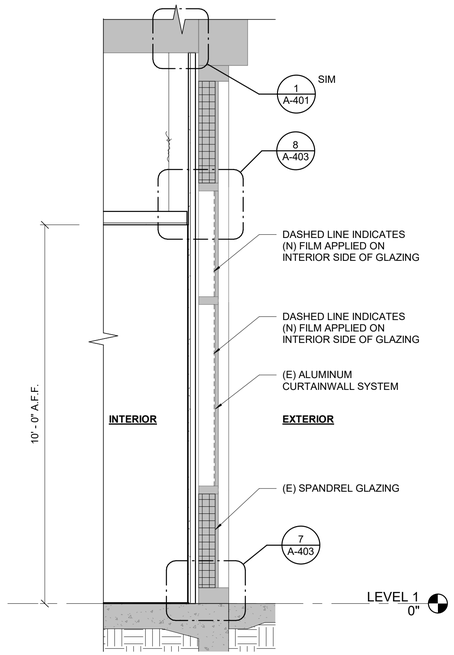
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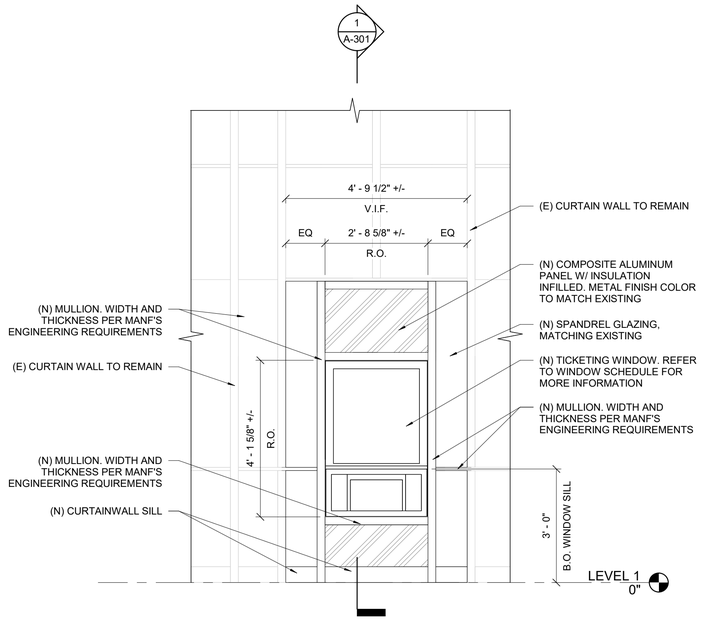
6 A-101 — SECTION @ EXIST. CURTAINWALL B

1/2" = 1'-0"



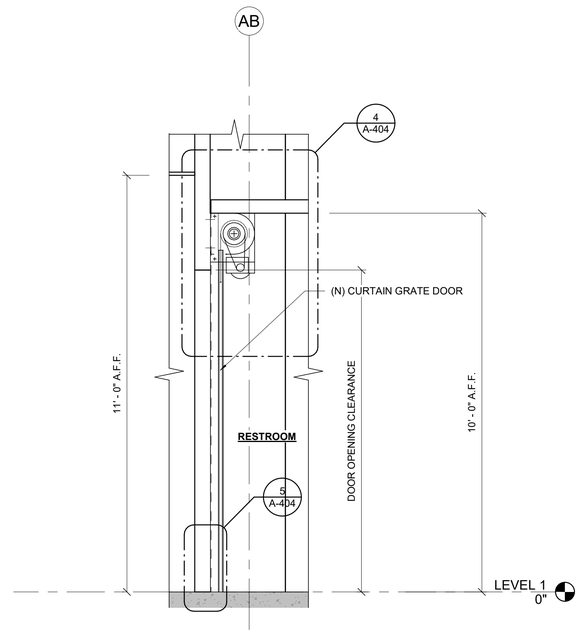
4 A-203 — SECTION @ EXIST. CURTAINWALL A

1/2" = 1'-0"



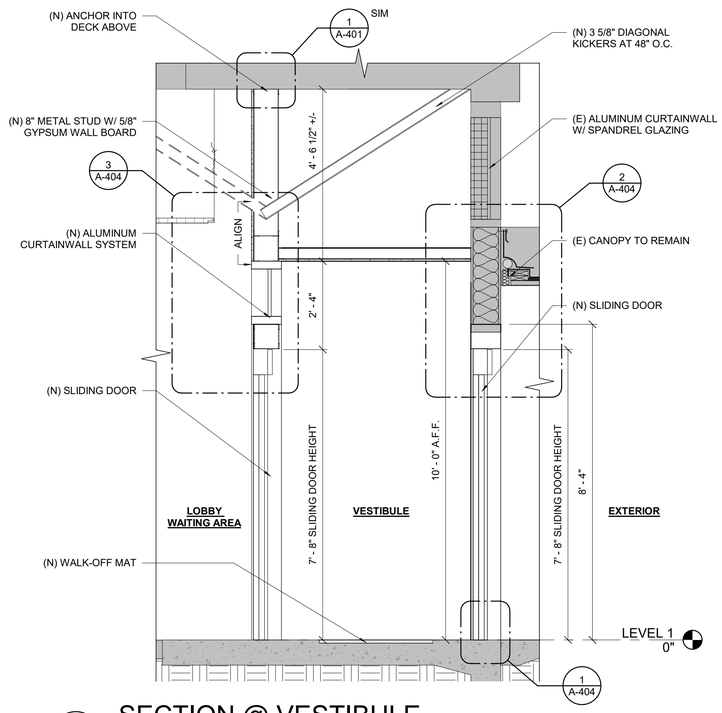
2 A-101 — ELEVATION @ TICKETING WINDOW

1/2" = 1'-0"



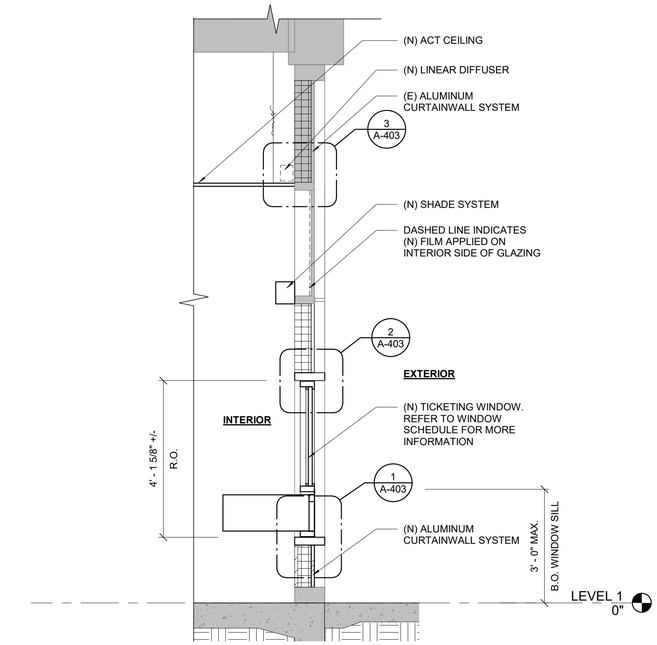
5 A-203 — SECTION @ CURTAIN GRATE

1/2" = 1'-0"



3 A-101 — SECTION @ VESTIBULE

1/2" = 1'-0"



1 A-101 — SECTION @ TICKETING WINDOW

1/2" = 1'-0"

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One Financial Center, 3rd Floor
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PROJECT IDENTIFICATION

WORCESTER REGIONAL
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MAIN LOBBY RENOVATION

MARK	DATE	DESCRIPTION	BY

ISSUE BLOCK

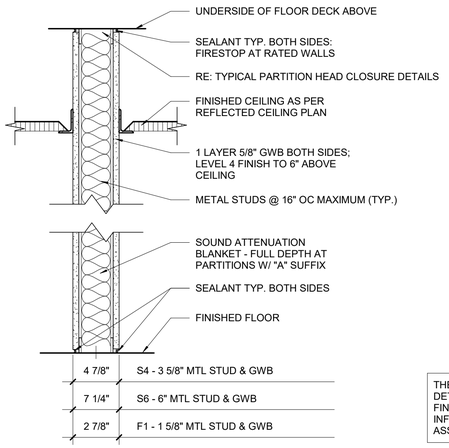
PROJECT NO.:	4022461
DESIGNED BY:	WX
DRAWN BY:	AA
CHECKED BY:	SC
APPROVED BY:	RR
DATE:	02/10/2025

SHEET TITLE

WALL SECTIONS AND ENLARGED ELEVATIONS

A-301

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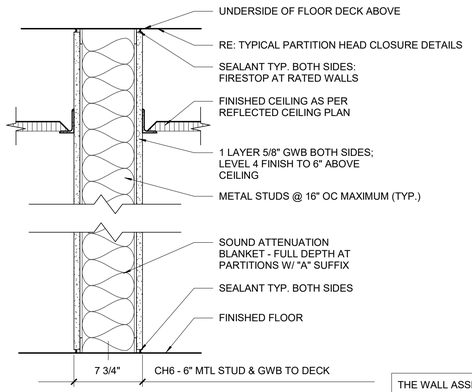


THE WALL ASSEMBLY SECTION DETAIL DOES NOT DEPICT FINISHES. FOR SPECIFIC FINISHES INFORMATION, REFER TO THE ASSEMBLY CHART BELOW.

TYPE	METAL STUD			HEIGHT	FINISH LAYERS	ACTUAL WIDTH	FIRE RATING	STC RATING
	SIZE	GAUGE	SPACING					
S4A	3 5/8"	22	16" O.C.	TO UNDERSIDE OF FLOOR DECK ABOVE	5/8" GYP BOARD ON BOTH SIDES	4 7/8"	NONE	49
S4'A	3 5/8"	22	16" O.C.	TO UNDERSIDE OF FLOOR DECK ABOVE	1/4" FIBERGLASS PANEL AND 5/8" GYP BOARD ON EACH SIDE	5 1/8"	NONE	49
S6A	6"	22	16" O.C.	TO UNDERSIDE OF FLOOR DECK ABOVE	1/4" FIBERGLASS PANEL AND 5/8" GYP BOARD ON EACH SIDE	7 5/8"	NONE	N/A
F1A	1 5/8"	22	16" O.C.	TO UNDERSIDE OF FLOOR DECK ABOVE	1/4" FIBERGLASS PANEL ON ONE SIDE	2 1/2"	NONE	N/A

NOTES:
1. BRACE METAL STUDS AS PER MANUFACTURER REQUIREMENTS TO BUILDING STRUCTURE.
2. PROVIDE METAL CLIP ANGLES AS REQUIRED TO INSTALL WALLS ON UNEVEN SURFACES (IE. PRECAST CONCRETE PANELS, EXISTING EXTERIOR WALLS, ETC.)
3. IN THE ASSEMBLY CHART, THE ACTUAL WIDTH MAY SUBJECT TO CHANGE DEPENDING ON FINISHES BEING USED AND SUPPLIERS THAT MANUFACTURER THE FINISH PRODUCT.
4. MOISTURE/MOLD-RESISTANT TYPE GYPSUM BOARD SHALL BE USED IN RESTROOMS, JANITOR'S CLOSETS, AND/OR AREAS SUBJECT TO WATER AND MOISTURE.

PARTITIONS - NON-RATED

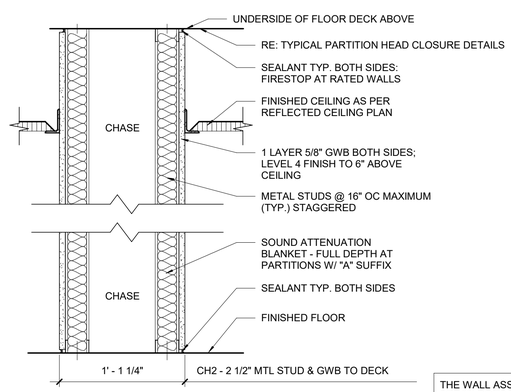


THE WALL ASSEMBLY SECTION DETAIL DOES NOT DEPICT FINISHES. FOR SPECIFIC FINISHES INFORMATION, REFER TO THE ASSEMBLY CHART BELOW.

TYPE	METAL STUD			HEIGHT	FINISH LAYERS	ACTUAL WIDTH	FIRE RATING	STC RATING
	SIZE	GAUGE	SPACING					
CH6A	6"	22	16" O.C.	TO UNDERSIDE OF FLOOR DECK ABOVE	1/4" FIBERGLASS PANEL ON BOTH SIDES	7 1/4"	NONE	NA

NOTES:
1. BRACE METAL STUDS AS PER MANUFACTURER REQUIREMENTS TO BUILDING STRUCTURE.
2. PROVIDE METAL CLIP ANGLES AS REQUIRED TO INSTALL WALLS ON UNEVEN SURFACES (IE. PRECAST CONCRETE PANELS, EXISTING EXTERIOR WALLS, ETC.)
3. IN THE ASSEMBLY CHART, THE ACTUAL WIDTH MAY SUBJECT TO CHANGE DEPENDING ON FINISHES BEING USED AND SUPPLIERS THAT MANUFACTURER THE FINISH PRODUCT.
4. MOISTURE/MOLD-RESISTANT TYPE GYPSUM BOARD SHALL BE USED IN RESTROOMS, JANITOR'S CLOSETS, AND/OR AREAS SUBJECT TO WATER AND MOISTURE.

CHASE WALL - TYPE 1

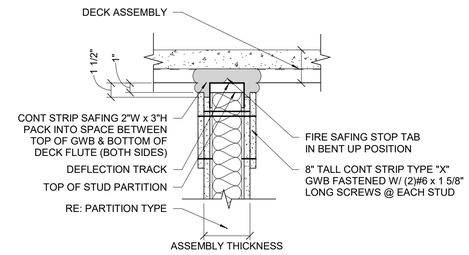


THE WALL ASSEMBLY SECTION DETAIL DOES NOT DEPICT FINISHES. FOR SPECIFIC FINISHES INFORMATION, REFER TO THE ASSEMBLY CHART BELOW.

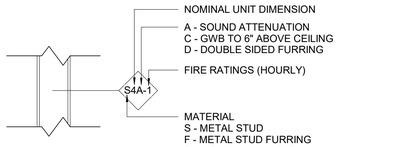
TYPE	METAL STUD			HEIGHT	FINISH LAYERS	ACTUAL WIDTH	FIRE RATING	STC RATING
	SIZE	GAUGE	SPACING					
CH2A	2 1/2"	22	16" O.C.	TO UNDERSIDE OF FLOOR DECK ABOVE	1/4" FIBERGLASS PANEL AND 5/8" GYP BOARD ON EACH SIDE	1 - 1 1/4"	NONE	NA

NOTES:
1. BRACE METAL STUDS AS PER MANUFACTURER REQUIREMENTS TO BUILDING STRUCTURE.
2. PROVIDE METAL CLIP ANGLES AS REQUIRED TO INSTALL WALLS ON UNEVEN SURFACES (IE. PRECAST CONCRETE PANELS, EXISTING EXTERIOR WALLS, ETC.)
3. IN THE ASSEMBLY CHART, THE ACTUAL WIDTH MAY SUBJECT TO CHANGE DEPENDING ON FINISHES BEING USED AND SUPPLIERS THAT MANUFACTURER THE FINISH PRODUCT.
4. MOISTURE/MOLD-RESISTANT TYPE GYPSUM BOARD SHALL BE USED IN RESTROOMS, JANITOR'S CLOSETS, AND/OR AREAS SUBJECT TO WATER AND MOISTURE.

CHASE WALL - TYPE 2



BRACING ALONG DECK FLUTES



NOTE:
THIS PARTITION WALL LEGEND GUIDE IS GENERAL. NOT ALL PARTITION TYPES SHOWN HERE ARE NECESSARILY USED IN THIS PROJECT. REFER TO THE LEVEL 1 FLOOR PLAN FOR SPECIFIC PARTITION TYPES USED.

1 / - PARTITION HEAD DETAILS, TYP.

1 1/2" = 1'-0"

0 6" 1' 1'6"

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ISSUE BLOCK

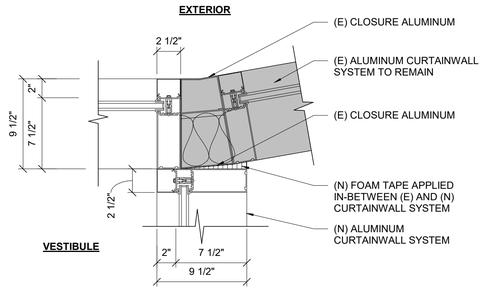
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PARTITION TYPES & DETAILS

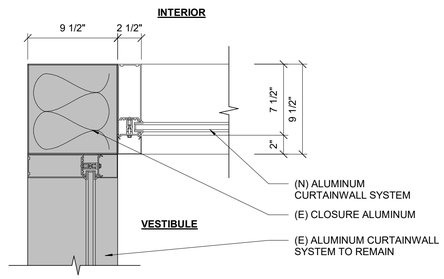
A-401

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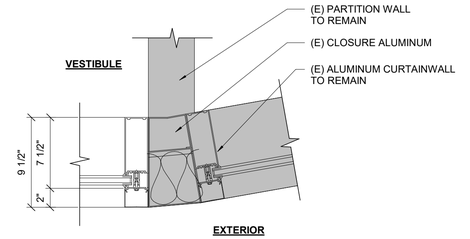
9 A-202 — T JAMB @ NORTH VESTIBULE

1 1/2" = 1'-0" — 0 2' 4' 8'



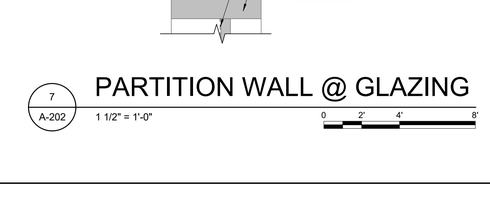
6 A-202 — L JAMB @ CURTAINWALL

1 1/2" = 1'-0" — 0 2' 4' 8'



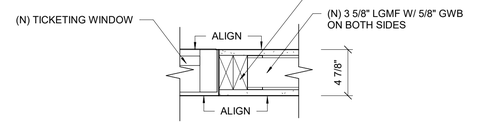
3 A-202 — T JAMB @ SOUTH VESTIBULE

1 1/2" = 1'-0" — 0 2' 4' 8'



8 A-202 — L JAMB @ NORTH VESTIBULE

1 1/2" = 1'-0" — 0 2' 4' 8'

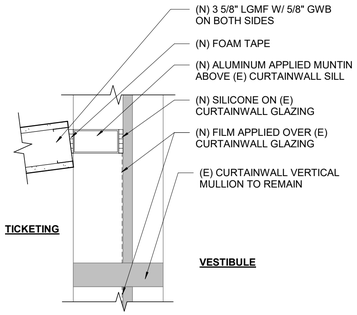


5 A-101 — TICKETING WINDOW JAMB

1 1/2" = 1'-0" — 0 2' 4' 8'

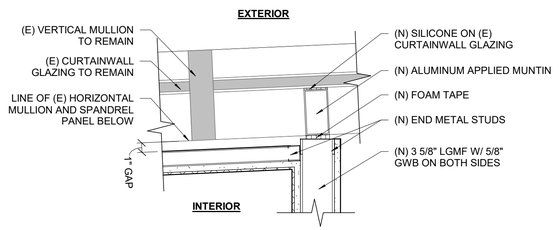
2 A-101 — TICKETING WINDOW JAMB @ MULLION

1 1/2" = 1'-0" — 0 2' 4' 8'



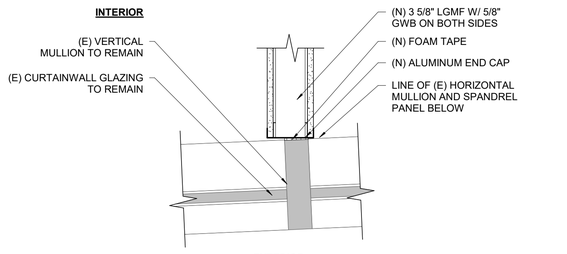
7 A-202 — PARTITION WALL @ GLAZING

1 1/2" = 1'-0" — 0 2' 4' 8'



4 A-203 — PARTITION CLOSURE @ GLAZING, TYP.

1 1/2" = 1'-0" — 0 2' 4' 8'



1 A-101 — PARTITION CLOSURE @MULLION, TYP.

1 1/2" = 1'-0" — 0 2' 4' 8'

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ISSUE BLOCK

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APPROVED BY:	RR
DATE:	02/10/2025

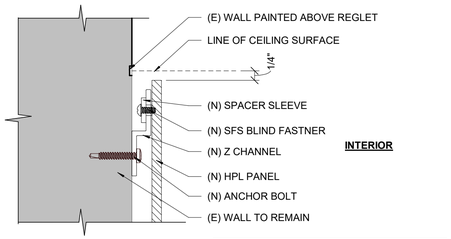
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PLAN DETAILS

A-402

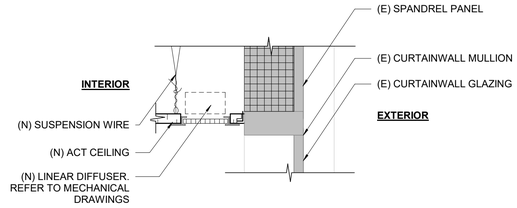
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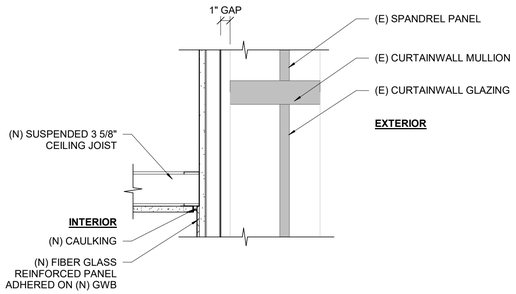
6 A-201 WOOD PANEL @ TOP

6" = 1'-0"



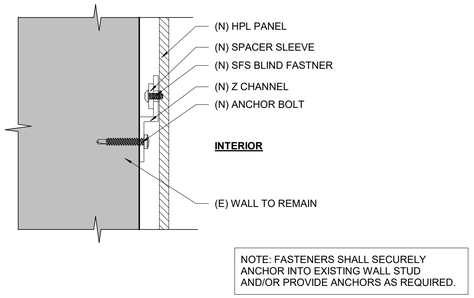
3 A-301 ACT CELING @ CURTAINWALL

1 1/2" = 1'-0"



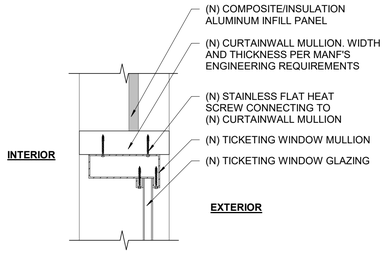
8 A-301 GYP CEILING @ CURTAINWALL

1 1/2" = 1'-0"



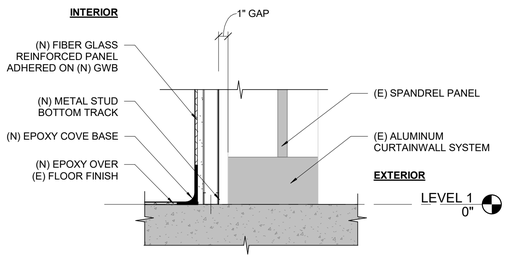
5 - PANEL HORIZONTAL REVEAL

6" = 1'-0"



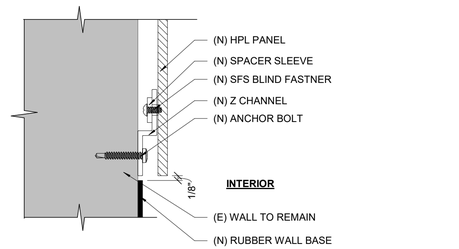
2 A-301 TICKETING WINDOW @ HEAD

1 1/2" = 1'-0"



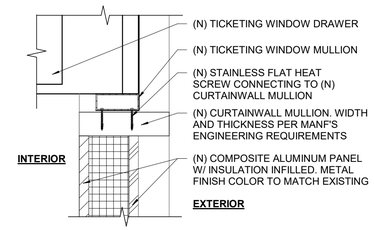
7 A-301 GWB BASE @ CURTAINWALL

1 1/2" = 1'-0"



4 A-201 WOOD PANEL @ BASE

6" = 1'-0"



1 A-301 TICKETING WINDOW @ SILL

1 1/2" = 1'-0"

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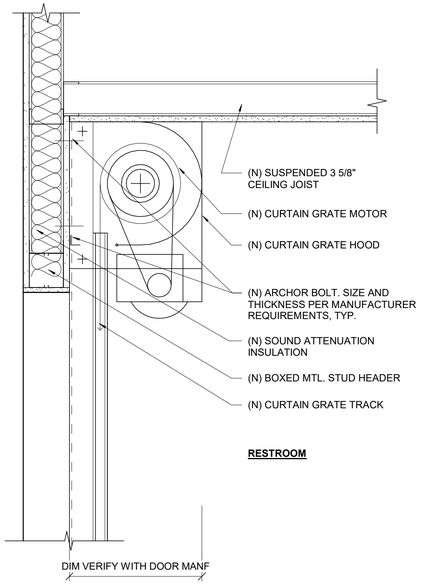
PROJECT NO.:	4022461
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CHECKED BY:	SC
APPROVED BY:	RR
DATE:	02/10/2025

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SECTION DETAILS - PART 1 OF 2

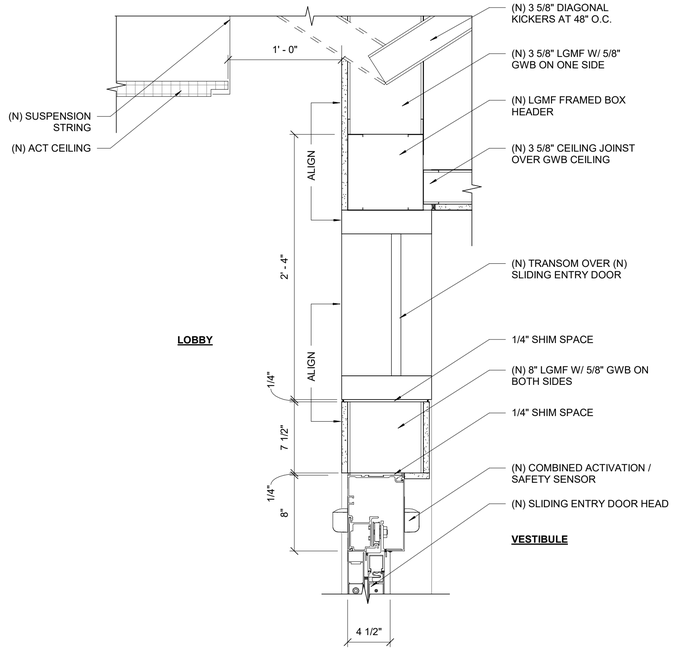
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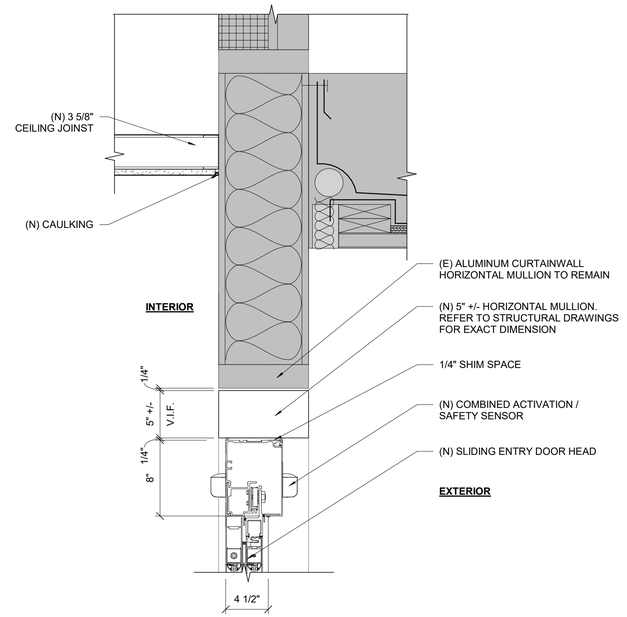
4 A-301 CURTAIN GRATE @ HEAD

1 1/2" = 1'-0"



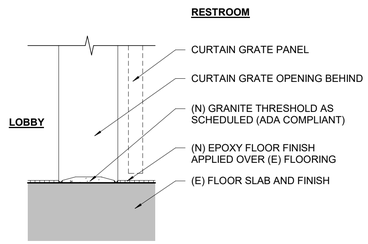
3 A-301 @ SLIDING ENTRY DOOR HEAD

1 1/2" = 1'-0"



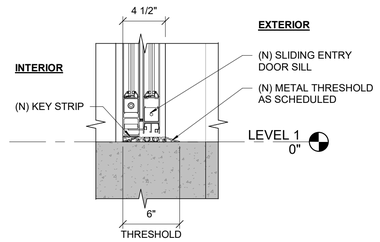
2 A-301 SLIDING ENTRY DOOR HEAD

1 1/2" = 1'-0"



5 A-301 CURTAIN GRATE @ SILL

1 1/2" = 1'-0"



1 A-301 SLIDING ENTRY DOOR SILL

1 1/2" = 1'-0"

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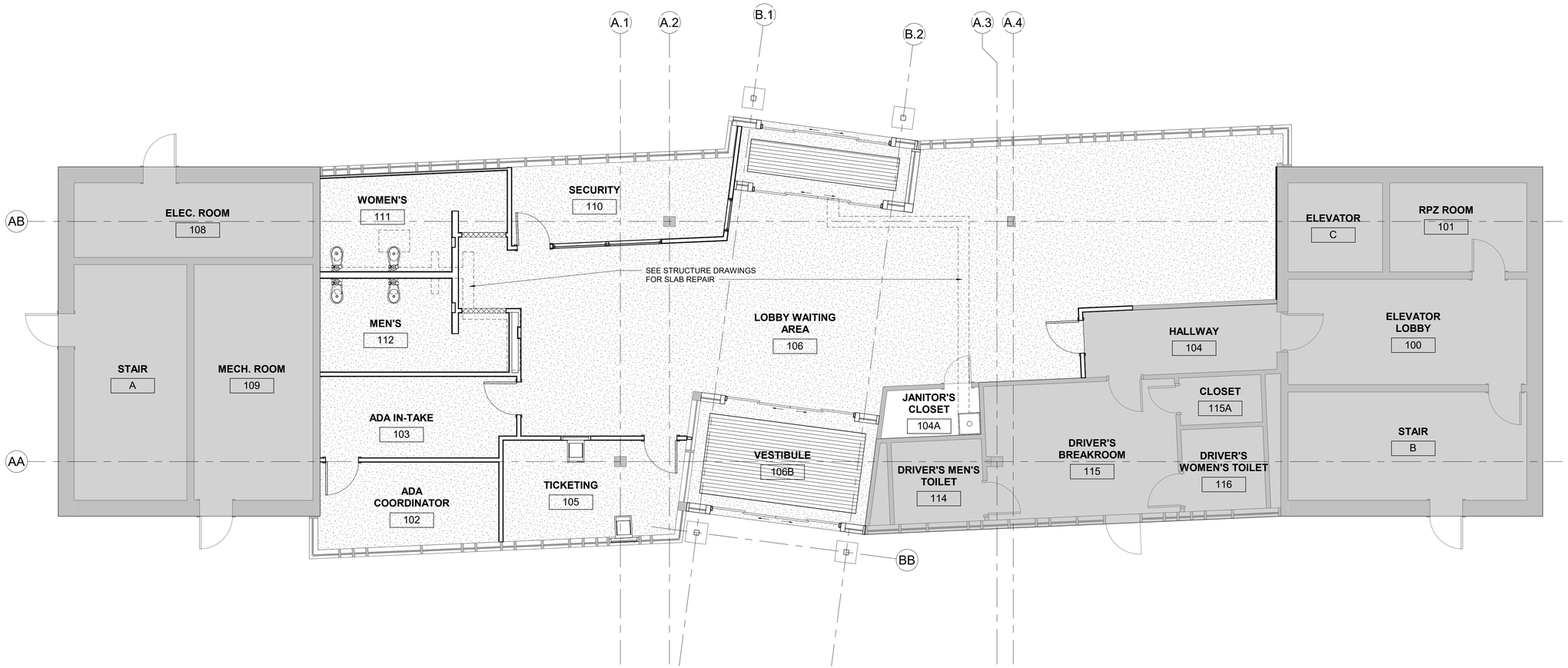
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SECTION DETAILS - PART 2 OF 2

A-404

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LEVEL 1 FLOOR FINISH PLAN

3/16" = 1'-0"

0 4' 8' 12'

FINISH NOTES:

1. ALL EXISTING PAINTED WALLS AND/OR DOORS TO REMAIN SHALL BE CLEANED AND PAINTED. REMOVE AND REINSTALL EXISTING SIGNAGE, PLAQUES, AND OR OTHER EQUIPMENT OR DEVICES AS REQUIRED.
2. EPOXY COATING SHALL BE FINISHED TO PROVIDE A SLIP-RESISTANT SURFACE.
3. EPOXY COATING SHALL BE INSTALLED IN THICKNESS SUFFICIENT TO CONCEAL EXISTING TILE GROUT LINES, MATERIAL TRANSITIONS, ETC. FOR A LEVEL AND UNIFORM SURFACE.
4. THERE SHALL BE NO LEVEL CHANGES AND/OR DIFFERENCES OF MORE THAN 1/4"; LEVEL CHANGES SHALL COMPLY WITH ADA SLOPE REQUIREMENTS, AS REQUIRED.
5. ALL NEW GYPSUM BOARD WALLS, EXPOSED TO VIEW, SHALL BE FINISHED TO A 'LEVEL 4' FINISH AND PREPARED FOR PAINT, AS REQUIRED.

FLOOR FINISH SYMBOLS LEGEND

- EPOXY FLOORING
- WALK OFF MAT
- POLISHED CONCRETE - EXISTING
- GRANITE THRESHOLD

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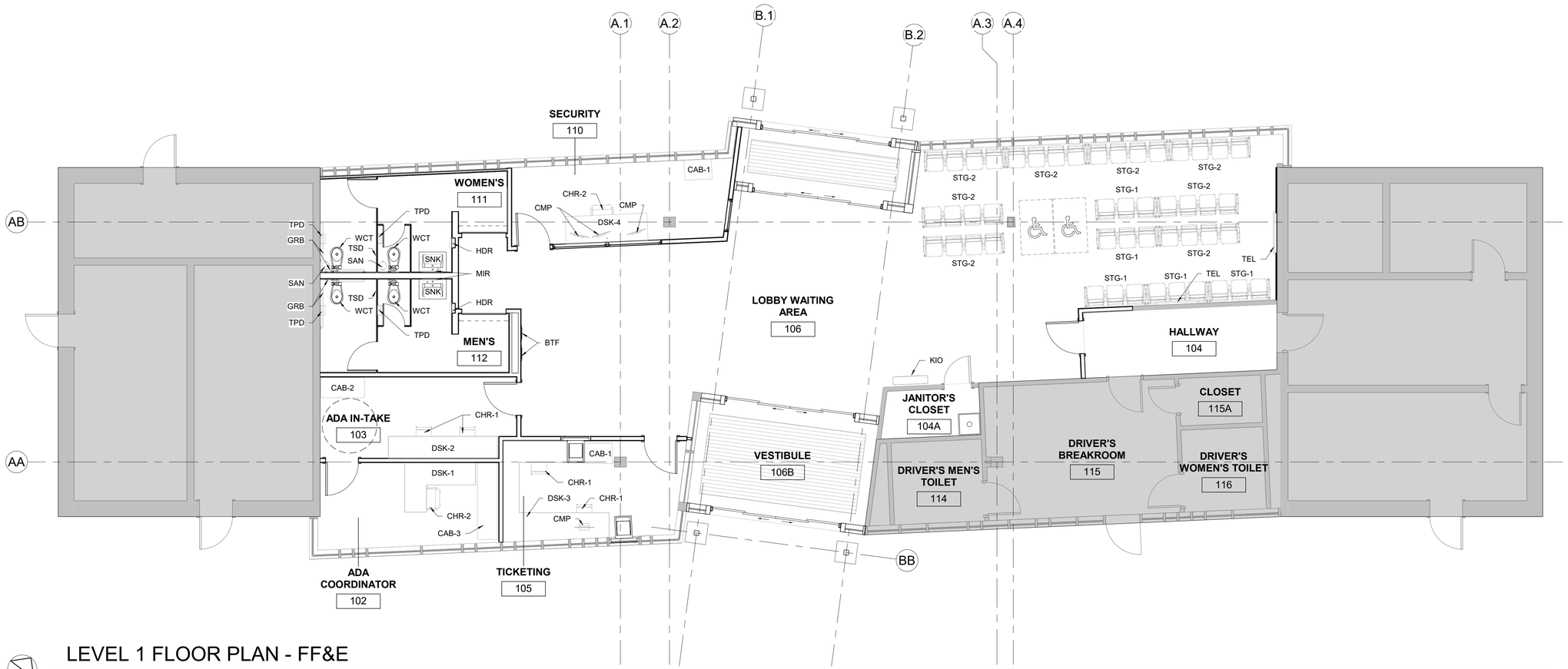
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SHEET TITLE

LEVEL 1 FLOOR FINISH PLAN & SCHEDULE

A-501

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LEVEL 1 FLOOR PLAN - FF&E

3/16" = 1'-0"

0 4' 8' 12'

FURNITURE AND EQUIPMENT SCHEDULE - BASIS OF DESIGN

MARK	NAME	MANUFACTURER - MODEL	COUNT	LOCATION	CLIENT FURNISH, GC INSTALL
BTF	Bottle Filler	HAWS - 2000HS	2	RM-106	NO
CAB-1	Tall Cabinet Instrument Unit - 30" x 22" x 84"	N/A	2	RM-105/110	YES
CAB-2	Tall Cabinet Instrument Unit - 48" x 22" x 84"	N/A	1	RM-103	YES
CAB-3	Tall Cabinet Instrument Unit - 84" x 22" x 84"	N/A	1	RM-102	YES
CHR-1	Office Chair	N/A	4	RM-103/105	YES
CHR-2	Chair-Executive	N/A	2	RM-102/110	YES
CMP	Computer Set	N/A	5	RM-105/110	YES
DSK-1	Desk @ ADA Coordinator	N/A	1	RM-102	YES
DSK-2	Desk @ ADA In-Take	N/A	1	RM-103	YES
DSK-3	Desk @ Ticketing	N/A	1	RM-105	YES
DSK-4	Desk @ Security	N/A	1	RM-110	YES
GRB	Stainless Steel Grab Bar w/ Concealed Flange	DEARBORN - DB8742	4	RM-111/112	NO
HDR	Electrical Hand Dryer	TOTO - HDR111#SS	2	RM-111/112	NO
KIO	Trip Planning Kiosk	CONNECTPOINT - SmartStop	1	RM-106	YES
MIR	Mirror	K-26052-BLL	2	RM-111/112	NO
SAN	Sanitary Receptacle	BOBRICK - B-270	2	RM-111/112	NO
SNK	Restroom Sink	TRUEFORM - FLO-30V-ADA	2	RM-111/112	NO
STG-1	Waiting Room Seating 1	ZOEFTIG - Contact PU Seat and Back - 3 Unit	5	RM-106	YES
STG-2	Waiting Room Seating 2	ZOEFTIG - Contact PU Seat and Back - 4 Unit	8	RM-106	YES
TEL	Television - Plasma	N/A	2	RM-106	YES
TPD	Toilet Paper Dispenser	BOBRICK - B-2890	4	RM-111/112	NO
WCT	Water Closet	ACORN - R2141-3	4	RM-111/112	NO

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PROJECT IDENTIFICATION

WORCESTER REGIONAL TRANSIT AUTHORITY

MAIN LOBBY RENOVATION

MARK	DATE	DESCRIPTION	BY

ISSUE BLOCK

PROJECT NO.:	4022461
DESIGNED BY:	WX
DRAWN BY:	AA
CHECKED BY:	SC
APPROVED BY:	RR
DATE:	02/10/2025

SHEET TITLE

FURNITURE AND EQUIPMENT SCHEDULE

A-502

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DOOR SCHEDULE

DOOR NUMBER	DOOR					FRAME				FIRE RATING	HARDWARE SET #	COMMENTS
	TYPE	MAT.	NOMINAL SIZE			TYPE	MAT.	DETAIL				
			WIDTH	HEIGHT	THICKNESS			JAMB	HEAD			
102	A	HM	3' - 0"	7' - 0"	1 3/4"	1	HM	1/A-601	3/A-601	None	3	
103	A	HM	3' - 0"	7' - 0"	1 3/4"	1	HM	1/A-601	3/A-601	None	2	
104	A	HM/GLASS	3' - 0"	7' - 0"	1 3/4"	1	HM	1/A-601	3/A-601	None	2	ELEC. EXIT DEVICE ON ELEV. LOBBY SIDE
105	A	HM	3' - 0"	7' - 0"	1 3/4"	1	HM	1/A-601	3/A-601	None	2	
106A1	S-S	ALUM/GLASS	11' - 8 1/2"	7' - 0"	1 3/4"	1	ALUM			None	1	PACKAGE WIDTH 12' - 0"
106A2	S-S	ALUM/GLASS	11' - 8 1/2"	7' - 0"	1 3/4"	1	ALUM			None	1	PACKAGE WIDTH 12' - 0"
106A7	B		1' - 5 1/2"	1' - 5 1/2"								
106B1	S-S	ALUM/GLASS	11' - 8 1/2"	7' - 0"	1 3/4"	1	ALUM			None	1	PACKAGE WIDTH 12' - 0"
106B2	S-S	ALUM/GLASS	11' - 8 1/2"	7' - 0"	1 3/4"	1	ALUM			None	1	PACKAGE WIDTH 12' - 0"
110	A	HM	3' - 0"	7' - 0"	1 3/4"	1	HM	1/A-601	3/A-601	None	2	
111	R	MTL GRATE	4' - 0 3/4"	8' - 6"	1 3/4"	1	N/A	2/A-601	4/A-601	None	4	
112	R	MTL GRATE	4' - 0 3/4"	8' - 6"	1 3/4"	1	N/A	2/A-601	4/A-601	None	4	

HARDWARE SET #1 AUTOMATIC SLIDING ENTRY DOORS

- COORDINATE REQUIREMENTS WITH DOOR MANF.
- SENSOR
- TRACKS
- CYLINDER(S)
- THRESHOLD AT EXTERIOR DOOR(S) ONLY

HARDWARE SET #2 STOREROOM FUNCTION W/ CARD READER

- 1 1/2 PAIRS OF HINGES
- ELECTRIFIED LOCKSET (STOREROOM FUNCTION)
- 1 CLOSER
- 1 SET OF SILENCERS
- 2 KICK PLATES
- CARD READER
- POWER/COMM. SUPPLY- SEE ELEC DWGS

HARDWARE SET #3 OFFICE FUNCTION

- 1 1/2 PAIRS OF HINGES
- LOCKSET (OFFICE FUNCTION)
- 1 SET OF SILENCERS
- 2 KICK PLATES

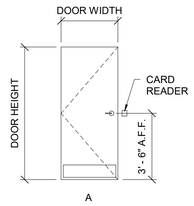
HARDWARE SET #4 MOTORIZED OVERHEAD GRILLE

- 1 CYLINDER
- COORDINATE REQUIREMENTS WITH GRILLE MANF.

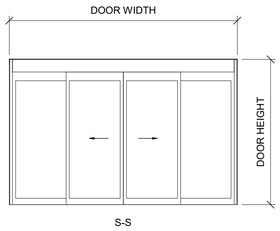
HARDWARE NOTES:

A. CONFIRM HARDWARE SETS WITH OWNER/ TENANT PRIOR TO HARDWARE ORDER AND PURCHASE.
B. ALL LOCK SETS TO BE ARROWS UNLESS OTHERWISE NOTED.
C. THE CONTRACT DOCUMENT HARDWARE SETS:
   1. ARE PRELIMINARY SETS WHICH ONLY DESCRIBE THE BASIC OPERATION AND FEATURES INTENDED.
   2. MAY NOT INCLUDE ALL REQUIRED HARDWARE ITEMS.
   3. MAY NOT INCLUDE COORDINATED HARDWARE ITEMS.
D. SEE SPECIFICATIONS 087100 FOR ADDITIONAL INFORMATION.

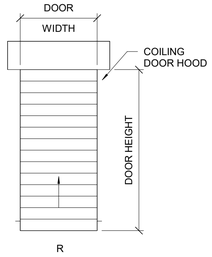
DOOR PANEL TYPES



A

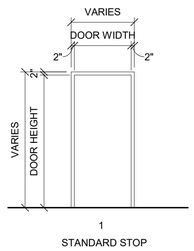


S-S



R

DOOR FRAME TYPES

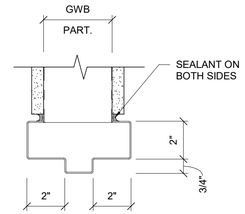


1
STANDARD STOP

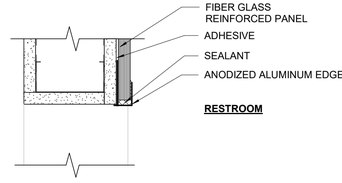
WINDOW SCHEDULE

MARK	MANUFACTURER	MODEL	HEIGHT	WIDTH	COUNT	COMMENTS
W1	QUICKSERVE	QSP-713M MINI COMBO	4' - 1 1/4"	2' - 8 1/4"	2	
W2	ARCHITECTURAL WINDOW MANUFACTURING CORPORATION	8090i FIXED	4' - 0"	5' - 0"	2	
W3	ARCHITECTURAL WINDOW MANUFACTURING CORPORATION	8090i FIXED	4' - 0"	3' - 0"	1	

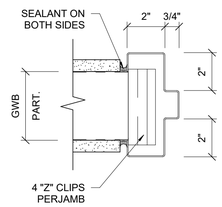
NOTE:
1. MANUFACTURERS AND MODELS OF THE WINDOW PRODUCTS IN THE SCHEDULE ARE BASIS OF DESIGN.



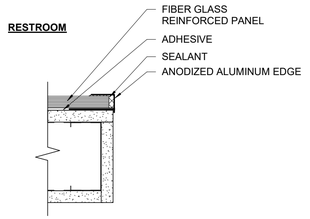
4 DOOR HEAD DETAIL, TYP.
3" = 1'-0"



2 DOOR HEAD DETAIL @ FRP
3" = 1'-0"



3 DOOR JAMB DETAIL, TYP.
3" = 1'-0"



1 DOOR JAMB DETAIL @ FRP
3" = 1'-0"

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DATE:	02/10/2025

SHEET TITLE

DOOR, WINDOW SCHEDULE AND DETAILS

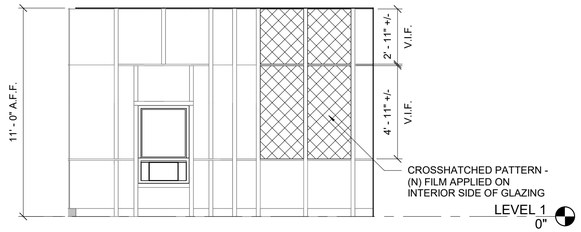
A-601

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ROOM FINISH SCHEDULE

ROOM #	ROOM NAME	WALL BASE	WALL FINISH	FLOOR FINISH	CEILING FINISH	COMMENTS
102	ADA COORDINATOR	RUBBER	PT	EPOXY	ACT	
103	ADA IN-TAKE	RUBBER	PT	EPOXY	ACT	
104	HALLWAY	RUBBER	PT	EPOXY	ACT	
105	TICKETING	RUBBER	PT	EPOXY	ACT	
106	LOBBY WAITING AREA	RUBBER	PT	EPOXY	ACT	HPL WALL FINISH PER PLANS
106A	VESTIBLUE	RUBBER	PT	EPOXY	GYP	
106B	VESTIBULE	RUBBER	PT	EPOXY	GYP	
110	SECURITY	RUBBER	PT	EPOXY	ACT	
111	WOMEN'S	EPOXY COVE	FRP	EPOXY	GYP	
112	MEN'S	EPOXY COVE	FRP	EPOXY	GYP	

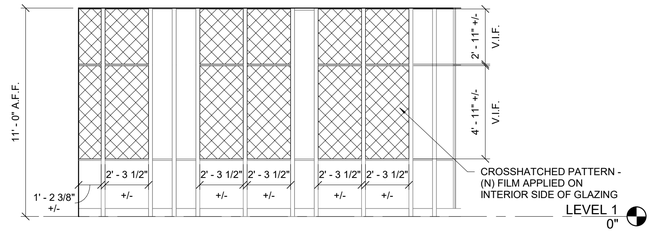
HPL - HIGH PRESSURE LAMINATED PANELS. REFER TO DETAILS ON THE SHEET A-403.



1 A-101 — SOUTH ELEVATION @ TICKETING

1/4" = 1'-0"

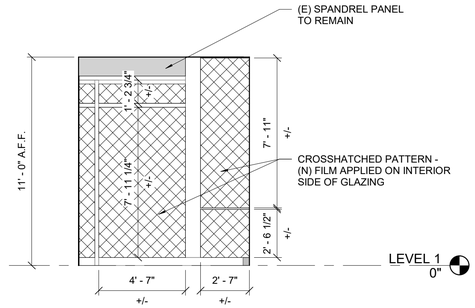
0 2' 4' 8'



2 A-101 — NORTH ELEVATION @ SECURITY

1/4" = 1'-0"

0 2' 4' 8'



3 A-101 — EAST ELEVATION @ TICKETING

1/4" = 1'-0"

0 2' 4' 8'

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SHEET TITLE

ROOM FINISH SCHEDULE AND DETAILS

A-701

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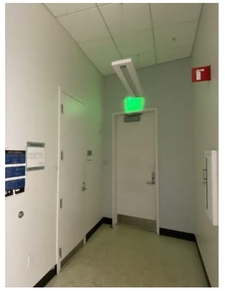
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18 NORTH FACADE
3/16" = 1'-0"



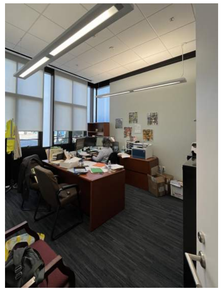
14 SOUTH ENTRY
3/16" = 1'-0"



10 HALLWAY
3/16" = 1'-0"



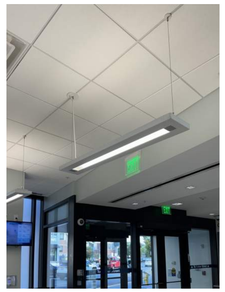
6 NORTH VESTIBULE
3/16" = 1'-0"



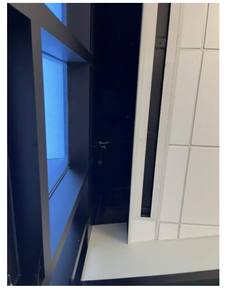
3 ADA COORDINATOR
3/16" = 1'-0"



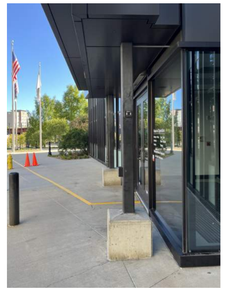
17 NORTH ENTRY
3/16" = 1'-0"



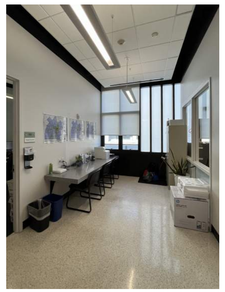
13 VESTIBULE DOOR HEAD
3/16" = 1'-0"



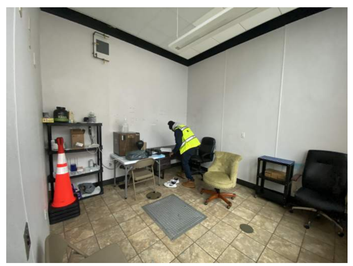
9 CEILING EDGE
3/16" = 1'-0"



5 CURTAINWALL CORNER
3/16" = 1'-0"



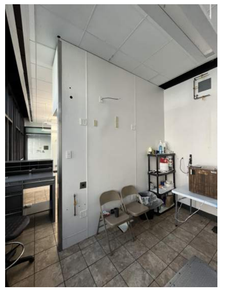
2 ADA INTAKE
3/16" = 1'-0"



16 SUPERVISOR ROOM B
3/16" = 1'-0"



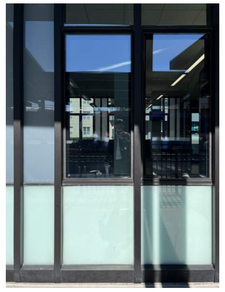
12 VESTIBULE CEILING
3/16" = 1'-0"



8 SUPERVISOR ROOM A
3/16" = 1'-0"



4 TICKETING WINDOW
3/16" = 1'-0"



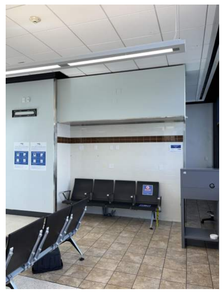
1 CURTAINWALL SYSTEM
3/16" = 1'-0"



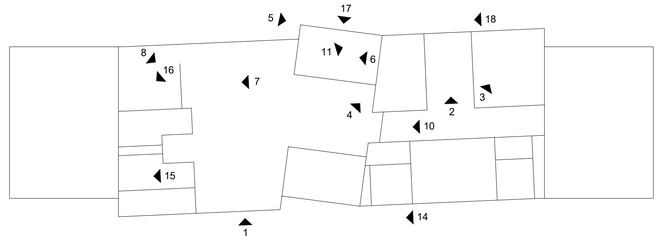
15 EXISTING RESTROOM
3/16" = 1'-0"



11 VESTIBULE CURTAINWALL
3/16" = 1'-0"



7 SEATING AREA
3/16" = 1'-0"



KEY PLAN
1/16" = 1'-0"
0 8' 16' 32'

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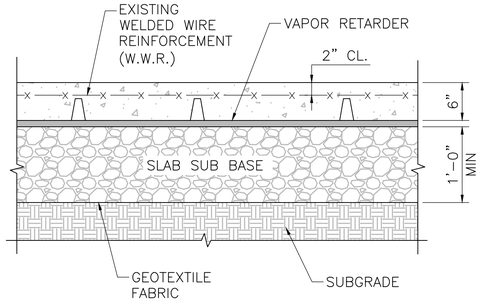
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REFERENCE PHOTOS

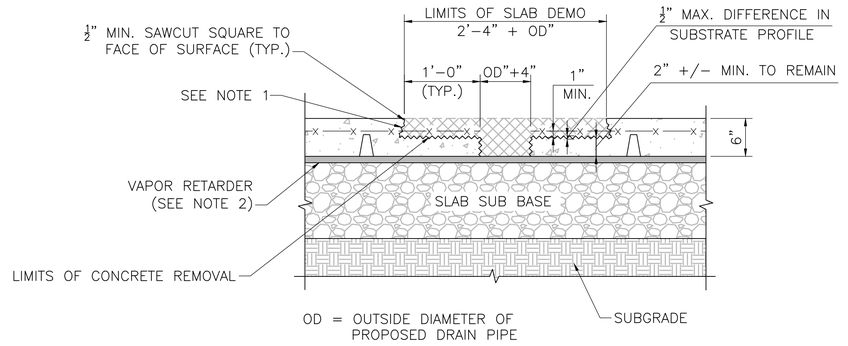
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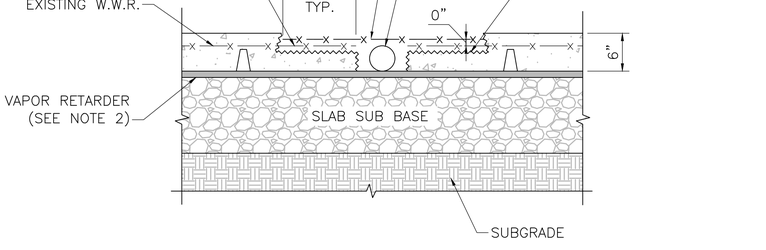
EXISTING SLAB SECTION

SCALE: 1" = 1'-0"



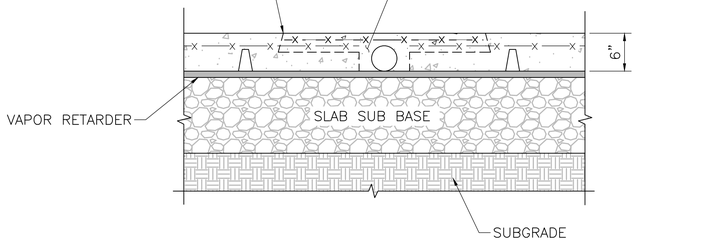
PROPOSED SLAB DEMO – STEP 1

SCALE: 1" = 1'-0"



PROPOSED SLAB DEMO – STEP 2

SCALE: 1" = 1'-0"



FINAL PROPOSED SECTION

SCALE: 1" = 1'-0"

NOTES:

1. REMOVE CONCRETE BELOW SAWCUT AT +/- 15 DEGREE ANGLE.
2. CONTRACTOR TO MAKE ALL EFFORTS NOT TO DAMAGE VAPOR RETARDER LAYER. IF DAMAGED, VAPOR RETARDER SHALL BE REPLACED/RESTORED TO EXISTING CONDITION. PROPOSED PRODUCT/METHOD SHALL BE SUBMITTED TO ENGINEER FOR REVIEW. INSTALL IN ACCORDANCE WITH MANUFACTURERS RECOMMENDATIONS.
3. FULL DEPTH DEMO WIDTH IS OD+4". ONLY REMOVE EXISTING W.W.R. FROM THIS REGION. 12" OF EXISTING W.W.R. TO EITHER SIDE OF FULL DEPTH DEMO SHALL REMAIN IN PLACE FOR LAPPING.
4. ALL DEMO AND PROPOSED SLAB WORK IS SYMMETRICAL ABOUT PROPOSED CL OF DRAIN PIPE.
5. ALL AREAS IN AND AROUND THE SLAB DEMO SHALL BE CLEANED BEFORE AND AFTER PLACING DRAIN PIPE AND W.W.R.
6. PROPOSED WELDED WIRE REINFORCEMENT SHALL CONFORM TO ASTM A185.
7. MAINTAIN MIN 1½" TOP COVER ABOVE THE NEW W.W.R.
8. ENSURE JOINTS ARE CLEAN, DRY AND FREE OF DEBRIS BEFORE APPLYING METHACRYLATE AND CAULK. JOINT SEALING SHALL NOT BE PERFORMED UNTIL PROPOSED CEMENTITIOUS MORTAR IS FULLY CURED. CAULKING SHALL NOT BE APPLIED UNTIL METHACRYLATE SEALER HAS FULLY CURED.

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PROJECT IDENTIFICATION

WORCESTER REGIONAL TRANSIT AUTHORITY

MAIN LOBBY RENOVATION

MARK	DATE	DESCRIPTION	BY

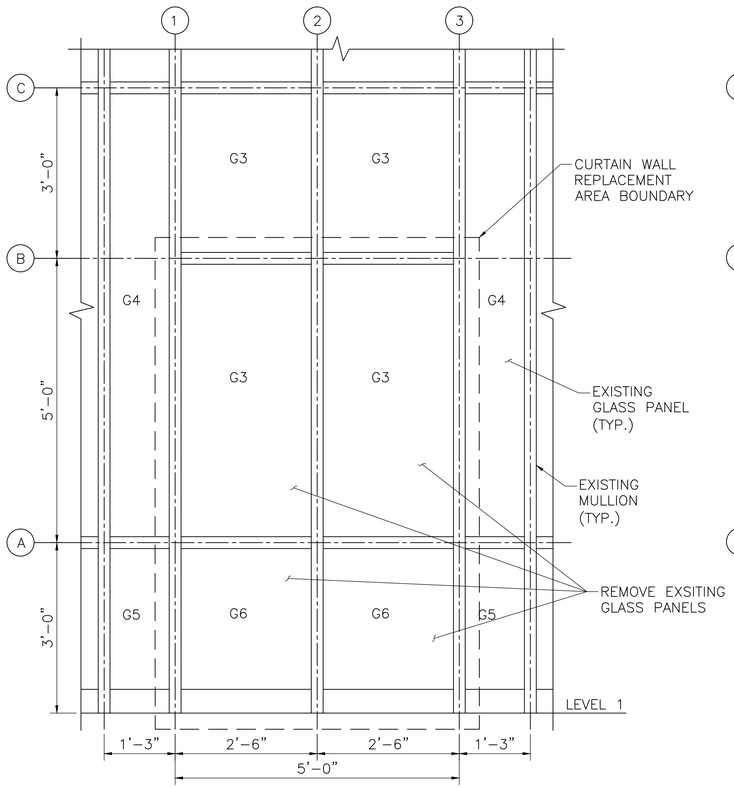
ISSUE BLOCK

PROJECT NO.:	4022461
DESIGNED BY:	AB
DRAWN BY:	AB
CHECKED BY:	ENB
APPROVED BY:	ENB
DATE:	02/10/2025

SHEET TITLE

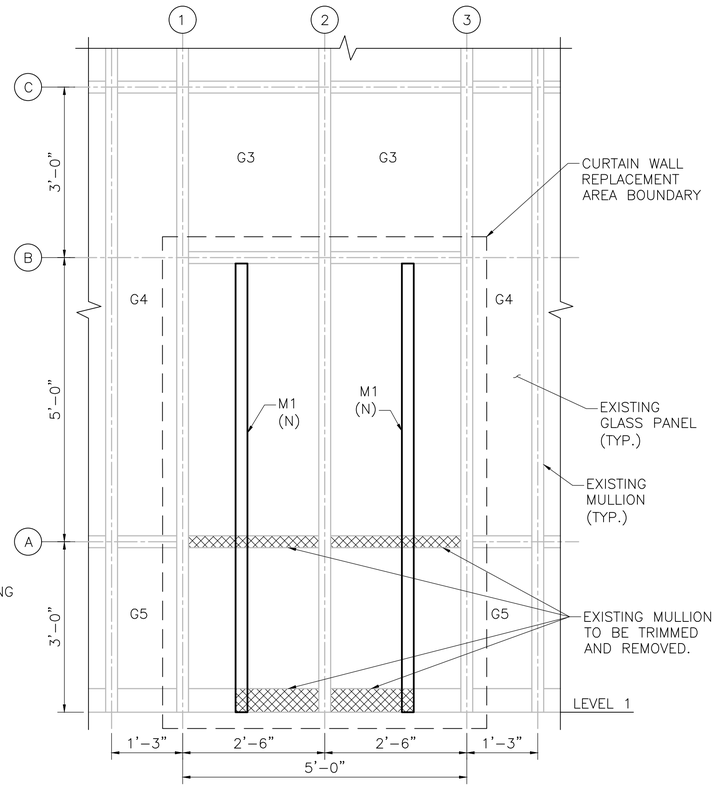
SLAB ON GRADE DEMO

S-101



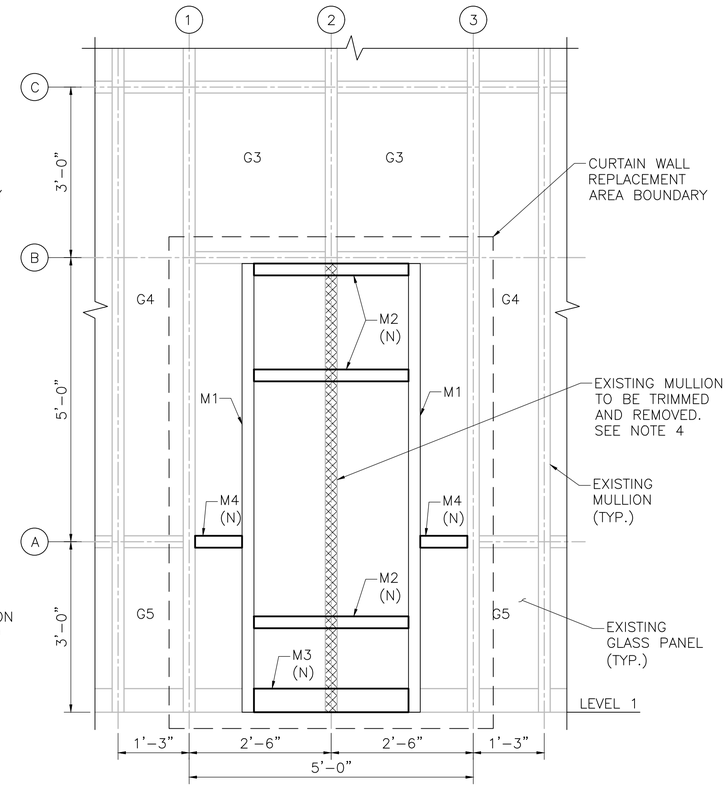
EXISTING CURTAIN WALL – WEST ELEVATION

SCALE: $\frac{3}{4}$" = 1'-0"



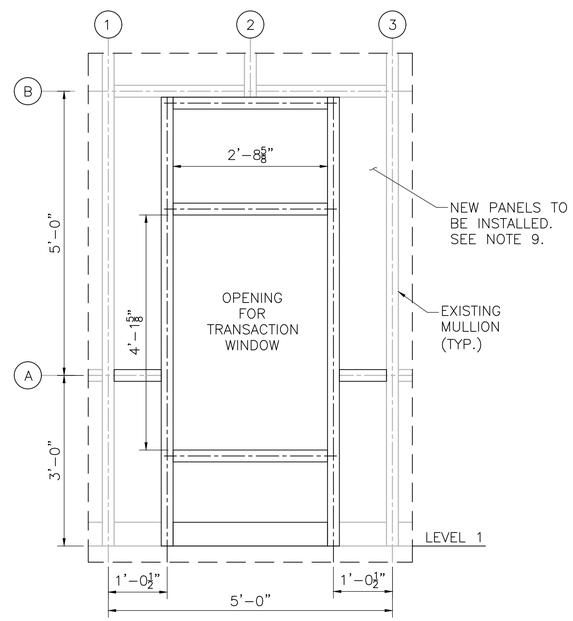
PROPOSED ELEVATION – STEP 1

SCALE: $\frac{3}{4}$" = 1'-0"



PROPOSED ELEVATION – STEP 2

SCALE: $\frac{3}{4}$" = 1'-0"



PROPOSED CURTAIN WALL – FINAL ELEVATION

SCALE: $\frac{3}{4}$" = 1'-0"

LEGEND:

- ▨ = EXISTING MEMBERS TO BE REMOVED
- (N) = NEW MEMBERS TO BE INSTALLED IN CURRENT STEP

NOTES:

1. ALL DIMENSIONS ARE APPROXIMATE. CONTRACTOR TO VERIFY EXISTING DIMENSIONS IN FIELD PRIOR TO FABRICATION.
2. GLASS TYPES (G3,G4,G5 AND G6) SHOWN HERE ONLY FOR REFERENCE.
3. GRID LINES A, B AND C OR 1, 2 AND 3 USED IN THIS SHEET ARE FOR REFERENCE ONLY.
4. CURTAIN WALL REPLACEMENT MENTIONED IN THIS SHEET IS TO ACCOMMODATE THE NEW PROPOSED TRANSACTION WINDOW TO BE INSTALLED. ALL CONSTRUCTION IS TO BE PERFORMED WITHIN THE REPLACEMENT BOUNDARY REGION ON THE CURTAIN WALL AS SHOWN IN THE ELEVATION VIEWS.
5. PART OF CENTRAL VERTICAL MULLION TO BE TRIMMED AND REMOVED TO MAKE SPACE FOR THE PROPOSED TRANSACTION WINDOW. SEE PROPOSED STEPS FOR APPROXIMATE TRIM LOCATION AND SIZE.
6. INSTALL M1 MEMBERS PRIOR TO TRIMMING EXISTING VERTICAL MULLION. REFER TO CONSTRUCTION SEQUENCE FOR DETAILED STEPS.
7. CONSTRUCTION SEQUENCE:
   - 7.1. REMOVE ALL GLASS PANELS IN THE REPLACEMENT AREA AS SHOWN IN EXISTING ELEVATION VIEW.
   - 7.2. REMOVE HORIZONTAL MULLIONS AS SHOWN IN STEP–1. CLEAN AND PREPARE THE AREA FOR PROPOSED INSTALLATION.
   - 7.3. INSTALL M1 MEMBERS AS SHOWN IN PROPOSED ELEVATION STEP–1.
   - 7.4. TRIM EXISTING VERTICAL MULLION AS SHOWN IN STEP–2.
   - 7.5. INSTALL ALL M2, M3 AND M4 MEMBERS AS SHOWN IN STEP–2.
   - 7.6. CLEAN AREA AND PREPARE FRAME FOR INSTALLATION OF THE NEW PROPOSED TRANSACTION WINDOW.
   - 7.7. M1 AND M2 MEMBERS WILL ACT AS BASE FRAME FOR TRANSACTION WINDOW INSTALLATION.
8. MULLION WIDTHS AND THICKNESS PER MANUFACTURERS ENGINEERING REQUIREMENTS.
9. FOR OTHER DIMENSIONS AND ADDITIONAL INFO, REFER ARCHITECTURAL DRAWINGS.

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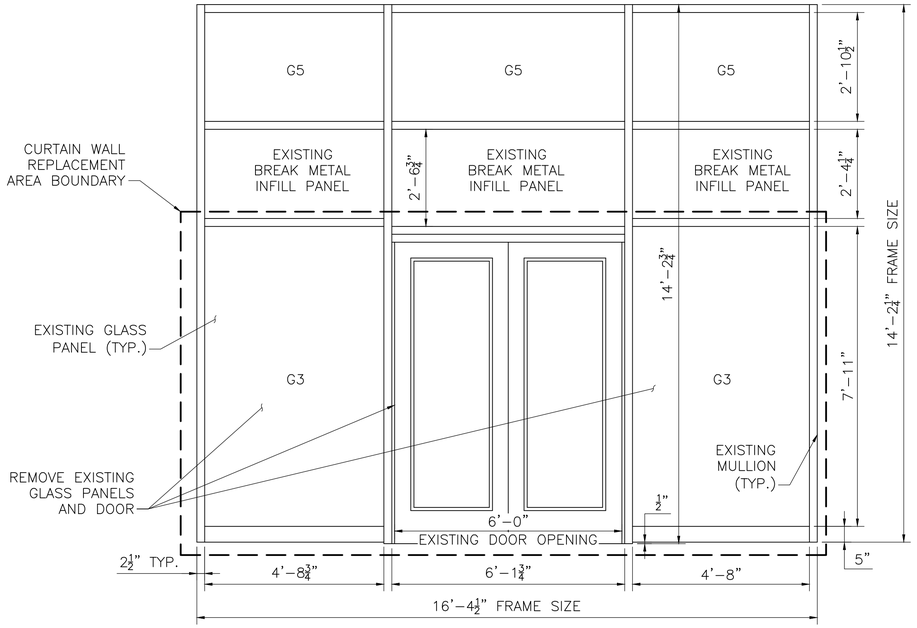
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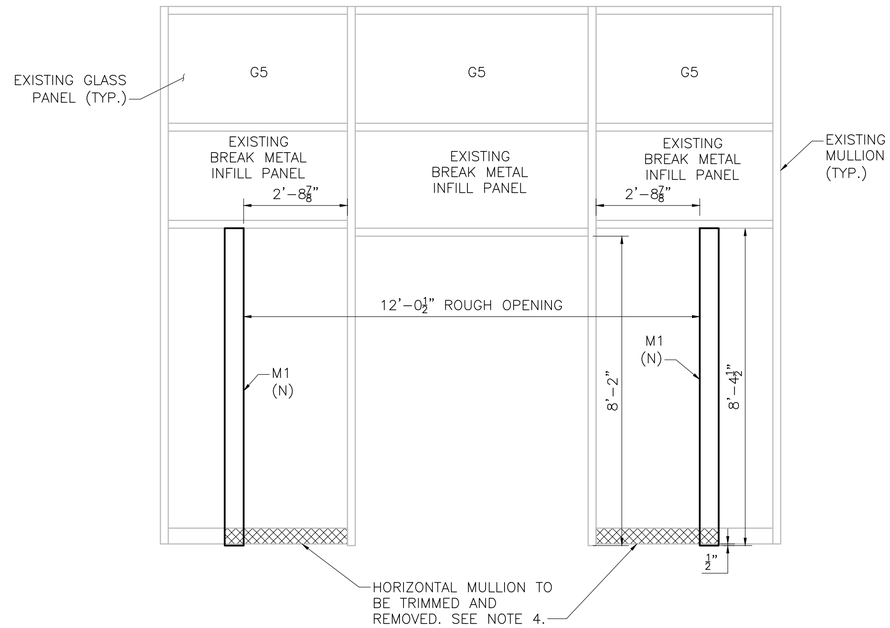
CURTAIN WALL REPLACEMENT

S-102



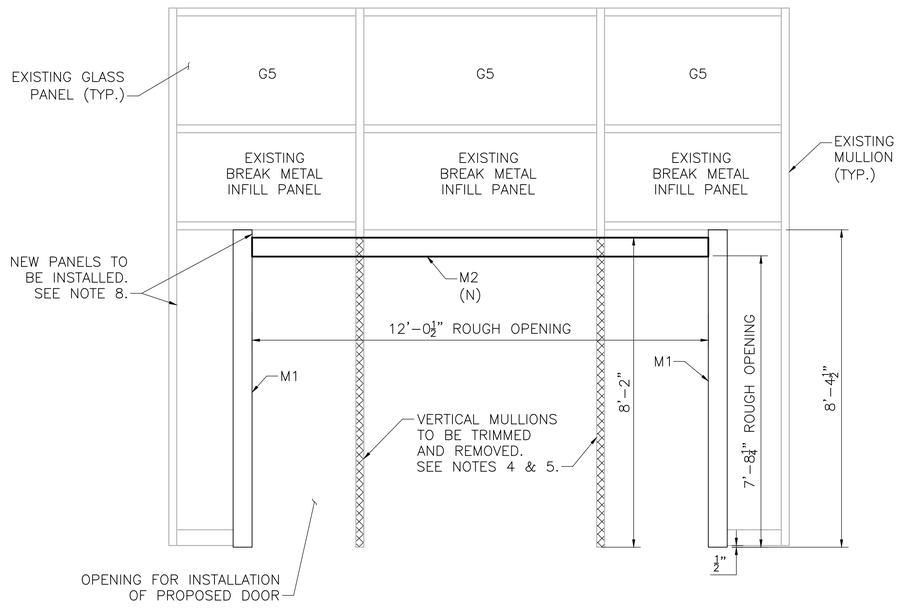
EXISTING ELEVATION – CURTAIN WALL AT ENTRY DOOR

SCALE: ½" = 1'-0"



PROPOSED ELEVATION – STEP 1

SCALE: ½" = 1'-0"



PROPOSED ELEVATION – STEP 2

SCALE: ½" = 1'-0"

LEGEND:

▨ = EXISTING MEMBERS TO BE REMOVED

(N) = NEW MEMBERS TO BE INSTALLED IN CURRENT STEP

NOTES:

1. ALL DIMENSIONS ARE APPROXIMATE. CONTRACTOR TO VERIFY EXISTING DIMENSIONS IN FIELD PRIOR TO FABRICATION.
2. GLASS TYPES (G3 AND G5) OR ANY PANELS SPECIFIED ARE ONLY FOR REFERENCE.
3. CURTAIN WALL REPLACEMENT PRESENTED ON THIS SHEET IS TO ACCOMMODATE THE NEW PROPOSED SLIDING DOOR TO BE INSTALLED. ALL CONSTRUCTION IS TO BE PERFORMED WITHIN THE REPLACEMENT BOUNDARY REGION ON THE CURTAIN WALL AS SHOWN IN THE EXISTING ELEVATION VIEW.
4. PART OF HORIZONTAL AND VERTICAL MULLIONS TO BE TRIMMED AND REMOVED TO MAKE SPACE FOR THE PROPOSED DOOR INSTALLATION. SEE PROPOSED ELEVATIONS FOR APPROXIMATE TRIM LOCATION AND SIZE.
5. INSTALL M1 MEMBERS PRIOR TO TRIMMING EXISTING VERTICAL MULLIONS. REFER TO CONSTRUCTION SEQUENCE FOR DETAILED STEPS.
6. CONSTRUCTION SEQUENCE:
   - 6.1. REMOVE ALL GLASS PANELS, DOOR AND DOOR ATTACHMENTS IN THE REPLACEMENT AREA AS SHOWN IN EXISTING ELEVATION VIEW.
   - 6.2. TRIM AND REMOVE EXISTING HORIZONTAL MULLIONS AS SHOWN IN STEP–1.
   - 6.3. INSTALL M1 MEMBERS AS SHOWN IN STEP–1.
   - 6.4. TRIM AND REMOVE EXISTING VERTICAL MULLIONS AS SHOWN IN STEP–2.
   - 6.5. INSTALL M2 MEMBER AS SHOWN IN STEP–2.
   - 6.6. CLEAN AREA AND PREPARE FRAME FOR INSTALLATION OF THE NEW PROPOSED DOOR.
   - 6.7. M1 AND M2 MEMBERS WILL ACT AS BASE FRAME FOR PROPOSED DOOR INSTALLATION.
7. MULLION WIDTHS AND THICKNESS PER MANUFACTURERS ENGINEERING REQUIREMENTS.
8. FOR OTHER DIMENSIONS AND ADDITIONAL INFO, REFER ARCHITECTURAL DRAWINGS.
9. EXTERIOR DOOR REPLACEMENT SHOWN, INTERIOR DOOR REPLACEMENT SIMILAR.

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ENTRY DOOR REPLACEMENT

S-103

SYMBOLS - DUCTWORK	
	SUPPLY DUCT DOWN - DOUBLE LINE, SINGLE LINE
	SUPPLY DUCT UP - DOUBLE LINE, SINGLE LINE
	RETURN DUCT DOWN - DOUBLE LINE, SINGLE LINE
	RETURN DUCT UP - DOUBLE LINE, SINGLE LINE
	EXHAUST DUCT DOWN - DOUBLE LINE, SINGLE LINE
	EXHAUST DUCT UP - DOUBLE LINE, SINGLE LINE
	NEW DUCTWORK - SINGLE LINE
	NEW DUCTWORK - DOUBLE LINE
	ACOUSTICALLY LINED DUCTWORK - SINGLE LINE
	ACOUSTICALLY LINED DUCTWORK - DOUBLE LINE
	SUPPLY DIFFUSER
	RETURN DIFFUSER / REGISTER / GRILLE
	EXHAUST DIFFUSER / REGISTER / GRILLE
	LINEAR DIFFUSER
	SUPPLY / RETURN / EXHAUST AIRFLOW
LD	LOUVER DOOR (SIZE AS NOTED)
	UNDERCUT DOOR (3/4" UNO)
BD	BACKDRAFT DAMPER
VD	VOLUME DAMPER
FD	FIRE DAMPER
GD	GRAVITY DAMPER
SD	SMOKE DAMPER
FSD	FIRE / SMOKE DAMPER
MD	MOTORIZED DAMPER (MODULATING)
	VIBRATION ISOLATOR

MECHANICAL EQUIPMENT SYMBOL
X / X — EQUIPMENT TYPE / EQUIPMENT NUMBER
MECHANICAL AIR TERMINAL SYMBOL
TYPE — S# - / XXX CFM — ACTIVE SIDE: "-" = ALL, "3" = 3-WAY, "2" = 2-WAY, "1" = 1-WAY; AIRFLOW (CFM)

MECHANICAL DUCT INSTALLATION
REFER TO SPECIFICATION FOR ALL DETAILS AND CLARIFICATION ON MECHANICAL DUCTWORK INSTALLATION.

DESIGN CONDITION			
CITY	HEATING DESIGN TEMPERATURE (99.6%)	COOLING DESIGN TEMPERATURE (0.4%)	
		DRY BULB	WET BULB
WORCESTER, MA	1.7 °F	86.0 °F	71.4 °F

NOTES:
CLIMATE DATA TAKEN FROM ASHREA FUNDAMENTALS, 2021

SYMBOLS - PIPING	
V	AUTOMATIC AIR VENT
	BRANCH OFF BOTTOM OF MAIN
	BRANCH OFF TOP OF MAIN
	ELBOW DOWN
	ELBOW UP
HPG	REFRIGERANT HIGH PRESSURE SUPPLY
RGR	REFRIGERANT GAS SUCTION RETURN
RLS	REFRIGERANT LIQUID SUPPLY

MECHANICAL SYMBOLS - CONTROLS	
AF	AIRFLOW MONITORING STATION
CS	CURRENT SENSING RELAY
SDT	SMOKE DETECTOR
HD	HEAT DETECTOR
HOA	"HAND, OFF, AUTO" SWITCH
VFD	VARIABLE FREQUENCY DRIVE
TS	TEMPERATURE SENSOR
T	THERMOSTAT
C	CARBON DIOXIDE (CO2) SENSOR
CO	CARBON MONOXIDE (CO) SENSOR
DS	DISCONNECT SWITCH
DPS	DIFFERENTIAL PRESSURE SENSOR
M	MOTOR
MS	MOTOR STARTER
CP	CONTROL PANEL
DSD	DUCT SMOKE DETECTOR
AI	ANALOG INPUT
AO	ANALOG OUTPUT
BI	BINARY INPUT
BO	BINARY OUTPUT
	CONTROL LINE HOMERUN
H	HYDROGEN SENSOR

MECHANICAL DEMOLITION / RELOCATION LEGEND	
"X"	EXISTING MECHANICAL EQUIPMENT, DEVICE AND/OR SYSTEM TO BE SELECTIVELY DEMOLISHED
"XR"	EXISTING MECHANICAL EQUIPMENT TO BE REMOVED, STORED AND RE-LOCATED
"XT"	EXISTING MECHANICAL DEVICE OR EQUIPMENT TO BE REMOVED AND TURNED OVER TO OWNER FOR RE-USE
"XL"	RE-LOCATED EXISTING MECHANICAL EQUIPMENT OR DEVICE
"E"	EXISTING MECHANICAL EQUIPMENT OR DEVICE TO REMAIN

EXAMPLE

X XR XT XL E

ABBREVIATIONS	
ACD	AUTOMATIC CONTROL DAMPER
ADJ	ADJUSTABLE (BMS SETPOINT)
AFF	ABOVE FINISHED FLOOR
AHU	AIR HANDLING UNIT
AS	AIR SEPERATOR
ATC	AUTOMATIC TEMPERATURE CONTROL
B	BOILER
BMS	BUILDING MANAGEMENT SYSTEM
BT	BUFFER TANK
C	AIR CURTAIN
CB	CONDENSATE BASIN
CD	CONDENSATE DRAIN
CFM	CUBIC FEET PER MINUTE
CO	CLEAN OUT
CP	CONDENSATE PUMP
CR	CEILING REGISTER
CU	CONDENSING UNIT
CUH	CABINET UNIT HEATER
CW	COLD WATER
D	CONDENSATE DRAIN
Db	DRY BULB
dB	DECIBELS
DEMO	DEMOLITION
DDC	DIRECT DIGITAL CONTROL (BMS SYSTEM)
DX	DIRECT EXPANSION
EA	EXHAUST AIR
EB	ELECTRIC BASEBOARD
EER	ENERGY EFFICIENCY RATIO
EF	EXHAUST FAN
EFA	EXHAUST FAN ATTENUATION
EXIST	EXISTING
FCU	FAN COIL UNIT
FD	FIRE DAMPER
FACP	FIRE ALARM CONTROL PANEL
FTR	FIN TUBE RADIANT
H	HUMIDIFIER
HP	HORSEPOWER
HVLS	HIGH VOLUME LOW SPEED
HZ	HERTZ
IN	INCHES
IN WG	INCHES WATER GAGE
L	LOUVER
LBS	POUNDS
LBS/HR	POUNDS PER HOUR
LEL	LOWER EXPLOSIVE LIMIT
kW	KILOWATTS
MAX	MAXIMUM
MFR	MANUFACTURER
MIN	MINIMUM
NC	NORMALLY CLOSED
NO	NORMALLY OPEN
OA	OUTSIDE AIR
OED	OPEN END DUCT WITH 3/4" WIRE MESH SCREEN
PC	PIECE
PD	PRESSURE DROP
PH	PHASE
PRV	PRESSURE REDUCING VALVE
PT	PROPANE TANK
RA	RETURN AIR
REF	RELIEF EXHAUST FAN
RGR	REFRIGERANT GAS RETURN
Rh	RELATIVE HUMIDITY
RLS	REFRIGERANT LIQUID SUPPLY
RM	ROOM
RMC	RIGID METALLIC CONDUIT
RPM	REVOLUTIONS PER MINUTE
RTC	ROOFTOP CURB
SA	SUPPLY AIR
SQ FT	SQUARE FEET
STC	SOUND TRANSMISSION CLASS
TCC	TEMPERATURE CONTROL CONTRACTOR
TYP	TYPICAL
UH	UNIT HEATER
SD	SMOKE DAMPER
SP	STATIC PRESSURE
UNO	UNLESS NOTED OTHERWISE
VAV	VARIABLE AIR VOLUME
VD	VOLUME DAMPER
VFD	VARIABLE FREQUENCY DRIVE
W	WATTS
Wb	WET BULB
WMS	WIRE MESH SCREEN (1" UNO)

GENERAL NOTES

1. DUCTWORK, PIPING AND EQUIPMENT LAYOUT SHOWN IS DIAGRAMMATIC. ACTUAL LOCATION SHALL BE COORDINATED IN FIELD. THE CONTRACTOR SHALL VISIT THE SITE TO REVIEW AND REVISE THEIR DUCTWORK SHOP DRAWINGS PRIOR TO SUBMITTING TO ENGINEER. EVERY ELBOW, FITTING, ETC. IS NOT SHOWN. PROVIDE SUCH COMPONENTS AS REQUIRED FOR COMPLETE INSTALLATION, PROPERLY COORDINATED WITH ALL TRADES.
2. PROVIDE FLEXIBLE CONNECTORS AT ALL FAN AND PUMP CONNECTIONS.
3. INSTALL ACCESS DOORS AT ALL COILS, FILTERS, CONTROL DEVICES AND VOLUME, CONTROL AND FIRE DAMPER.
4. ALL MATERIALS, METHODS AND EQUIPMENT INSTALLED UNDER THIS CONTRACT SHALL BE IN COMPLIANCE WITH ALL APPLICABLE CODES AND REGULATIONS.
5. PROVIDE AND INSTALL SEISMIC RESTRAINTS ON ALL EQUIPMENT AND PIPING IN COMPLIANCE WITH PROJECT SPECIFICATIONS AND APPLICABLE CODES.
6. ALL PIPING AND DUCTS IN FINISHED ROOMS OR SPACES SHALL BE CONCEALED IN A FURRED CHASE OR ABOVE THE SUSPENDED CEILING.
7. ACCESS PANELS IN SOLID CEILINGS ARE REQUIRED FOR ALL VALVES, TRAPS, VOLUME, CONTROL AND FIRE DAMPERS, CLEAN-OUTS, CONTROLS, AND TEST STATIONS ACCESS PANELS SHALL BE FURNISHED AND INSTALLED.
8. PROVIDE FLEXIBLE PIPE AND DUCT CONNECTIONS AT ALL BUILDING EXPANSION AND SEISMIC JOINTS.
9. ALL EXISTING AND NEW EQUIPMENT SHALL BE TIED INTO EXISTING LOCAL CONTROL SYSTEM.
10. COORDINATE FINAL LOCATIONS OF THERMOSTATS, SENSORS AND MONITORS WITH ALL TRADES FOR AN AESTHETIC, FUNCTIONAL GROUPING. ROOM THERMOSTATS SHALL BE LOCATED 4' AFF EXCEPT AS APPROVED OTHERWISE.
11. COORDINATE ALL MOTOR, STARTER, DISCONNECT AND SMOKE DETECTOR ELECTRICAL REQUIREMENTS FOR ALL EQUIPMENT.
12. INSTALLATION OF EQUIPMENT SHALL PERMIT ACCESSIBILITY FOR MAINTENANCE AND/OR REPLACEMENT. MANUFACTURER'S RECOMMENDED CLEARANCES MUST BE MAINTAINED.
13. ALL CEILING MOUNTED EQUIPMENT SHALL BE INSTALLED IN SUCH A WAY THAT LIGHTS, PIPING AND DUCTWORK DO NOT BLOCK ACCESS TO UNITS AND RELATED ACCESSORIES.
14. ALL DUCT SIZES SHOWN ARE INSIDE, CLEAR DIMENSIONS.
15. PIPE SIZING SHOWN INDICATES NOMINAL PIPE DIMENSIONS.
16. PROVIDE INSTRUMENT TEST HOLES WITH RUBBER CAPS IN AIR DISTRIBUTION SYSTEM AS REQUIRED TO BALANCE SYSTEM.
17. EXACT LOCATION OF CEILING DIFFUSERS, GRILLES AND REGISTERS TO BE DETERMINED BY ARCHITECTURAL REFLECTED CEILING PLAN, WHERE DEVICES ARE SHOWN INDICATED ON ARCH. PLANS, LOCATION SHALL BE AS INDICATED AND COORDINATED WITH CEILING LAYOUT.
18. ALL EXPOSED EQUIPMENT (REGISTERS, UNIT HEATERS, ETC.) SHALL HAVE COLORS, SELECTED BY THE MBTA UNLESS NOTED OTHERWISE.
19. ANY SPACES OR GAPS AROUND DUCTWORK AND PIPING WHICH PENETRATE FIRE RATED WALLS AND FLOORS REQUIRED TO RESIST THE PASSAGE OF SMOKE, SHALL BE SEALED AIR-TIGHT TO PREVENT THE MIGRATION OF SMOKE, WITH APPROVED MATERIAL.
20. NOT ALL SYMBOLS, LEGENDS, AND NOTES ARE APPLICABLE TO THIS PROJECT.

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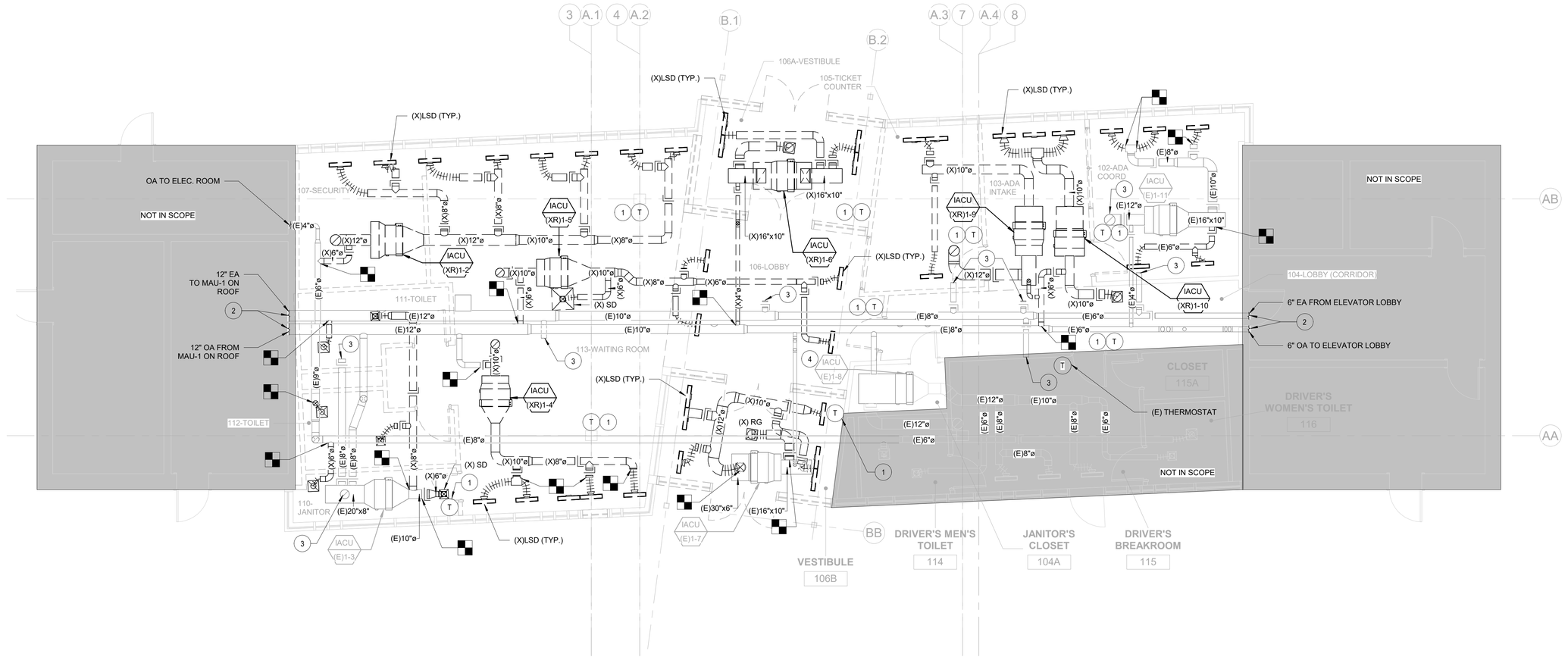
MECHANICAL LEGEND

M-001

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GENERAL SHEET NOTES	
1.	REFER TO M-001 FOR LEGEND.
2.	ALL EXISTING TO REMAIN DUCTWORK IS TO BE CLEANED.
3.	GRAYED OUT AREAS SHOWN IN PLANS ARE NOT IN SCOPE.

DEMOLITION KEYNOTES	
1	THERMOSTAT ASSOCIATED WITH IACU WILL BE RELOCATED TO ACCOMODATE NEW SPACE LAYOUT. REFER TO NEW WORK PLAN FOR ADDITIONAL DETAIL AND CLARIFICATION.
2	OBTAIN AIRFLOW AT DUCT MAIN VIA DUCT TRAVERSE AT APPROXIMATE LOCATION INDICATED. SYSTEMS SHALL BE SET TO OCCUPIED AND 100% FAN OUTPUT AT TIME OF TAB.
3	EXISTING OPEN ENDED DUCT.
4	NO WORK SHALL BE PERFORMED ON THIS EQUIPMENT; IT SERVES OUT OF SCOPE AREAS AND SHALL REMAIN OPERATIONAL THROUGHOUT CONSTRUCTION.



LEVEL 1 - MECHANICAL DEMO

3/16" = 1'-0"

0 4' 8' 12'

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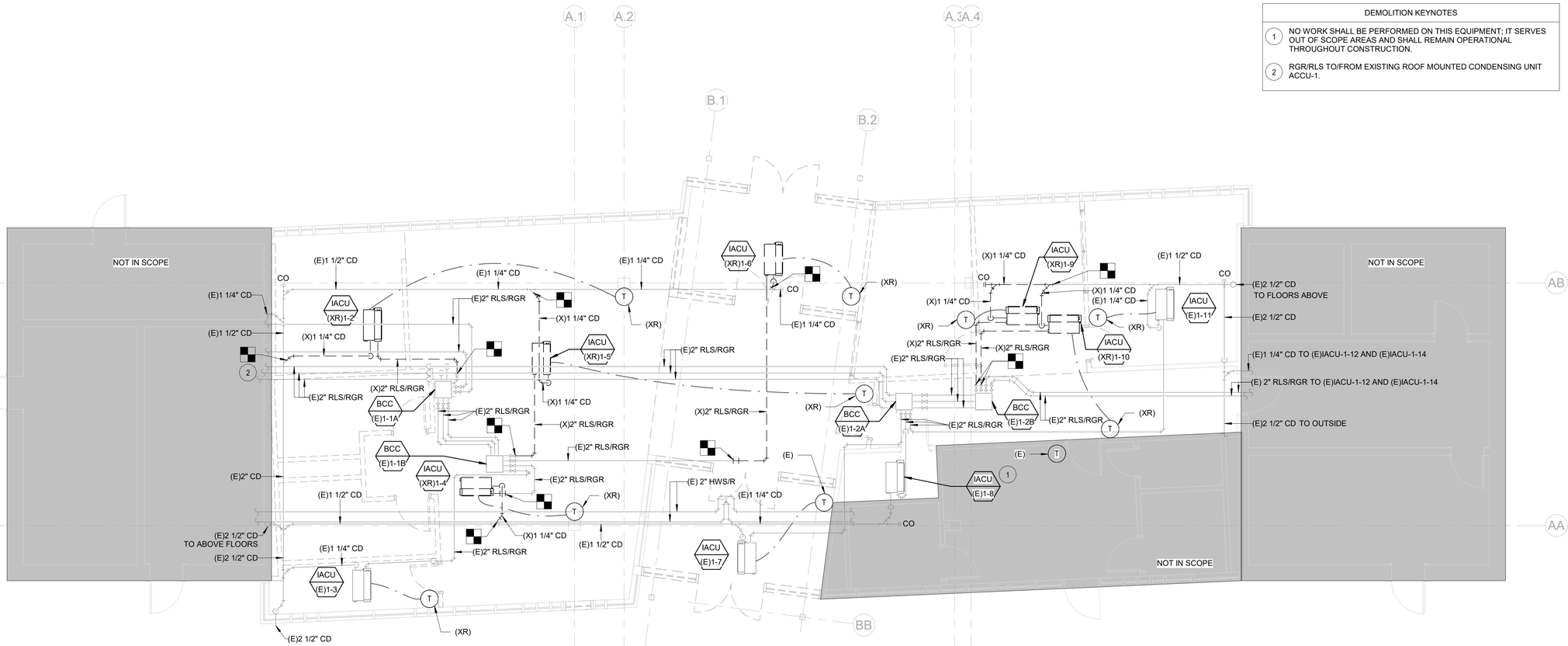
LEVEL 1 DEMOLITION PLAN

MD-100

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GENERAL SHEET NOTES
1. REFER TO M-001 FOR LEGEND.
2. THE EXISTING LG VRF SYSTEM 1ST FLOOR IACU(S) AND THEIR ASSOCIATED REFRIGERANT PIPING LOCATIONS SHALL BE MODIFIED AS PART OF THIS WORK. CONTRACTOR SHALL DRAIN ENTIRETY OF (E) ACCU-1'S REFRIGERANT AND ALL ASSOCIATED IACU(S), BRANCH BOX(S) AND PIPING PRIOR TO START OF WORK. SYSTEM SHALL BE RECHARGED WITH REFRIGERANT AT COMPLETION OF NEW WORK. FOLLOW ALL CODE AND MANUFACTURER RECOMMENDED GUIDELINES.
3. GRAYED OUT AREAS SHOWN IN PLANS ARE NOT IN SCOPE.
4. EXISTING THERMOSTAT(S) SHOWN ON PLANS SHALL BE RE-USED AS PART OF NEW WORK, REMOVE AND STORE DURING CONSTRUCTION. REFER TO NEW WORK PLANS FOR APPROXIMATE LOCATION OF RELOCATED THERMOSTAT(S) AND EQUIPMENT SERVED.

DEMOLITION KEYNOTES
(1) NO WORK SHALL BE PERFORMED ON THIS EQUIPMENT; IT SERVES OUT OF SCOPE AREAS AND SHALL REMAIN OPERATIONAL THROUGHOUT CONSTRUCTION.
(2) RGR/RLS TO/FROM EXISTING ROOF MOUNTED CONDENSING UNIT ACCU-1.



LEVEL 1 - MECHANICAL PIPING DEMO

3/16" = 1'-0"

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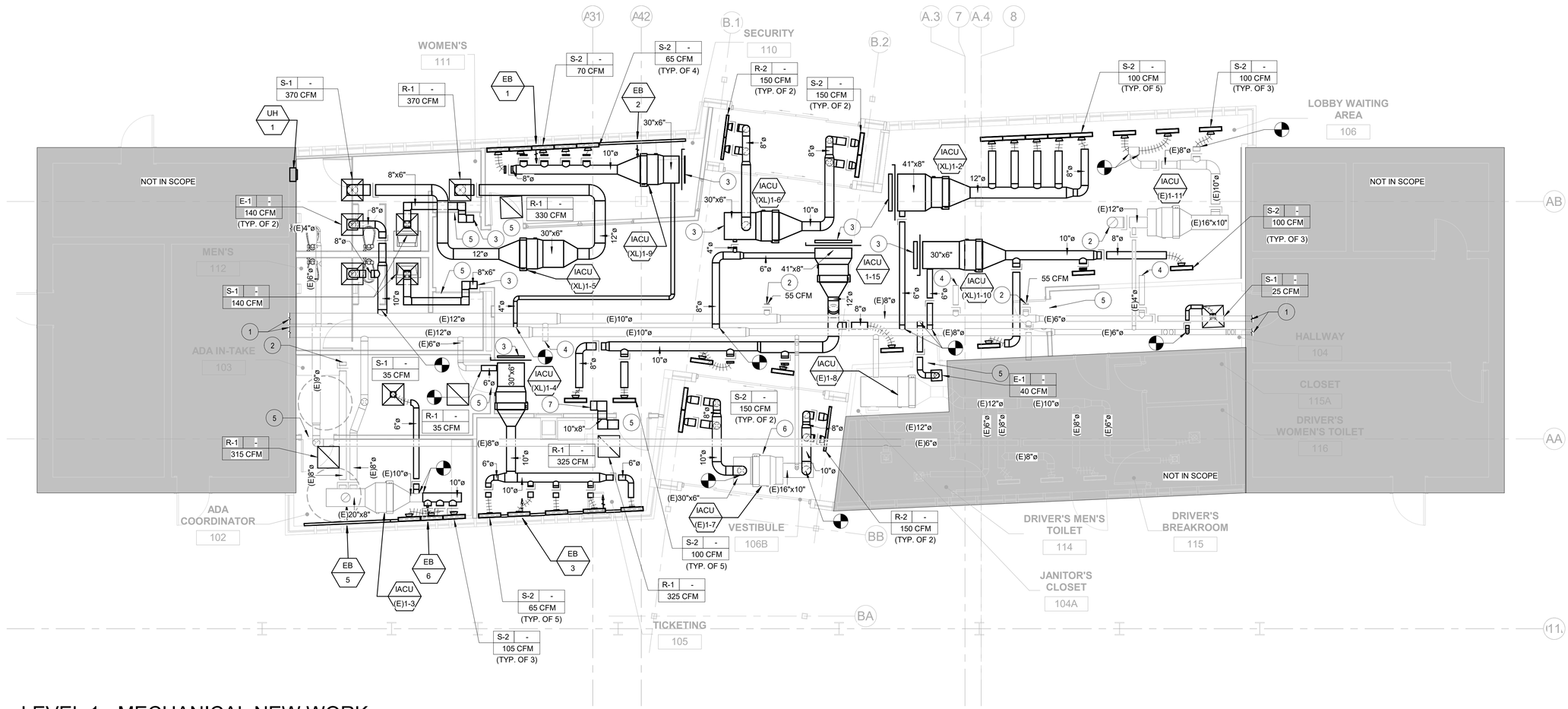
LEVEL 1 PIPING AND CONTROLS DEMOLITION PLAN

MD-110

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GENERAL SHEET NOTES	
1.	REFER TO M-001 FOR LEGEND.
2.	ALL EXISTING TO REMAIN DUCTWORK IS TO BE CLEANED.
3.	GRAYED OUT AREAS SHOWN IN PLANS ARE NOT IN SCOPE.
4.	REFER TO IACU SCHEDULES ON SHEET M-700 FOR MINIMUM OA REQUIREMENTS FOR EACH IACU.

NEW WORK KEYNOTES	
1	AT COMPLETION OF NEW WORK REBALANCE AIRFLOW TO VALUE OBTAINED PRIOR TO START OF CONSTRUCTION +/- NEW WORK AIRFLOW REQUIREMENTS.
2	EXISTING OPEN ENDED DUCT.
3	OPEN ENDED DUCT, WITH 3/4" WMS.
4	CAP EXISTING DUCTWORK AND CLOSE VOLUME DAMPER.
5	3/4" UNDERCUT ON BATHROOM DOOR.
6	PROVIDE 2'X2' ACCESS PANEL IN CEILING AT APPROXIMATE LOCATION, COORDINATE WITH ARCHITECTURAL DRAWINGS.
7	OPEN ENDED DUCT, EACH END FITTED WITH 3/4" WMS.



LEVEL 1 - MECHANICAL NEW WORK

3/16" = 1'-0"

0 4' 8' 12'

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PROJECT IDENTIFICATION

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MAIN LOBBY RENOVATION

MARK	DATE	DESCRIPTION	BY

ISSUE BLOCK

PROJECT NO.:	4022461
DESIGNED BY:	LPM
DRAWN BY:	JDO
CHECKED BY:	MAC
APPROVED BY:	RR
DATE:	02/10/2025

SHEET TITLE

LEVEL 1 FLOOR PLAN

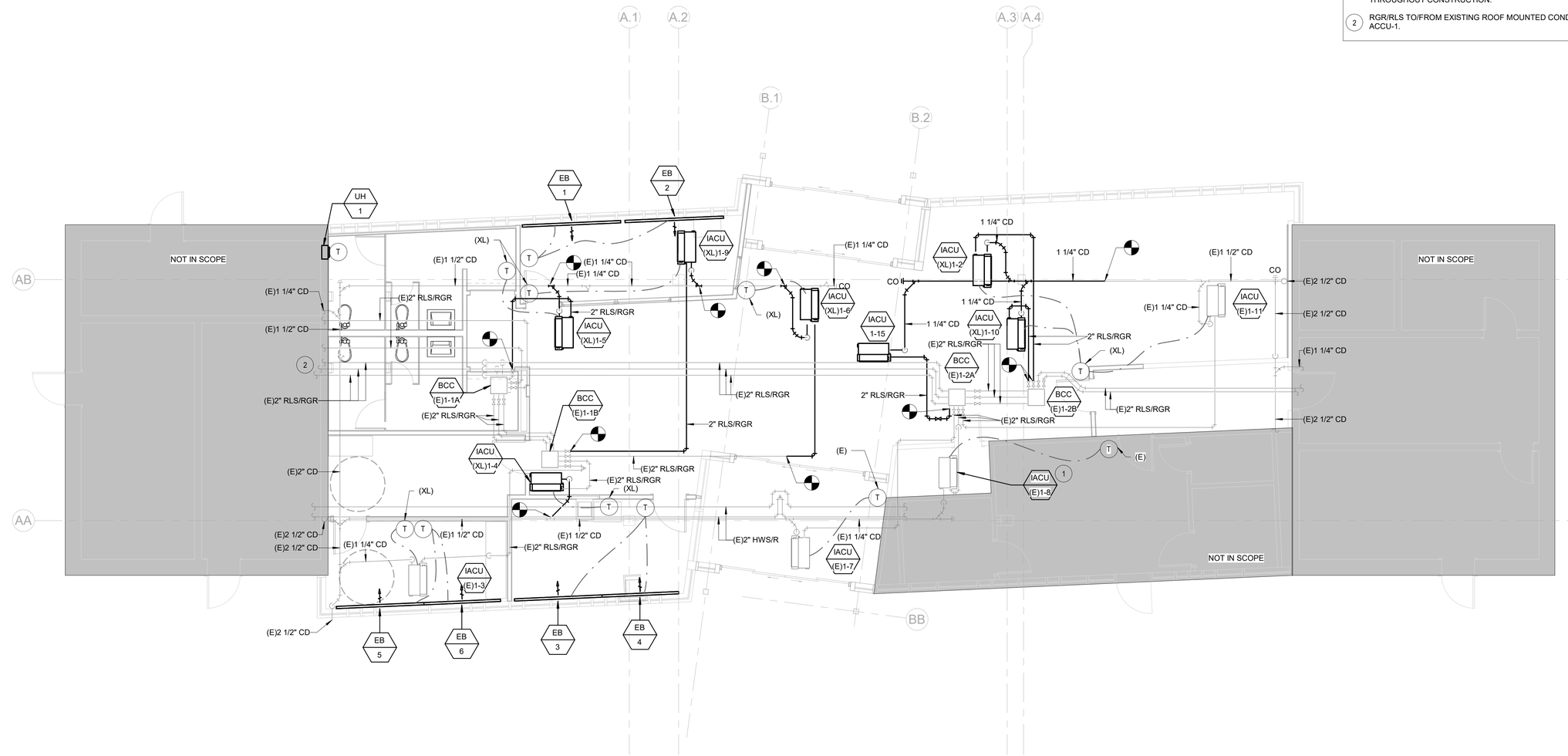
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GENERAL SHEET NOTES
1. REFER TO M-001 FOR LEGEND.
2. THE EXISTING LG VRF SYSTEM BEING MODIFIED AS PART OF THIS WORK WILL REQUIRE A REFRIGERANT TRIM CHARGE UPDATE TO ACCOMODATE THE INCLUSION OF NEW IACU-1-15 INTO THIS EXISTING SYSTEM. CONTACT STEVE MAGNUS OF APA HVAC TECHNOLOGIES AT PHONE: 781-805-5369 EMAIL: SMAGNUS@APAV.COM FOR ASSISTANCE WITH CALCULATING THE APPROPRIATE TRIM CHARGE TO BE USED FOR THIS SYSTEM.
3. GRAYED OUT AREAS SHOWN IN PLANS ARE NOT IN SCOPE.

NEW WORK KEYNOTES
(1) NO WORK SHALL BE PERFORMED ON THIS EQUIPMENT; IT SERVES OUT OF SCOPE AREAS AND SHALL REMAIN OPERATIONAL THROUGHOUT CONSTRUCTION.
(2) RGR/RLS TO/FROM EXISTING ROOF MOUNTED CONDENSING UNIT ACCU-1.



LEVEL 1 - MECHANICAL PIPING NEW WORK

3/16" = 1'-0"

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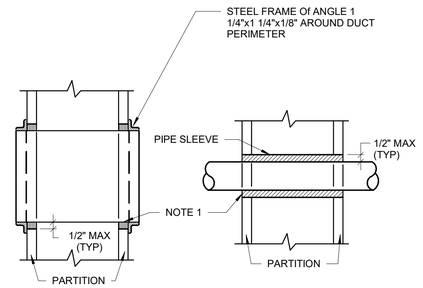
SHEET TITLE

LEVEL 1 PIPING AND CONTROLS FLOOR PLAN

M-110

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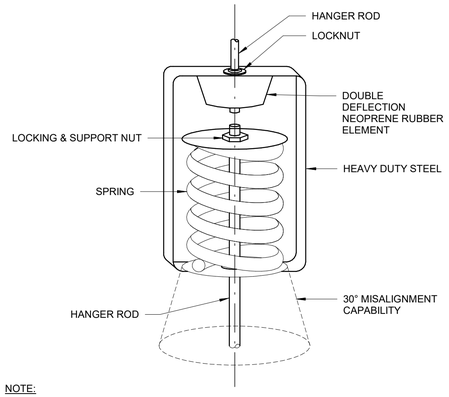
NOTE:
DUCT PENETRATION SHOWN IS WHERE
FIRE DAMPER IS NOT REQUIRED BY CODE



1
NOTES:
AT FIRE RATED PARTITIONS, ADD ADDITIONAL LAYER OF FIRE SAFING INSULATION
2 AROUND PENETRATION SO AS TO FILL CAVITY.
. DUCT AND PIPE PENETRATIONS THRU CORRIDOR WALLS ABOVE THE CEILING ARE TO BE FIRE STOPPED AROUND THE PENETRATION.

1 DUCT AND PIPE PENETRATIONS

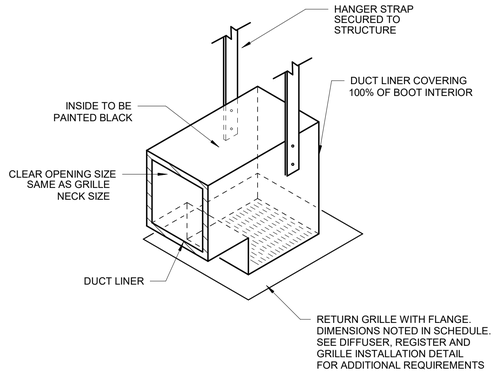
NO SCALE



NOTE:
1. ALL AIR HANDLING EQUIPMENT SUSPENDED FROM STRUCTURES AND ALL STEAM AND CHILLED WATER PIPING IN MECHANICAL ROOMS SHALL BE HUNG WITH VIBRATION ISOLATORS.
2. HANGER SIZE SHALL BE AS PER MANUFACTURER'S RECOMMENDATIONS AND ACCORDING TO THE LOAD OF THE EQUIPMENT.

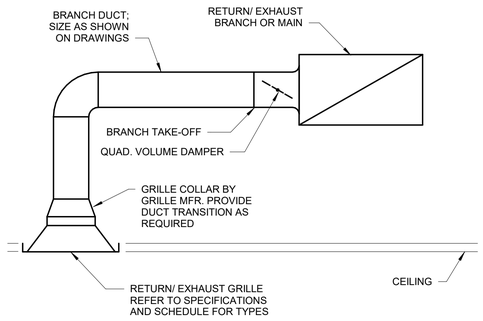
2 VIBRATION ISOLATION HANGER DETAIL

NO SCALE



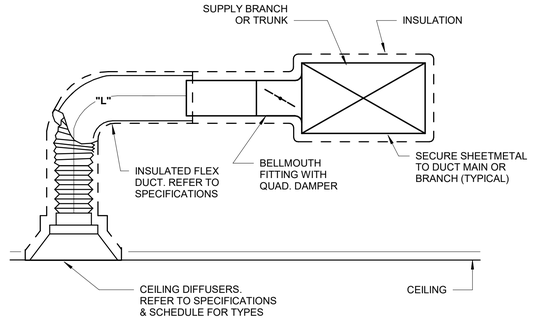
3 RETURN GRILLE ACOUSTIC BOOT DETAIL

NO SCALE



4 INSTALLATION AT CEILING RETURN/EXHAUST GRILLES

NO SCALE

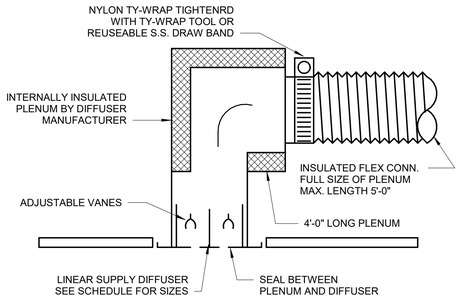


NOTES:
1. FASTEN INSULATED FLEX DUCT TO METAL DUCT WITH 22 GAUGE BAND CLAMPS & 4 SHEETMETAL SCREWS AND SEAL. DO NOT USE PLASTIC ZIP-TIES.
2. MAXIMUM LENGTH OF INSULATED FLEX DUCT "L" = 3'-0"
3. NO BOTTOM SUPPLY CONNECTIONS TO MAIN OR BRANCH ALLOWED

5 CEILING SUPPLY DIFFUSERS INSTALLATION DETAIL

NO SCALE

NOTES:
1. OFFSETS WITH DUCT SHALL NOT EXCEED 30° AND SHALL BE GRADUAL OFFSETS IN EXCESS OF 30° SHALL BE HARD DUCTED.
2. FLEX DUCT SHALL NOT HAVE MORE THAN 1/2" SAG/FT.
3. FOR PERIMETER DIFFUSERS LOCATE DISTANCE FROM OUTSIDE WALL SHOWN ON ARCH. PLANS.
4. CONNECTION TO MAIN DUCT SHALL BE WITH TAPERED CONNECTION AND VOLUME DAMPER.



6 LINEAR DIFFUSER CONNECTION

NO SCALE

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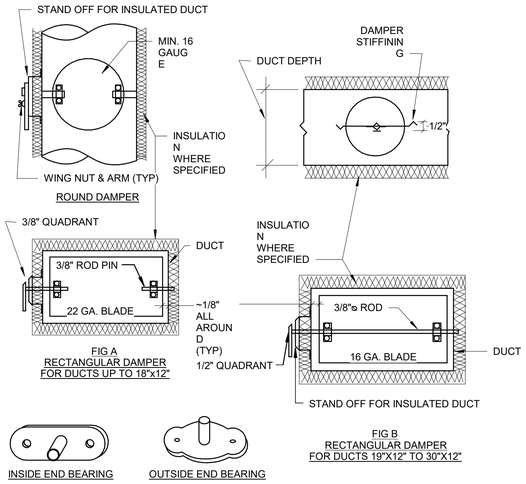
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MECHANICAL DETAILS 1 OF 2

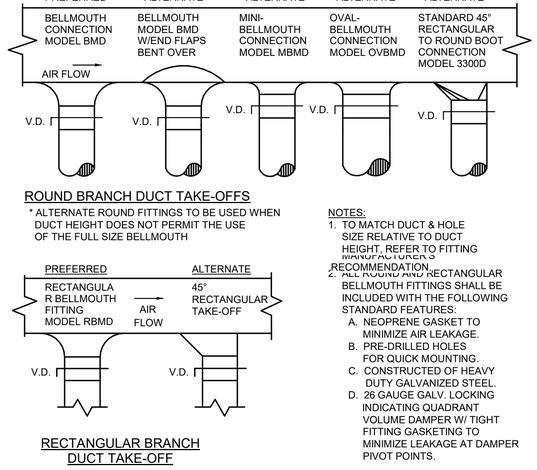
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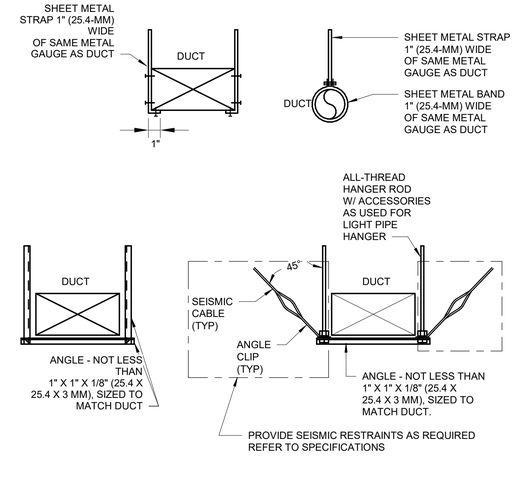
1 SINGLE BLADE VOLUME DAMPER DETAIL

NO SCALE



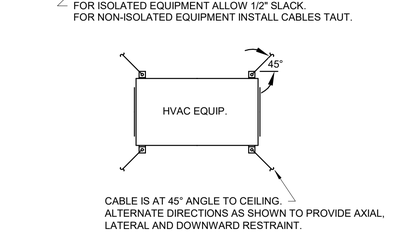
2 BRANCH TAKE-OFFS

NO SCALE



3 SHEET-METAL DUCT HANGERS

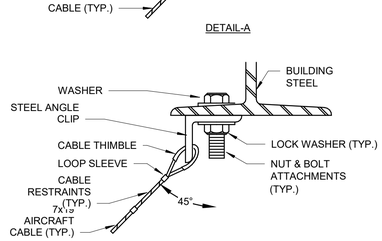
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NOTE: ANCHOR INTO EXISTING CONCRETE DECK. PROVIDE ANCHOR BOLTS, INSTALL PER SMACNA GUIDELINES.

4 SEISMIC BRACING DETAIL

NO SCALE



5 ANCHOR DETAIL

NO SCALE

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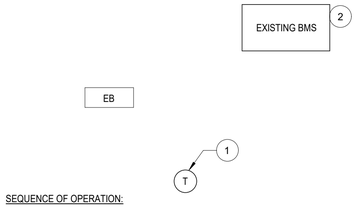
SHEET TITLE

MECHANICAL DETAILS 2 OF 2

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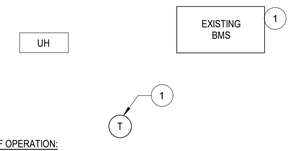


SEQUENCE OF OPERATION:

1. ELECTRIC BASEBOARD SHALL BE CONTROLLED LOCALLY BY WALL MOUNTED THERMOSTAT TO MAINTAIN SPACE TEMPERATURE SETPOINT OF 60°F(ADJ.). HEATING SHALL BE DISABLED DURING COOLING SEASON, SET VIA SCHEDULING.
2. UNIT SHALLTRANSMIT STATUS TO BUILDING'S EXISTING BMS VIA CURRENT SENSOR.

1 ELECTRIC BASEBOARD CONTROL DIAGRAM

NO SCALE



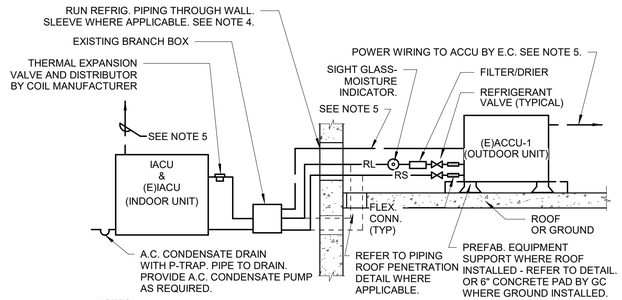
SEQUENCE OF OPERATION:

1. UNIT HEATER SHALL BE CONTROLLED LOCALLY BY INTEGRAL TAMPER PROOF THERMOSTAT TO MAINTAIN SPACE TEMPERATURE SETPOINT OF 70°F(ADJ.).

   UNIT SHALLTRANSMIT STATUS TO BUILDING'S EXISTING BMS VIA CURRENT SENSOR.

2 ELECTRIC UNIT HEATER CONTROL DIAGRAM

NO SCALE



NOTES:

1. SIZE PIPING PER EQUIPMENT MANUFACTURER'S RECOMMENDATIONS.
2. ALL INTERIOR PIPING SHALL BE CONCEALED IN CEILINGS AND WALLS..
3. FURNISH AND INSTALL ALL REFRIGERANT VALVES AND SPECIALTIES REQUIRED BY MANUFACTURER.
4. PROVIDE WEATHERTIGHT SEAL AT ALL PIPING PENETRATIONS. COORDINATE PENETRATIONS WITH G.C. AND ALL ASSOCIATED TRADES AS REQUIRED.
5. SPLIT SYSTEM MANUFACTURERS UTILIZE DIFFERENT WIRING CONFIGURATIONS. THE MECH. CONT'R SHALL COORDINATE WIRING/POWER REQUIREMENTS OF THE SHOP DRAWING APPROVED EQUIPMENT WITH THE ELEC. CONT'R.

   A. SINGLE FEED SYSTEM

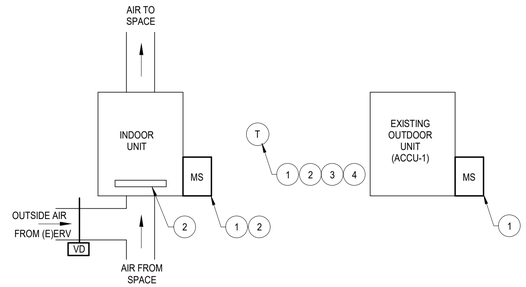
   THE ELEC. CONT'R SHALL BE RESPONSIBLE FOR POWER WIRING TO THE OUTDOOR UNIT, DISCONNECT SWITCH AND WIRING TO THE OUTDOOR UNIT. THE LOW OR LINE VOLTAGE CONTROL/FAN POWER WIRING BETWEEN THE OUTDOOR AND INDOOR UNIT SHALL BE PROVIDED BY THE ATC CONT'R.

   B. DUAL FEED SYSTEM

   THE ELEC. CONT'R SHALL BE RESPONSIBLE FOR POWER WIRING TO THE OUTDOOR AND INDOOR UNITS. THE ELEC. CONT'R SHALL PROVIDE POWER FEED, DISCONNECT SWITCH AND WIRING TO THE OUTDOOR AND INDOOR UNITS. THE CONTROL WIRING BETWEEN THE OUTDOOR AND INDOOR UNIT SHALL BE PROVIDED BY THE ATC CONT'R.

3 HEAT PUMP INSTALLATION DETAIL

NO SCALE



(EXISTING & NEW) - VRF (VARIABLE REFRIGERANT FLOW) SYSTEM CONTROL DIAGRAM

NTS

SEQUENCE OF OPERATION

THE EXISTING TO REMAIN VRF SYSTEM SEQUENCES SHALL NOT BE MODIFIED. NEW IACU SERVING THIS SPACE SHALL FOLLOW THE SEQUENCES IDENTIFIED IN THIS CONTROL DIAGRAM. THE EXISTING INDOOR UNITS AND NEW IACU TIE INTO THE EXISTING ACCU-1 ROOF MOUNTED CONDENSING UNIT SERVING THIS 1ST FLOOR VRF SYSTEM. PROVIDE A COMPLETE AND OPERATIONAL AUTOMATIC CONTROL SYSTEM INCLUDING ALL CONTROLS (IF NOT PROVIDED WITH EQUIPMENT), RELAYS, LOW-VOLTAGE POWER FROM A LINE VOLTAGE SOURCE IN THE ELECTRICAL PANEL, WIRING AND DEVICES TO ACHIEVE THE SEQUENCES OF OPERATION AS DESCRIBED BELOW FOR INDOOR UNITS AND THEIR ASSOCIATED DX COIL / OUTDOOR UNIT. ALL CONTROLS SHALL BE PACKAGED STAND ALONE AT EACH VRF HEAT PUMP UNIT. SETPOINTS SHALL BE ADJUSTED AND MEASURED AT THE LOCAL DIGITAL PROGRAMMABLE THERMOSTAT / CONTROL PANEL.

PROVIDE OCCUPANT OVERRIDE AT DIGITAL PROGRAMMABLE THERMOSTATS, REFER TO BMS GENERAL NOTES.

THE SYSTEMS SHALL OPERATE IN THE FOLLOWING MODES:

CONTROL MODE: THE INDOOR VRF HEAT PUMP UNITS ARE STARTED AND STOPPED ON A TIME OF DAY SCHEDULE AS CONTROLLED BY THE LOCAL PROGRAMMABLE THERMOSTAT/CONTROL PANEL.

1. IN COOLING MODE, ROOM TEMPERATURE IS MAINTAINED AT 75°F (ADJ.) AND CONTROLLED BY CYCLING THE COMPRESSOR ON AND OFF IN THE ASSOCIATED OUTDOOR CONDENSING UNIT AS SENSED BY THE SPACE TEMPERATURE SENSOR. COMPRESSOR FAILURE SHALL GENERATE AN ALARM AT THE INDOOR VRF HEAT PUMP(S) LOCAL CONTROL PANEL / CONTROLLER.
2. IN HEATING MODE, THE LOCAL CONTROL PANEL SHALL MODULATE THE COMPRESSOR ON AND OFF IN THE ASSOCIATED OUTDOOR CONDENSING UNIT TO BE THE PRIMARY MEANS OF HEATING TO MAINTAIN THE SUPPLY AIR TEMPERATURE SETPOINT OF 70°F (ADJ.). LOCAL CONTROL PANEL SHALL MODULATE ELECTRIC FIN TUBE RADIATION CONTROL AS SECONDARY MEANS OF HEATING TO MAINTAIN SPACE TEMPERATURE SETPOINT OF 70°F (ADJ.).
3. UNOCCUPIED MODE: THE SPACE TERMOSTAT SHALL BE PROGRAMMED AT 60°F (ADJ) DURING HEATING MODE AND 80°F(ADJ) DURING COOLING MODE.
4. EXISTING VRF CONTROL SYSTEM SHALL MONITOR THE FOLLOWING:
   1. INDOOR EVAPORATOR COIL UNIT STATUS
   2. SPACE TEMPERATURE (FROM WALL MOUNTED DIGITAL PROGRAMMABLE THERMOSTAT)
   3. RETURN AIR TEMPERATURE
   4. SUPPLY AIR TEMPERATURE
   5. AIR COOLED CONDENSING UNIT STATUS
   6. ALARM SIGNALS
   7. CONDENSATE PUMP ALARM

4 VRF CONTROL DIAGRAM

NO SCALE

(EXISTING) & (NEW) FAN COIL UNIT POINTS LIST			
DESCRIPTION	**ANALOG INPUT**	**BINARY INPUT**	**NOTES**
LOW TEMP. ALARM		1	PROVIDED BY TEMPERATURE SENSOR
HIGH TEMP. ALARM		1	PROVIDED BY TEMPERATURE SENSOR
STATUS		1	PROVIDED BY MANUFACTURER CONTROLS
SYSTEM FAILURE		1	SYSTEM FAILURE ALARM RELAY MODULE

(EXISTING) AIR COOLED CONDENSING UNIT POINTS LIST			
DESCRIPTION	**ANALOG INPUT**	**BINARY INPUT**	**NOTES**
STATUS		1	PROVIDED BY CURRENT SENSOR

ELECTRIC BASEBOARD & UNIT HEATER POINTS LIST			
DESCRIPTION	**ANALOG INPUT**	**BINARY INPUT**	**NOTES**
STATUS		1	PROVIDED BY CURRENT SENSOR

EXISTING CONTROL SYSTEM GENERAL NOTES

1. EXISTING AND NEW EQUIPMENT SHALL REPORT THE LISTED POINTS AND ALARMS TO WRTA'S EXISTING FACILITY CONTROL & MONITORING SYSTEM, AS REQUIRED. SYSTEM SHALL INCLUDE ALL CONTROLS (IF NOT PROVIDED WITH EQUIPMENT), RELAYS, LOW-VOLTAGE FROM A LINE VOLTAGE SOURCE, WIRING AND DEVICES TO ACHIEVE THE SEQUENCE OF OPERATIONS AS DESCRIBED FOR EACH COMPONENT. REFER TO SPECIFICATIONS FOR EXISTING BUILDING MONITORING SYSTEM REQUIREMENTS.
2. THE POINTS LISTED HEREIN ARE THE MINIMUM POINTS REQUIRED FOR THE MONITORING OF THE EQUIPMENT. THIS POINTS LIST IS TYPICAL FOR EACH SYSTEM OF THIS TYPE. IF THE SEQUENCE OF OPERATION REQUIRES ADDITIONAL OR DIFFERING INFORMATION IT MUST BE PROVIDED BY THE RESPECTIVE PROVIDER OF CONTROLS FOR THIS TYPE OF EQUIPMENT AS COORDINATED BY THE CONTRACTOR.
3. TEMPERATURE CONTROL CONTRACTOR SHALL PROVIDE ALL DIGITAL ALARM LOGIC.
4. OCCUPIED AND UNOCCUPIED MODE SHALL BE BASED ON AN ADJUSTABLE TIME SCHEDULE PER WRTA AND SHALL HAVE LOCAL MANUAL OVERRIDE CAPABILITY, AS REQUIRED.
5. ALL SETPOINTS AND SCHEDULES SHALL BE ADJUSTABLE AT WRTA HEAD-END, LOCAL CONTROLLERS, THERMOSTATS AND LOCAL TEMPERATURE SENSOR, AS REQUIRED.
6. ALL LOCAL THERMOSTATS SHALL BE PROVIDED WITH OCCUPANT SETPOINT OVERRIDE CAPABILITY. THE OVERRIDE SHALL BE LIMITED TO PLUS OR MINUS 3°F (ADJ) FROM THE SETPOINT FOR THE SPACE. THE OVERRIDE SHALL TIME OUT AFTER 8 HOURS (ADJ). THERMOSTATIC CONTROL SHALL HAVE A 5°F DEADBAND (ADJ).

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SHEET TITLE

MECHANICAL CONTROLS

M-402

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EXISTING IACU SCHEDULE & NEW IACU SCHEDULE

REMARKS:
1. INSTALL PER MANUFACTURER'S INSTALLATION INSTRUCTIONS.
2. PROVIDE INTEGRAL DISCONNECT SWITCH. DISCONNECTS SUPPLIED BY MECHANICAL CONTRACTOR AND INSTALLED AND INTERCONNECTED BY ELECTRICAL CONTRACTOR.
3. PROVIDE ALL REQUIRED WALL AND OR CEILING MOUNTING HARDWARE AND ACCESSORIES.
4. PROVIDE CONDENSATE PUMP.
5. REFER TO SPECIFICATIONS FOR ALL ADDITIONAL REQUIRED OPTIONS AND ACCESSORIES.
6. UNIT SHALL BE PROVIDED WITH INTEGRAL FAN SPEED CONTROLLER.
7. PROVIDE VARIABLE REFRIGERANT FLOW SYSTEM WITH A INTELLIGENT MANAGER LED TOUCH CONTROL PANEL WITH BACNET INTEGRATION AND WEB ACCESS AND CONTROL.

						COOLING			HEATING									
SYMBOL	NUMBER	MANUFACTURER	MODEL	LOCATION	ASSOCIATED REFRIGERANT CONTROLLER	NOMINAL CAPACITY (MBH)	ACTUAL CAPACITY (MBH)	SENSIBLE CAPACITY (MBH)	NOMINAL CAPACITY (MBH)	ACTUAL CAPACITY (MBH)	SUPPLY AIRFLOW	MINIMUM OA	VOLTAGE	PHASE	Hz	MCA	MOP	REMARKS
IACU	(E)1-3	LG	ARNU123MAA4	RM-102	BCC-(E)1-1B	12.0	10.9	8.1	13.5	7.4	370 CFM	40 CFM	208 V	1	60 Hz	1.21 A	15 A	1,2,3 & 5
IACU	(E)1-7	LG	ARNU123MAA4	RM-106B	BCC-(E)1-2A	8.0	7.3	6.2	9.0	4.9	300 CFM	10 CFM	208 V	1	60 Hz	1.05 A	15 A	1,2,3 & 5
IACU	(E)1-8	LG	ARNU183MAA4	RM-104A	BCC-(E)1-2A	8.0	7.3	6.2	9.0	4.9	300 CFM	40 CFM	208 V	1	60 Hz	1.05 A	15 A	1,2,3 & 5
IACU	(E)1-11	LG	ARNU093MAA4	RM-106	BCC-(E)1-2A	8.0	7.3	6.2	9.0	4.9	300 CFM	35 CFM	208 V	1	60 Hz	1.05 A	15 A	1,2,3 & 5
IACU	(XL)1-2	LG	ARNU183MAA4	RM-106	BCC-(E)1-2B	18.0	16.4	13.3	20.0	16.4	600 CFM	90 CFM	208 V	1	60 Hz	1.56 A	15 A	1,2,3 & 5
IACU	(XL)1-4	LG	ARNU123MAA4	RM-106	BCC-(E)1-1B	8.0	7.3	6.2	8.0	4.9	300 CFM	25 CFM	208 V	1	60 Hz	1.05 A	15 A	1,2,3 & 5
IACU	(XL)1-5	LG	ARNU093MAA4	RM-106	BCC-(E)1-1A	12.0	10.9	8.1	13.5	7.4	370 CFM	N/A	208 V	1	60 Hz	1.21 A	15 A	1,2,3 & 5
IACU	(XL)1-6	LG	ARNU093MAA4	RM-106	BCC-(E)1-1B	18.0	16.4	13.3	20.0	10.9	600 CFM	10 CFM	208 V	1	60 Hz	1.56 A	15 A	1,2,3 & 5
IACU	(XL)1-9	LG	ARNU073MAA4	RM-110	BCC-(E)1-1B	12.0	10.9	8.1	13.5	7.4	370 CFM	25 CFM	208 V	1	60 Hz	1.21 A	15 A	1,2,3 & 5
IACU	(XL)1-10	LG	ARNU093MAA4	RM-106	BCC-(E)1-2B	18.0	16.4	13.3	20.0	10.9	600 CFM	90 CFM	208 V	1	60 Hz	1.56 A	15 A	1,2,3 & 5
IACU	1-15	LG	ARNU183MAA4	RM-106	BCC-(E)1-2A	18.0	16.4	13.3	20.0	16.4	600 CFM	100 CFM	208 V	1	60 Hz	1.56 A	15 A	ALL

ELECTRIC UNIT HEATER SCHEDULE

REMARKS:
1. INSTALL PER MANUFACTURER'S INSTALLATION INSTRUCTIONS.
2. PROVIDE WITH ALL MANUFACTURER RECOMMENDED MOUNTING EQUIPMENT, HARDWARE AND ACCESSORIES.
3. PROVIDE DISCONNECT SWITCH. DISCONNECTS SUPPLIED BY MECHANICAL CONTRACTOR AND INSTALLED AND INTERCONNECTED BY ELECTRICAL CONTRACTOR.
4. PROVIDE WITH WALL RECESSED KIT AND ALL NECESSARY ACCESSORIES.
5. REFER TO SPECIFICATION FOR ALL ADDITIONAL REQUIRED OPTIONS AND ACCESSORIES.
6. PROVIDE WITH INTEGRAL PACKAGE CONTROLS. UNIT MOUNTED TEMPERATURE SENSOR.

						ELECTRICAL DATA						
SYMBOL	NUMBER	MANUFACTURER	MODEL	LOCATION	KW RATING	VOLTS	PHASE	HZ	FLA	BTU/HR	WEIGHT	REMARKS
UH	1	QMARK	AWH-4408F	RM-111	2.0	208 V	1	60 Hz	9.60 A	6824.0 Btu/h	25.00 lb	ALL

ELECTRIC BASEBOARD HEATER SCHEDULE

REMARKS:
1. PROVIDE WITH WALL MOUNTED THERMOSTAT.
2. PROVIDE WITH PEDESTAL FLOOR MOUNT KIT.
3. COORDINATE FINAL FINISH WITH ARCHITECTURAL DOCUMENTS.
4. MECHANICAL CONTRACTOR TO FURNISH LINE VOLTAGE THERMOSTAT AND MANUFACTURERS BASEBOARD MOUNTED LINE VOLTAGE JUNCTION BOX OPTION. ELECTRICAL CONTRACTOR TO INSTALL AND WIRE.
5. REFER TO DETAILS AND SPECIFICATIONS FOR ADDITIONAL DETAIL AND CLARIFICATION.

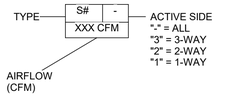
						ELECTRICAL DATA				
SYMBOL	NUMBER	MANUFACTURER	MODEL	BTUH OUTPUT	LENGTH (FT)	VOLTS	PHASE	Hz	WEIGHT	REMARKS
EB	1	RUNTAL	EB3-108-208D	4500.0 Btu/h	9' - 0"	208 V	1	60 Hz	90.00 lb	ALL
EB	2	RUNTAL	EB3-108-208D	4500.0 Btu/h	9' - 0"	208 V	1	60 Hz	90.00 lb	ALL
EB	3	RUNTAL	EB3-96-208D	4000.0 Btu/h	8' - 0"	208 V	1	60 Hz	80.00 lb	ALL
EB	4	RUNTAL	EB3-84-208D	3500.0 Btu/h	7' - 0"	208 V	1	60 Hz	70.00 lb	ALL
EB	5	RUNTAL	EB3-96-208D	4000.0 Btu/h	8' - 0"	208 V	1	60 Hz	80.00 lb	ALL
EB	6	RUNTAL	EB3-84-208D	3500.0 Btu/h	7' - 0"	208 V	1	60 Hz	70.00 lb	ALL

AIR DISTRIBUTION SCHEDULE

REMARKS:
1. REFER TO PLANS FOR LOCATION, AIR QUALITIES AND NECK SIZES OF EACH DEVICE.
2. BORDER TYPES SHALL BE COMPATIBLE WITH CEILING TYPE FOR THE ROOM IN WHICH IT IS LOCATED. CONTRACTOR SHALL REVIEW THE ARCHITECURAL REFLECTED CEILING PLANS FOR SPECIFIC CEILING TYPES IN EACH SPACE.
3. FINISHES AND BORDER TYPES SHALL BE APPROVED BY THE ARCHITECT.
4. ALL AIR DEVICES SHALL BE TESTED IN ACCORDANCE WITH ASHRAE STANDARD 70-2006.

MARK	CFM RANGE	NECK SIZE INCHES	FACE SIZE	DESCRIPTION (BASIS OF DESIGN: TITUS)	NOISE CRITERIA
S-1	0 - 125	6" DIA.	24" x 24"	SUPPLY REGISTER MAKE / MODEL: TITUS OMNI SERIES MATERIAL: STEEL OR ALUMINUM BORDER: LAY-IN, OR SURFACE MOUNT COLOR: WHITE	< 21
	126 - 225	8" DIA.	24" x 24"		
	226 - 325	10" DIA.	24" x 24"		
	326 - 500	12" DIA.	24" x 24"		
	501 - 725	14" DIA.	24" x 24"		
	726 - 850	15" DIA.	24" x 24"		
S-2	0 - 180	12" ø	2 FT	SUPPLY REGISTER MAKE / MODEL: TITUS FL-20 - 2 SLOT MATERIAL: STEEL OR ALUMINUM BORDER: SURFACE MOUNT COLOR: WHITE	
	181 - 330	12" ø	4 FT		
	331 - 480	12" ø	5 FT		
	N/A	N/A	N/A		
R-1	0 - 250	8"x8"	24" x 24"	RETURN REGISTER MAKE / MODEL: TITUS 50F EGG CRATE MATERIAL: ALUMINUM BORDER: LAY-IN, OR SURFACE MOUNT COLOR: WHITE OPTIONAL FILTER (MODEL 50FF) - NOTED ON DWG'S WHERE APPLICABLE	< 21
	251 - 600	12"x12"	24" x 24"		
	601 - 1000	16"x16"	24" x 24"		
	1001-1500	18"x18"	24" x 24"		
	1501-2000	22"x22"	24" x 24"		
	N/A	N/A	N/A		
R-2	0 - 180	12" ø	2 FT	RETURN REGISTER MAKE / MODEL: TITUS FL-20 - 2 SLOT MATERIAL: STEEL OR ALUMINUM BORDER: SURFACE MOUNT COLOR: WHITE	
	181 - 330	12" ø	4 FT		
	331 - 480	12" ø	5 FT		
	N/A	N/A	N/A		
E-1	0 - 225	8" x 8"	8" x 8"	EXHAUST / RETURN MAKE / MODEL: TITUS 350 SERIES MATERIAL: ALUMINUM BORDER: SURFACE MOUNT FOR PLASTER, DUCT MOUNT COLOR: WHITE	< 21
	226 - 430	12" x 10"	12" x 10"		
	431-660	18" x 10"	18" x 10"		
	661-750	24" x 10"	24" x 10"		
	751-1050	24" x 14"	24" x 14"		
	1051-1285	20" x 20"	20" x 20"		
	1286-2000	24" x 20"	24" x 20"		
	2001-3000	36" x 20"	36" x 20"		

DUCT TAG:



WORCESTER REGIONAL TRANSIT AUTHORITY
287 Grove Street, Worcestor, MA 01605
t 508.791.7962 f 508.791.2389
www. therta.com

PRIMARY

One Financial Center, 3rd Floor
Boston, MA 02111
t 617.482.7298 f 617.482.1837
www.stvinc.com

CONSULTANTS

SEALS

PROJECT IDENTIFICATION

WORCESTER REGIONAL TRANSIT AUTHORITY

MAIN LOBBY RENOVATION

MARK	DATE	DESCRIPTION	BY

ISSUE BLOCK

PROJECT NO.:	4022461
DESIGNED BY:	LPM
DRAWN BY:	JDO
CHECKED BY:	MAC
APPROVED BY:	RR
DATE:	02/10/2025

SHEET TITLE

MECHANICAL SCHEDULES

M-700

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WIRING DEVICES

SYMBOL	DESCRIPTION
#	DUPLEX RECEPTACLE, GROUNDING TYPE, NEMA 5-20, 125V "#" - INDICATES CIRCUIT NUMBER "WP" - INDICATES WEATHERPROOF "C" - INDICATES COUNTER HEIGHT "XP" - INDICATES EXPLOSION PROOF "YC" - INDICATES ONE OF TWO OUTLET CONTROLLED BY VACANCY SENSOR "TV" - INDICATES RECEPTACLE FOR TELEVISION, HEIGHT OF 80" UNLESS OTHERWISE NOTED
	SPECIAL PURPOSE RECEPTACLE FOR INDUSTRIAL EQUIPMENT. DUST AND MOISTURE RESISTANT WITH PROTECTIVE GASKET COVER. FOR NEMA CONFIGURATION, REFER TO DRAWINGS.
	SIMPLEX RECEPTACLE "EV" - REFERS TO ELECTRIC CHARGING STATION.
	SHADING INDICATES GROUND FAULT INTERRUPTER
GFI	DOUBLE DUPLEX RECEPTACLE, GROUNDING TYPE, RATED 20A, 125V
CE	DUPLEX RECEPTACLE MOUNTED FLUSH TO FINISHED CEILING OR SURFACE TO BOTTOM OF SLAB
DJ	FLOOR MOUNTED BOX WITH DOUBLE DUPLEX RECEPTACLE AND TEL/DATA JACK
	CEILING OR EQUIPMENT MOUNTED BOX WITH WHIP. "MD" - INDICATES MOTORIZED DAMPERS.
J	JUNCTION BOX "CS" - INDICATES BUS CHARGING STATION. "TFT" - INDICATES TOILET FLUSH TRANSFORMER. "CE" - INDICATES COMMUNICATIONS EQUIPMENT. "HD" - INDICATES HAND DRYER.
J	CEILING OR EQUIPMENT MOUNTED JUNCTION BOX "CE" - INDICATES COMMUNICATIONS EQUIPMENT.
EH	ELECTRIC DOOR HINGE OPERATOR FURNISHED & INSTALLED BY DOOR HARDWARE. WIRED BY EC.
	FIRE-RATED 6" RECESSED POKE-THROUGH CONTAINING QUAD/RUPLEX RECEPTACLE
	FIRE-RATED 8" RECESSED POKE-THROUGH CONTAINING DUPLEX RECEPTACLE, 2 DATA RJ45 PORTS, 1 VOICE RJ45 PORT, HDMI, AND 3.5 MM AUDIO
HDMI	HDMI RECEPTACLE FOR TELEVISION OR PROJECTOR
	VEHICLE-RATED 4" RECESSED FLOOR BOX "VC" - INDICATES ONE OF TWO RECEPTACLES CONTROLLED BY VACANCY SENSORS

BRANCH CIRCUIT & FEEDER LEGEND

SYMBOL	DESCRIPTION
(PP1)-(X)	BRANCH CIRCUIT HOME RUN. TYPICAL INTERIOR BUILDING 2#12 & 1#12G IN ¾" RGC MINIMUM. PP1-(1) INDICATES PANEL AND CIRCUIT DESIGNATION FROM WHICH HOME RUN SHALL ORIGINATE. EACH CIRCUIT SHALL BE 20A-1P (20AMP SINGLE POLE) UNLESS NOTED OTHERWISE. TYPICAL SITE CONDUCTORS MINIMUM 2#10 & #10G IN RTRC 2"C MINIMUM.
(PP1)-(X)	

POWER DISTRIBUTION LEGEND

SYMBOL	DESCRIPTION
	208Y/120 VOLT PANELBOARD, REFER TO SCHEDULE OF PANELBOARDS
	480Y/277 VOLT PANELBOARD, REFER TO SCHEDULE OF PANELBOARDS
	GROUND BAR (SEE GENERAL NOTE 18.)

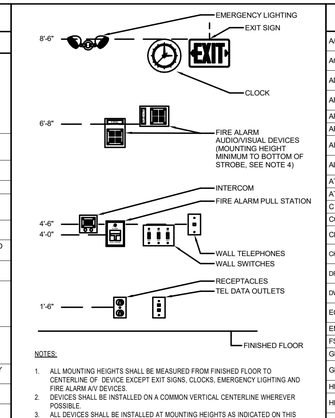
TELECOMMUNICATIONS LEGEND

ALL DATA AND TELEPHONE CABLING SHALL BE BY OTHERS. ELECTRICAL DRAWINGS INDICATE RACEWAY AD BACKBOX SYSTEMS ONLY AND INDICATE TEL/DATA OUTLET CONFIGURATIONS FOR REFERENCE ONLY.

SYMBOL	DESCRIPTION
W	TELEPHONE OUTLET "W" - INDICATES WALL PHONE, MOUNTED AT 4'-0" ABOVE FINISHED FLOOR "P" - INDICATES PAY PHONE "C" - INDICATES COUNTER HEIGHT "FAX" - INDICATES FAX MACHINE
	TEL/DATA OUTLET
	¾" PLYWOOD BACKBOARD WITH 2"x4" STUDS PLACED 16" OFF CENTER

ACCESS/SECURITY LEGEND

SYMBOL	DESCRIPTION
CR	CARD READER - MOUNT 4'-0" AFF. BASIS OF DESIGN MANUFACTURER HID WITH MODEL NUMBER: 40KNKS-00-000000.
	CLOSED CIRCUIT TELEVISION (CCTV) CAMERA. SEE CAMERA SCHEDULE (E-606) FOR MOUNTING AND CAMERA TYPES.
IC C	INTERCOM STATION WITH BASIS OF DESIGN MANUFACTURER OF "LOURDE ELECTRONICS" WITH MODEL NUMBER AOP-540 "C" INDICATES "CELL" INTERCOM STATION WITH BASIS OF DESIGN MANUFACTURER OF "LOURONE ELECTRONICS" WITH MODEL NUMBER TLSP-CM.
RX	INTEGRATED REQUEST TO EXIT PANIC DEVICE SHALL BE BUILT IN MICROSWITCH WITHIN DOOR HARDWARE BY OTHERS. INSTALLED BY DOOR HARDWARE CONTRACTOR AND WIRED BY EC.
DC	RECESSED MAGNETIC DOOR CONTACT PROVIDED BY DOOR HARDWARE CONTRACTOR AND WIRED BY EC. BASIS OF DESIGN MANUFACTURER "FRI RISK" WITH MODEL NUMBER: 195-12-W IN DOOR AND DOORFRAME.
PT	POWER SUPPLY FOR MAGNETIC LOCKS AND ELECTRIC LOCKS FURNISHED BY DOOR HARDWARE CONTRACTOR INSTALLED & WIRED BY EC.
EL	ELECTRIC LOCK FURNISHED AND INSTALLED BY HARDWARE CONTRACTOR WIRED BY EC.
DJ	DOOR JUNCTION BOX BY EC.
EH	ELECTRIC DOOR HINGE FURNISHED & INSTALLED BY DOOR HARDWARE, WIRED BY EC.
TS	THERMAL SWITCH FURNISHED AND INSTALLED BY EC. SWITCH RATING TO BE DETERMINED BY POWER SUPPLY MOP REQUIREMENTS.
SP	CEILING MOUNTED SPEAKER.
MS	CEILING MOUNTED MOTION SENSOR.



NOTES:

1. ALL MOUNTING HEIGHTS SHALL BE MEASURED FROM FINISHED FLOOR TO CENTERLINE OF DEVICE EXCEPT EXIT SIGNS, CLOCKS, EMERGENCY LIGHTING AND FIRE ALARM AV DEVICES.
2. DEVICES SHALL BE INSTALLED ON A COMMON VERTICAL CENTERLINE WHEREVER POSSIBLE.
3. ALL DEVICES SHALL BE INSTALLED AT MOUNTING HEIGHTS AS INDICATED ON THIS DETAIL UNLESS OTHERWISE NOTED.
4. STROBE HEIGHT ILLUSTRATED AT MAXIMUM HEIGHT. STROBE SHALL BE 80" AFF OR 6" BELOW CEILING, WHICHEVER IS LOWER.

TYPICAL DEVICE MOUNTING HEIGHTS DETAIL

GENERAL SYMBOLS

SYMBOL	
	DIRECTION OF VIEW
1 / E-XXX	SECTION NUMBER DWG NUMBER ON WHICH SECTION IS SHOWN
A / E-XXX	DETAIL LETTER DWG NUMBER ON WHICH DETAIL IS SHOWN
XXX / #	MECHANICAL EQUIPMENT TAG (REFER TO MECHANICAL EQUIPMENT SCHEDULES SHEETS E-916 & E-917 FOR CONDUCTORS, CONDUIT, BREAKER, DISCONNECT AND PROTECTIVE DEVICE SIZES) MECHANICAL EQUIPMENT DESIGNATION MECHANICAL EQUIPMENT REFERENCE NUMBER (TYP)
IQ XX- ##	INDUSTRIAL EQUIPMENT TAG (REFER TO INDUSTRIAL EQUIPMENT SCHEDULE SHEET E-918 FOR CONDUCTORS, CONDUIT, BREAKER, DISCONNECT AND PROTECTIVE DEVICE SIZES)
#	KEY NOTE TAG

LIGHTING NOTES

1	PROVIDE COMMON FACE PLATE AND REQUIRED METAL INTERIOR BOX BARRIERS FOR ALL MULTIPLE GANG SWITCH LOCATIONS.
2	SURFACE MOUNTED FIXTURES (INCLUDING EXIT SIGNS) THAT CREATE OBSTRUCTIONS EXCEEDING 4 1/2 INCHES FROM THE CEILING SURFACE TO THE BOTTOM OF THE FIXTURE SHALL BE SPACED A MINIMUM OF 2'6" FROM ANY SPRINKLER HEAD. COORDINATE THE EXACT PLACEMENT OF ALL FIXTURES WITH THE REFLECTED CEILING PLAN AND THE FIRE PROTECTION CONTRACTOR.
3	PROVIDE CONSTANTLY ENERGIZED (UNSWITCHED) BRANCH CIRCUIT TO ALL EXIT SIGNS AND EGRESS LIGHTS FROM THE DESIGNATED SOURCE.
4	CONTRACTOR SHALL VERIFY ALL DOORS SWINGS BEFORE INSTALLING SWITCH BOXES.

LIGHTING FIXTURE LEGEND

LIGHTING FIXTURE

FIXTURE SYMBOLS SHOWN BELOW ARE REPRESENTATIVE. NOT ALL SYMBOLS FROM PLANS HAVE BEEN SHOWN ON LEGEND. FIXTURE TAG AND CIRCUIT # LOCATIONS ARE ALSO REPRESENTATIVE. ACTUAL TAG AND CIRCUIT # LOCATIONS MAY VARY ON PLANS.

SYMBOL	DESCRIPTION
FA / L	LIGHTING FIXTURES (SEE LIGHTING FIXTURE SCHEDULE) "FA" - INDICATES LIGHTING FIXTURE TYPE "L" - INDICATES ROW-MOUNT LENGTH "a" - INDICATES SWITCH CONTROL "#" - INDICATES CIRCUIT NUMBER
A / #	SHADING INDICATES EMERGENCY FIXTURE

SWITCHING LEGEND

SYMBOL	DESCRIPTION
$a # or LETTER	WALL MOUNTED SWITCH, LOW VOLTAGE WITH DIMMER. BOD IS CRESTON ZUMLINK-BTN6 "a" - LOWER CASE LETTER INDICATES FIXTURE SWITCH CONTROL (TYP) SWITCH TYPE: # OR LETTER "3" - INDICATES THREE WAY SWITCH "4" - INDICATES FOUR WAY SWITCH SENSOR TYPE - (REFER TO SPEC FOR ADDITIONAL INFORMATION) "VS" - INDICATES VACANCY SENSOR. BOD IS SENSORWORX SWX-1-2-3-WH "L" - INDICATES LINE VOLTAGE 20A, 120/277V
(XX) a C	OCCUPANCY/VACANCY SENSOR, LOW VOLTAGE, CEILING MOUNTED WITH POWER PACKS AS REQUIRED. SINGLE POLE UON "VS" - INDICATES VACANCY SENSOR. BOD IS SENSORYWORX SWX-228-1AR. COVERAGE LEVEL TO BE DETERMINED BY CONTROLS VENDOR BASED ON THE ROOM SIZE/SENSOR LAYOUT "OS" - INDICATES OCCUPANCY SENSOR. "DS" - INDICATES DAY LIGHTING PHOTOCELL SENSOR. BOD IS SENSORWORX SWX-250-1-D "C" - INDICATES CORRIDOR STYLE SENSOR. BOD IS SENSORWORX SWX-402-1. ARROW INDICATES THE SENSOR ORIENTATION. "a" - INDICATES CONTROL GROUP

ABBREVIATIONS

A/AMP	AMPERE	KW	KILOWATT
AC	ALTERNATING CURRENT	LOP	LOSS OF POWER
ADA	AMERICAN WITH DISABILITIES ACT	LTG	LIGHTING
AF	AMPERE FRAME	MCB	MAIN CIRCUIT BREAKER
AFF	ABOVE FINISHED FLOOR	MEC	MASSACHUSETTS ELECTRIC CODE
AFG	ABOVE FINISHED GRADE	MH	MANHOLE
AIC	AMPERE INTERRUPTING CAPACITY	MLO	MAIN LUGS ONLY
AL	ALUMINUM	MTD	MOUNTED
AT	AMPERE TRIP	NEC	NATIONAL ELECTRIC CODE
ATS	AUTOMATIC TRANSFER SWTICH	NTS	NOT TO SCALE
C	CONDUIT	PVC	POLYVINYL CHLORIDE
CCTV	CLOSED CIRCUIT TELEVISION	RGC	RIGID GALVANIZED CONDUIT
CB	CIRCUIT BREAKER	RTRC	REINFORCED THERMOSETTING RESIN CONDUIT
CKT	CIRCUIT	VC	VACANCY CONTROLLED
DPM	DIGITAL POWER METER	SWBD	SWITCHBOARD
DWG	DRAWING	TEL	TELEPHONE
EC	ELECTRICAL CONTRACTOR	TYP	TYPICAL
EMT	ELECTRICAL METALLIC TUBING	UON	UNLESS OTHERWISE NOTED
FSD	FIRE SMOKE DAMPER	UPS	UNINTERRUPTIBLE POWER SUPPLY
GFI	GROUND FAULT INTERRUPTING	V	VOLT
GND	GROUND	VA	VOLT AMPERE
HH	HANDHOLE	VFD	VARIABLE FREQUENCY DRIVE
HP	HORSEPOWER	W	WATT
HVAC	HEATING, VENTILATION AND AIR CONDITIONING	WP	WEATHERPROOF
HZ	HERTZ	XFRM	TRANSFORMER
KVA	KILOVOLT - AMPERE		

FIRE ALARM SYSTEM DEVICES

SYMBOL	DESCRIPTION
F WP	WALL MOUNTED DUAL ACTION MANUAL PULL STATION WITH POLYCARBONATE COVER WITH LOCAL HORN. "WP" MANUAL PULL STATIONS WILL BE CONVENTIONAL TYPE DEVICE WITHIN WEATHERPROOF ENCLOSURE WITH REMOTE MONITOR MODULE
F WP	WALL MOUNTED COMBINATION FA SPEAKER/STROBE NOTIFICATION DEVICE, FIELD SELECTABLE CD RATING 75CD UON "CLG" INDICATES CEILING MOUNT "WP" INDICATES WEATHERPROOF
F WP	WALL MOUNTED FA STROBE NOTIFICATION DEVICE, M.H. 6'-8" AFF UON FIELD SELECTABLE CD RATING "WP" INDICATES A WEATHERPROOF DEVICE
S E WP	SMOKE DETECTOR - E INDICATES ELEVATOR RECALL "WP" INDICATES A CONVENTIONAL WEATHERPROOF DEVICE WITH A REMOTE MONITOR MODULE "R" INDICATES SMOKE DETECTOR FOR DOOR RELEASE
H E WP	HEAT DETECTOR - FIXED TEMPERATURE 135° E INDICATES ELEVATOR RECALL "WP" INDICATES CONVENTIONAL WEATHERPROOF DEVICE WITH REMOTE MONITOR MODULE "R" INDICATES SMOKE DETECTOR FOR DOOR RELEASE
	MASTER BOX - WALL MOUNTED
FACP	FIRE ALARM CONTROL PANEL - SURFACE WALL MOUNTED
FAA	FIRE ALARM ANNUNCIATOR - SURFACE WALL MOUNTED
	RED EXTERIOR BEACON
MM	MONITOR MODULE
CM	CONTROL MODULE
RM	RELAY MODULE
FSD	MOTORIZED FIRE/SMOKE DAMPER
FATC	FIRE ALARM TERMINAL CABINET - SURFACE WALL MOUNTED
K	KNOX BOX
IM	ISOLATION MODULE
RAI	REMOTE ALARM INDICATOR
DH	DOOR HOLDER
IAM	INDIVIDUAL ADDRESSABLE MODULE
CZAM	CONTROLLABLE ZONE ADDRESSABLE MODULE
FSR	FAN SHUT-DOWN RELAY
	FIRE ALARM SYSTEM TAMPER FLOW SWITCH
	FIRE ALARM SYSTEM WATER FLOW SWITCH

GENERAL NOTES:

1. DRAWINGS ARE DIAGRAMMATIC AND INDICATE GENERAL ARRANGEMENT ONLY. VERIFY ALL CONDITIONS AND DIMENSIONS SHOWN ON DRAWINGS. EXACT LOCATIONS OF EQUIPMENT SHALL BE DETERMINED IN THE FIELD.
2. CONTRACTOR SHALL SUBMIT FOR APPROVAL SHOP DRAWING THE DETAILS OF THE METHOD OF INSTALLATION AND MOUNTING OF EQUIPMENT PRIOR TO INSTALLATION SHOP DRAWINGS MUST BE APPROVED BY THE ENGINEER. ANY PROPOSED MODIFICATIONS OF THE CONTRACT DRAWINGS ARE TO BE HIGHLIGHTED ON THE SHOP DRAWING SUBMISSION.
3. CHECK TO ENSURE CLEARANCES BEFORE INSTALLING ANY EQUIPMENT.
4. FURNISH AND INSTALL ALL REQUIRED CONDUIT, WIRE AND CABLE, FITTINGS, BOXES, AND HARDWARE IN ORDER TO MAKE A COMPLETE ELECTRICAL SYSTEM READY FOR OPERATION. PRIOR TO INSTALLATION, SUBMIT DRAWINGS FOR APPROVAL SHOWING LAYOUT DETAILS.
5. CIRCUIT NUMBERS ARE DIAGRAMMATIC. EXACT NUMBERS SHALL BE DETERMINED IN THE FIELD AND REFLECTED ON AS-BUILT DOCUMENTATION BY THE ELECTRICAL CONTRACTOR. THE ASSOCIATED CIRCUIT NUMBERS THAT ARE APPLIED TO EACH DEVICE AND PIECE OF EQUIPMENT INFERS INTERCONNECTING BRANCH CIRCUITRY. INTERCONNECTING BRANCH WIRING SHALL BE SIZED EQUAL TO THE HOMERUN, UNLESS OTHERWISE NOTED.
6. VOLTAGE DROP HAS BEEN CONSIDERED IN THE DESIGN OF ALL BRANCH CIRCUITRY AND FEEDER SIZES BASED UPON THE ILLUSTRATED EQUIPMENT LAYOUTS AND SHORTEST CONDUCTOR/RACEWAY ROUTING. THE ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR DEVIATIONS TAKEN THAT WILL INCREASE CONDUCTOR/RACEWAY ROUTING LENGTHS. BRANCH CIRCUITS LONGER THAN 75' FOR 120V FROM PANEL TO LAST OUTLET SHALL BE INCREASED A MINIMUM OF ONE SIZE ABOVE THAT SPECIFIED TO LIMIT VOLTAGE DROP TO LESS THAN 3%. FEEDERS SHALL FOLLOW SIMILAR GUIDELINES AND BE LIMITED TO 2% VOLTAGE DROP WHERE CONDUCTOR SIZE SHOWN DOES NOT ALLOW FOR CONNECTION ONTO THE NOTED EQUIPMENT, BREAKER, OR PANELBOARD THE CONTRACTOR SHALL SPLICE THE LARGEST SIZE CONDUCTOR THE NOTED EQUIPMENT WILL ACCEPT ONTO THE CONDUCTOR NOTED IN THE DESIGN DRAWINGS WITHIN 10' OF THE EQUIPMENT IN QUESTION. JUNCTION/SPLICE BOX LOCATION TO BE COORDINATED TO ALLOW FOR THE SPLICE TO OCCUR.
7. COORDINATE ALL EXACT DEVICE LOCATIONS AND MOUNTING HEIGHTS WITH ARCHITECTURAL DWGS & OWNER PRIOR TO ROUGH-IN. ALL DEVICES SHALL BE MOUNTED IN ACCORDANCE WITH THE LATEST REQUIREMENTS OF THE ACCESSIBILITY CODE.
8. BRANCH CIRCUITRY SHALL BE INSTALLED IN CONDUIT FROM THE PANEL TO THE DEVICES. MC CABLE IS NOT PERMITTED.
9. ALL ELECTRICAL WORK SHALL COMPLY WITH MASSACHUSETTS STATE BUILDING CODE AND NFPA/NATIONAL ELECTRIC CODE (NEC). ALL GROUNDING MUST BE IN CONFORMANCE WITH NEC ARTICLE 250.
10. WHERE OPENINGS ARE NOT AVAILABLE. THE CONTRACTOR SHALL CORE DRILL THROUGH WALLS AS REQUIRED AND PASS CONDUITS THROUGH SLEEVES. AFTER COMPLETION OF INSTALLATION, FILL IN AND WATERPROOF ALL OPENINGS WITH MATERIALS AS DIRECTED BY THE ENGINEER AND FINISH TO MATCH SURROUNDING AREAS. ALL PENETRATIONS MUST BE SEALED AND TREATED FOR AT LEAST 2 HOURS FIRE RATED.
11. ALL BOLTS SHALL HAVE LOCK WASHERS AND ELASTIC STOP NUTS IN ADDITION TO REGULAR NUTS.
12. CONDUITS SHALL NOT BE LESS THAN 3/4" DIAMETER WHERE EXPOSED AND 1" DIAMETER WHERE CONCEALED.
13. EXPOSED CONDUIT SHALL BE FASTENED NOT MORE THAN 5'-0" ON CENTERS. USE CLAMP AND STUD ANCHORS AS DIRECTED. FRICTION CLAMPS SHALL NOT BE USED.
14. ALL CONDUITS AND RACEWAYS SHALL BE IN COMPLIANCE WITH THE NATIONAL ELECTRICAL CODE.
15. NOTE NOT USED.
16. ALL ELECTRICAL EQUIPMENT SHALL BE GROUNDED AS PER CODES AND SPECIFICATIONS. THE GROUND RESISTANCE SHALL NOT EXCEED 5 OHMS. ALL RELATED TESTS AND MEASUREMENTS SHALL BE PERFORMED BY THE CONTRACTOR.
17. AT ALL JUNCTION BOXES LEAVE SUFFICIENT SLACK OF WIRE FOR CONNECTION BY SPLICING
18. ELECTRICAL RACEWAYS AND ELECTRICAL EQUIPMENT SHALL MAINTAIN A MINIMUM OF 12" SEPARATION IN ALL DIRECTIONS BETWEEN SPRINKLER PIPES, PLUMBING, STEAM, HYDRAULIC AND OTHER LINES AND APPURTENANCES.
19. ALL EXPOSED ABOVEGROUND CONDUIT WITHIN THE FACILITY SHALL BE HEAVY WALL, RMC, RIGID GALVANIZED STEEL WITH THREADED MATCHING GALVANIZED FITTINGS.
20. CONTRACTOR SHALL INSTALL PULL/SPLICE BOXES AS REQUIRED AND AS DIRECTED.
21. EACH RACEWAY SHALL CONTAIN INDEPENDENT GROUND WIRE WHETHER SPECIFICALLY SHOWN OR NOT ON THE INDIVIDUAL DRAWINGS. WIRES SHALL BE SIZED AS PER NATIONAL ELECTRICAL CODE.
22. PROVIDE WATERTIGHT HUBS FOR ALL CONDUIT ENTRANCE INTO THE TOP OF THE EQUIPMENT ENCLOSURE.
23. PROVIDE EXPANSION FITTINGS WITH INTERNAL BONDING JUMPER WHEN CROSSING AN EXPANSION JOINT OF BUILDING AND IF THE CONDUIT RUN EXCEEDS 300 FEET.
24. AFTER INSTALLATION OF NEW EQUIPMENT, CONTRACTOR SHALL TEST THE SYSTEM.
25. A FINAL ACCEPTANCE TEST SHALL BE PERFORMED UPON COMPLETION OF INSTALLATION. PROVIDE AS-BUILT DRAWING TO WRTA ENGINEER AFTER ACCEPTANCE TEST. ALSO PROVIDE LABELS, CONDUIT & WIRE TAGS. NAME ID TAG SHALL IDENTIFY EQUIPMENT ID NAME, SOURCE PANEL, AND VOLTAGE.
26. EACH RECEPTACLE CIRCUIT SHALL BE PROVIDED WITH DEDICATED NEUTRAL WIRE AND SHALL BE INDEPENDENT OF LIGHTING CIRCUITS.
27. EACH LIGHTING CIRCUIT SHALL BE PROVIDED WITH DEDICATED NEUTRAL WIRE AND SHALL BE INDEPENDENT OF RECEPTACLE CIRCUITS.
28. MAINTAIN SEPARATION OF EMERGENCY CIRCUIT WIRING FROM NORMAL CIRCUIT WIRING AND STANDBY CIRCUIT WIRING, IN ACCORDANCE WITH NATIONAL ELECTRICAL CODE.
29. UNLESS COORDINATED IN ADVANCE WITH THE OWNER; WORK THAT REQUIRES OUTAGES FOR CUTTING OF EXISTING LINES OR DE-ENERGIZATION OF EQUIPMENT SHALL BE ACCOMPLISHED OUTSIDE OF NORMAL OWNER WORKING HOURS AS SCHEDULED BY THE OWNER, AT NO ADDITIONAL COST TO THE OWNER. OUTAGES SHALL BE KEPT TO THE SHORTEST POSSIBLE LENGTH OF TIME.
30. RECESSED ELECTRICAL BOXES SHALL NOT BE MOUNTED BACK TO BACK IN WALLS. PROVIDE 12" MINIMUM SEPARATION IN NON-RATED PARTITIONS AND 24" MINIMUM SEPARATION IN FIRE RATED PARTITIONS.
31. ALL LIQUID TIGHT SHALL BE LOW SMOKE ZERO HALOGEN (LSZH)

FIRE ALARM NOTES:

1. THE DRAWINGS AND DIAGRAMS IN THE DESIGN SET ARE COPIED FROM THE EXISTING WORCESTER REGIONAL TRANSIT AUTHORITY BUS LOBBY FIRE ALARM CONSTRUCTION DRAWINGS. THE NEW WORK SHALL BE COMPLETED BY A LICENSED ELECTRICAL CONTRACTOR. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING AND INSTALLING ALL FIRE ALARM SYSTEM COMPONENTS, DEVICES, WIRING, CONDUIT AND REQUIRED HARDWARE. THE CONTRACTOR SHALL ALSO BE RESPONSIBLE FOR SUB-CONTRACTING SIMPLEX GRINNELL OR APPROVED EQUAL LICENSED FIRE ALARM VENDOR/DISTRIBUTOR. THIS SUB-CONTRACTOR SHALL BE RESPONSIBLE TO PROVIDE THE CONTRACTOR ALL THE REQUIRED FIRE ALARM COMPONENTS AND PANELS, TECHNICAL SUPPORT, ASSISTANCE WITH SHOP DRAWING, SYSTEM PROGRAMMING AND TESTING AS WELL AS OVERALL INSTALLATION.
2. ALL ELECTRICAL WORK SHALL FOLLOW THE APPLICABLE SECTIONS OF THE BUILDING CODE OF MASSACHUSESTTS: CMR 780, CMR 527, NFPA 72 AND NATIONAL ELECTRIC CODE (NEC). ALL WIRING REQUIREMENTS SHALL BE VERIFIED WITH THE FIRE ALARM SYSTEM CONTRACTOR AND MANUFACTURERS. ALL CONDUIT SHALL BE SIZED TO MEET SPECIFICATIONS AND NEC. THE MINIMUM SIZE OF CONDUIT SHALL BE 3/4".
3. PROVIDE APPROVED UL LISTED FIRE STOP ASSEMBLIES FOR EVERY FLOOR, WALL AND BARRIER PENETRATION TO MAINTAIN FIRE SMOKE RATINGS. ALL FAS CONDUITS, JUNCTION BOXES, AND TERMINAL BOXES SHALL BE PAINTED FIRE DEPARTMENT RED, IN ACCORDANCE WITH CODE.
4. DRAWINGS ARE DIAGRAMMATIC AND INDICATE GENERAL ARRANGEMENT OF SYSTEMS AND WORK. THE DIMENSIONS, LOCATIONS AND CONDITIONS SHOWN ARE APPROXIMATE. TAKE MEASUREMENTS IN THE FIELD, NOT FROM DIMENSIONS PROVIDED HEREIN. VERIFY ALL EXISTING CONDITIONS AND DIMENSIONS IN THE FIELD PRIOR TO ORDERING ANY MATERIALS AND EQUIPMENT AND PERFORMING WORK AND NOTIFY THE ENGINEER OF ANY DISCREPANCIES AND CHANGES. CONTRACTOR SHALL BE RESPONSIBLE TO PROVIDE ALL THE FINAL QUANTITIES OF BOOSTER POWER SUPPLIES BASED ON TOTAL CURRENT DRAW AND AMPLIFIERS BASED ON TOTAL REQUIRED WATTAGE.
5. CONTRACTOR SHALL CHECK DRAWINGS OF OTHER TRADES TO VERIFY ADDITIONAL INTERFACE REQUIREMENTS & COORDINATION.
6. THE AUDIO DEVICES SHALL BE TESTED AND ENSURED TO MEET SOUND LEVEL REQUIREMENTS PER NFPA 72.
7. AT THE COMPLETION OF ALL INSTALLATIONS, THE CONTRACTOR SHALL PERFORM ACCEPTANCE TESTING IN ACCORDANCE WITH NFPA 72. THE CONTRACTOR SHALL PROVIDE ADEQUATE PERSONNEL FOR ALL PRE-TESTING AND FD INSPECTIONS.
8. ALL FIRE ALARM JUNCTION BOXES TO BE CLEARLY MARKED FOR EASY IDENTIFICATION. COVERS SHALL BE PAINTED "FIRE DEPARTMENT RED".
9. CABINET TERMINALS SHALL BE NUMBERED AND CODED.
10. MINIMUM WIRE SIZE ALLOWED SHALL BE 16 AWG, 18 AWG WIRE SHALL NOT BE USED.
11. FIRE ALARM CIRCUITS SHALL BE IDENTIFIED IN ACCORDANCE WITH APPROPRIATE SECTION OF NEC 760, MARK ALL FIRE ALARM WIRES IN ACCORDANCE WITH THE NFPA 70, ARTICLE 760 FOR POWER LIMITED AND NON-POWER LIMITED WIRE.
12. CONTRACTOR SHALL FIELD VERIFY AND CONFIRM ENVIRONMENTAL CONDITIONS FOR FIRE ALARM DEVICE PLACEMENT. AREAS THAT WILL REQUIRE A MODIFIED LAYOUT SHALL BE IDENTIFIED; NOTIFYING ENGINEER OF RECORD PRIOR TO FINALIZING FIRE ALARM DRAWINGS.

EXISTING EQUIPMENT LEGEND

SYMBOL	DESCRIPTION
X	EXISTING EQUIPMENT TO BE REMOVED
XM	EXISTING EQUIPMENT TO REMAIN
XR	EXISTING EQUIPMENT TO BE RELOCATED
	EXISTING EQUIPMENT TO BE REMOVED - (X) INDICATED BY SYMBOL WITH DASHED AND IN FUNCTION LINE TYPE
	EXISTING EQUIPMENT TO REMAIN FOR INFORMATION ONLY - (XM) INDICATED BY SYMBOL WITH LIGHT OUT OF FUNCTION LINE TYPE

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PROJECT IDENTIFICATION

WORCESTER REGIONAL TRANSIT AUTHORITY

MAIN LOBBY RENOVATION

MARK	DATE	DESCRIPTION	BY

ISSUE BLOCK

PROJECT NO.:	4022461
DESIGNED BY:	AR
DRAWN BY:	WH
CHECKED BY:	JV
APPROVED BY:	MS
DATE:	01/27/2025

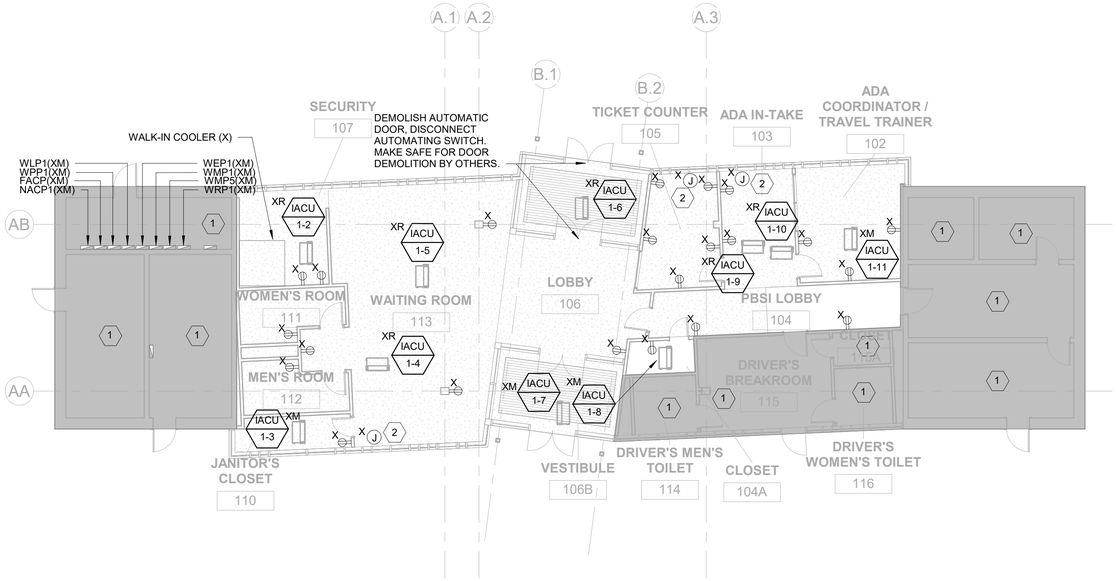
SHEET TITLE

LEGEND, NOTES, & ABBREVIATIONS

E-001

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DEMOLITION LEVEL 1 POWER PLAN

1" = 10'-0"



DEMOLITION LEVEL 1 FIRE ALARM PLAN

1" = 10'-0"

GENERAL NOTES

1. FOR LEGEND, NOTES AND ABBREVIATIONS REFER TO SHEET E-001.

2. FOR SCHEDULE OF EXISTING PANELS, SEE SHEET ED-901 & ED-902.

3. EQUIPMENT LOCATIONS ON THE DEMOLITION PLAN WERE COPIED FROM THE EXISTING CONSTRUCTION DRAWINGS. THE QUANTITY AND LOCATION OF THE EQUIPMENT SHALL BE CONFIRMED BY EC PRIOR TO BID PROPOSAL.

4. EXISTING FIRE ALARM DEVICES THAT ARE NOT BEING DEMOLISHED SHALL BE REWIRED TO REMAIN OPERATIONAL DURING CONSTRUCTION.

KEYNOTES

1. THE EXISTING POWER AND FIRE ALARM EQUIPMENT IN THIS SPACE TO REMAIN. ENSURE POWER AND FIRE ALARM EQUIPMENT REMAIN POWERED AND OPERATIONAL THROUGH CONSTRUCTION FOR THE ROOMS' CONTINUED USE.

2. DEMOLISH ALL JUNCTION BOXES USED FOR MOTORIZED SHADES, ALONG WITH THEIR ASSOCIATED CONDUITS, CABLES, AND SUPPORTS BACK TO THE SOURCE.

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MAIN LOBBY RENOVATION

MARK	DATE	DESCRIPTION	BY

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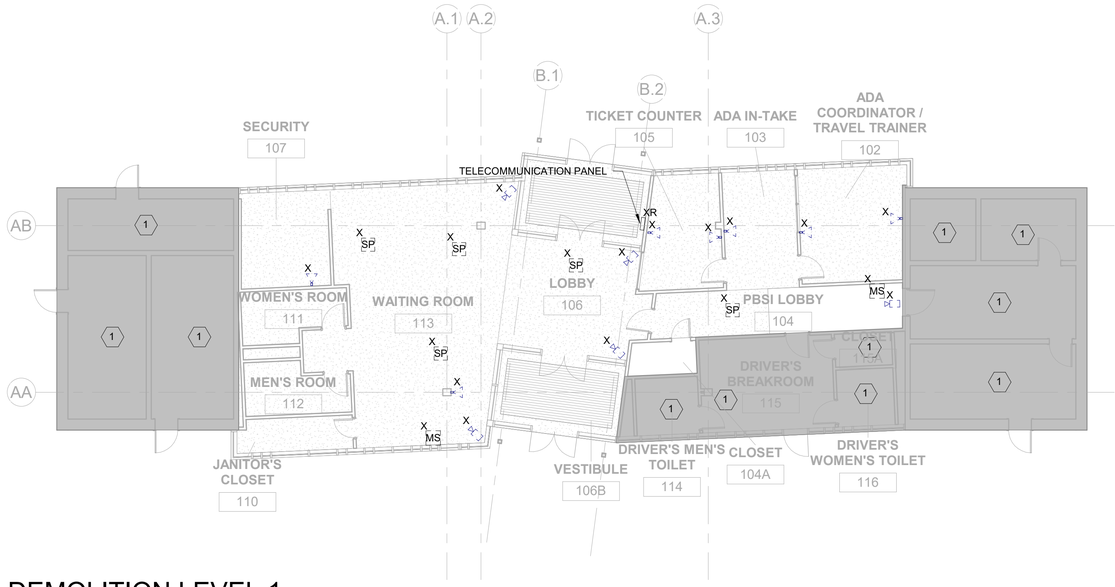
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DEMOLITON LEVEL 1 POWER & FIRE ALARM PLAN

ED-101

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DEMOLITION LEVEL 1 SECURITY, COMMS, & DATA PLAN

1" = 10'-0"

GENERAL NOTES

1. FOR LEGEND, NOTES AND ABBREVIATIONS REFER TO SHEET E-001.

2. FOR SCHEDULE OF EXISTING PANELS, SEE SHEET ED-901 & ED-902.

3. EQUIPMENT LOCATIONS ON THE DEMOLITION PLAN WERE COPIED FROM THE EXISTING CONSTRUCTION DRAWINGS. THE QUANTITY AND LOCATION OF THE EQUIPMENT SHALL BE CONFIRMED BY EC PRIOR TO BID PROPOSAL.

KEYNOTES

1. THE EXISTING SECURITY, COMMS, & DATA EQUIPMENT IN THIS SPACE TO REMAIN. ENSURE SECURITY, COMMS, & DATA EQUIPMENT REMAIN POWERED AND OPERATIONALTHROUGH CONSTRUCTION FOR THE ROOMS' CONTINUED USE.

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MAIN LOBBY RENOVATION

MARK	DATE	DESCRIPTION	BY

ISSUE BLOCK

PROJECT NO.:	4022461
DESIGNED BY:	AR
DRAWN BY:	WH
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APPROVED BY:	MS
DATE:	01/27/2025

SHEET TITLE

DEMO LEVEL 1 SECURITY, COMMS, & DATA PLAN

ED-102

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DEMOLITION LEVEL 1 LIGHTING PLAN

1/8" = 1'-0"

GENERAL NOTES

1. FOR LEGEND, NOTES AND ABBREVIATIONS REFER TO SHEET E-001.

2. FOR SCHEDULE OF EXISTING PANELS, SEE SHEET ED-901 & ED-902.

3. EQUIPMENT LOCATIONS ON THE DEMOLITION PLAN WERE COPIED FROM THE EXISTING CONSTRUCTION DRAWINGS. THE QUANTITY AND LOCATION OF THE EQUIPMENT SHALL BE CONFIRMED BY EC PRIOR TO BID PROPOSAL.

4. DEMOLISH ALL LIGHTING FIXTURES AND EXIST SIGNS, ALONG WITH THEIR ASSOCIATED SWITCHES, BOXES, CONDUITS, CABLES, AND SUPPORTS BACK TO THE SOURCE.

KEYNOTES

1. THE EXISTING LIGHTING FIXTURES IN THIS SPACE TO REMAIN. ENSURE LIGHTING FIXTURES REMAIN POWERED THROUGH CONSTRUCTION FOR THE ROOMS' CONTINUED USE.

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MAIN LOBBY RENOVATION

MARK	DATE	DESCRIPTION	BY

ISSUE BLOCK

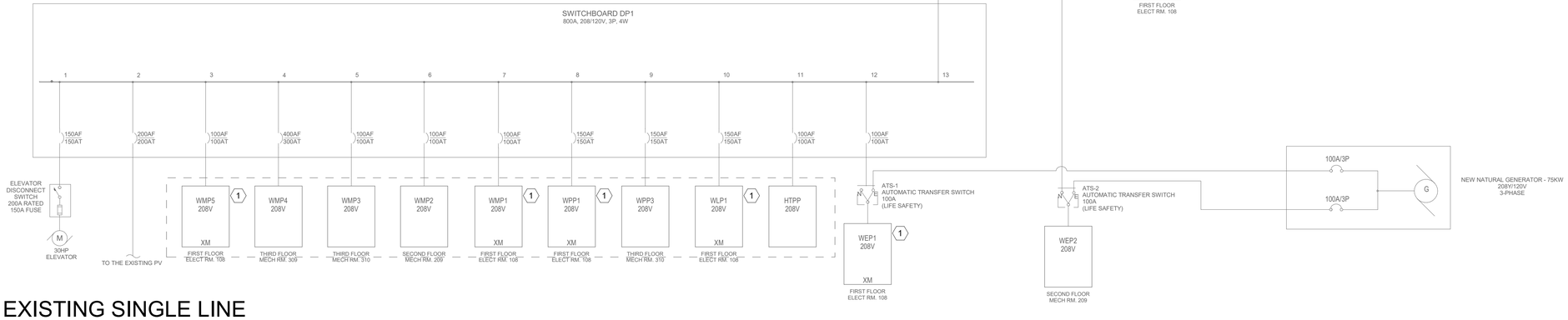
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CHECKED BY:	JV
APPROVED BY:	MS
DATE:	01/27/2025

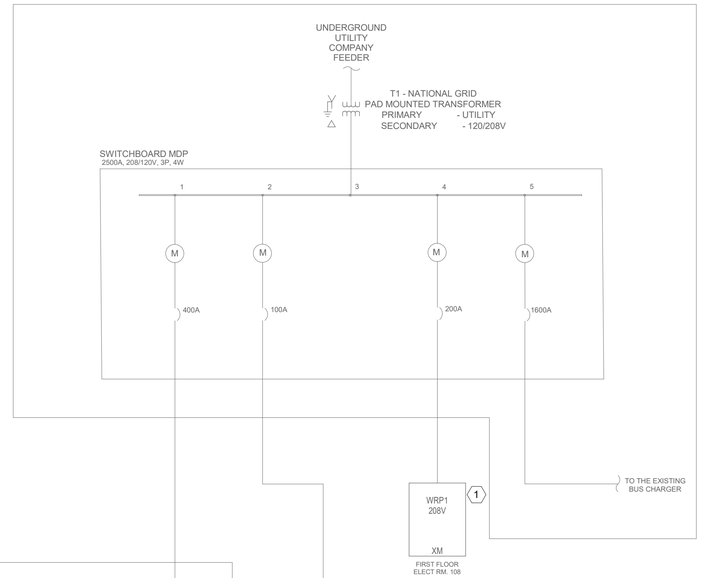
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DEMOLITION LEVEL 1 LIGHTING PLAN

ED-201

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GENERAL NOTES

1. FOR LEGEND, NOTES AND ABBREVIATIONS REFER TO SHEET E-001.

2. FOR SCHEDULE OF EXISTING PANELS, SEE SHEET ED-901 & ED-902.

KEYNOTES

1. THE PANEL WILL BE MODIFIED ACCORDING TO THE DESIGN NEEDS. REFER TO THE PANEL SCHEDULES FOR THE NECESSARY CHANGES.

EXISTING SINGLE LINE DIAGRAM

N.T.S.

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MAIN LOBBY RENOVATION

MARK	DATE	DESCRIPTION	BY

ISSUE BLOCK

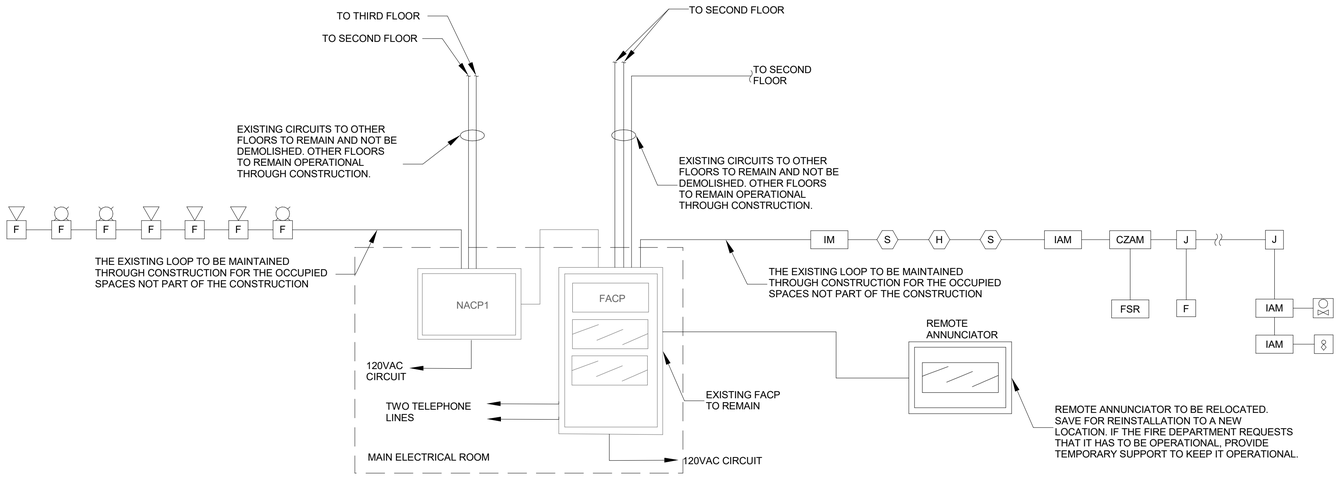
PROJECT NO.:	4022461
DESIGNED BY:	AR
DRAWN BY:	WH
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APPROVED BY:	MS
DATE:	01/27/2025

SHEET TITLE

EXISTING SINGLE LINE DIAGRAM

ED-601

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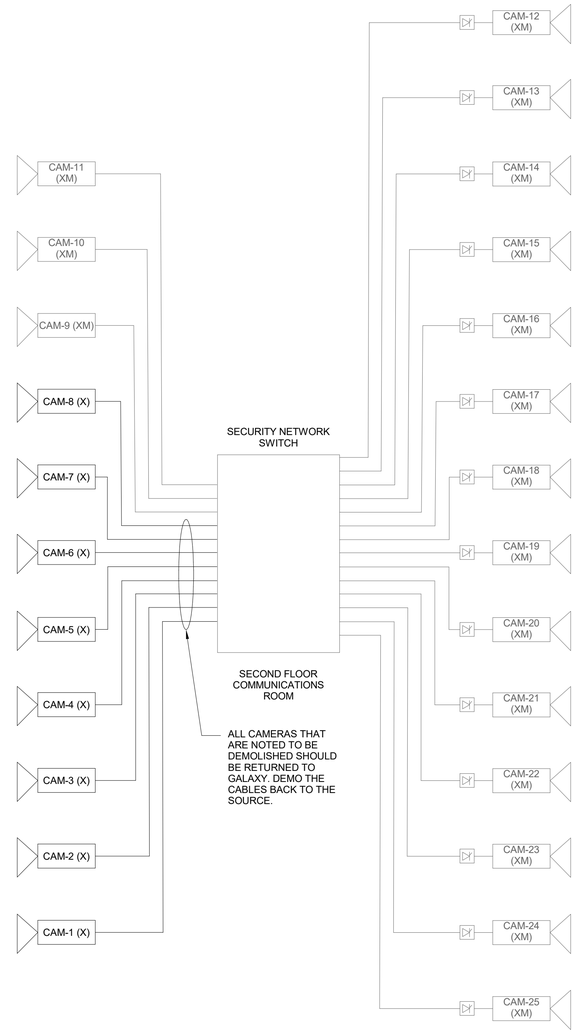
*NOTE: ONE LINE IS N.T.S. AND IS MEANT TO BE DIAGRAMMATICAL

EXISTING FIRE ALARM ONELINE

-

CCTV CAMERA SCHEDULE

CAMERA	LOCATION
CAM-1 (X)	NORTH ENTRANCE
CAM-2 (X)	SOUTH ENTRANCE
CAM-3 (X)	WAITING
CAM-4 (X)	WAITING
CAM-5 (X)	WEST ENTRANCE
CAM-6 (X)	104 CORRIDOR
CAM-7 (X)	ELEVATOR LOBBY
CAM-8 (X)	SOUTHEAST ENTRANCE
CAM-9 (XM)	NORTH EXTERIOR ENTRANCE
CAM-10 (XM)	NORTH DRIVE ENTRANCE
CAM-11 (XM)	N.E. ENTRANCE
CAM-12 (XM)	S.E. ENTRANCE UNDER CANOPY
CAM-13 (XM)	N.S. CANOPY WALKWAY
CAM-14 (XM)	WEST VIEW UNDER CANOPY
CAM-15 (XM)	EAST VIEW UNDER CANOPY
CAM-16 (XM)	BUS DOOR
CAM-17 (XM)	BUS DOOR
CAM-18 (XM)	BUS DOOR
CAM-19 (XM)	BUS DOOR
CAM-20 (XM)	BUS DOOR
CAM-21 (XM)	BUS DOOR
CAM-22 (XM)	BUS DOOR
CAM-23 (XM)	BUS DOOR
CAM-24 (XM)	UNDER CANOPY WALK TO WEST
CAM-25 (XM)	UNDER CANOPY WALK TO WEST



EXISTING CAMERA ONELINE

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MAIN LOBBY RENOVATION

MARK	DATE	DESCRIPTION	BY

ISSUE BLOCK

PROJECT NO.:	4022461
DESIGNED BY:	AR
DRAWN BY:	WH
CHECKED BY:	JV
APPROVED BY:	MS
DATE:	01/27/2025

SHEET TITLE

DEMOLITION FA & CAMERA ONE LINE & SCHEDULE

ED-701

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Branch Panel: WPP1 (XM)

Location:	ELECTRICAL ROOM 108	**Volts:**	208/120 V	**A.I.C. Rating:**	42kA
Supply From:	-	**Phases:**	3	**Mains Type:**	MLO
Mounting:	Surface	**Wires:**	4	**Mains Rating:**	
Enclosure:	NEMA 1			**MLO Rating:**	150 A

CKT.	Circuit Description	Trip	Poles	A		B		C		Poles	Trip	Circuit Description	CKT.
1	ELECTRICAL ROOM 108 GFCI (XM)	20 A	1	540	900					1	20 A	TICKET COUNTER ROOM 105 RECEPTACLES (X)	2
3	MECHANICAL ROOM 109 RECEPTACLES (XM)	20 A	1			540	360			1	20 A	ADA IN-TAKE ROOM 103 RECEPTACLES (X)	4
5	TOILET ROOM GCFI (X)	20 A	1					360	540	1	20 A	ADA COORDINATOR 102 RECEPTACLES (X)	6
7	WAITING ROOM & ROOM 110 RECEPTACLES (X)	20 A	1	540	360					1	20 A	PBSI LOBBY RECEPTACLES (X)	8
9	AUTOMATIC DOORS (XM)	20 A	1			600	360			1	20 A	STORAGE ROOMS RECEPTACLES (XM)	10
11	AUTOMATIC DOORS (X)	20 A	1					600	360	1	20 A	DRIVER BREAKER ROOM RECEPTACLES (XM)	12
13	TICKET MACHINE (X)	20 A	1	600	360					1	20 A	-	14
15	OUTDOOR RECEPTACLES (XM)	20 A	1			1080	540			1	20 A	ELEVATOR LOBBY RECEPTACLES (XM)	16
17	ELEVATOR PIT LIGHTING (XM)	20 A	1					200	1261	1	20 A	ROOMS 109, 110, 107, 112, 111 LIGHTING (XM)	18
19	CANOPY TICKET MACHINE (XM)	20 A	1	600	684					1	20 A	ROOMS 106, 106A, & 106B LIGHTING (XM)	20
21	CANOPY RECEPTACLES (ADD ALT #2) (XM)	20 A	1			360	253			1	20 A	PBSI LOBBY LIGHTING (XM)	22
23	CANOPY RECEPTACLES (XM)	20 A	1					360	836	1	20 A	ROOMS 105, 102, 115, 104A, 115A LTG (XM)	24
25	CANOPY RECEPTACLES (XM)	20 A	1	360	304					1	20 A	ELEVATOR LOBBY LIGHTING (XM)	26
27	GENERATOR BATTERY CHARGER (XM)	20 A	1			1500	1440			1	20 A	DIGITAL SIGN (XM)	28
29	GENERATOR HEATER (XM)	20 A	1					1920	1440	1	20 A	DIGITAL SIGN (XM)	30
31	GENERATOR ENCLOSURE RECEPT. (XM)	20 A	1	180	1440					1	20 A	DIGITAL SIGN (XM)	32
33	FIRE/SMOKE DAMPER (XM)	20 A	1			1200	600			1	20 A	RIFID DEVICES (XM)	34
35	FIRE/SMOKE DAMPER (XM)	20 A	1					1200	600	1	20 A	RIFID DEVICES (XM)	36
37	SPARE	20 A	1							1	20 A	SPARE	38
39	SPARE	20 A	1							1	20 A	SPARE	40
41	SPARE	20 A	1							1	20 A	SPARE	42
		Total Load:		6868	VA	8833	VA	9677	VA				
		Total Load:		57.2	A	73.6	A	80.6	A				

Load Classification	Connected Load		Demand Factor		Estimated Demand		Panel Totals		
HVAC	0	VA	#NUM!	%	#NUM!	VA			
Receptacle	0	VA	NOTE 1.	%	0	VA	Total Connected Load	25378.0	VA
Power	0	VA	1	%	0	VA	Total Estimated Demand	#NUM!	VA
Lighting	0	VA	1	%	0	VA	Total Connected Current	70.5	A
Motor	0	VA	0.6	%	0	VA	Total Estimated Demand Current	#NUM!	A
Other		VA		%	0	VA			

Branch Panel: WLP1 (XM)

Location:	ELECTRICAL ROOM 108	**Volts:**	208/120 V	**A.I.C. Rating:**	42kA
Supply From:	-	**Phases:**	3	**Mains Type:**	MLO
Mounting:	Surface	**Wires:**	4	**Mains Rating:**	
Enclosure:	NEMA 1			**MLO Rating:**	150 A

CKT.	Circuit Description	Trip	Poles	A		B		C		Poles	Trip	Circuit Description	CKT.
1	SITE LIGHTING (XM)	20 A	1	1650	1100					1	20 A	SITE LIGHTING (XM)	2
3	WALL WASHER LIGHTING (XM)	20 A	1			855	970			1	20 A	SITE LIGHTING (XM)	4
5	SITE LIGHTING (XM)	20 A	1					1650	380	1	20 A	IN-GROUND LIGHTING (XM)	6
7	SITE LIGHTING (XM)	20 A	1	1650	970					1	20 A	SITE LIGHTING (XM)	8
9	SITE LIGHTING (XM)	20 A	1			1650	390			1	20 A	FLAG POLE LIGHTING (XM)	10
11	PEDESTRIAN WARNING SYSTEM (XM)	20 A	1					600	1222	1	20 A	BOLLARD LIGHTING (XM)	12
13	PEDESTRIAN WARNING SYSTEM (XM)	20 A	1	600	1650					1	20 A	SITE LIGHTING (XM)	14
15	PEDESTRIAN WARNING SYSTEM (XM)	20 A	1			600	600			1	20 A	WRTA SIGN (BUILDING MOUNTED) (XM)	16
17	PEDESTRIAN WARNING SYSTEM (XM)	20 A	1					600	600	1	20 A	WRTA SIGN (BUILDING MOUNTED) (XM)	18
19	CANOPY LIGHTING (XM)	20 A	1	665	190					1	20 A	CANOPY LIGHTING (BID ALT. #2) (XM)	20
21	CANOPY LIGHTING (XM)	20 A	1			1330	380			1	20 A	CANOPY LIGHTING (BID ALT. #2) (XM)	22
23	CANOPY LIGHTING (XM)	20 A	1					855	665	1	20 A	CANOPY LIGHTING (BID ALT. #2) (XM)	24
25	CANOPY LIGHTING (XM)	20 A	1	855	950					1	20 A	CANOPY LIGHTING (BID ALT. #2) (XM)	26
27	CANOPY LIGHTING (XM)	20 A	1			855				1	20 A	SPARE	28
29	CANOPY LIGHTING (XM)	20 A	1					855		1	20 A	SPARE	30
31	CANOPY LIGHTING (XM)	20 A	1	950						1	20 A	SPARE	32
33	CANOPY LIGHTING (XM)	20 A	1			380				1	20 A	SPARE	34
35	CANOPY LIGHTING (XM)	20 A	1					190		1	20 A	SPARE	36
37	SPARE	20 A	1							1	20 A	SPARE	38
39	SPARE	20 A	1							1	20 A	SPARE	40
41	SPARE	20 A	1							1	20 A	SPARE	42
		Total Load:		11230	VA	8010	VA	7617	VA				
		Total Amps:		93.6	A	66.8	A	63.5	A				

Load Classification	Connected Load		Demand Factor		Estimated Demand		Panel Totals		
HVAC	0	VA	#NUM!	%	#NUM!	VA			
Receptacle	0	VA	NOTE 1.	%	0	VA	Total Connected Load	26857.0	VA
Power	0	VA	1	%	0	VA	Total Estimated Demand	#NUM!	VA
Lighting	0	VA	1	%	0	VA	Total Connected Current	74.6	A
Motor	0	VA	0.6	%	0	VA	Total Estimated Demand Current	#NUM!	A
Other		VA		%	0	VA			

Branch Panel: EMERGENCY PANEL - WEP1 (XM)

Location:	ELECTRICAL ROOM 108	**Volts:**	208/120 V	**A.I.C. Rating:**	42kA
Supply From:	-	**Phases:**	3	**Mains Type:**	MLO
Mounting:	Surface	**Wires:**	4	**Mains Rating:**	
Enclosure:	NEMA 1			**MLO Rating:**	150 A

CKT.	Circuit Description	Trip	Poles	A		B		C		Poles	Trip	Circuit Description	CKT.
1	FIRST FLOOR EMERGENCY LIGHTING (XM)	20 A	1	820	441					1	20 A	STAIRWELL LIGHTING (XM)	2
3	SECOND FLOOR EMERGENCY LIGHTING (XM)	20 A	1			355	441			1	20 A	STAIRWELL LIGHTING (XM)	4
5	THIRD FLOOR EMERGENCY LIGHTING (XM)	20 A	1					703	600	1	20 A	FACP (XM)	6
7	PENTHOUSE EMERGENCY LIGHTING (XM)	20 A	1	139	600					1	20 A	NACP1 (XM)	8
9	OUTDOOR EGRESS LIGHTING (XM)	20 A	1			239	600			1	20 A	NACP2 (XM)	10
11	FIRST FLOOR EXIT SIGNS (X)	20 A	1					45		1	20 A	SPARE	12
13	SECOND FLOOR EXIT SIGNS (XM)	20 A	1	20						1	20 A	SPARE	14
15	THIRD FLOOR & PENTHOUSE EXIT SIGNS (XM)	20 A	1			45				1	20 A	SPARE	16
17	SPARE	20 A	1							1	20 A	SPARE	18
19	SPARE	20 A	1							1	20 A	SPARE	20
21	-	-	-							-	-	-	22
23	-	-	-							-	-	-	24
25	-	-	-							-	-	-	26
27	-	-	-							-	-	-	28
29	-	-	-							-	-	-	30
31	-	-	-							-	-	-	32
33	-	-	-							-	-	-	34
35	-	-	-							-	-	-	36
37	-	-	-							-	-	-	38
39	-	-	-							-	-	-	40
41	-	-	-							-	-	-	42
		Total Load:		2020	VA	1680	VA	1348	VA				
		Total Amps:		16.8	A	14.0	A	11.2	A				

Load Classification	Connected Load		Demand Factor		Estimated Demand		Panel Totals		
HVAC	0	VA	#NUM!	%	#NUM!	VA			
Receptacle	0	VA	NOTE 1.	%	0	VA	Total Connected Load	5048.0	VA
Power	0	VA	1	%	0	VA	Total Estimated Demand	#NUM!	VA
Lighting	0	VA	1	%	0	VA	Total Connected Current	14.0	A
Motor	0	VA	0.6	%	0	VA	Total Estimated Demand Current	#NUM!	A
Other		VA		%	0	VA			

Branch Panel: WMP1 (XM)

Location:	ELECTRICAL ROOM 108	**Volts:**	208/120 V	**A.I.C. Rating:**	42kA
Supply From:	-	**Phases:**	3	**Mains Type:**	MLO
Mounting:	Surface	**Wires:**	4	**Mains Rating:**	
Enclosure:	NEMA 1			**MLO Rating:**	225 A

CKT.	Circuit Description	Trip	Poles	A		B		C		Poles	Trip	Circuit Description	CKT.
1	IACU-1-1 (XM)	15 A	2	19.76	162.24					2	15 A	IACU-1-8 (XM)	2
3						19.76	162.24						4
5	IACU-1-2 (XR)	15 A	2					162.24	109.2	2	15 A	IACU-1-9 (XR)	6
7				162.24	109.2								8
9	IACU-1-3 (XM)	15 A	2			125.84	109.2			2	15 A	IACU-1-10 (XR)	10
11								125.84	109.2				12
13	IACU-1-4 (XR)	15 A	2	125.84	109.2					2	15 A	IACU-1-11 (XM)	14
15						125.84	109.2						16
17	IACU-1-5 (XR)	15 A	2					109.2	109.2	2	15 A	IACU-1-12 (XM)	18
19				109.2	109.2								20
21	IACU-1-6 (XR)	15 A	2			109.2	109.2			2	15 A	IACU-1-13 (XM)	22
23								109.2	109.2				24
25	IACU-1-7 (XM)	15 A	2	125.84	20					2	15 A	IACU-1-14 (XM)	26
27						125.84	20						28
29	BCC-1-1 (X)	15 A	2					88.4	82	2	15 A	BCC-1-2 (X)	30
31				88.4	82								32
33	EWH-1 (XM)	20 A	1			750	480			1	20 A	HWB-1 (XM)	34
35	EWH-2 (XM)	20 A	1					1000	480	1	20 A	HWB-2 (XM)	36
37	CP-1 (XM)	20 A	1	62						1	20 A	SPARE	38
39	DWH-1 (XM)	20 A	1			1080				1	20 A	SPARE	40
41	SPARE	20 A	1							1	20 A	SPARE	42
		Total Load:		1285	VA	3326	VA	2594	VA				
		Total Amps:		10.7	A	27.7	A	21.6	A				

Load Classification	Connected Load		Demand Factor		Estimated Demand		Panel Totals		
HVAC	0	VA	#NUM!	%	#NUM!	VA			
Receptacle	0	VA	NOTE 1.	%	0	VA	Total Connected Load	7205.4	VA
Power	0	VA	1	%	0	VA	Total Estimated Demand	#NUM!	VA
Lighting	0	VA	1	%	0	VA	Total Connected Current	20.0	A
Motor	0	VA	0.6	%	0	VA	Total Estimated Demand Current	#NUM!	A
Other		VA		%	0	VA			

GENERAL NOTES

1. FOR LEGEND, NOTES AND ABBREVIATIONS REFER TO SHEET E-001.

2. EXISTING CIRCUITS IN GRAY WERE COPIED FROM THE EXISTING CONSTRUCTION DRAWINGS. CIRCUITS SHALL BE CONFIRMED BY EC PRIOR TO BID PROPOSAL.

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PROJECT IDENTIFICATION

WORCESTER REGIONAL TRANSIT AUTHORITY

MAIN LOBBY RENOVATION

MARK	DATE	DESCRIPTION	BY

ISSUE BLOCK

PROJECT NO.:	4022461
DESIGNED BY:	AR
DRAWN BY:	WH
CHECKED BY:	JV
APPROVED BY:	MS
DATE:	01/27/2025

SHEET TITLE

EXISTING PANEL SCHEDULES (SHEET 1 OF 2)

ED-901

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Branch Panel: WMP5 (XM)

Location:	ELECTRICAL ROOM 108			**Volts:**	208/120 V			**A.I.C. Rating:**	42kA				
Supply From:	-			**Phases:**	3			**Mains Type:**	MLO				
Mounting:	Surface			**Wires:**	4			**Mains Rating:**					
Enclosure:	NEMA 1							**MLO Rating:**	225 A				

CKT.	Circuit Description	Trip	Poles	A		B		C		Poles	Trip	Circuit Description	CKT.
1	P-1 (XM)	20 A	3	1320	1320					3	20 A	P-2 (XM)	2
3						1320	1320						4
5								1320	1320				6
7	EUH-1 (XM)	25 A	2	1650	1650					2	25 A	EUH-2 (XM)	8
9						1650	1650						10
11	-											-	12
13	-											-	14
15	-											-	16
17	-											-	18
19	-											-	20
21	-											-	22
23	-											-	24
25	-											-	26
27	-											-	28
29	-											-	30
31	-											-	32
33	-											-	34
35	-											-	36
37	-											-	38
39	-											-	40
41	-											-	42
		Total Load:		5940	VA	5940	VA	2640	VA				
		Total Amps:		49.5	A	49.5	A	22.0	A				

Load Classification	**Connected Load**		**Demand Factor**		**Estimated Demand**		**Panel Totals**		
HVAC	0	VA	#NUM!	%	#NUM!	VA			
Receptacle	0	VA	NOTE 1.	%	0	VA	Total Connected Load	14520.0	VA
Power	0	VA	1	%	0	VA	Total Estimated Demand	#NUM!	VA
Lighting	0	VA	1	%	0	VA	Total Connected Current	40.3	A
Motor	0	VA	0.6	%	0	VA	Total Estimated Demand Current	#NUM!	A
Other		VA		%	0	VA			

Branch Panel: WRP1 (XM)

Location:	ELECTRICAL ROOM 108			**Volts:**	208/120 V			**A.I.C. Rating:**	42kA				
Supply From:	-			**Phases:**	3			**Mains Type:**	MCB				
Mounting:	Surface			**Wires:**	4			**Mains Rating:**					
Enclosure:	NEMA 1							**MLO Rating:**	225 A				

CKT.	Circuit Description	Trip	Poles	A		B		C		Poles	Trip	Circuit Description	CKT.
1	COUNTER RECEPTACLES (X)	20 A	1	600	1920					3	20 A	WALK-IN COOLER (X)	2
3	COUNTER RECEPTACLES (X)	20 A	1			600	1920						4
5	RETAIL AREA RECEPTACLES (X)	20 A	1					180	1920				6
7	SPARE	20 A	1		1920					1	20 A	BAKERY DISPLAY CASE (X)	8
9	SPARE	20 A	1							1	20 A	SPARE	10
11	SPARE	20 A	1							1	20 A	SPARE	12
13	SPARE	20 A	1							1	20 A	SPARE	14
15	SPARE	20 A	1							1	20 A	SPARE	16
17	SPARE	20 A	1							1	20 A	SPARE	18
19	SPARE	20 A	1							1	20 A	SPARE	20
21	SPARE	20 A	1							1	20 A	SPARE	22
23	SPARE	20 A	1							1	20 A	SPARE	24
25	SPARE	20 A	1							1	20 A	SPARE	26
27	SPARE	20 A	1							1	20 A	SPARE	28
29	SPARE	20 A	1							1	20 A	SPARE	30
31	SPARE	20 A	1							1	20 A	SPARE	32
33	SPARE	20 A	1							1	20 A	SPARE	34
35	SPARE	20 A	1							1	20 A	SPARE	36
37	SPARE	20 A	1							1	20 A	SPARE	38
39	SPARE	20 A	1							1	20 A	SPARE	40
41	SPARE	20 A	1							1	20 A	SPARE	42
		Total Load:		4440	VA	2520	VA	2100	VA				
		Total Amps:		37.0	A	21.0	A	17.5	A				

Load Classification	**Connected Load**		**Demand Factor**		**Estimated Demand**		**Panel Totals**		
HVAC	0	VA	#NUM!	%	#NUM!	VA			
Receptacle	0	VA	NOTE 1.	%	0	VA	Total Connected Load	9060.0	VA
Power	0	VA	1	%	0	VA	Total Estimated Demand	#NUM!	VA
Lighting	0	VA	1	%	0	VA	Total Connected Current	25.2	A
Motor	0	VA	0.6	%	0	VA	Total Estimated Demand Current	#NUM!	A
Other		VA		%	0	VA			

GENERAL NOTES

1. FOR LEGEND, NOTES AND ABBREVIATIONS REFER TO SHEET E-001.

2. EXISTING CIRCUITS IN GRAY WERE COPIED FROM THE EXISTING CONSTRUCTION DRAWINGS. CIRCUITS SHALL BE CONFIRMED BY EC PRIOR TO BID PROPOSAL.

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PROJECT IDENTIFICATION

WORCESTER REGIONAL TRANSIT AUTHORITY

MAIN LOBBY RENOVATION

MARK	DATE	DESCRIPTION	BY

ISSUE BLOCK

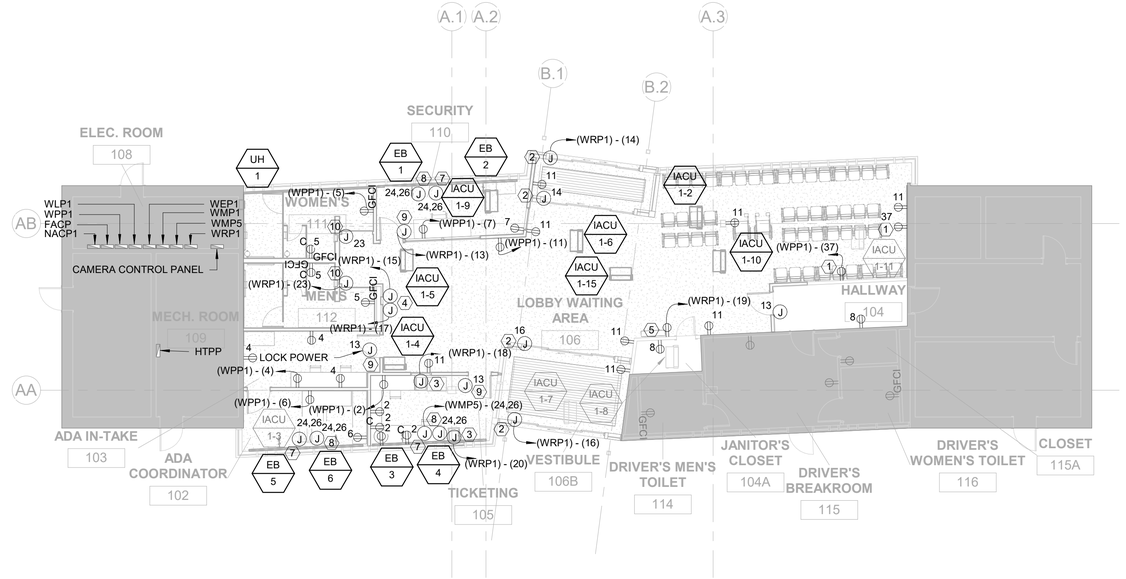
PROJECT NO.:	4022461
DESIGNED BY:	AR
DRAWN BY:	WH
CHECKED BY:	JV
APPROVED BY:	MS
DATE:	01/27/2025

SHEET TITLE

EXISTING PANEL SCHEDULE (SHEET 2 OF 2)

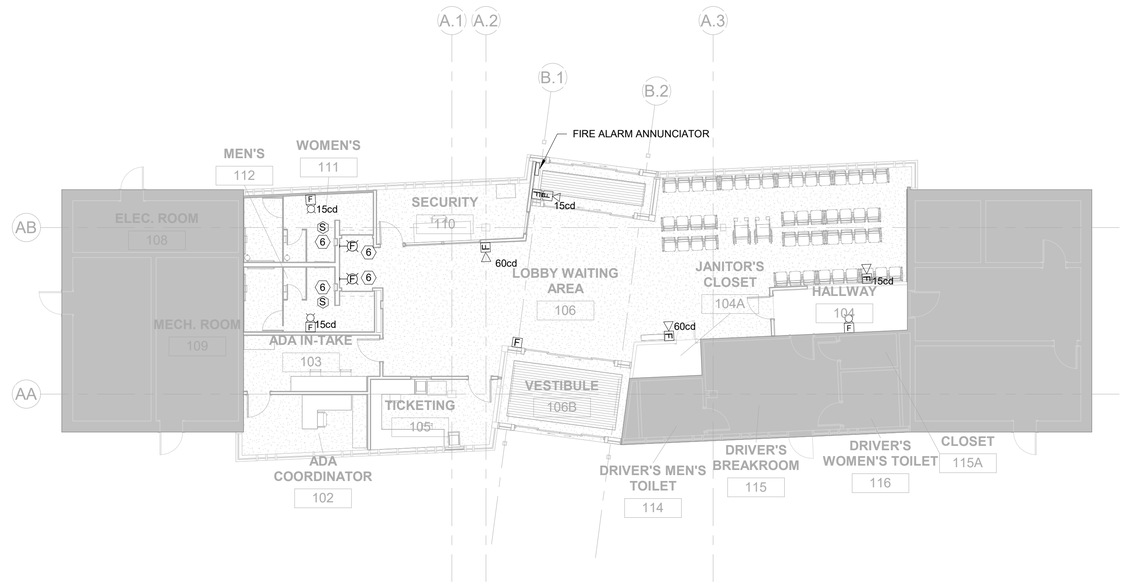
ED-902

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LEVEL 1 POWER PLAN

1" = 10'-0"



LEVEL 1 FIRE ALARM PLAN

1" = 10'-0"

GENERAL NOTES

1. FOR LEGEND, NOTES AND ABBREVIATIONS REFER TO SHEET E-001.

KEYNOTES

1. RECEPTACLE SHALL BE USED FOR A MONITOR. COORDINATE THE HEIGHT AND FINAL LOCATION OF THE RECEPTACLE WITH THE MONITOR INSTALLER.

2. JUNCTION BOX SHALL BE USED FOR SLIDING DOOR POWER CONNECTION.

3. JUNCTION BOX SHALL BE USED FOR FARE VENDING MACHING POWER CONNECTION.

4. JUNCTION BOX SHALL BE USED FOR WATER BOTTLE FILLER POWER CONNECTION.

5. RECEPTACLE SHALL BE USED FOR KIOSK. COORDINATE THE HEIGHT AND FINAL LOCATION OF THE RECEPTACLE WITH THE KIOSK INSTALLER.

6. SMOKE DETECTOR WILL NOT BE TIED INTO THE FIRE ALARM SYSTEM. IN EVENT OF SMOKE, THE STROBE OUTSIDE OF BATHROOM WILL ILLUMINATE. ONLY WRTA PERSONAL CAN RESET THE ALARM.

7. JUNCTION BOXES TO BE FURNISHED BY THE MC.

8. THE BASEBOARD HEATERS WILL BE POWERED VIA MC FURNISHED THERMOSTAT. COORDINATE THERMOSTAT LOCATION WITH THE MC.

9. SEE DOOR WIRING DETAIL ON E-701.

10. JB IS FOR THE COILING DOOR. COORDINATE ELECTRICAL WORK WITH DOOR PROVICER/INSTALLER.

FIRE ALARM NOTES

1. THE BUILDING'S FIRE ALARM SYSTEM MUST REMAIN OPERATIONAL AT ALL TIMES. PLEASE IMPLEMENT TEMPORARY ADJUSTMENTS TO THE NOTIFICATION DEVICES, DECTECTION DEVICES, AND FIRE ALARM PANEL TO ENSURE THAT THE SYSTEM CONTINUES TO FUNCTION EFFECTIVELY.

2. ONCE CONSTRUCTION IS COMPLETED, THE NEW FIRE ALARM NOTIFICATION DETECTION DEVICES SHALL BE CONNECTED TO THE SYSTEM AND THE FIRE ALARM PANEL WILL BE PROPERLY PROGRAMMED.

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MAIN LOBBY RENOVATION

MARK	DATE	DESCRIPTION	BY

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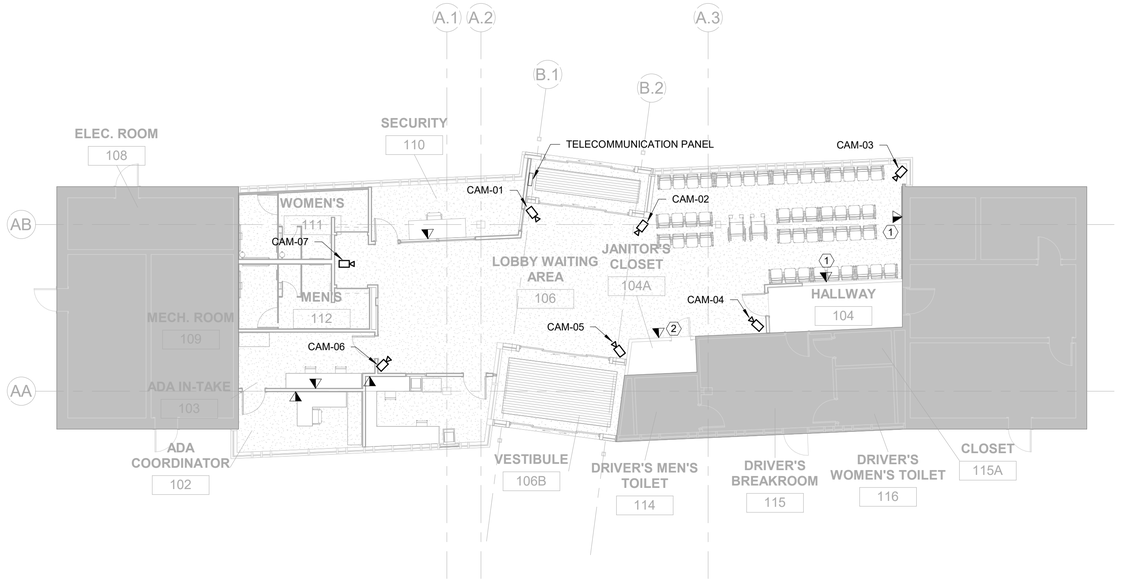
PROJECT NO.:	4022461
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APPROVED BY:	MS
DATE:	01/27/2025

SHEET TITLE

LEVEL 1 POWER & FIRE ALARM PLAN

E-101

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LEVEL 1 SECURITY, COMMS, & DATA PLAN

1" = 10'-0"

GENERAL NOTES

1. FOR LEGEND, NOTES AND ABBREVIATIONS REFER TO SHEET E-001.

2. FOR CAMERA SCHEDULE, SEE E-903.

KEYNOTES

1. RECEPTACLE SHALL BE USED FOR A MONITOR. COORDINATE THE HEIGHT AND FINAL LOCATION OF THE RECEPTACLE WITH THE MONITOR INSTALLER.

2. RECEPTACLE SHALL BE USED FOR KIOSK. COORDINATE THE HEIGHT AND FINAL LOCATION OF THE RECEPTACLE WITH THE KIOSK INSTALLER.

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MARK	DATE	DESCRIPTION	BY

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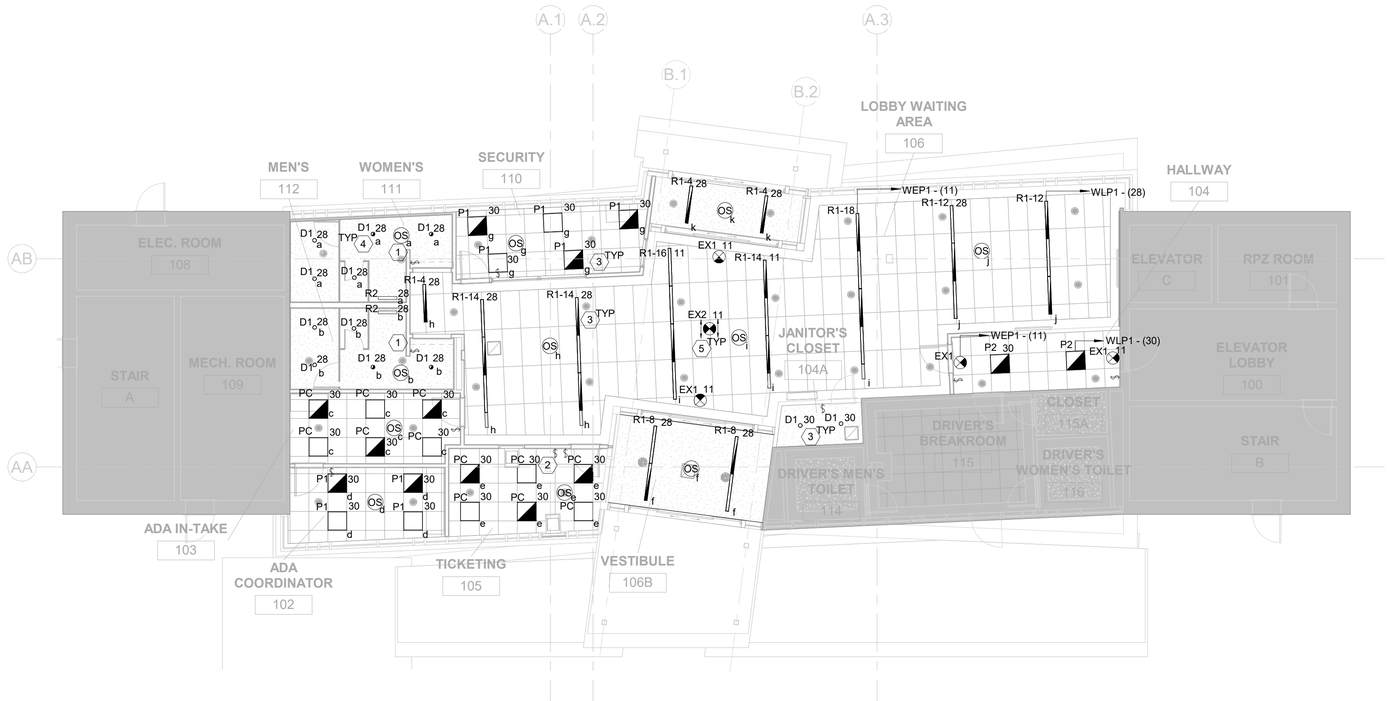
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SHEET TITLE

LEVEL 1 SECURITY, COMMS, & DATA PLAN

E-102

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GENERAL NOTES

1. FOR LEGEND, NOTES AND ABBREVIATIONS REFER TO SHEET E-001.

KEYNOTES

1. LOW VOLTAGE SWITCH SHALL BE KEY-OPERATED.
2. LIGHTING SWITCH SHALL CONTROL LOBBY WAITING AREA LIGHTING.
3. SHADED LIGHTING FIXTURES WILL BE EQUIPPED WITH 10W EMERGENCY BATTERY DRIVER.
4. SHADED LIGHTING FIXTURES WILL BE EQUIPPED WITH 10W EMERGENCY BATTERY DRIVERS AND REGRESSED TEST SWITCH.
5. EXIT SIGN SHALL BE EQUIPPED WITH NINETY MINUTE BATTERY AND SELF DIAGNOSTIC TESTING CAPACITY.

LEVEL 1 LIGHTING PLAN

1/8" = 1'-0"

LIGHTING FIXTURE SCHEDULE

BASIS OF DESIGN

FIXTURE TYPE	MANUFACTURER	CATALOG NUMBER	DESCRIPTION	MOUNTING	LAMP TYPE	VOLTAGE	LUMENS	LAMP WATTS	CRI	COLOR TEMP.	LLF	NOTES
EX1			SINGLE-SIDED CAST ALUMINUM LED EXIT SIGN	SURFACE	LED	120V	-	12	N/A	N/A	N/A	
EX2			DOUBLE-SIDED CAST ALUMINUM LED EXIT SIGN	SURFACE	LED	120V	-	12	N/A	N/A	N/A	
D1	H.E.WILLIAMS	4DR-TL-L20-835-DIM-UNV-LM-OF-CS	4DR 4IN DOWNLIGHT	WALL	LED	120V		19.8	80	3500K	0.95	
R1	H.E.WILLIAMS	LRX3-__-L8-835-DMA-DIM-UNV	LINEAR RECESSED WHITE STEEL HOUSING FROSTED, LENS ENCLOSURE	RECESSED	LED	120V	804	6.9/FT	80	3500K	0.95	1
R2	H.E.WILLIAMS	LRX3-2-L10-835-DMA-DIM-UNV	LINEAR RECESSED WHITE STEEL HOUSING FROSTED, LENS ENCLOSURE	RECESSED	LED	120V	1013	8.9/FT	80	3500K	0.95	
P1	H.E.WILLIAMS	AP-22-L40-835-DIM-UNV	AP LED EDGE-LIT ARCHED PANEL	RECESSED	LED	120V	4026	36.1	80	3500K	0.95	
P2	H.E.WILLIAMS	AP-22-L50-835-DIM-UNV	AP LED EDGE-LIT ARCHED PANEL	RECESSED	LED	120V	5065	45.7	80	3500K	0.95	
PC	H.E.WILLIAMS	APC-22-L30-835-DIM-UNV	AP LED EDGE-LIT ARCHED PANEL	RECESSED	LED	120V	3030	25.4	80	3500K	0.95	

NOTES:
1. FIXTURE IS ROW-MOUNTED AND WILL BE ORDERED BASED ON THE LENGTHS NEEDED. PLEASE SEE E-201 FOR FIXTURE LENGTHS.

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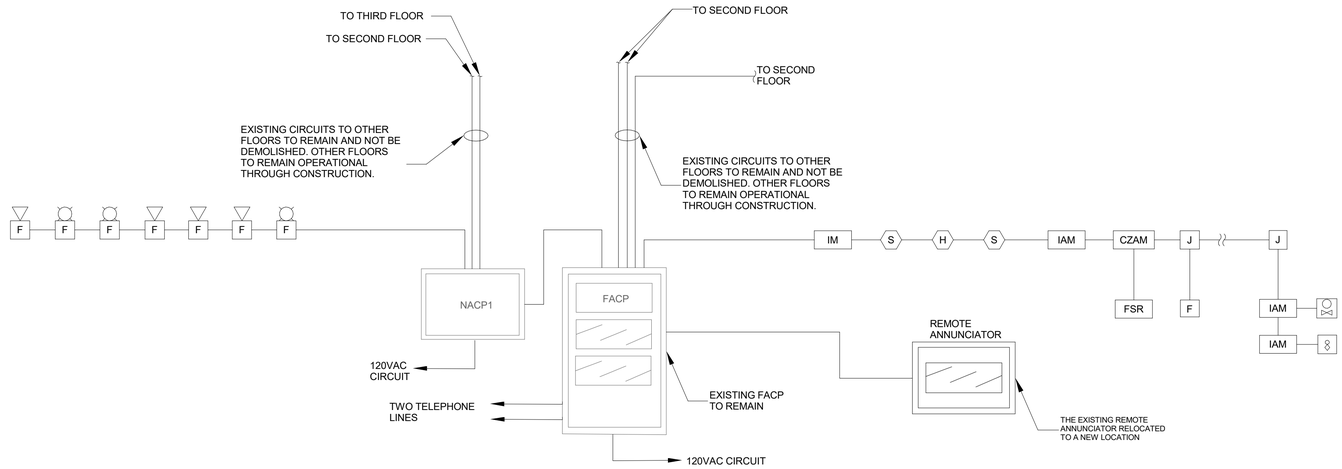
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SHEET TITLE

LEVEL 1 LIGHTING PLAN

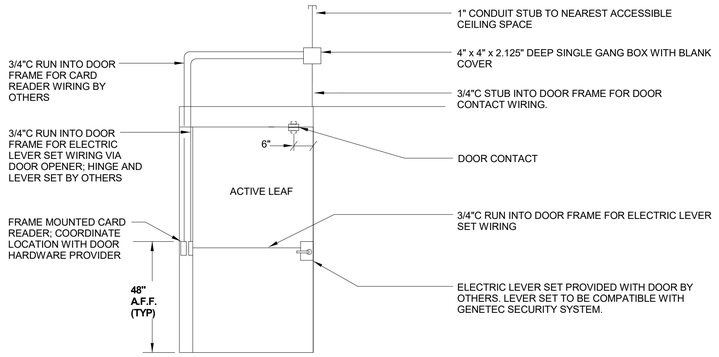
E-201

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FIRE ALARM SYSTEM NOTES

1. EC SHALL REFER TO THE NOTES ON THE FA LEGEND, NOTES PROVIDED ON THIS SHEET, CONTRACT SPECIFICATIONS AND DRAWINGS FOR SPARE CAPACITY, TYPE OF DEVICES, WIRING OF DEVICES, ETC.
2. ALL SPEAKER/STROBE UNITS SHALL BE WIRED SO THAT THE STROBES ARE SYNCHRONIZED WHERE MULTIPLE DEVICES ARE IN THE SAME FIELD OF VIEW PER NFPA 72 AND SO THAT ALL STATION SPEAKER/STROBES CAN BE SILENCED SIMULTANEOUSLY.
3. FIRE ALARM WIRING TERMINATIONS SHALL BE MADE ON TERMINAL BLOCKS; NO SPLICES ARE ALLOWED. NUMBER OR CIRCUITS TO BE DETERMINED BY THE CONTRACTOR.
4. ELECTRICAL CONTRACTOR SHALL PROVIDE ALL NECESSARY HARDWARE AND SOFTWARE FOR A COMPLETE AND OPERABLE SYSTEM.
5. ELECTRICAL CONTRACTOR SHALL PROVIDE ENOUGH BATTERY CAPACITY FOR THE FIRE ALARM SYSTEM TO OPERATE FOR 24 HOURS IN A NON-ALARM CONDITION AND CAPABLE OF OPERATING IN ALARM FOR 15 MINUTES AT THE END OF THE 24 HOUR PERIOD. ELECTRICAL CONTRACTOR TO TEST THE EXISTING BATTERIES AND VERIFY IF THE BATTERIES ARE ACCEPTABLE TO MEET THE ABOVE REQUIREMENTS. IF NOT, THEN NEW BATTERY CALCULATIONS WILL BE DONE AND NEW BATTERIES PROVIDED TO ENSURE THE ABOVE REQUIREMENTS ARE MET.
6. CONTROL MODULES SERVING MECHANICAL EQUIPMENT, MOTORIZED LOUVERS AND OTHER EMERGENCY FUNCTIONS SHALL BE LOCATED WITHIN 3 FEET OF THE CONTROLLED CIRCUIT OR APPLIANCE.
7. THE NUMBER OF FIRE ALARM CIRCUITS IS REPRESENTATIVE OF THE TYPES OF CIRCUITS REQUIRED. THE FINAL QUANTITY OF CIRCUITS SHALL BE DETERMINED BY THE FIRE ALARM INSTALLER.
8. ELECTRICAL CONTRACTOR SHALL UPDATE EXISTING FIRE ALARM MATRIX AFTER THE COMPLETION OF THE FIRE ALARM SYSTEM EQUIPMENT INSTALLATION AND REPROGRAMMING.

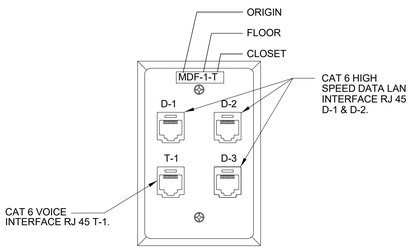


NOTES:

1. SEE DRAWINGS FOR LOCATIONS OF DOORS WITH ELECTRONIC LOCKS. SEE DRAWINGS FOR QUANTITY AND TYPES OF DEVICES AT EACH LOCATION.

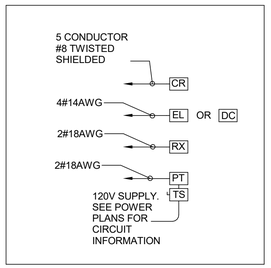
TYPICAL ELECTRIC LOCK DOOR WIRING DETAIL

N.T.S.



TYPICAL DATA/VOICE OUTLET DETAIL

N.T.S.



TYPICAL DOOR WIRING

N.T.S.

SYSTEM OUTPUTS

	SYSTEM INPUTS BUILDING	A. ACTIVATE COMMON ALARM LED AT FACP	B. ACTIVATE AUDIBLE ALARM SIGNAL AT FACP	C. ACTIVATE AUDIBLE/VISUAL SIGNALS THROUGHOUT THE BUILDING	D. ACTIVATE COMMON SUPERVISORY LED AT FACP	E. ACTIVATE COMMON TROUBLE LED AT FACP	F. ACTIVATE AUDIBLE TROUBLE SIGNAL AT FACP	G. DISPLAY CHANGES OF STATUS AT FACP	H. DISPLAY CHANGES OF STATUS AT REMOTE ANNUNCIATOR	I. ACTIVATE AUDIBLE SUPERVISORY SIGNAL AT IMPACT/FACP	J. TRANSMIT COMMON ALARM TO CENTRAL STATION	K. ACCESS CONTROL RELEASE	L. SHUT DOWN FANS AND CLOSE RELATED	M. TRANSMIT TROUBLE SIGNAL TO CENTRAL STATION	N. TRANSMIT SUPERVISORY SIGNAL TO CENTRAL STATION	O. SHUTDOWN ALL FANS	P. ACTIVATE ELEVATOR RECALL	Q. ACTIVATE FIREMENS HAT LED	R. SHUTDOWN ASSOCIATED FANS	CC. SEND SIGNAL TO BMS "FIRE ALARM SYSTEM IN ALARM MODE"
1	MANUAL FIRE ALARM PULL STATION	X	X	X				X	X		X	X				X				X
2	AREA SMOKE DETECTOR	X	X	X				X	X			X	X			X				X
3	FIRE ALARM SYSTEM LOW BATTERY				X	X	X	X			X									
4	OPEN CIRCUIT				X	X	X	X			X									
5	GROUND CIRCUIT				X	X	X	X			X									
6	NOTIFCATION APPLICANCE CIRCUIT SHORT				X	X	X	X			X									
7	TROUBLE				X	X	X	X			X									
8	DUCT SMOKE DETECTOR				X			X	X	X		X	X	X	X	X				
9	ELEVATOR LOBBY SMOKE DETECTOR	X	X	X				X	X		X	X	X	X						X
10	ELEVATOR MACHINE ROOM SMOKE DETECTOR AND TOP OF THE ELEVATOR SHAFT SMOKE DETECTOR	X	X	X				X	X		X	X								X
11	GENERATOR RUNNING				X			X	X	X					X					
12	GENERATOR FAILURE, STOP, PHASE REVERSAL,GENERATOR SWITCH IN NON-AUTOMATIC POSITION	X	X	X		X	X	X	X	X	X	X				X				
13	WATER FLOW SWITCH	X	X	X				X	X		X	X	X							

FIRE ALARM SEQUENCE OF OPERATION MATRIX

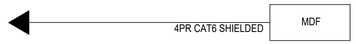
FIRE ALARM MATRIX

N.T.S.



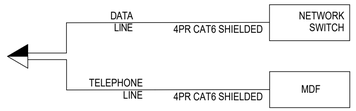
TYPICAL OUTLET DIAGRAM - DATA

N.T.S.



TYPICAL OUTLET DIAGRAM - TELEPHONE

N.T.S.



TYPICAL OUTLET DIAGRAM - TELEPHONE & DATA

N.T.S.

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CONSULTANTS

SEALS

PROJECT IDENTIFICATION

WORCESTER REGIONAL TRANSIT AUTHORITY

MAIN LOBBY RENOVATION

MARK	DATE	DESCRIPTION	BY

ISSUE BLOCK

PROJECT NO.:	4022461
DESIGNED BY:	AR
DRAWN BY:	WH
CHECKED BY:	JV
APPROVED BY:	MS
DATE:	01/27/2025

SHEET TITLE

FIRE ALARM RISER & MATRIX

E-701

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Branch Panel: WPP1

Location:	ELECTRICAL ROOM 108	**Volts:**	208/120 V	**A.I.C. Rating:**	42kA
Supply From:	-	**Phases:**	3	**Mains Type:**	MLO
Mounting:	Surface	**Wires:**	4	**Mains Rating:**	
Enclosure:	NEMA 1			**MLO Rating:**	150 A

CKT.	Circuit Description	Trip	Poles	A		B		C		Poles	Trip	Circuit Description	CKT.
1	ELECTRICAL ROOM 108 GFCI	20 A	1	540	900					1	20 A	TICKETING ROOM 105 RECEPTACLES	2
3	MECHANICAL ROOM 109 RECEPTACLES	20 A	1			540	720			1	20 A	ADA IN-TAKE ROOM 103 RECEPTACLES	4
5	MEN'S & WOMEN'S ROOM RECEPTACLES	20 A	1					720	360	1	20 A	ADA COORDINATOR ROOM 102 RECEPTACLES	6
7	SECURITY ROOM 110 RECEPTACLES	20 A	1	360	360					1	20 A	HALLWAY 104 & JANITOR CLOS. 104A RECEPTACLES	8
9	AUTOMATIC DOORS	20 A	1			600	360			1	20 A	STORAGE ROOMS RECEPTACLES	10
11	LOBBY WAITING AREA & VESTIBULE RECEPTACLES	30 A	1					2160	360	1	20 A	DRIVER BREAKER ROOM RECEPTACLES	12
13	-	20 A	1		360					1	20 A	-	14
15	OUTDOOR RECEPTACLES	20 A	1			1080	540			1	20 A	ELEVATOR LOBBY RECEPTACLES	16
17	ELEVATOR PIT LIGHTING	20 A	1					200	1261	1	20 A	ROOMS 109, 110, 107, 112, 111 LIGHTING	18
19	CANOPY TICKET MACHINE	20 A	1	600	684					1	20 A	ROOMS 106, 106A, & 106B LIGHTING	20
21	CANOPY RECEPTACLES (ADD ALT #2)	20 A	1			360	253			1	20 A	PBSI LOBBY LIGHTING	22
23	CANOPY RECEPTACLES	20 A	1					360	836	1	20 A	ROOMS 105, 102, 115, 104A, 115A LTG	24
25	CANOPY RECEPTACLES	20 A	1	360	304					1	20 A	ELEVATOR LOBBY LIGHTING	26
27	GENERATOR BATTERY CHARGER	20 A	1			1500	1440			1	20 A	DIGITAL SIGN	28
29	GENERATOR HEATER	20 A	1					1920	1440	1	20 A	DIGITAL SIGN	30
31	GENERATOR ENCLOSURE RECEPT.	20 A	1	180	1440					1	20 A	DIGITAL SIGN	32
33	FIRE/SMOKE DAMPER	20 A	1			1200	600			1	20 A	RIFID DEVICES	34
35	FIRE/SMOKE DAMPER	20 A	1					1200	600	1	20 A	RIFID DEVICES	36
37	LOBBY MONITOR RECEPTACLES	20 A	1							1	20 A	SPARE	38
39	SPARE	20 A	1							1	20 A	SPARE	40
41	SPARE	20 A	1							1	20 A	SPARE	42
		Total Load:		6088	VA	9193	VA	11417	VA				
		Total Load:		50.7	A	76.6	A	95.1	A				

Load Classification	Connected Load		Demand Factor		Estimated Demand		Panel Totals		
HVAC	0	VA	#NUM!	%	#NUM!	VA			
Receptacle	0	VA	NOTE 1.	%	0	VA	Total Connected Load	26698.0	VA
Power	0	VA	1	%	0	VA	Total Estimated Demand	#NUM!	VA
Lighting	0	VA	1	%	0	VA	Total Connected Current	74.2	A
Motor	0	VA	0.6	%	0	VA	Total Estimated Demand Current	#NUM!	A
Other		VA		%	0	VA			

Branch Panel: WLP1

Location:	ELECTRICAL ROOM 108	**Volts:**	208/120 V	**A.I.C. Rating:**	42kA
Supply From:	-	**Phases:**	3	**Mains Type:**	MLO
Mounting:	Surface	**Wires:**	4	**Mains Rating:**	
Enclosure:	NEMA 1			**MLO Rating:**	150 A

CKT.	Circuit Description	Trip	Poles	A		B		C		Poles	Trip	Circuit Description	CKT.
1	SITE LIGHTING	20 A	1	1650	1100					1	20 A	SITE LIGHTING	2
3	WALL WASHER LIGHTING	20 A	1			855	970			1	20 A	SITE LIGHTING	4
5	SITE LIGHTING	20 A	1					1650	380	1	20 A	IN-GROUND LIGHTING	6
7	SITE LIGHTING	20 A	1	1650	970					1	20 A	SITE LIGHTING	8
9	SITE LIGHTING	20 A	1			1650	390			1	20 A	FLAG POLE LIGHTING	10
11	PEDESTRIAN WARNING SYSTEM	20 A	1					600	1222	1	20 A	BOLLARD LIGHTING	12
13	PEDESTRIAN WARNING SYSTEM	20 A	1	600	1650					1	20 A	SITE LIGHTING	14
15	PEDESTRIAN WARNING SYSTEM	20 A	1			600	600			1	20 A	WRTA SIGN (BUILDING MOUNTED)	16
17	PEDESTRIAN WARNING SYSTEM	20 A	1					600	600	1	20 A	WRTA SIGN (BUILDING MOUNTED)	18
19	CANOPY LIGHTING	20 A	1	665	190					1	20 A	CANOPY LIGHTING (BID ALT. #2)	20
21	CANOPY LIGHTING	20 A	1			1330	380			1	20 A	CANOPY LIGHTING (BID ALT. #2)	22
23	CANOPY LIGHTING	20 A	1					855	665	1	20 A	CANOPY LIGHTING (BID ALT. #2)	24
25	CANOPY LIGHTING	20 A	1	855	950					1	20 A	CANOPY LIGHTING (BID ALT. #2)	26
27	CANOPY LIGHTING	20 A	1			855	768			1	20 A	NEW LOBBY LIGHTING (PUBLIC)	28
29	CANOPY LIGHTING	20 A	1					855	761	1	20 A	NEW LOBBY LIGHTING (PRIVATE)	30
31	CANOPY LIGHTING	20 A	1	950						1	20 A	SPARE	32
33	CANOPY LIGHTING	20 A	1			380				1	20 A	SPARE	34
35	CANOPY LIGHTING	20 A	1					190		1	20 A	SPARE	36
37	SPARE	20 A	1							1	20 A	SPARE	38
39	SPARE	20 A	1							1	20 A	SPARE	40
41	SPARE	20 A	1							1	20 A	SPARE	42
		Total Load:		11230	VA	8778	VA	8378	VA				
		Total Amps:		93.6	A	73.2	A	69.8	A				

Load Classification	Connected Load		Demand Factor		Estimated Demand		Panel Totals		
HVAC	0	VA	#NUM!	%	#NUM!	VA			
Receptacle	0	VA	NOTE 1.	%	0	VA	Total Connected Load	28386.0	VA
Power	0	VA	1	%	0	VA	Total Estimated Demand	#NUM!	VA
Lighting	0	VA	1	%	0	VA	Total Connected Current	78.9	A
Motor	0	VA	0.6	%	0	VA	Total Estimated Demand Current	#NUM!	A
Other		VA		%	0	VA			

Branch Panel: EMERGENCY PANEL - WEP1

Location:	ELECTRICAL ROOM 108	**Volts:**	208/120 V	**A.I.C. Rating:**	42kA
Supply From:	-	**Phases:**	3	**Mains Type:**	MLO
Mounting:	Surface	**Wires:**	4	**Mains Rating:**	
Enclosure:	NEMA 1			**MLO Rating:**	150 A

CKT.	Circuit Description	Trip	Poles	A		B		C		Poles	Trip	Circuit Description	CKT.
1	FIRST FLOOR EMERGENCY LIGHTING	20 A	1	820	441					1	20 A	STAIRWELL LIGHTING	2
3	SECOND FLOOR EMERGENCY LIGHTING	20 A	1			355	441			1	20 A	STAIRWELL LIGHTING	4
5	THIRD FLOOR EMERGENCY LIGHTING	20 A	1					703	600	1	20 A	FACP	6
7	PENTHOUSE EMERGENCY LIGHTING	20 A	1	139	600					1	20 A	NACP1	8
9	OUTDOOR EGRESS LIGHTING	20 A	1			239	600			1	20 A	NACP2	10
11	FIRST FLOOR EXIT SIGNS & EMERGENCY LIGHTING	20 A	1					392		1	20 A	SPARE	12
13	SECOND FLOOR EXIT SIGNS	20 A	1	20						1	20 A	SPARE	14
15	THIRD FLOOR & PENTHOUSE EXIT SIGNS (XM)	20 A	1			45				1	20 A	SPARE	16
17	SPARE	20 A	1							1	20 A	SPARE	18
19	SPARE	20 A	1							1	20 A	SPARE	20
21	-											-	22
23	-											-	24
25	-											-	26
27	-											-	28
29	-											-	30
31	-											-	32
33	-											-	34
35	-											-	36
37	-											-	38
39	-											-	40
41	-											-	42
		Total Load:		2020	VA	1680	VA	1695	VA				
		Total Amps:		16.8	A	14.0	A	14.1	A				

Load Classification	Connected Load		Demand Factor		Estimated Demand		Panel Totals		
HVAC	0	VA	#NUM!	%	#NUM!	VA			
Receptacle	0	VA	NOTE 1.	%	0	VA	Total Connected Load	5395.0	VA
Power	0	VA	1	%	0	VA	Total Estimated Demand	#NUM!	VA
Lighting	0	VA	1	%	0	VA	Total Connected Current	15.0	A
Motor	0	VA	0.6	%	0	VA	Total Estimated Demand Current	#NUM!	A
Other		VA		%	0	VA			

Branch Panel: WMP1

Location:	ELECTRICAL ROOM 108	**Volts:**	208/120 V	**A.I.C. Rating:**	42kA
Supply From:	-	**Phases:**	3	**Mains Type:**	MLO
Mounting:	Surface	**Wires:**	4	**Mains Rating:**	
Enclosure:	NEMA 1			**MLO Rating:**	225 A

CKT.	Circuit Description	Trip	Poles	A		B		C		Poles	Trip	Circuit Description	CKT.
1	IACU-1-1	15 A	2	19.76	162.24					2	15 A	IACU-1-8	2
3						19.76	162.24						4
5	IACU-1-2	15 A	2					162.12	125.75	2	15 A	IACU-1-9	6
7				162.12	125.75								8
9	IACU-1-3	15 A	2			125.84	162.12			2	15 A	IACU-1-10	10
11								125.84	162.12				12
13	IACU-1-4	15 A	2	109.12	109.2					2	15 A	IACU-1-11	14
15						109.12	109.2						16
17	IACU-1-5	15 A	2					125.75	109.2	2	15 A	IACU-1-12	18
19				125.75	109.2								20
21	IACU-1-6	15 A	2			162.12	109.2			2	15 A	IACU-1-13	22
23								162.12	109.2				24
25	IACU-1-7	15 A	2	125.84	20					2	15 A	IACU-1-14	26
27						125.84	20						28
29	-	15 A	2						162.12	2	15 A	IACU-1-15	30
31					162.12								32
33	EWH-1	20 A	1			750	480			1	20 A	HWB-1	34
35	EWH-2	20 A	1					1000	480	1	20 A	HWB-2	36
37	CP-1	20 A	1	62						1	20 A	SPARE	38
39	DWH-1	20 A	1			1080				1	20 A	SPARE	40
41	SPARE	20 A	1							1	20 A	SPARE	42
		Total Load:		1293	VA	3415	VA	2724	VA				
		Total Amps:		10.8	A	28.5	A	22.7	A				

Load Classification	Connected Load		Demand Factor		Estimated Demand		Panel Totals		
HVAC	0	VA	#NUM!	%	#NUM!	VA			
Receptacle	0	VA	NOTE 1.	%	0	VA	Total Connected Load	7432.7	VA
Power	0	VA	1	%	0	VA	Total Estimated Demand	#NUM!	VA
Lighting	0	VA	1	%	0	VA	Total Connected Current	20.6	A
Motor	0	VA	0.6	%	0	VA	Total Estimated Demand Current	#NUM!	A
Other		VA		%	0	VA			

GENERAL NOTES

1. FOR LEGEND, NOTES AND ABBREVIATIONS REFER TO SHEET E-001.

2. EXISTING CIRCUITS IN GRAY WERE COPIED FROM THE EXISTING CONSTRUCTION DRAWINGS. CIRCUITS SHALL BE CONFIRMED BY EC PRIOR TO BID PROPOSAL.

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CONSULTANTS

SEALS

PROJECT IDENTIFICATION

WORCESTER REGIONAL TRANSIT AUTHORITY

MAIN LOBBY RENOVATION

MARK	DATE	DESCRIPTION	BY

ISSUE BLOCK

PROJECT NO.:	4022461
DESIGNED BY:	AR
DRAWN BY:	WH
CHECKED BY:	JV
APPROVED BY:	MS
DATE:	01/27/2025

SHEET TITLE

PANEL SCHEDULES (SHEET 1 OF 2)

E-901

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Branch Panel: WMP5

Location:	ELECTRICAL ROOM 108			**Volts:**	208/120 V			**A.I.C. Rating:**	42kA				
Supply From:	-			**Phases:**	3			**Mains Type:**	MLO				
Mounting:	Surface			**Wires:**	4			**Mains Rating:**					
Enclosure:	NEMA 1							**MLO Rating:**	225 A				

CKT.	Circuit Description	Trip	Poles	A		B		C		Poles	Trip	Circuit Description	CKT.
1	P-1	15 A	2	1320	1320					2	15 A	P-2	2
3						1320	1320						4
5								1320	1320				6
7	EUH-1	15 A	2	1650	1650					2	15 A	EUH-2	8
9						1650	1650						10
11	EB-1	20 A	2					659	659	2	20 A	EB-2	12
13				659	659								14
15	EB-3	20 A	2			586	586			2	20 A	EB-4	16
17								586	586				18
19	EB-5	20 A	2	586	513					2	20 A	EB-6	20
21						586	513						22
23	UH-1	20 A	2					998		2	20 A	EB THERMOSTAT	24
25				998									26
27	-	20 A	1							1	20 A	-	28
29		20 A								1	20 A	-	30
31	-	20 A	1							1	20 A	-	32
33	-	20 A	1							1	20 A	-	34
35	-	20 A	1							1	20 A	-	36
37	-	20 A	1							1	20 A	-	38
39	-	20 A	1							1	20 A	-	40
41	-	20 A	1							1	20 A	-	42
		Total Load:		9355	VA	8211	VA	6128	VA				
		Total Amps:		78.0	A	68.4	A	51.1	A				

Load Classification	Connected Load		Demand Factor		Estimated Demand		Panel Totals		
HVAC	0	VA	#NUM!	%	#NUM!	VA			
Receptacle	0	VA	NOTE 1.	%	0	VA	Total Connected Load	23694.0	VA
Power	0	VA	1	%	0	VA	Total Estimated Demand	#NUM!	VA
Lighting	0	VA	1	%	0	VA	Total Connected Current	65.8	A
Motor	0	VA	0.6	%	0	VA	Total Estimated Demand Current	#NUM!	A
Other		VA		%	0	VA			

Branch Panel: WRP1

Location:	ELECTRICAL ROOM 108			**Volts:**	208/120 V			**A.I.C. Rating:**	42kA				
Supply From:	-			**Phases:**	3			**Mains Type:**	MCB				
Mounting:	Surface			**Wires:**	4			**Mains Rating:**					
Enclosure:	NEMA 1							**MLO Rating:**	225 A				

CKT.	Circuit Description	Trip	Poles	A		B		C		Poles	Trip	Circuit Description	CKT.
1	-	20 A	1							3	20 A	-	2
3	-	20 A	1										4
5	-	20 A	1										6
7	SPARE	20 A	1							1	20 A	-	8
9	SPARE	20 A	1							1	20 A	SPARE	10
11	SPARE	20 A	1							1	20 A	SPARE	12
13	LOCK POWER	30 A	1	2000	1000					1	15 A	SLIDING DOOR	14
15	(1) WATER BOTTLE FILLER	15 A	1			600	1000			1	15 A	SLIDING DOOR	16
17	(1) WATER BOTTLE FILLER	15 A	1					600	500	1	20 A	FARE VENDING MACHINE	18
19	KIOSK RECEPTACLES	20 A	1	300	500					1	20 A	FARE VENDING MACHINE	20
21	SPARE	20 A	1							1	20 A	SPARE	22
23	COILING DOORS	20 A	1					600		1	20 A	SPARE	24
25	SPARE	20 A	1							1	20 A	SPARE	26
27	SPARE	20 A	1							1	20 A	SPARE	28
29	SPARE	20 A	1							1	20 A	SPARE	30
31	SPARE	20 A	1							1	20 A	SPARE	32
33	SPARE	20 A	1							1	20 A	SPARE	34
35	SPARE	20 A	1							1	20 A	SPARE	36
37	SPARE	20 A	1							1	20 A	SPARE	38
39	SPARE	20 A	1							1	20 A	SPARE	40
41	SPARE	20 A	1							1	20 A	SPARE	42
		Total Load:		3800	VA	1600	VA	1700	VA				
		Total Amps:		31.7	A	13.3	A	14.2	A				

Load Classification	Connected Load		Demand Factor		Estimated Demand		Panel Totals		
HVAC	0	VA	#NUM!	%	#NUM!	VA			
Receptacle	0	VA	NOTE 1.	%	0	VA	Total Connected Load	7100.0	VA
Power	0	VA	1	%	0	VA	Total Estimated Demand	#NUM!	VA
Lighting	0	VA	1	%	0	VA	Total Connected Current	19.7	A
Motor	0	VA	0.6	%	0	VA	Total Estimated Demand Current	#NUM!	A
Other		VA		%	0	VA			

GENERAL NOTES

1. FOR LEGEND, NOTES AND ABBREVIATIONS REFER TO SHEET E-001.

2. EXISTING CIRCUITS IN GRAY WERE COPIED FROM THE EXISTING CONSTRUCTION DRAWINGS. CIRCUITS SHALL BE CONFIRMED BY EC PRIOR TO BID PROPOSAL.

KEYNOTES

1. PROVIDE 120V, 30mA, 15A GFCI BREAKER IN THE PANEL.

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CONSULTANTS

SEALS

PROJECT IDENTIFICATION

WORCESTER REGIONAL TRANSIT AUTHORITY

MAIN LOBBY RENOVATION

MARK	DATE	DESCRIPTION	BY

ISSUE BLOCK

PROJECT NO.:	4022461
DESIGNED BY:	AR
DRAWN BY:	WH
CHECKED BY:	JV
APPROVED BY:	MS
DATE:	01/27/2025

SHEET TITLE

PANEL SCHEDULES (SHEET 2 OF 2)

E-902

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GENERAL NOTES
1. FOR LEGEND, NOTES AND ABBREVIATIONS REFER TO SHEET E-001.

CAMERA SCHEDULE

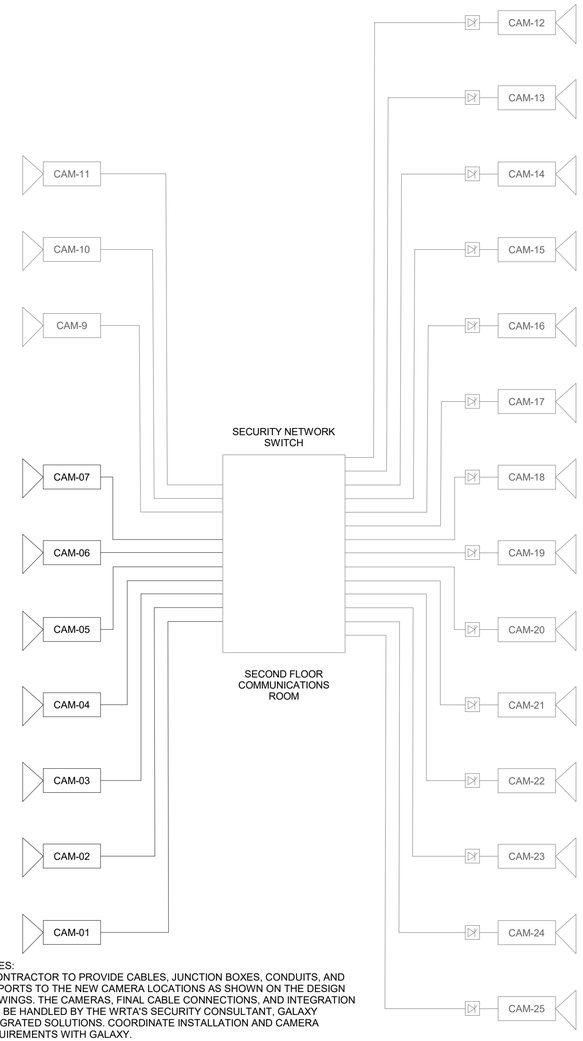
CAMERA NUMBER	TYPE	MANUFACTURER	CATALOG NUMBER	LENS	MOUNTING TYPE	LOCATION	NOTES
CAM-01	-	-	-	-	-	FOSTER STREET ENTRANCE	1
CAM-02	-	-	-	-	-	FOSTER STREET ENTRANCE	1
CAM-03	-	-	-	-	-	LOBBY WAITING ROOM	1
CAM-04	-	-	-	-	-	LOBBY WAITING ROOM	1
CAM-05	-	-	-	-	-	BUS LOOP ENTRANCE	1
CAM-06	-	-	-	-	-	LOBBY WAITING ROOM	1
CAM-07	-	-	-	-	-	RESTROOM ROOM ENTRANCE	1

NOTES:
1. CONTRACTOR TO PROVIDE WIRING JUNCTION BOXES AND CONDUITS TO THE NEW CAMERA LOCATIONS AS SHOWN ON THE DESIGN DRAWINGS. CAMERAS TO BE FURNISHED AND INSTALLLED BY GALAXY SECURITY SCONSULTANT. FINAL WIRING CONNECTIONS, AND INTEGRATION WILL BE HANDLED BY THE WRTA'S SECURITY CONSULTANT, GALAXY INTEGRATED SOLUTIONS. COORDINATE INSTALLATION AND CAMERA REQUIREMENTS WITH GALAXY.

MECHANICAL - ELECTRICAL EQUIPMENT SCHEDULE

EQUIPMENT TAG			LOADS					PANEL	CIRCUIT NUMBER	BRANCH WIRING	PROTECTIVE DEVICES				NOTES
EQUIP. DESIG.	EQUIP. #	EQUIPMENT DESCRIPTION	FLA	HP	KVA	VOLTAGE RATING	NO. OF POLES				VFD	DISCONNECT SWITCH	FUSED DISCONNECT SWITCH	DEVICE RATING	
EB	1	ELECTRIC BASEBOARD HEATER	6.341		1.318928	208 V	2	WMP5	11,13	2#12, 1#12 GND, 3/4" C	N				
EB	2	ELECTRIC BASEBOARD HEATER	6.341		1.318928	208 V	2	WMP5	12,14	2#12, 1#12 GND, 3/4" C	N				
EB	3	ELECTRIC BASEBOARD HEATER	5.634		1.171872	208 V	2	WMP5	15,17	2#12, 1#12 GND, 3/4" C	N				
EB	4	ELECTRIC BASEBOARD HEATER	5.634		1.171872	208 V	2	WMP5	16,18	2#12, 1#12 GND, 3/4" C	N				
EB	5	ELECTRIC BASEBOARD HEATER	5.634		1.171872	208 V	2	WMP5	19,21	2#12, 1#12 GND, 3/4" C	N				
EB	6	ELECTRIC BASEBOARD HEATER	4.932		1.025856	208 V	2	WMP5	20,22	2#12, 1#12 GND, 3/4" C	N				
IACU	1-2	AIR CONDITIONING UNIT	1.248		0.259584	208 V	2	WMP1	5,7	2#12, 1#12 GND, 3/4" C	N				1
IACU	1-4	AIR CONDITIONING UNIT	0.84		0.17472	208 V	2	WMP1	13,15	2#12, 1#12 GND, 3/4" C	N				1
IACU	1-5	AIR CONDITIONING UNIT	0.968		0.201344	208 V	2	WMP1	17,19	2#12, 1#12 GND, 3/4" C	N				1
IACU	1-6	AIR CONDITIONING UNIT	1.248		0.259584	208 V	2	WMP1	21,23	2#12, 1#12 GND, 3/4" C	N				1
IACU	1-9	AIR CONDITIONING UNIT	0.968		0.201344	208 V	2	WMP1	6,8	2#12, 1#12 GND, 3/4" C	N				1
IACU	1-10	AIR CONDITIONING UNIT	1.248		0.259584	208 V	2	WMP1	10,12	2#12, 1#12 GND, 3/4" C	N				1
IACU	1-15	AIR CONDITIONING UNIT	1.248		0.259584	208 V	2	WMP1	30,32	2#12, 1#12 GND, 3/4" C	N				1
UH	1	UNIT HEATER	9.6		1.9968	208 V	2	WMP5	23,25	2#12, 1#12 GND, 3/4" C	N				1

NOTES:
1. DISCONNECT WILL BE SUPPLIED BY THE MECHANICAL CONTRACTOR. THE DISCONNECT WILL BE INSTALLED AND INTERCONNECTED BY THE ELECTRICAL CONTRACTOR.



NOTES:
1. CONTRACTOR TO PROVIDE CABLES, JUNCTION BOXES, CONDUITS, AND SUPPORTS TO THE NEW CAMERA LOCATIONS AS SHOWN ON THE DESIGN DRAWINGS. THE CAMERAS, FINAL CABLE CONNECTIONS, AND INTEGRATION WILL BE HANDLED BY THE WRTA'S SECURITY CONSULTANT, GALAXY INTEGRATED SOLUTIONS. COORDINATE INSTALLATION AND CAMERA REQUIREMENTS WITH GALAXY.

NEW CAMERA ONELINE

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CONSULTANTS

SEALS

PROJECT IDENTIFICATION

WORCESTER REGIONAL TRANSIT AUTHORITY

MAIN LOBBY RENOVATION

MARK	DATE	DESCRIPTION	BY

ISSUE BLOCK

PROJECT NO.:	4022461
DESIGNED BY:	AR
DRAWN BY:	WH
CHECKED BY:	JV
APPROVED BY:	MS
DATE:	01/27/2025

SHEET TITLE

NEW SCHEDULES

E-903

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PLUMBING PIPING LEGEND

——— — ———	COLD WATER
——— — — ———	HOT WATER
——— — — — ———	HOT WATER RETURN
— —— —— —— —	SANITARY OR STORM (UNDERGROUND)
— — — — — — —	VENT
——— SAN ———	SANITARY
——— ICW ———	INDUSTRIAL COLD WATER
——— IW ———	INDUSTRIAL WASTE
——— G ———	NATURAL GAS
——— ST ———	STORM
———◄———	DIRECTION OF FLOW
———○	PIPE DOWN
———○———	PIPE DROP
———○	PIPE RISE
———×———	PIPE ANCHOR
——— ———	PIPE GUIDE OR SLEEVE
———▷———	PIPE REDUCER
———]	PLUGGED OR CAPPED PIPE
———||	CLEANOUT PLUG (WITH FINISHED PLATE FOR WCO)
———⊘	FLOOR CLEANOUT

PLUMBING SYMBOL LEGEND

	THERMOMETER
	PRESSURE GAUGE WITH PETCOCK
	WATER HAMMER ARRESTER WITH SHUTOFF VALVE
	STRAINER - 'Y' TYPE
	P-TRAP
	ROOF DRAIN
	FLOOR DRAIN
	UNION
	PETCOCK
	BALANCING VALVE
	BALL VALVE
	CHECK VALVE
	BACKFLOW PREVENTER (DOUBLE CHECK VALVE TYPE)
	BACKFLOW PREVENTER (RPD) W/SHUTOFF VALVES
	HOSE BIBB (HB)
	PRESSURE REDUCING VALVE (* = PSI SETTING)
	DRAIN
M	WATER METER
	CONNECT TO EXISTING
	PUMP
	ADA ACCESSIBLE FIXTURE
	QUICK CONNECT
	MIXING VALVE
	CONNECT TO EXISTING
	DISCONNECT FROM EXISTING

PLUMBING GENERAL NOTES

THE CONTRACTOR IS RESPONSIBLE FOR THE FOLLOWING:

A. THESE GENERAL NOTES ARE APPLICABLE TO ALL PLUMBING DRAWINGS.

B. DRAWINGS ARE DIAGRAMMATIC AND SHOW GENERAL INTENT OF WORK, SEE DETAILS, SCHEDULES AND SPECIFICATIONS FOR ADDITIONAL INFORMATION.

C. REVIEW DRAWINGS OF THE OTHER TRADES AS PART OF THIS CONTRACT FOR ADDITIONAL WORK REQUIRED AND COORDINATION OF CONTRACTUAL WORK FOR OPERATIONS AND CONNECTIONS TO OTHER SYSTEMS.

D. PROVIDE ALL SERVICES TO HVAC EQUIPMENT INCLUDING BUT NOT LIMITED TO: GAS SUPPLY PIPING, CONDENSATE PIPING, COLD WATER SUPPLY PIPING, DRAINS, AND CONNECTIONS TO AIR HANDLING UNITS, FAN COIL UNITS, UNIT HEATERS, BOILERS, CHILLERS, ETC. ALSO, PROVIDE ADDITIONAL DEVICES INCLUDING BUT NOT LIMITED TO: BACKFLOW PREVENTERS, REGULATORS, UNIONS, TRAPS, AND SHUT-OFF VALVES REQUIRED FOR AFOREMENTIONED EQUIPMENT. REFER TO HVAC DRAWINGS FOR ADDITIONAL INFORMATION AND COORDINATION.

E. PROVIDE PIPE EXPANSION JOINTS AS REQUIRED PER BUILDING CODES WHETHER OR NOT SHOWN ON DRAWINGS. REVIEW ARCHITECTURAL AND STRUCTURAL DRAWINGS FOR EXACT BUILDING EXPANSION JOINT LOCATIONS AND EXPANSION DIMENSIONS.

F. ALL UNDERGROUND SANITARY AND STORM PIPING IS SLOPED AT 1/8" PER FOOT UNLESS OTHERWISE SHOWN ON THE DRAWINGS AS NOTES, INVERTS, ETC.

G. ALL PRODUCTS USED IN ANY PLUMBING OR GAS SYSTEM SHALL BE PRODUCT-APPROVED BY THE BOARD OF STATE EXAMINERS OF PLUMBERS AND GAS FITTERS.

H. ALL PLUMBING PIPES SHALL BE INSTALLED TO AVOID EQUIPMENT OPERATING AREAS.

I. COMPLY WITH THE MASSACHUSETTS BUILDING CODES AND ALL OTHER APPLICABLE CODES.

LEGEND NOTE

THESE ARE THE GENERAL LEGENDS OF SYMBOLS AND ABBREVIATIONS, AND SHALL BE USED AS A DICTIONARY TO DEFINE ITEMS INDICATED ON DRAWINGS. NOT ALL SYMBOLS OR ABBREVIATIONS DEFINED ARE NECESSARILY USED ON THIS PROJECT.

MINIMUM FACILITIES

AREA	OCCUPANT LOAD	FEMALE OCCUPANT LOAD	MALE OCCUPANT LOAD	TOILETS		URINALS	LAVATORIES		DRINKING FOUNTAINS	SHOWERS		SERVICE SINK
				FEMALE	MALE	MALE	FEMALE	MALE		FEMALE	MALE	
REQUIRED	23	12	12	1	1	0	1	1	1	0	0	1
PROVIDED				2	2	0	1	1	1	0	0	1

MINIMUM FACILITIES FOR BUILDING OCCUPANCY

BUILDING TYPE	TOILETS		URINALS (UP TO 33%)	LAVATORIES EACH SEX	DRINKING FOUNTAINS	SHOWER	SERVICE SINK
	FEMALE	MALE					
OFFICE SPACE	1 PER 20	1 PER 25	1 PER 50	1 PER 50	1 PER FLOOR	0	1 PER FLOOR

PLUMBING DEMOLITION NOTES

A. THESE PLUMBING DEMOLITION NOTES APPLY TO ALL PLUMBING DEMOLITION DRAWINGS. BEFORE STARTING WORK, ARRANGE TO SHUT DOWN UTILITIES AND SERVICE LINES IN AREA OF DEMOLITION WORK. BE SURE THAT LOCATIONS OF UTILITIES IN VICINITY ARE KNOWN AND IDENTIFIED AS "IN SERVICE" OR "SHUT DOWN". THE CONTRACTOR SHALL VERIFY THE EXACT SERVICE OF ANY EXISTING PIPING PRIOR TO BEGINNING DEMOLITION. COORDINATE DEMOLITION AND UTILITY SHUT DOWN AS REQUIRED WITH THE OWNER. THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING ALL VALVES REQUIRED TO ISOLATE THE WORK.

B. DEMOLITION WORK SHALL COMPLY WITH ALL OSHA, STATE AND LOCAL CODES/ORDINANCES. OBSERVE RECOMMENDATIONS IN "BUILDING CONSTRUCTION AND DEMOLITION OPERATIONS" OF NFPA STANDARD 241. REFER TO DIVISION 1 OF THE CONTRACT DOCUMENTS FOR ADDITIONAL REQUIREMENTS.

C. ABANDONED PIPING IS TO BE CUT BACK TO MAIN AND CAPPED. DEMOLITION OF PIPING SHALL BE DONE IN A MANNER SO AS NOT TO CREATE DEAD-LEGS OFF ANY MAINS.

D. ALL EQUIPMENT, MATERIALS AND DEBRIS DESIGNATED FOR DEMOLITION, OR AS A RESULT OF DEMOLITION, SHALL BE REMOVED FROM THE PROPERTY IN A TIMELY MANNER AS REQUIRED BY THE GENERAL CONTRACTOR OR OWNER. THIS DOES NOT INCLUDE ANY EQUIPMENT OR MATERIALS DESIGNATED TO BE REUSED OR SALVAGED, WHICH SHALL BE COORDINATED WITH THE GENERAL CONTRACTOR FOR ADDITIONAL REQUIREMENTS.

E. ANY PROPERTY OR ITEMS DAMAGED DURING THE PROGRESS OF THE DEMOLITION WORK, INCLUDING ANY DAMAGE TO EXISTING STRUCTURE, PAVEMENT, SIDEWALKS OR ADJACENT GROUNDS CAUSED BY THE TRANSPORTING OF MATERIALS OR EQUIPMENT, SHALL BE REPAIRED AND/OR REPLACED IN A TIMELY MANNER, OR AS REQUIRED BY THE OWNER.

F. INFORMATION CONTAINED ON THIS DRAWING WAS OBTAINED FROM ARCHIVED DRAWINGS AND FIELD VISITS. NOT ALL PLUMBING SYSTEMS, FIXTURES, EQUIPMENT AND PIPING MAY BE SHOWN. VISIT THE SITE PRIOR TO SUBMITTAL OF BID TO DETERMINE CONDITIONS AFFECTING THE EXECUTION OF WORK. AFTER VISITING THE SITE, REQUEST SUCH FURTHER INFORMATION AND/OR CLARIFICATION AS NECESSARY TO FULLY UNDERSTAND THE WORK REQUIRED AND TO PROPERLY ESTIMATE COST. THE RENDERING OF A PROPOSAL OR BID TO PERFORM THE WORK SHALL REPRESENT THAT THE SITE HAS BEEN VISITED AND ALL CONDITIONS AFFECTING THE PERFORMANCE OF THE CONTRACT HAVE BEEN NOTED.

G. REFER TO THE SPECIFICATIONS FOR REQUIREMENTS OF PATCHING AND REPAIRS DUE TO DEMOLITION WORK.

PLUMBING ABBREVIATIONS

AC	AIR COMPRESSOR	IW	INDUSTRIAL WASTE	DSC	DOWNSPOUT COVER	RW	RINSE WATER
ACT	ACOUSTIC CEILING TILE	KW	KILOWATT	DIP	DUCTILE IRON PIPE	S, SAN	SANITARY
AFD	ACID FLOOR DRAIN	LF	LINEAR FEET	DN	DOWN	SD	STORM DRAIN
AFF	ABOVE FINISHED FLOOR	L,LV,LAV	LAVATORY	EC	ELECTRICAL CONTRACTOR	SF, SQFT	SQUARE FEET
AFG	ABOVE FINISHED GRADE	M	METER	ECO	END CLEANOUT	SH	SHOWER
APPROX	APPROXIMATELY	MAU	MAKEUP AIR UNIT	EL	ELEVATION	SHA	SHOWER ACCESSIBLE
AV	ACID VENT	MAX	MAXIMUM	EQ	EQUIPMENT	SPRK	SPRINKLER
AW	ACID WASTE	MIN	MINIMUM	ES/EW	EMERGENCY SHOWER AND EYE WASH	SS	STAINLESS STEEL
B	BOILER	MEP	MECHANICAL, ELECTRICAL & PLUMBING	EX	EXISTING	ST	STORM
BCA	BREATHING COMPRESSED AIR	NIC	NOT IN CONTRACT	FCO	FLOOR CLEANOUT	SZVAV	ROOF TOP HVAC UNIT
BFP	BACKFLOW PREVENTER DEVICE	NC	NORMALLY CLOSED	FD	FLOOR DRAIN	T	TRAP
BOS	BOTTOM OF STEEL	NG	NATURAL GAS	FRP	FIBERGLASS REINFORCED PIPING	TD	TRENCH DRAIN
BOF	BOTTOM OF FOOTING	NT	NEUTRALIZING TANK	G	GASOLINE	TOF	TOP OF FOOTING
BWV	BACK WATER VALVE	P	PITCH	GAL	GALLONS	TP	TRAP PRIMER
C	CONDENSATE	PC	PLUMBING CONTRACTOR	GALV	GALVANIZED	TYP	TYPICAL
CA	COMPRESSED AIR	PRV	PRESSURE REDUCING VALVE	GC	GENERAL CONTRACTOR	UG	UNDERGROUND
CFH	CUBIC FEET PER HOUR	PSI	POUNDS PER SQUARE INCH	GPM	GALLONS PER MINUTE	V	VENT
CI	CAST IRON	QC	QUICK CONNECT	GV	GATE VALVE	VIF	VERIFY IN FIELD
CO	CLEANOUT	R	AIR RECEIVER	GW	GREASE WASTE	VS	VENT STACK
CONT	CONTINUATION	RD	ROOF DRAIN	HB	HOSE BIBB	VTR	VENT THRU ROOF
CTE	CONNECT TO EXISTING	RCP	REINFORCED CONCRETE PIPE	HC	HANDICAPPED ACCESSIBLE	W	WASTE
CV	CHECK VALVE	RPD	REDUCED PRESSURE BACKFLOW PREVENTER	HR	HOSE REEL	WC	WATER CLOSET
DCW	DOMESTIC COLD WATER	RTU	ROOFTOP UNIT	HWH	HOT WATER HEATER	WHA	WATER HAMMER ARRESTER
DHW	DOMESTIC HOT WATER	WCO	WALL CLEANOUT	INV	INVERT	WW	WASH WATER
DHWR	DOMESTIC HOT WATER RETURN	WH	WATER HEATER	ICW	INDUSTRIAL COLD WATER	X" VENT (Y)	Y=VENT QUANTITY

NOT ALL ABBREVIATIONS DEFINED ARE NECESSARILY USED ON THIS PROJECT

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MAIN LOBBY RENOVATION

MARK	DATE	DESCRIPTION	BY

ISSUE BLOCK

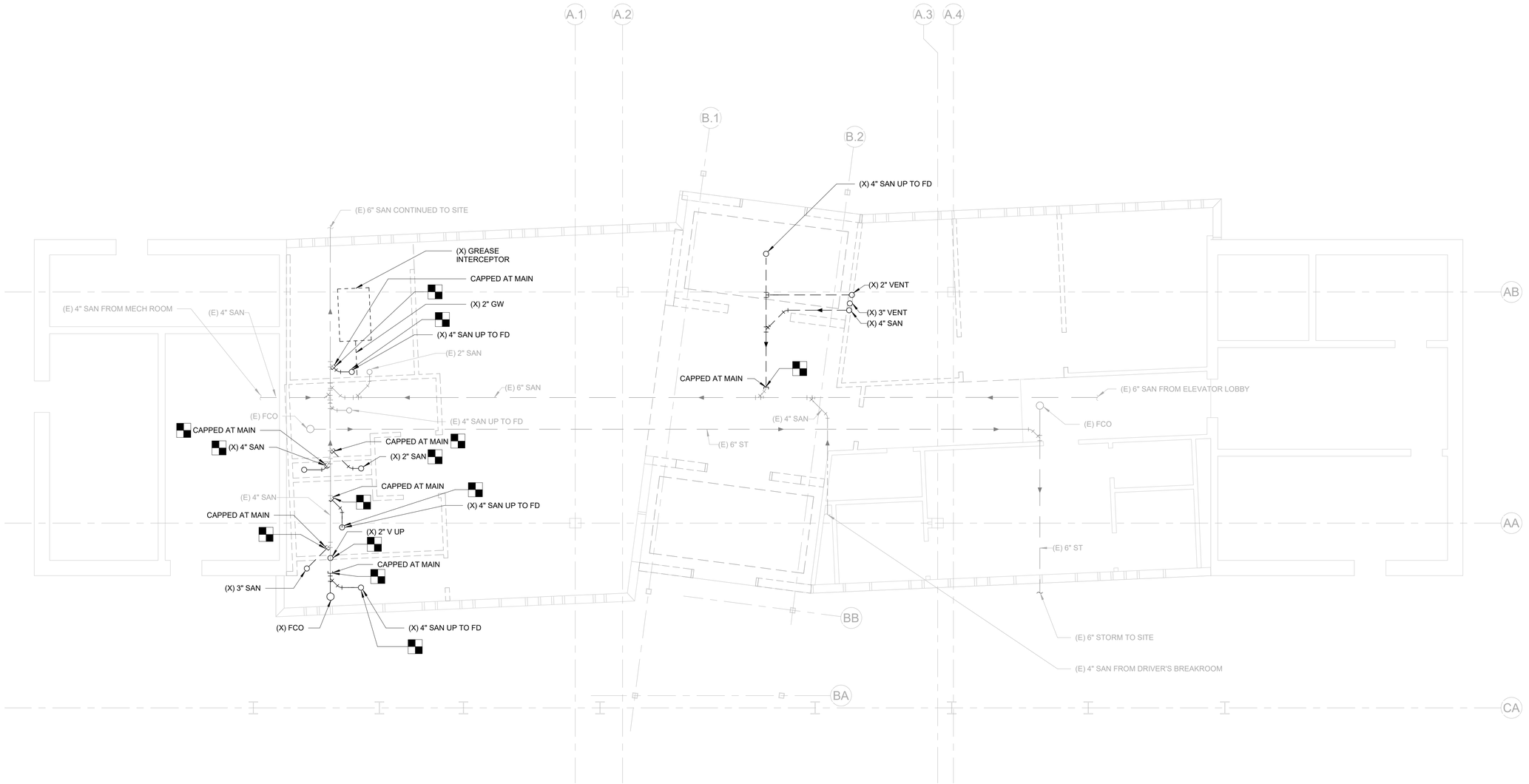
PROJECT NO.:	4022461
DESIGNED BY:	JML
DRAWN BY:	JML
CHECKED BY:	JO
APPROVED BY:	MAC
DATE:	02/10/2025

SHEET TITLE

PLUMBING LEGEND

P-001

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PLUMBING - UNDERGROUND DEMOLITION PLAN

3/16" = 1'-0"

0 4' 8' 12'

NOTE: PLUMBING CONTRACTOR SHALL ABANDON PIPING AND CAP AT MAIN TO REDUCE THE DEMOLITION OF EXISTING SLAB.

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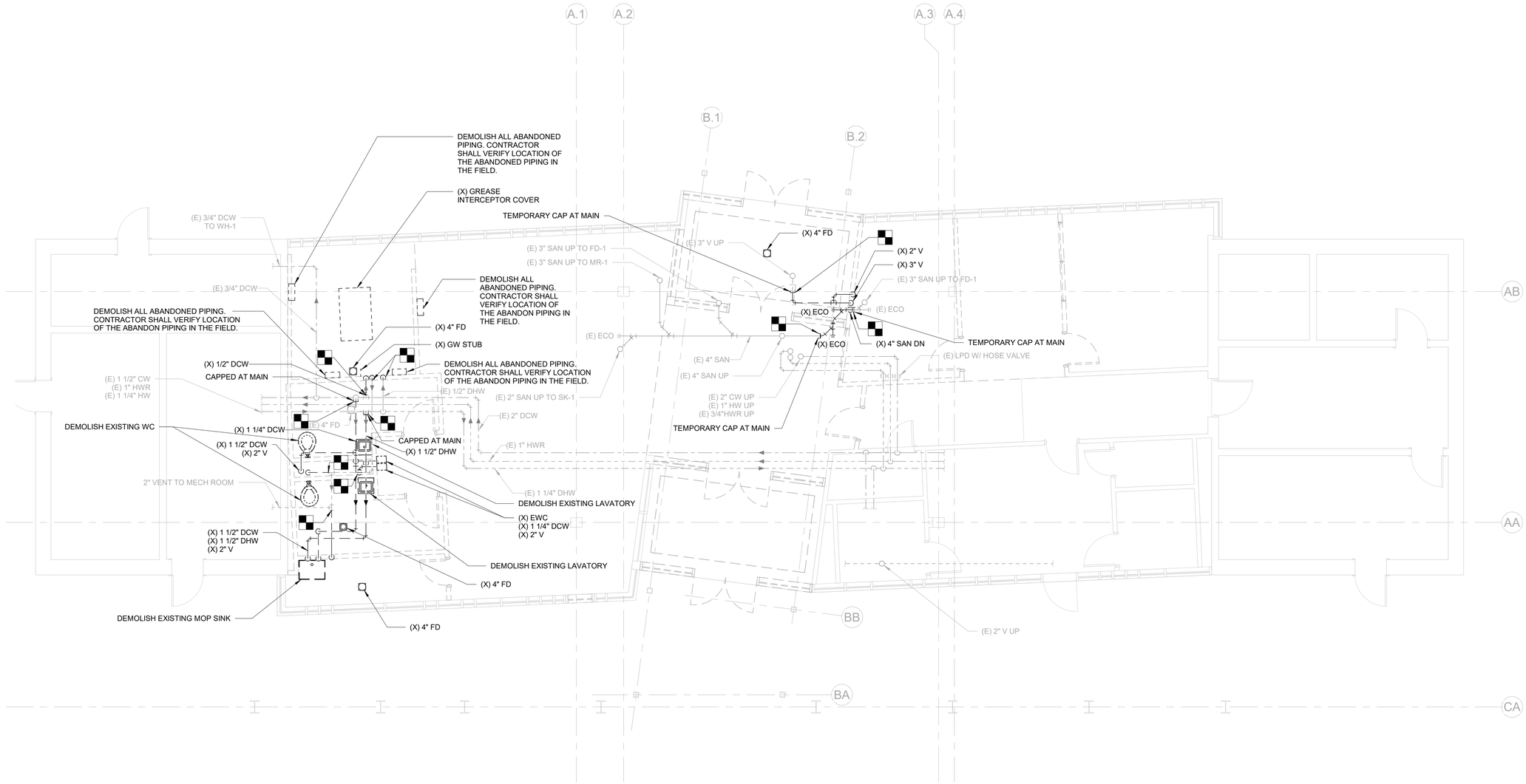
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SHEET TITLE

PLUMBING UNDERGROUND DEMOLITION PLAN

PD-100

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PLUMBING - FIRST FLOOR DEMOLITION PLAN

3/16" = 1'-0"

0 4" 8" 16"

NOTE: PLUMBING CONTRACTOR SHALL ABANDON PIPING AND CAP AT MAIN TO REDUCE THE DEMOLITION OF EXISTING SLAB.

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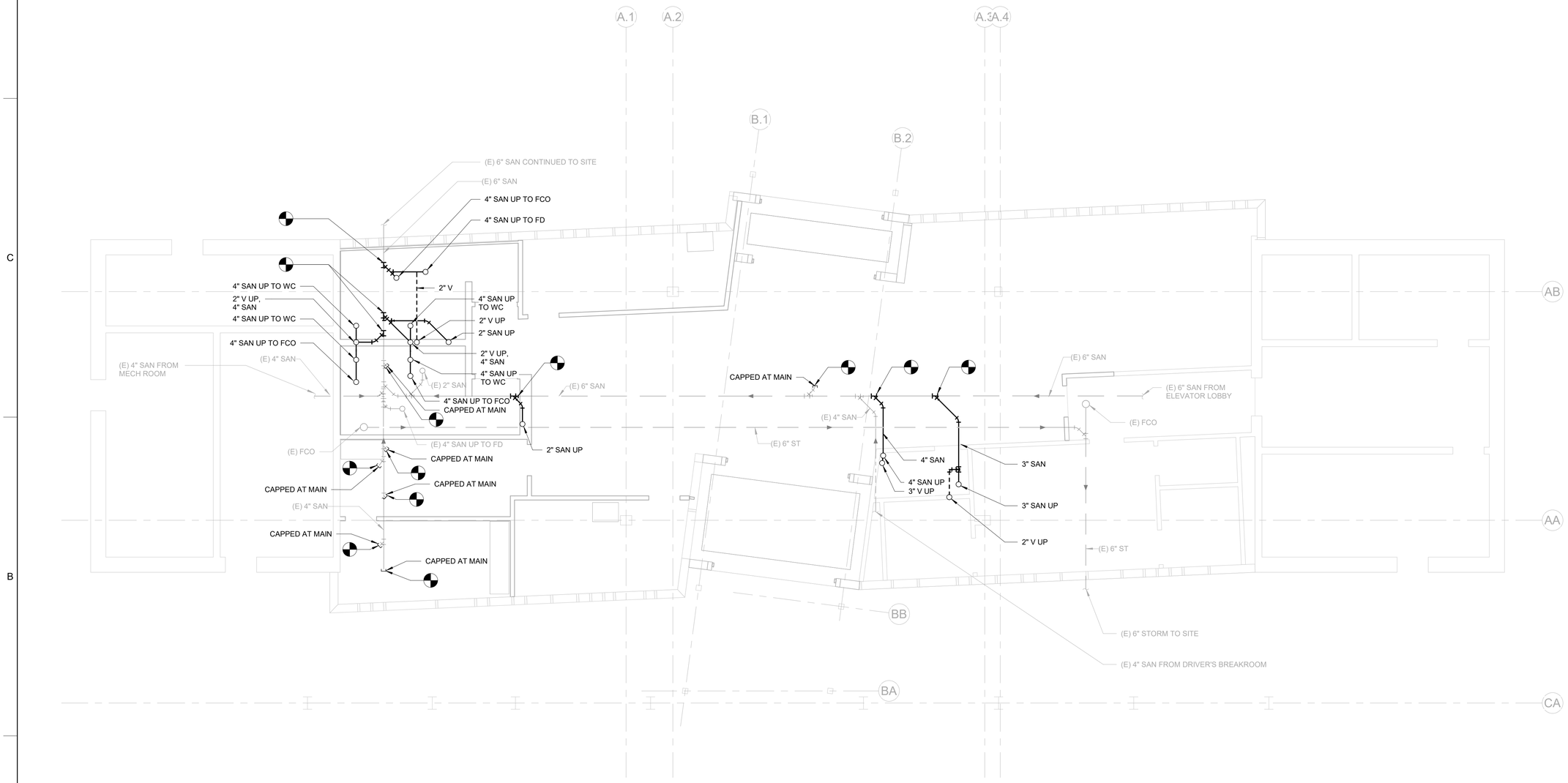
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DATE:	02/10/2025

SHEET TITLE

PLUMBING FIRST FLOOR DEMOLITION PLAN

PD-101

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PLUMBING - UNDERGROUND PLAN

3/16" = 1'-0"

0 4' 8' 12'

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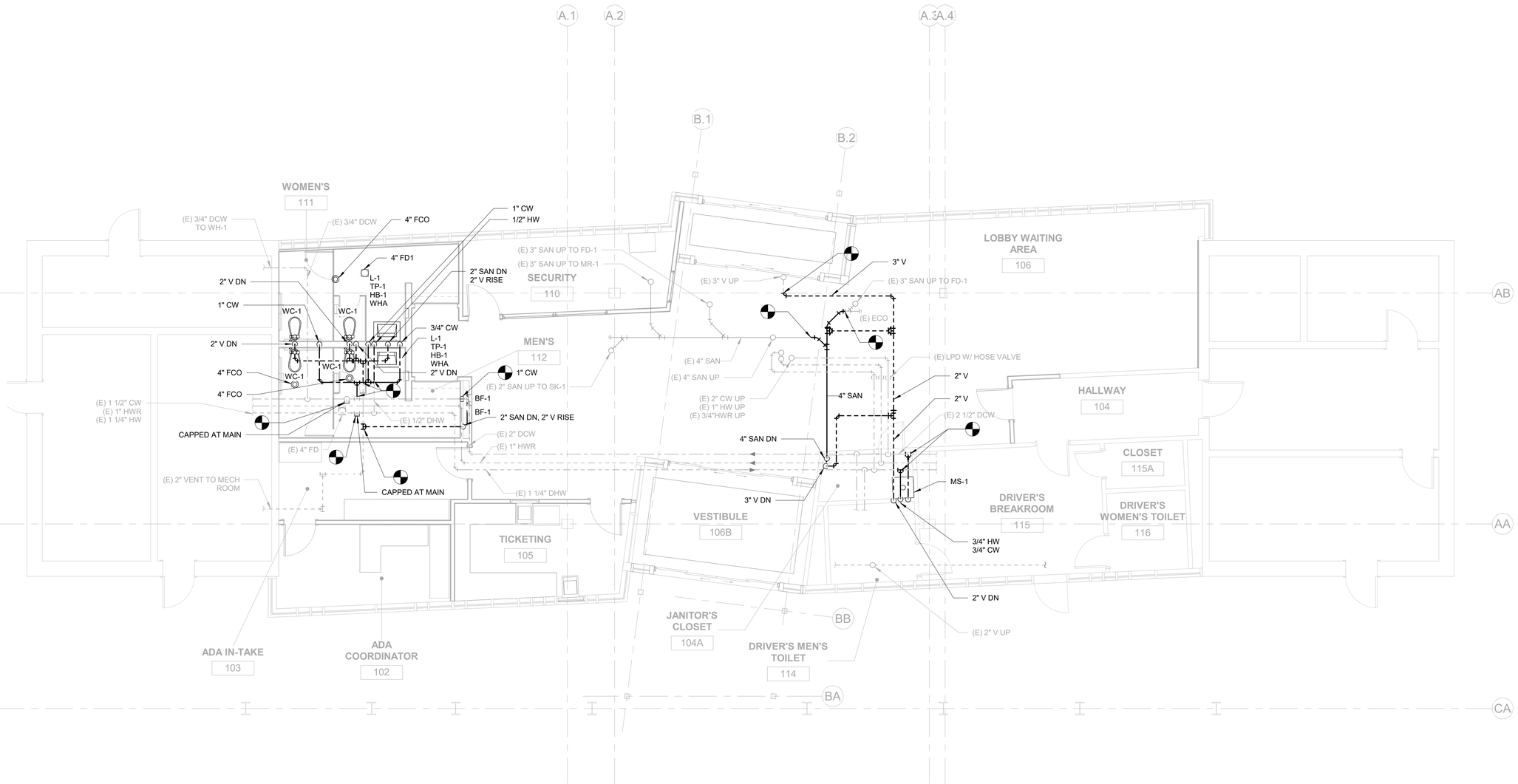
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SHEET TITLE

PLUMBING UNDERGROUND PLAN

P-100

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PLUMBING - FIRST FLOOR PLAN

3/16" = 1'-0"

0 4' 8' 12'

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PLUMBING FIRST FLOOR PLAN

P-101

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PLUMBING FIXTURE SCHEDULE

SYMBOL	ADA	MANUFACTURER/ MODEL NUMBER (BASIS OF DESIGN)	PRODUCT APPROVAL CODE	DESCRIPTION OF FIXTURE	FIXTURE CONNECTION SIZES				TRIM AND ACCESSORIES
					WASTE	VENT	COLD WATER	HOT WATER	
BF-1	♿	HAWS MODEL 2000 HS	P3-0616-570	HYDRATION STATION MOTION-ACTIVATED RECESSED BOTTLE FILLER ADA COMPLIANT	1 1/4"	1 1/2"	3/8"	--	ADA COMPLIANT WITH HAWS MODEL 6603 ACCESS PANEL, PROVIDE WITH AIR CHAMBER VENT ON COLD WATER SUPPLY LINE. PROVIDE TRAP ADAPTER. REQUIRE JUNCTION BOX 120V 15A GFCI-PROTECTED CIRCUIT
L-1	♿	TRUEFORM MODEL FLO-30V-ADA AMERICAN STANDARD MODEL 775B103.002	P1-0319-434 P1-0517-508	30" ADA FLOATING CONCRETE RAMP SINK SINGLE HOLE TOUCHLESS FAUCET, 13 YEAR BATTERY LIFE	1 1/2"	1 1/2"	1/2"	1/2"	0.35 GPM AERATOR, WATERSENSE LABELED, THERMOSTATIC MIXING VALVE FOR HOT WATER LIMITING OUTPUT TEMPERATURE TO 110°F, P-TRAP, JR SMITH MODEL SERIES 0700 WALL HANGER, SCREW DRIVER STOPS, TRUBRO LAV GUARD 2 INCLUDES PWRX BATTERY SYSTEM, PROVIDE WITH AIR CHAMBER VENTS ON BOTH HOT WATER AND COLD WATER SUPPLY LINES
MS-1	♿	KOHLER MODEL K-6710 (BASIN) / CHICAGO MODEL 540-LD897SWXFABCP (FAUCET)	P3-0515-456 P1-0118-259	ENAMELED CAST IRON CORNER MOP SINK	3"	1 1/2"	3/4"	3/4"	CHICAGO MODEL 540-LD897SWXFCP FAUCET WITH VACUUM BREAKER AND BRACE, K-8940 KOHLER RIM GUARD
WC-1	♿	ACORN MODEL DURA-WARE-2120-T-3 SLOAN MODEL G2 8111	P3-1018-105 P3-0116-220	ADA FLOOR MOUNT STAINLESS STEEL,WATER CLOSET 1.28/1.6 GPF, SENSOR OPERATED, 6 YEAR BATTERY, POLISHED CHROME, FLUSH VALVE	4"	2"	1"	--	WATER HAMMER ARRESTOR, JR SMITH MODEL SERIES 0200Y SUPPORT, WATERSENSE LABELED PWRX LONG-LIFE BATTERY SYSTEM

PLUMBING SPECIALTIES SCHEDULE

SYMBOL	MANUFACTURER/ MODEL NUMBER (BASIS OF DESIGN)	PRODUCT APPROVAL CODE	DESCRIPTION	FIXTURE CONNECTION SIZES				COMPONENTS AND ACCESSORIES
				WASTE	VENT	COLD WATER	HOT WATER	
HB	CHICAGO FAUCETS MODEL 998	P3-0717-655	HOSE BIBB	--	--	3/4"	--	VACUUM BREAKER
TP-1	PPP MODEL PRO1-500	P3-0717-653	FLOW ACTIVATE TRAP PRIMER	--	--	1/2"	--	--
WHA	WATTS LF15M2	P1-1014-111	USED TO CONTROL WATER PRESSURE SHOCK AND PREVENT WATER HAMMER CONDITIONS. FACTORY AIR CHARGED AND IS NOT RECHARGEABLE. MAXIMUM WORKING PRESSURE: 150 PSI	--	--	1/2"	--	SIZE PER MANUFACTURERS' INSTRUCTIONS

CLEANOUT SCHEDULE

SYMBOL	MANUFACTURER/ MODEL NUMBER (BASIS OF DESIGN)	PRODUCT APPROVAL CODE	DESCRIPTION	COMPONENTS AND ACCESSORIES
ECO	JR SMITH MODEL SERIES 4420	P3-0818-621	CAULK FERRULE CLEANOUTS LESS COVER AND SCREW	VANDAL PROOF SCREWS
FCO	JR SMITH MODEL SERIES 4040	P3-0818-621	SQUARE NICKEL BRONZE FINISH FLOOR AREA FLOOR CLEANOUT	VANDAL PROOF TOP, TOP TO BE COMPATIBLE WITH FINISH FLOOR MATERIAL, COORDINATE WITH ARCHITECTURAL FINISHES

INSULATION SCHEDULE

SERVICE	PIPE SIZE	INSULATION THICKNESS	FITTINGS	INSULATION TYPE	COMMENTS AND ACCESSORIES
COLD WATER	ALL	1/2"	PREMOLDED	PIPE-FIBERGLASS WITH ALL SERVICE JACKET FITTINGS-FIBERGLASS WITH LOW SMOKE PVC COVER	PROVIDE INSULATION SHIELD AT ALL HANGERS
HOT WATER	LESS THAN 1-1/2"	1-1/2"	PREMOLDED	PIPE-FIBERGLASS WITH ALL SERVICE JACKET FITTINGS-FIBERGLASS WITH LOW SMOKE PVC COVER	PROVIDE INSULATION SHIELD AT ALL HANGERS
HOT WATER	MORE THAN 1-1/2"	2"	PREMOLDED	PIPE-FIBERGLASS WITH ALL SERVICE JACKET FITTINGS-FIBERGLASS WITH LOW SMOKE PVC COVER	PROVIDE INSULATION SHIELD AT ALL HANGERS
HOT WATER RETURN	ALL	1"	PREMOLDED	PIPE-FIBERGLASS WITH ALL SERVICE JACKET FITTINGS-FIBERGLASS WITH LOW SMOKE PVC COVER	PROVIDE INSULATION SHIELD AT ALL HANGERS

DRAIN SCHEDULE

SYMBOL	MANUFACTURER/ MODEL NUMBER (BASIS OF DESIGN)	PRODUCT APPROVAL CODE	DESCRIPTION	FIXTURE CONNECTION SIZES				COMPONENTS AND ACCESSORIES
				WASTE	VENT	COLD WATER	HOT WATER	
FD1	JR SMITH MODEL SERIES 2005	P3-0818-621	CAST IRON BODY WITH FLASHING COLLAR AND ADJUSTABLE SQUARE STRAINER HEAD	4"	2"	--	--	PROVIDE TRAP PRIMER CONNECTION

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SEALS

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MAIN LOBBY RENOVATION

MARK	DATE	DESCRIPTION	BY

ISSUE BLOCK

PROJECT NO.:	4022461
DESIGNED BY:	JML
DRAWN BY:	JML
CHECKED BY:	JO
APPROVED BY:	MAC
DATE:	02/10/2025

SHEET TITLE

PLUMBING SCHEDULES

P-401

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FIRE PROTECTION DEMOLITION NOTES

A. THESE FIRE PROTECTION DEMOLITION NOTES APPLY TO ALL FIRE PROTECTION DEMOLITION DRAWINGS. BEFORE STARTING WORK, ARRANGE TO SHUT DOWN FIRE PROTECTION SYSTEM IN AREA OF DEMOLITION WORK. THE CONTRACTOR SHALL VERIFY THE EXACT SERVICE OF ANY EXISTING FIRE PROTECTION SYSTEM PRIOR TO BEGINNING DEMOLITION. COORDINATE DEMOLITION AND FIRE PROTECTION SYSTEM SHUT DOWN AS REQUIRED WITH THE OWNER. THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING ALL VALVES REQUIRED TO ISOLATE THE WORK.

B. DEMOLITION WORK SHALL COMPLY WITH ALL OSHA, STATE AND LOCAL CODES/ORDINANCES. OBSERVE RECOMMENDATIONS IN "BUILDING CONSTRUCTION AND DEMOLITION OPERATIONS" OF NFPA STANDARD 241. REFER TO DIVISION 1 OF THE CONTRACT DOCUMENTS FOR ADDITIONAL REQUIREMENTS.

C. ABANDONED PIPING IS TO BE CUT BACK TO MAIN AND CAPPED. DEMOLITION OF PIPING SHALL BE DONE IN A MANNER SO AS NOT TO CREATE DEAD-LEGS OFF ANY MAINS.

D. ALL EQUIPMENT, MATERIALS AND DEBRIS DESIGNATED FOR DEMOLITION, OR AS A RESULT OF DEMOLITION, SHALL BE REMOVED FROM THE PROPERTY IN A TIMELY MANNER AS REQUIRED BY THE GENERAL CONTRACTOR OR OWNER. THIS DOES NOT INCLUDE ANY EQUIPMENT OR MATERIALS DESIGNATED TO BE SALVAGED, WHICH SHALL BE COORDINATED WITH THE GENERAL CONTRACTOR FOR ADDITIONAL REQUIREMENTS.

E. ANY PROPERTY OR ITEMS DAMAGED DURING THE PROGRESS OF THE DEMOLITION WORK, INCLUDING ANY DAMAGE TO EXISTING STRUCTURE, OR ADJACENT EQUIPMENT CAUSED BY THE TRANSPORTING OF MATERIALS OR EQUIPMENT, SHALL BE REPAIRED AND/OR REPLACED IN A TIMELY MANNER, OR AS REQUIRED BY THE OWNER.

F. INFORMATION CONTAINED ON THIS DRAWING WAS OBTAINED FROM ARCHIVED DRAWINGS AND FIELD VISITS. NOT ALL FIRE PROTECTION SYSTEMS, EQUIPMENT AND PIPING MAY BE SHOWN. VISIT THE SITE PRIOR TO SUBMITTAL OF BID TO DETERMINE CONDITIONS AFFECTING THE EXECUTION OF WORK. AFTER VISITING THE SITE, REQUEST SUCH FURTHER INFORMATION AND/OR CLARIFICATION AS NECESSARY TO FULLY UNDERSTAND THE WORK REQUIRED AND TO PROPERLY ESTIMATE COST. THE RENDERING OF A PROPOSAL OR BID TO PERFORM THE WORK SHALL REPRESENT THAT THE SITE HAS BEEN VISITED AND ALL CONDITIONS AFFECTING THE PERFORMANCE OF THE CONTRACT HAVE BEEN NOTED.

G. REFER TO THE SPECIFICATIONS FOR REQUIREMENTS OF PATCHING AND REPAIRS DUE TO DEMOLITION WORK.

FIRE PROTECTION GENERAL NOTES

A. THESE GENERAL NOTES ARE APPLICABLE TO ALL FIRE PROTECTION DRAWINGS.

B. DRAWINGS ARE DIAGRAMMATIC AND SHOW THE GENERAL INTENT OF WORK. SEE DETAILS AND SPECIFICATIONS FOR ADDITIONAL INFORMATION.

C. FIRE PROTECTION PIPING AND EQUIPMENT TO BE INSTALLED TO COMPLY WITH FM GLOBAL, NFPA, STATE OF MASSACHUSETTS AND LOCAL CODES.

D. REVIEW THE ARCHITECTURAL AND STRUCTURAL PLANS AS PART OF THIS CONTRACT FOR ADDITIONAL INFORMATION SUCH AS CEILING TYPES, AND OR OTHER DEVICE LOCATIONS.

E. REVIEW THE ELECTRICAL DRAWINGS AND COORDINATE THE FIRE PROTECTION WORK WITH LOCATIONS OF LIGHTS. FIRE SPRINKLER PIPING SHALL BE INSTALLED AT CEILING LEVEL, WITH SPRINKLER HEADS INSTALLED PARALLEL TO ROOF DECK.

F. REVIEW THE HVAC DRAWINGS AND COORDINATE THE FIRE PROTECTION WORK WITH LOCATIONS OF CEILING MOUNTED DEVICES SUCH AS DIFFUSERS, GRILLS, REGISTERS, LOCATIONS OF HEAT PRODUCING EQUIPMENT AND DUCTWORK.

G. REFER TO SITE PLAN, PLUMBING PLAN AND CIVIL PLANS FOR ADDITIONAL INFORMATION PERTAINING TO COORDINATION OF SITE UTILITIES, BOTH EXISTING AND NEW.

H. FIRE PROTECTION CONTRACTOR SHALL CONFIRM AND VERIFY EXISTING PIPE SIZES IN THE FIELD.

I. COORDINATE FIRE ALARM SYSTEM WORK WITH ELECTRICAL SYSTEM WORK.

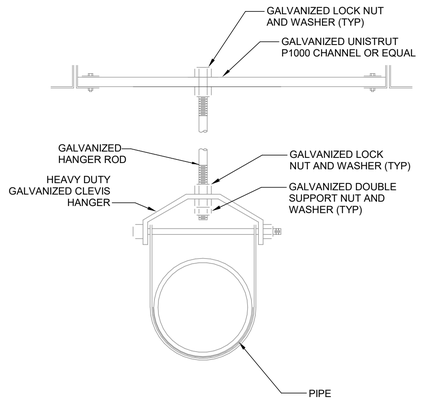
J. NFPA 13 COMPLIANT FLEXIBLE CONNECTIONS SHALL BE PROVIDED AT EACH OF THE NEW SPRINKLER HEADS. FLEXIBLE CONNECTIONS SHALL BE PROVIDED WITH MANUFACTURER RECOMMENDED SUPPORT.

SPRINKLER SYSTEM DESIGN CRITERIA

1. SYSTEM DESIGN: NFPA 13-2019, STANDARD FOR THE INSTALLATION OF SPRINKLER SYSTEMS.
2. CLASSIFICATION:
   OFFICE AREAS: LIGHT HAZARD
   MECHANICAL/JANITOR ROOMS: ORDINARY HAZARD GROUP 1
3. PIPE SIZING:
   OFFICE AREAS: 0.1 GPM/SF OVER 1500
   MECHANICAL/JANITOR ROOMS: 0.15 GPM/SF OVER 1500 SF
4. SPRINKLER MINIMUM NOMINAL K-FACTOR:
   CONTRACTOR TO CONFIRM K-FACTOR IN FIELD AND USE SAME K FACTORS AS EXISTING IN SPACES WHERE K-FACTORS ARE BEING ADDED. ALL SPRINKLER HEADS THAT ARE PROTECTING THE SAME HAZARD AREA SHALL BE OF THE SAME K-FACTOR.
5. SPRINKLER MINIMUM TEMPERATURE RATING: 155°F ORDINARY TEMPERATURE RATING.
6. ALL PIPE ASSOCIATED WITH THE SPRINKLER SYSTEM SHALL BE SCHEDULE 40 BLACK STEEL.
7. ALL VALVES CONTROLLING THE FLOW OF WATER TO SPRINKLERS SHALL BE PROVIDED WITH TAMPER SWITCHES WIRED TO BUILDING ALARM.
8. SPRINKLER HEAD LOCATIONS SHOWN ON PLANS ARE APPROXIMATE AND FOR APPROVAL PURPOSES ONLY.
9. CONTRACTOR SHALL LOCATE PIPING AND HEADS. SUBMIT SHOP DRAWINGS, PLANS AND HYDRAULIC CALCULATIONS, SIGNED AND SEALED BY A LICENSED PROFESSIONAL FIRE PROTECTION ENGINEER, REGISTERED IN THE COMMONWEALTH OF MASSACHUSETTS.
10. CONTRACTOR'S HYDRAULIC CALCULATIONS SHALL USE FLOW TEST DATA FROM WITHIN 1 YEAR OF THEIR WORK.

FIRE PROTECTION ABBREVIATIONS

ACV	ALARM CHECK VALVE
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
APPROX	APPROXIMATELY
ATS	AUTOMATIC TRANSFER SWITCH
BFP	BACKFLOW PREVENTER
BOP	BOTTOM OF PIPE
CTE	CONNECT TO EXISTING
DN	DOWN
EL	ELEVATION
EX	EXISTING
FACP	FIRE ALARM CONTROL PANEL
FDC	FIRE DEPARTMENT CONNECTION
FHV	FIRE HOSE VALVE
FS	FLOW SWITCH
FSP	FIRE STANDPIPE
FVA	FLOOR CONTROL VALVE ASSEMBLY
FVC	FIRE VALVE CABINET
G	CAGE GUARD
GPM	GALLONS PER MINUTE
HC-#	FM GLOBAL HAZARD CATEGORY
LPS	LOW PRESSURE SWITCH
NC	NORMALLY CLOSED
NIC	NOT IN CONTRACT
N/O	NORMALLY OPEN
PIV	POST INDICATOR VALVE
PRV	PRESSURE REGULATING VALVE
PS	PRESSURE SWITCH
PSI	POUNDS PER SQUARE INCH
RCV	RISER CONTROL VALVE
RPD	REDUCED PRESSURE BACKFLOW PREVENTER ASSEMBLY
RR	REMOVE & RELOCATE
SP	SPRINKLER PIPE
SS	SUPERVISORY SWITCH
TYP	TYPICAL
UG	UNDERGROUND
UPF	UNDER PLATFORM
VIF	VERIFY IN FIELD
WPIV	WALL POST INDICATOR VALVE



TYPICAL PIPE HANGER DETAIL

NTS

FIRE PROTECTION SYMBOLS

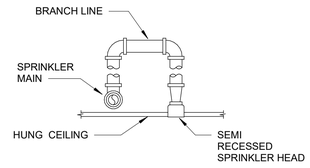
	ANGLE HOSE VALVE W/CAP & CHAIN
SS	SUPERVISORY SWITCH (TAMPER SWITCH)
SS	OS&Y VALVE (SUPERVISED)
SS	GLOBE VALVE (SUPERVISED)
SS	BUTTERFLY VALVE (SUPERVISED)
FCVA	FLOOR CONTROL VALVE ASSEMBLY
	CHECK VALVE
	DRAIN VALVE
	BACKFLOW PREVENTER (BFP)
FDC	FREE STANDING FIRE DEPT CONNECTION (REFER TO SPECS FOR TYPE)
	PENDENT SPRINKLER
	SEMI-RECESSED PENDENT SPRINKLER
	UPRIGHT SPRINKLER
	SIDEWALL SPRINKLER
	FIRE EXTINGUISHER, UL RATING 3A:40B:C, AND MOUNTING BRACKET
	FIRE EXTINGUISHER, UL RATING 3A:40B:C, IN SEMI-RECESSED CABINET
	5 LB ABC CLEAN AGENT TYPE FIRE EXTINGUISHER, AND MOUNTING BRACKET
	FM-200 SPRINKLER HEAD
	MANUAL RELEASE UNIT AND ABORT BUTTON
S	SMOKE DETECTOR
X	HYDRAULIC NODE
	CONNECT TO EXISTING
	DISCONNECT FROM EXISTING

FIRE PROTECTION LEGEND

	FLOW DIRECTION
	FIRE STANDPIPE LINE
F	WET SPRINKLER PIPING
D	DRAIN PIPING
	PIPE DOWN
	PIPE UP
	PIPE DROP
	CAPPED PIPE
	PIPE REDUCER

LEGEND NOTE

THESE ARE THE GENERAL LEGENDS OF SYMBOLS AND ABBREVIATIONS, AND SHALL BE USED AS A DICTIONARY TO DEFINE ITEMS INDICATED ON DRAWINGS. NOT ALL SYMBOLS OR ABBREVIATIONS DEFINED ARE NECESSARILY USED ON THIS PROJECT.



SPRINKLER HEAD INSTALLATION

NTS

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SHEET TITLE

FIRE PROTECTION LEGEND

FP-001

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FIRE PROTECTION - FIRST FLOOR DEMO PLAN

3/16" = 1'-0"

0 4' 8' 12'

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FIRE PROTECTION FIRST FLOOR DEMO PLAN

FPD-100

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FIRE PROTECTION - FIRST FLOOR PLAN

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0 4' 8' 12'

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FIRE PROTECTION FIRST FLOOR PLAN

FP-100

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