PROJECT MANUAL

ADDITION OF TRUCK WASH FACILITY TO EXISTING DEPARTMENT OF PUBLIC WORKS GARAGE

55 SEA STREET
QUINCY, MA

JULY 29, 2013

CONSULTANTS:

ARCHITECT:
HOLMES & EDWARDS, INC.
26 CHESTNUT STREET
QUINCY, MA 02169
WWW.HOLMESEDWARDS.COM
PHONE: 617.471.7377
FAX: 617.471.9203

STRUCTURAL ENGINEER:
ODEH ENGINEERS, INC.
1223 MINERAL SPRING AVENUE
NO. PROVIDENCE, RI 02904
WWW.ODEHENGINEERS.COM
PHONE: 401.724.1771
FAX: 401.724.1981

MEP/FP ENGINEER:
BUILDING ENGINEERING RESOURCES, INC.
66 MAIN STREET
NORTH EASTON, MA 02356
WWW.BER-ENGINEERING.COM
PHONE: 508.230.0260
FAX: 508.230.0265

SPECIFICATIONS:
KALIN ASSOCIATES, INC.
1121 WASHINGTON STREET
NEWTON, MA 02465
WWW.KALINASSOCIATES.COM
PHONE: 617.964.5477
FAX: 617.964.5788

PROJECT MANUAL

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INVITATION TO BID

The City of Quincy the ("Awarding Authority"), invites sealed bids for Addition of Truck Wash Facility to the existing Department of Public Works Garage, located at 55 Sea Street, Quincy, MA in accordance with Drawings and Specifications prepared by Holmes & Edwards, Inc.

The work of this Contract involves the construction of an 1800 s.f. masonry addition to the existing Garage facility. Construction will include exterior masonry walls with brick veneer, rubber membrane roofing, doors and windows. Interior construction will include mechanical, electrical, plumbing, fire protection and fire alarm systems. Site work will include connections to existing utilities, paving and exterior lighting. The projected construction duration will be 10 weeks.

Bidding procedures shall be in accordance with Chapter 149 of Massachusetts General Laws, as amended, including "Construction Reform" amendments contained in Chapter 193 of the Acts of 2004.of Massachusetts Legislature. Bids will be accepted only from General Bidders and Sub-Bidders eligible to bid on this Project.

Sealed bids submitted on forms furnished by the Awarding Authority and clearly identified as bids, endorsed with the name and address of the bidder and the name of the Project, will be received no later than the times and dates specified below for receipt of bids and will forthwith be publicly opened and read aloud in the City Council Chamber, 1305 Hancock Street, Quincy, MA.

- Sealed Filed Sub-Bids for the sub-trades designated below will be received by the Awarding Authority at the City Council Chamber, 1305 Hancock Street, Quincy, MA at **11AM on Thursday, August 15, 2013.**
- Sealed General-Bids for the General Contract will be received by the Awarding Authority at the City Council Chamber, 1305 Hancock Street, Quincy, MA at **11AM on Thursday, August 22, 2013**.

Each Bid shall be accompanied by Bid Security equal to five (5) percent of the Bid amount in the form of a Bid Bond, Cash or a Certified, Treasurer's or Cashier's Check issued by a responsible U.S. bank or Trust Company, payable to the City of Quincy. Each Bidder shall attach the required Bid Bond or Check to the Bid Form. This requirement applies to the following:

- General Bidders
- Filed Sub-Bidders

Each Bidder shall be certified by the Department of Capital Asset Management (OWNER) for the category of work and dollar amount of this Project, and to be considered, shall submit with his or her Bid, an OWNER Certification and Update Statement indicating additional work or contracts performed or executed after the certification date.

- Estimated construction cost of this Project: $300,000
- DCAM Certification Category: General Building Construction.

Filed Sub-Bids will be required for the Work of the following sub-trades:

MASONRY
MISCELLANEOUS AND ORNAMENTAL IRON
WATERPROOFING, DAMPPROOFING AND CAULKING
ROOFING AND FLASHING
GLASS AND GLAZING
PAINTING
PLUMBING
HVAC
ELECTRICAL WORK

Bidding Documents comprise Bidding Requirements and Contract Documents including all Addenda, as defined in Document 002113 – INSTRUCTIONS TO BIDDERS.

Each General Bidder may obtain two (2) complete sets of Bidding Documents and each Sub-Bidder may obtain one (1) complete set of Bidding Documents at Quincy Purchasing Department at 1305 Hancock Street, Quincy, MA and Holmes & Edwards, Inc. between the hours of 9:00 a.m. and 4:00 p.m., upon deposit of $100 per set in the form of money order or a certified check made payable to the City of Quincy. 24 hours notice must be given for printing of plans and specifications. Plans may also be obtained by calling Signal Graphics, 1363 Hancock Street, Quincy, MA, 617-472-1700, attention Rui.

- Additional sets may be purchased at the same office for $100 per set, refundable.
- Copies of the FORM FOR GENERAL BID and FORM FOR SUB-BID will be available at no cost.
- Copies of Addenda will be mailed or delivered to each registered General Bidder and Filed Sub-Bidder at no cost.

The full amount of each deposit for Bidding Documents will be refunded to each Bidder returning complete sets of Bidding Documents (including Addenda if issued) to the City of Quincy or Holmes & Edwards, Inc. in good condition within thirty (30) days after the date of the General Bid opening. Deposits for Bidding Documents will be forfeited to the City of Quincy if Bidding Documents are not returned within the specified time limit.

Bidders shall address inquiries regarding availability of Bidding Documents, delivery time and other similar matters to the City of Quincy or Holmes & Edwards, Inc. Arrangements for delivery or mailing may be made directly with Holmes & Edwards, Inc., Diom O'Connell, 617-471-7377 or Signal Graphics, 617-472-7100. A non-refundable mailing and handling charge per set shall accompany each request for mailed Bidding Documents. No documents will be mailed before receipt of the mailing charge. Copies of Addenda will be mailed or delivered to registered bidders without charge.

A Pre-Bid Conference will be held at D.P.W, 55 Sea Street, Quincy, MA on **Thursday, August 6, 2013 at 10AM**. All bidders are invited and encouraged to attend.

The Bidding Documents may be examined at the following places during normal business hours after issuance:

City of Quincy
Purchasing Department
1305 Hancock Street
Quincy, MA 02169
Phone: 617-376-1060

City of Quincy
Public Buildings Department
58 Saville Avenue
Quincy, MA 02169
Phone: 617-376-1542

Holmes & Edwards, Inc.
26 Chestnut Street
Quincy, MA 02169
Phone: 617-471-7377

The Bid Securities of all General Bidders, except those of the three lowest responsible and eligible General Bidders, will be returned within five (5) days, Saturdays, Sundays, and legal holidays excluded, after the opening of General Bids.

The successful General Bidder will be required to furnish a Performance Bond and a labor and materials Payment Bond as required by the Bidding Documents.

All bids for this Project are subject to the provisions of Massachusetts General Laws (Ter. Ed), Chapter 30, Section 39M as amended; Portions of Mass. G.L. Chapter 149, Sections 44A through 44L inclusive; and Chapter 149, Section 26 through 27D inclusive; except Section 44F, as amended by Chapter 193 of the Acts of 2004 of the Massachusetts Legislature.

The minimum wages to be paid mechanics, apprentices, teamsters, chauffeurs, and laborers on the Project shall be established by the Minimum Wage Schedule, as determined by the Commissioner of

Labor and Industries, pursuant to the provisions of M.G.L. Chapter 149, Section 25 to 27D, inclusive, as amended, which schedule is included in the Bidding Documents.

The Awarding Authority reserves the right to waive any informalities and to reject any or all General Bids if it be in the public interest so to do, and to reject any sub-bid on any sub-trade if it determines that such Sub-bid does not represent the sub-bid of a person competent to perform the work as specified or that less than three such Sub-bids were received and that the prices are not reasonable for acceptance without further competition.

All bids shall remain in effect for 30 days, Saturdays, Sundays, and legal holidays excluded after opening of General Bids. Successful bidders shall agree to commence work and complete the Work in accordance with the dates set forth in the Bidding Documents.

Ms. Kathryn Hobin, Purchasing Agent
City of Quincy Purchasing Department
1305 Hancock Street
Quincy, MA 02169

DOCUMENT 002113

INSTRUCTIONS TO BIDDERS

Project Name and Location: Addition of Truck Wash Facility to the existing Department of Public Works Garage, 55 Sea Street, Quincy, MA.

1. This document contains instructions to bidders for the project named above. This bidding document is not part of the Contract Documents, unless specifically referenced in the Contract.

   To obtain bidding documents contact:

   a. The bidding documents are available at the Purchasing Department, Quincy City Hall, 1305 Hancock Street, Quincy, MA 02169 and through an online link provide by the City of Quincy Purchasing Department. Interested contractors may request the link at purchasing@quincyma.gov.

Name:	Ms. Kathryn Hobin, Purchasing Agent
Address:	City of Quincy Purchasing Department
	1305 Hancock Street
City, State, ZIP:	Quincy, MA 02169
Phone:	617-376-1060
Fax:	617-376-1074
Email:	khobin@quincyma.gov
Cc:	kimtrillcott@quincyma.gov

   b. An online link will also be provided through the Architect's office.

Name:	Diom O'Connell, Vice President
Firm:	Holmes & Edwards, Inc.
Address:	26 Chestnut Street
City, State, ZIP:	Quincy, MA 02169
Phone:	617-471-7377
Fax:	617-471-9203
Email:	doconnell@holmesedwards.com

   c. Contact Signal Graphics to obtain printed bid documents. A twenty-four (24) hour waiting period will be required by Signal Graphics for printing. Printed documents will be made available for pick up or can be mailed at cost to the Contractor.

Address:	Signal Graphics
	1363 Hancock Street
City, State, ZIP:	Quincy, MA 02169
Phone:	617-472-1700
Fax:	617-472-1776
Email:	sg225@signalgraphics.net

   d. The bidding documents are available for review at:

Address:	Public Buildings Department
	58 Saville Avenue
	Quincy, MA
Phone:	617-376-1542
Attn:	Gary Cunniff or Walter MacDonald

2. Deposits for Documents: Refundable of $100 per set required to obtain prints.

3. Submission of Bids: All bids must be sealed and clearly labeled as described in Invitation to Bid and hand delivered. Submit all bid documents and required forms before the time and date below.

Submit Bids to:

Name:	Ms. Kathryn Hobin, Purchasing Agent
Address:	City of Quincy Purchasing Department
	1305 Hancock Street
City, State, ZIP:	Quincy, MA 02169
Phone:	617-376-1060
Fax:	617-376-1074

Bids due: Date and Time of day: Sub- Bids – Thursday, August 13, 2013 @ 11:00 AM
General Bids – Thursday, August 22, 2013 @ 11:00 AM

4. A Bid Security is required – 5% bid bond.

5. A 100% Performance and Payment Bond is required.

6. Oral modifications to bids will not be considered.

7. All blanks must be filled in on bid forms.

8. The City of Quincy reserves the right to reject or accept any or all bids or to enter into negotiations with any bidder. The City of Quincy reserves the right to waive any alleged breach of technicality.

9. The City of Quincy reserves the right to modify the Contract Documents and re-bid the project, if necessary, to meet the budgetary requirements.

10. Questions: Submit Request for Information questions in writing by e-mail only to the person named below, no later than 4:00 PM of the business day, as follows:
Sub Trades – August 9, 2013 at noon
General Contractors – August 9, 2013 at noon

Name:	Diom O'Connell
Firm:	Holmes & Edwards, Inc.
Address:	26 Chestnut Street
City, State, ZIP:	Quincy, MA 02169
Phone:	617-471-7377
Fax:	617-471-9203
Email:	doconnell@holmesedwards.com

All RFI questions shall be on a form including the following information:
1. Request for Information (RFI) number and date
2. Company name, address, e-mail
3. Project Name
4. Subject
5. Discipline
6. Category
7. Question
8. Contact name, e-mail

11. A non-mandatory pre-bid walk thru will be held on Tuesday, August 6, 2013 at 10:00 AM at the site.

12. The successful Bidder agrees to commence work within five (5) days of the execution of the General Contract, AIA Document A101-2007. Substantial completion to be achieved no later than October 31, 2013. Subcontractors and General Contractors shall have Liquidated Damages in the amount of $1,500 per day.

13. The Contractor shall visit the site and carefully examine the areas affected and all conditions, which may affect proper execution of the work, including field dimensions. The City of Quincy will provide additional access at their convenience. No claims for additional costs will be allowed because of lack of full knowledge of the existing conditions. Contractor's proposal shall include all work necessary to complete the work as hereinafter specified.

14. The Contractor shall include all charges for labor, materials, tools, staging, equipment, and supervision to complete, in a thoroughly workmanlike manner, all the work described hereafter. All work shall be according to code and approved by the proper authority.

15. The Contractor shall be responsible for obtaining all necessary permits required for the work. Such permits shall be obtained from the local and state authorities having jurisdiction over the work. There will be no fee associated with building permits issued by the Inspectional Services Department, City of Quincy.

16. Where necessary, the Contractor shall take full and protective precautions to protect any and all property and structures in the vicinity of the work area from any damage whatsoever arising from the work. He shall, at his own expense, completely repair to the satisfaction of the City and all damages to such property and structures arising from his operations.

17. Materials having salvage value shall become the property of the City. All other materials and debris accumulated because of this operation shall be deposited in a designated dumpster on site. No hazardous materials shall be left on site or deposited in any container on site. The premises are to be left clean and neat.

18. Changes to the work order from these specifications, as written shall not be made by the Subcontractor except as provided in the General Conditions of the Contract. The City of Quincy will not pay for any work done by the Contractors unless the Architect confirms the change or changes in writing prior to the execution of these changes. AIA Form G701 shall be used to show any additions or deductions to the contract proposal.

19. The City of Quincy reserves the right to reject any and all bids for the work, for any reason, and to waive any informalities in the bid procedure of bidding and to award the work to the bidder most suitable to the interest of the City of Quincy.

20. Proposals shall be broken down to show a separate price for work by the trade division. Proposal shall also include total price for the complete work. In addition, proposals shall state the commencement and completion dates of the work. These dates shall be based on the estimate of working days excluding Saturdays, Sundays, and holidays.

21. Contractor's invoices or requisitions shall be submitted using AIA Form G702 and G702A. All requisitions shall be notarized.

22. The Bidder is advised that City of Quincy is a "not for profit public agency" and is not required to pay the Massachusetts Sales Tax on materials to be purchased and built into the work. Contractor proposal and invoices for the project shall reflect this requirement.

23. Contractor shall furnish to the City when requested and before or with his invoice or requisition, Release of Lien form similar to AIA Document G706A.

END OF DOCUMENT

DOCUMENT 004100

FORM FOR GENERAL BID

Due Date for Bid, Thursday, August 22, 2013 @ 11:00 AM

TO: The Awarding Authority

A. BASE BID: The undersigned proposes to furnish all labor and materials required for construction of Addition of Truck Wash Facility to the existing Department of Public Works Garage, 55 Sea St., Quincy, Massachusetts in accordance with Contract Documents, including Drawings and Specifications, all as prepared by Holmes & Edwards, Inc. for the Contract Price specified below, subject to additions and deductions according to the terms of the Contract Documents.

B. CONTRACT PRICE: The proposed Contract Price is _

_____Dollars ($ _____).

C. ADDENDA: This Bid includes Addenda numbered:_____

D. SUB-DIVISION OF BID: The sub-division of the proposed Contract Price is as follows:

Item 1: The work of the General Contractor, being all work other than that covered by Item 2:

_____

Dollars ($ _____).

Item 2: Sub-Bids as follows:

Sub-Trade	Name of Sub-Bidder	Amount	Bonds required by General Bidder (Yes or No). This column does not apply to Projects with Subcontractor Prequalification under c.149§44D3/4 and should be left blank on such Projects)
Masonry		$	
Miscellaneous and Ornamental Iron		$	
Waterproofing, Dampproofing and Caulking		$	

Sub-Trade	Name of Sub-Bidder	Amount	Bonds required by General Bidder (Yes or No). This column does not apply to Projects with Subcontractor Prequalification under c.149§44D3/4 and should be left blank on such Projects)
Roofing and Flashing		$	
Masonry		$	
Glass and Glazing		$	
Miscellaneous and Ornamental Iron		$	
Painting		$	
Elevators		$	
Plumbing		$	
HVAC		$	
Electrical		$	

Total of Item 2: _____

E. SUB-BIDS: The undersigned agrees that each of the above named sub-bidders will be used for the work indicated at the amount stated, unless a substitution is made. The undersigned further agrees to pay the premiums for any performance and payment bonds furnished by sub-bidders as requested herein by the undersigned, and that all of the cost of all such premiums is included in the amount set forth in Item 1 of this bid. The undersigned further agrees that the cost of premiums for payment and performance bonds furnished by sub-bidders pursuant to section 44d3/4 shall not be included in the amount set forth in Item 1, but shall be paid by the sub-bidders and included in their sub-bid price.

F. The undersigned agrees that if he is selected as general contractor, he will promptly confer with the awarding authority on the question of sub-bidders; and that the awarding authority may substitute for any sub-bid listed above a sub-bid filed with the awarding authority by another sub-bidder for the sub-trade against whose standing and ability the undersigned makes no objection; and that the undersigned will use all such finally selected sub-bidders at the amounts named in the respective sub-bids and be in every way as responsible for them and their work as

if they had been originally named in this general bid, the total contract price being adjusted to conform thereto.

G. UNIT PRICES: Should certain additional work be required, or should the quantities of certain classes of work be increased or decreased from those on which the General Bid is to be based, by order or approval of the Architect, the undersigned agrees that the attached Appendix 012201 - Unit Price Proposal Sheet will be the basis of payment to him or credit to the Awarding Authority for such addition, increase or decrease in the Work. Unit Prices given shall represent the exact net amount per unit to be paid the Contractor (in the case of additions or increases) or to be refunded the Awarding Authority (in the case of decreases). No additional adjustment will be allowed for overhead, profit, insurance, compensation insurance or other direct or indirect expenses of Contractor or Subcontractors. The Awarding Authority shall have the right to reject any or all proposed Unit Prices at any time prior to signing the Agreement, in which case the cost of extra work shall be as determined by one of the other methods set forth in Article 7 of the GENERAL CONDITIONS.

H. ESTIMATED QUANTITIES: Estimated quantities identified in the Appendix 012201 - Unit Price Proposal Sheet shall be included in the total Contract Price listed in paragraph B. of this Form For General Bid.

I. TIME OF COMPLETION: The undersigned agrees to commence work within five (5) days of execution of a General Contract and to complete the Work so as to reach Substantial Completion for each Phase on or before the date October 31, 2013. In case the Work is not completed within the specified time, it is understood and agreed that the Contractor shall pay the Owner, not as a penalty but as liquidated damages, the sums stated in Document 002113 – INSTRUCTIONS TO BIDDERS, for each calendar day after which completion was required.

J. CONTRACT: The undersigned agrees that, if he is selected as General Contractor, he will, within five (5) days, Saturdays, Sundays and legal holidays excluded, after presentation thereof by the Awarding Authority, execute a Contract in accordance with the terms of this General Bid and furnish a Performance Bond and also a Labor and Materials or Payment Bond, each of a Surety Company qualified to do business under the laws of the Commonwealth and satisfactory to the Awarding Authority, and each in the sum of one hundred percent (100%) of the Contract Price, the premiums for which are to be paid by the General Contractor and are included in the Contract Price.

K. LABOR: 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, and that he will comply fully with all laws and regulations applicable to awards made subject to Section 44A of Chapter 149 of the Massachusetts General Laws.

L. OSHA CERTIFICATION: In accordance with M.G.L.c. 30, Section 39S bidders shall include with their bids a certificate indicating “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...”.

M. CERTIFICATE OF ELIGIBILITY: The undersigned has included with this Bid his Certificate of Eligibility and Update Statement as required by Chapter 149, Section 44D.

N. NON-COLLUSION CERTIFICATION: The undersigned certifies under 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 Paragraph, the word "person" shall mean any natural person, joint venture, partnership, corporation, or any other business or legal entity.

O. TAXES: As required by MGL Chapter. 62c, Section49A, Chapter 62C, the undersigned certifies that the bidder has complied with all laws of the Commonwealth relating to taxes.

P. DEBARMENT: The undersigned further certifies under penalties of perjury that the said undersigned is not presently debarred from doing public construction work in the Commonwealth under provisions of Section 29F of Chapter 29, or any other applicable debarment provisions of any other Chapter of the General Laws or any rule or regulation promulgated thereunder.

Date:_____

Name of General Bidder:_____

By:_____

Title:_____

Business Address:_____

City and State:_____

NOTE: This proposal must bear the written signature of the Bidder. If the Bidder is a partnership, the proposal must be signed by a partner. If the Bidder is a corporation, the proposal must be signed by a duly authorized officer or agent of such corporation.

END OF DOCUMENT

DOCUMENT 004113

FORM FOR SUB-BID

Due Date for Bid, Thursday, August 15, 2013 @ 11:00 AM

TO: All General Bidders Except Those Excluded

A. BASE BID: The undersigned proposes to furnish all labor and materials required for completing, in accordance with the Drawings, Specifications, and Addenda, all the work specified in Section No._____ Trade:_____ of the Contract Documents, specifications, and in any plans specified in such Section, prepared by Holmes & Edwards, Inc. for construction of the Addition of Truck Wash Facility to the existing Department of Public Works Garage, 55 Sea St., Quincy, Massachusetts for the contract sum of:

_____Dollars

($ _____).

B. ADDENDA: This sub-bid includes Addenda numbered:_____

C. UNIT PRICES: Should certain additional work be required, or should the quantities of certain classes of work be increased or decreased from those on which the Sub-Bid is to be based, by order or approval of the Architect, the undersigned agrees that the attached Appendix 012201 - Unit Price Proposal Sheet will be the basis of payment to him or credit to the Contractor for such addition, increase or decrease in the Work. Unit Prices given shall represent the exact net amount per unit to be paid the contractor (in the case of additions or increases) or to be refunded the Contractor (in the case of decreases). No additional adjustment will be allowed for overhead, profit, insurance, compensation insurance or other direct or indirect expenses of contractor or subcontractors. The Awarding Authority shall have the right to reject any or all proposed Unit Prices at any time prior to signing the Agreement, in which case the cost of extra work shall be as determined by one of the other methods set forth in Article 7 of the GENERAL CONDITIONS.

D. ESTIMATED QUANTITITES: Estimated quantities identified in the Appendix 012201 - Unit Price Proposal Sheet shall be included in the total Contract Price listed in paragraph A. of this Form For Sub-Bid.

E. EXCLUSIONS: This sub-bid

__ may be used by any General Bidder except_____

_____

_____

__ may be used by only 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).

F. SUB-BID LISTING: 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 of work for which the provisions of the Section of the Specifications for 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 of each such class of work 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).

The undersigned agrees that the above list of bids to the undersigned represents bona fide bids based on the herein before described 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 Awarding Authority.

G. EXECUTION OF CONTRACT: The undersigned agrees that, if he is selected as a sub-bidder, he will, within 5 days, Saturdays, Sundays, and legal holidays excluded, after presentation of a subcontract by the general bidder selected as the general contractor, execute with such general bidder a subcontract in accordance with the terms of this sub-bid, and contingent upon the execution of the general contract, and, if requested so to do in the general bid by the general bidder, who shall pay the premiums therefore, or if prequalification is required pursuant to section 44D ¾, furnish a performance and payment bond of a surety company qualified to do business under the laws of the commonwealth and satisfactory to the awarding authority, in the full sum of the subcontract price.

H. CONTRACT DOCUMENTS: The undersigned further agrees to be bound to the General Contractor by the terms of the herein before described Drawings, Specifications (including all General Conditions stated therein), and Addenda, and to assume toward him all the obligations and responsibilities that he, by those documents, assumes toward the Owner.

I. BIDDER'S QUALIFICATIONS (Not required if bidders are pre-qualified for this project): The undersigned offers the following information as evidence for his qualifications to perform the work as bid upon according to all requirements of the Drawings and the 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 buildings with names of general contractor and architect on which you served as subcontractor for work of similar character as required for the above-named buildings:

Building	Architect	General Contractor	Amount

4. Bank Reference:___

J. LABOR: 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, and that he will comply fully with all laws and regulations applicable to awards made subject to Section 44A of Chapter 149 of the Massachusetts General Laws.

K. AFFIRMATIVE ACTION: The undersigned hereby certifies that he will comply with the minority manpower ratio and specific action steps contained in the EEO Program included in the Contract Documents.

L. NON-COLLUSION CERTIFICATION: The undersigned certifies under 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 Paragraph, the word "person" shall mean any natural person, joint venture, partnership, corporation, or any other business or legal entity.

M. TAXES: As required by MGL, C.62c,s 49A, Chapter 62C, the undersigned certifies that the bidder has complied with all laws of the Commonwealth relating to taxes.

N. DEBARMENT: The undersigned further certifies under penalties of perjury that the said undersigned is not presently debarred from doing public construction work in the Commonwealth under provisions of Section 29F of Chapter 29, or any other applicable debarment provisions of any other Chapter of the General Laws or any rule or regulation promulgated thereunder.

Date:_____

Signature: _____

Name of Sub-Bidder:_____

By:_____

Title:_____

Business Address:_____

City and State:_____

NOTE: This proposal must bear the written signature of the Bidder. If the Bidder is a partnership, the proposal must be signed by a partner. If the Bidder is a corporation, the proposal must be signed by a duly authorized officer or agent of such corporation.

END OF DOCUMENT

DOCUMENT 005200

FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

PART 1 - GENERAL

1.1 OWNER-CONTRACTOR AGREEMENT

A. The attached copy of the “AIA A101 Standard Form of Agreement Between Owner and Contractor 2007 edition”, is hereby made part of these Contract Documents. This form of agreement shall be used by Contractor in fulfilling the requirements of these Contract Documents.

END OF DOCUMENT

DRAFT

AIA® Document A101™ – 2007

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)

«"sample"»
« »
« »

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.

AIA Document A201™–2007, 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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10 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 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 the date of this Agreement unless a different date is stated below or provision is made for the date to be fixed in a notice to proceed issued by the Owner.
(Insert the date of commencement if it differs from the date of this Agreement or, if applicable, state that the date will be fixed in a notice to proceed.)

« »

If, prior to the commencement of the Work, the Owner requires time to file mortgages and other security interests, the Owner's time requirement shall be as follows:

« »

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

§ 3.3 The Contractor shall achieve Substantial Completion of the entire Work not later than « » (« ») days from the date of commencement, or as follows:
(Insert number of calendar days. Alternatively, a calendar date may be used when coordinated with the date of commencement. If appropriate, insert requirements for earlier Substantial Completion of certain portions of the Work.)

« »

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Portion of Work	Substantial Completion Date

, subject to adjustments of this Contract Time as provided in the Contract Documents.
(Insert provisions, if any, for liquidated damages relating to failure to achieve Substantial Completion on time or for bonus payments for early completion of the Work.)

« »

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 The Contract Sum is based upon the following alternates, if any, which are described in the Contract Documents and are hereby accepted by the Owner:
(State the numbers or other identification of accepted alternates. If the bidding or proposal documents permit the Owner to accept other alternates subsequent to the execution of this Agreement, attach a schedule of such other alternates showing the amount for each and the date when that amount expires.)

« »

§ 4.3 Unit prices, if any:
(Identify and state the unit price; state quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price Per Unit ($0.00)

§ 4.4 Allowances included in the Contract Sum, if any:
(Identify allowance and state exclusions, if any, from the allowance price.)

Item	Price

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, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided below and elsewhere in the Contract Documents.

§ 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 is received by the Architect not later than the « » day of a month, the Owner shall make payment of the certified amount to the Contractor not later than the « » day of the « » month. If an Application for Payment is received by the Architect after the application date fixed above, payment shall be made by the Owner not later than « » (« ») 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 may require. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment.

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§ 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 Subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

.1 Take that portion of the Contract Sum properly allocable to completed Work as determined by multiplying the percentage completion of each portion of the Work by the share of the Contract Sum allocated to that portion of the Work in the schedule of values, less retainage of « » percent (« » %). Pending final determination of cost to the Owner of changes in the Work, amounts not in dispute shall be included as provided in Section 7.3.9 of AIA Document A201™–2007, General Conditions of the Contract for Construction;

.2 Add 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), less retainage of « » percent (« » %);

.3 Subtract the aggregate of previous payments made by the Owner; and

.4 Subtract amounts, if any, for which the Architect has withheld or nullified a Certificate for Payment as provided in Section 9.5 of AIA Document A201–2007.

§ 5.1.7 The progress payment amount determined in accordance with Section 5.1.6 shall be further modified under the following circumstances:

.1 Add, upon Substantial Completion of the Work, a sum sufficient to increase the total payments to the full amount of the Contract Sum, less such amounts as the Architect shall determine for incomplete Work, retainage applicable to such work and unsettled claims; and
(Section 9.8.5 of AIA Document A201–2007 requires release of applicable retainage upon Substantial Completion of Work with consent of surety, if any.)

.2 Add, if final completion of the Work is thereafter materially delayed through no fault of the Contractor, any additional amounts payable in accordance with Section 9.10.3 of AIA Document A201–2007.

§ 5.1.8 Reduction or limitation of retainage, if any, shall be as follows:
(If it is intended, prior to Substantial Completion of the entire Work, to reduce or limit the retainage resulting from the percentages inserted in Sections 5.1.6.1 and 5.1.6.2 above, and this is not explained elsewhere in the Contract Documents, insert here provisions for such reduction or limitation.)

« »

§ 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 except for the Contractor's responsibility to correct Work as provided in Section 12.2.2 of AIA Document A201–2007, 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 no later than 30 days after the issuance of the Architect's final Certificate for Payment, or as follows:

« »

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ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 INITIAL DECISION MAKER

The Architect will serve as Initial Decision Maker pursuant to Section 15.2 of AIA Document A201–2007, unless the parties appoint below another individual, not a party to this Agreement, to serve as Initial Decision Maker.
(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 pursuant to Section 15.3 of AIA Document A201–2007, the method of binding dispute resolution shall be as follows:
(Check the appropriate box. If the Owner and Contractor do not select a method of binding dispute resolution below, 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.)

[« »] Arbitration pursuant to Section 15.4 of AIA Document A201–2007

[« »] Litigation in a court of competent jurisdiction

[« »] Other *(Specify)*

« »

ARTICLE 7 TERMINATION OR SUSPENSION

§ 7.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A201–2007.

§ 7.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A201–2007.

ARTICLE 8 MISCELLANEOUS PROVISIONS

§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A201–2007 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

§ 8.2 Payments due and unpaid under the Contract shall bear interest from the date payment is due at the rate stated below, or in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.
(Insert rate of interest agreed upon, if any.)

« » % « »

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

« »
« »
« »
« »
« »
« »

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

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« »
« »
« »
« »
« »
« »

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

§ 8.6 Other provisions:

« »

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 The Contract Documents, except for Modifications issued after execution of this Agreement, are enumerated in the sections below.

§ 9.1.1 The Agreement is this executed AIA Document A101–2007, Standard Form of Agreement Between Owner and Contractor.

§ 9.1.2 The General Conditions are AIA Document A201–2007, General Conditions of the Contract for Construction.

§ 9.1.3 The Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

§ 9.1.4 The Specifications:
(Either list the Specifications here or refer to an exhibit attached to this Agreement.)
« »

Section	Title	Date	Pages

§ 9.1.5 The Drawings:
(Either list the Drawings here or refer to an exhibit attached to this Agreement.)
« »

Number	Title	Date

§ 9.1.6 The Addenda, if any:

Number	Date	Pages

Portions of Addenda relating to bidding requirements are not part of the Contract Documents unless the bidding requirements are also enumerated in this Article 9.

§ 9.1.7 Additional documents, if any, forming part of the Contract Documents:

.1 AIA Document E201™–2007, Digital Data Protocol Exhibit, if completed by the parties, or the following:

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« »

.2 Other documents, if any, listed below:
(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A201–2007 provides that bidding requirements such as advertisement or invitation to bid, Instructions to Bidders, sample forms and the Contractor's bid are not part of the Contract Documents unless enumerated in this Agreement. They should be listed here only if intended to be part of the Contract Documents.)

« »

ARTICLE 10 INSURANCE AND BONDS

The Contractor shall purchase and maintain insurance and provide bonds as set forth in Article 11 of AIA Document A201–2007.
(State bonding requirements, if any, and limits of liability for insurance required in Article 11 of AIA Document A201–2007.)

Type of insurance or bond	Limit of liability or bond amount ($0.00)

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)*

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SECTION 006113

PERFORMANCE AND PAYMENT BOND

PART 1 - GENERAL

1.1 PERFORMANCE AND PAYMENT BOND

A. The attached copy of the American Institute of Architects "Performance and Payment Bond", Document No. A-312 - 2010, is hereby made part of these Contract Documents. This form of performance bond shall be used by Contractor and Surety in fulfilling the requirements of these Contract Documents.

B. The Performance Bond shall be in the amount of one hundred percent (100%) of the Contract Price for faithful performance of this Contract.

C. The Payment Bond shall be in the amount of one hundred percent (100%) of the Contract Price for faithful performance of this Contract.

D. The cost of the Performance Bond shall be included in the Contract Amount.

END OF DOCUMENT

AIA® Document A312™ – 2010

Performance Bond

CONTRACTOR:
(Name, legal status and address)
Sample
Sample
Sample

OWNER:
(Name, legal status and address)
Sample
Sample
Sample

CONSTRUCTION CONTRACT
Date:

Amount:

Description:
(Name and location)
Sample
Sample

BOND
Date:
(Not earlier than Construction Contract Date)

Amount:

Modifications to this Bond: ☐ None ☐ See Section 16

SURETY:
(Name, legal status and principal place of business)
Sample
Sample
Sample

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

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

AIA Document A312–2010 combines two separate bonds, a Performance Bond and a Payment Bond, into one form. This is not a single combined Performance and Payment Bond.

CONTRACTOR AS PRINCIPAL
Company: *(Corporate Seal)*

Signature: _____
Name and Title:

SURETY
Company: *(Corporate Seal)*

Signature: _____
Name and Title:

(Any additional signatures appear on the last page of this Performance Bond.)

(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or BROKER:

OWNER'S REPRESENTATIVE:
(Architect, Engineer or other party:)

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§ 1 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.

§ 2 If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Section 3.

§ 3 If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond shall arise after

.1 the Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice shall indicate whether the Owner is requesting a conference among the Owner, Contractor and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Section 3.1 shall be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default;

.2 the Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and

.3 the Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.

§ 4 Failure on the part of the Owner to comply with the notice requirement in Section 3.1 shall not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.

§ 5 When the Owner has satisfied the conditions of Section 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

§ 5.1 Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;

§ 5.2 Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;

§ 5.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Section 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

§ 5.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor and with reasonable promptness under the circumstances:

.1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or

.2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.

§ 6 If the Surety does not proceed as provided in Section 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Section 5.4, and the Owner refuses the payment or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.

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§ 7 If the Surety elects to act under Section 5.1, 5.2 or 5.3, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety shall not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication, for

.1 the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;

.2 additional legal, design professional and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Section 5; and

.3 liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.

§ 8 If the Surety elects to act under Section 5.1, 5.3 or 5.4, the Surety's liability is limited to the amount of this Bond.

§ 9 The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors and assigns.

§ 10 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ 11 Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 12 Notice to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears.

§ 13 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§ 14 Definitions

§ 14.1 Balance of the Contract Price. The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made, including allowance to the Contractor of any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

§ 14.2 Construction Contract. The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.

§ 14.3 Contractor Default. Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.

§ 14.4 Owner Default. Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

§ 14.5 Contract Documents. All the documents that comprise the agreement between the Owner and Contractor.

§ 15 If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

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§ 16 Modifications to this bond are as follows:

(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL		SURETY	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:		Signature:	
Name and Title:		Name and Title:	
Address:		Address:	

Init.

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AIA® Document A312™ – 2010

Payment Bond

CONTRACTOR:
(Name, legal status and address)
Sample
Sample
Sample

OWNER:
(Name, legal status and address)
Sample
Sample
Sample

SURETY:
(Name, legal status and principal place of business)
Sample
Sample
Sample

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

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

AIA Document A312–2010 combines two separate bonds, a Performance Bond and a Payment Bond, into one form. This is not a single combined Performance and Payment Bond.

CONSTRUCTION CONTRACT
Date:

Amount:

Description:
(Name and location)
Sample
Sample

BOND
Date:
(Not earlier than Construction Contract Date)

Amount:

Modifications to this Bond: ☐ None ☐ See Section 18

CONTRACTOR AS PRINCIPAL
Company: *(Corporate Seal)*

Signature: _____
Name and Title:

SURETY
Company: *(Corporate Seal)*

Signature: _____
Name and Title:

(Any additional signatures appear on the last page of this Payment Bond.)

(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or **BROKER:**

OWNER'S REPRESENTATIVE:
(Architect, Engineer or other party:)

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§ 1 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner to pay for labor, materials and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.

§ 2 If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies and holds harmless the Owner from claims, demands, liens or suits by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.

§ 3 If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond shall arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Section 13) of claims, demands, liens or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract and tendered defense of such claims, demands, liens or suits to the Contractor and the Surety.

§ 4 When the Owner has satisfied the conditions in Section 3, the Surety shall promptly and at the Surety's expense defend, indemnify and hold harmless the Owner against a duly tendered claim, demand, lien or suit.

§ 5 The Surety's obligations to a Claimant under this Bond shall arise after the following:

§ 5.1 Claimants, who do not have a direct contract with the Contractor,

- **.1** have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and
- **.2** have sent a Claim to the Surety (at the address described in Section 13).

§ 5.2 Claimants, who are employed by or have a direct contract with the Contractor, have sent a Claim to the Surety (at the address described in Section 13).

§ 6 If a notice of non-payment required by Section 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Section 5.1.1.

§ 7 When a Claimant has satisfied the conditions of Sections 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:

§ 7.1 Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and

§ 7.2 Pay or arrange for payment of any undisputed amounts.

§ 7.3 The Surety's failure to discharge its obligations under Section 7.1 or Section 7.2 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Section 7.1 or Section 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

§ 8 The Surety's total obligation shall not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Section 7.3, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.

§ 9 Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.

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§ 10 The Surety shall not be liable to the Owner, Claimants or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to, or give notice on behalf of, Claimants or otherwise have any obligations to Claimants under this Bond.

§ 11 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ 12 No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Section 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 13 Notice and Claims to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, shall be sufficient compliance as of the date received.

§ 14 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§ 15 Upon request by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.

§ 16 Definitions

§ 16.1 Claim. A written statement by the Claimant including at a minimum:

- **.1** the name of the Claimant;
- **.2** the name of the person for whom the labor was done, or materials or equipment furnished;
- **.3** a copy of the agreement or purchase order pursuant to which labor, materials or equipment was furnished for use in the performance of the Construction Contract;
- **.4** a brief description of the labor, materials or equipment furnished;
- **.5** the date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
- **.6** the total amount earned by the Claimant for labor, materials or equipment furnished as of the date of the Claim;
- **.7** the total amount of previous payments received by the Claimant; and
- **.8** the total amount due and unpaid to the Claimant for labor, materials or equipment furnished as of the date of the Claim.

§ 16.2 Claimant. An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials or equipment were furnished.

§ 16.3 Construction Contract. The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.

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§ 16.4 Owner Default. Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

§ 16.5 Contract Documents. All the documents that comprise the agreement between the Owner and Contractor.

§ 17 If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

§ 18 Modifications to this bond are as follows:

(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:		Signature:	
Name and Title:		Name and Title:	
Address:		Address:	

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DOCUMENT 007200

GENERAL CONDITIONS OF THE CONTRACT

PART 1 - GENERAL

1.1 GENERAL CONDITIONS

A. The attached copy of the "AIA A201 General Conditions of the Contract for Construction, 2007 edition", is hereby made part of these Contract Documents. These conditions apply to the Work of the Contractor in fulfilling the requirements of the Contract Documents.

END OF DOCUMENT

DOCUMENT 007316

INSURANCE 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 INSURANCE REQUIREMENTS

A. The General Contractor shall purchase and maintain such insurance as will protect him from claims under worker's compensation acts and from claims for damages because of bodily injury, including death, and property damage which might arise from and during operations under this Contract, whether such operations be by himself or by a Subcontractor or anyone directly or indirectly employed by either of them.

B. Contractor shall not commence work under this Contract until he has obtained all insurance required herein nor until such insurance has been approved by the Owner. Contractor shall not allow any Subcontractor to commence work until the insurance required of the Subcontractor has been so obtained and approved.

C. Subcontracts: Contractor shall either (1) require each Subcontractor to procure and to maintain during the life of his Subcontract, Subcontractor's General Liability and Property Damage Insurance of same type and in same manner as specified herein, or (2) insure activities of his Subcontractors in his own policy.

D. All insurance required by this Section shall be provided by a Best "A"-rated company, or companies, authorized to do business in the Commonwealth of Massachusetts and satisfactory to the Owner and shall be written for not less than any limits of liability specified herein, or required by law, whichever is greater. The Owner shall be named as an additional insured under all policies.

E. Certificates: Certificates of Insurance acceptable to the Owner shall be submitted in triplicate to the Owner simultaneously with the execution to the Contract. Certificates shall indicate that broad form Contractual Liability coverage is in force, as well as deletions of the XCU exclusions. Certificates shall contain a provision that the insurance company will notify the Owner by registered mail at least sixty (60) calendar days in advance of any cancellation, change or expiration of the policies. Certificates shall include description of coverage, effective dates and expiration dates of policies.

F. Deductibles: In the event of paid claims, Contractor shall bear costs of any amounts deductible.

G. Waiver: Submit to the consent of their respective insurers, the Owner and the Contractor waive all rights against each other and against the subcontractors, consultants, agents and employees of the other, for damages to the Project covered by any property insurance.

1.3 COVERAGE AND LIMITS

A. Worker's Compensation Insurance: Procure and maintain during the life of this Contract Workers Compensation and Employer's Liability Insurance as required by State law for all employees to be engaged in work at the site of the Project. In case of any such work sublet, Contractor shall require subcontractors similarly to provide Workers Compensation and Employer's Liability Insurance for all of the latter's employees to be engaged in such work unless such employees are covered by the protection afforded by the Contractor's Insurance. The limit of liability for Employers Liability insurance shall be not less than **[$500,000.00].** In case any class of employees engaged in hazardous work on the Project under this Contract is not protected under the Workers Compensation Statute, the Contractor shall provide and shall cause each Subcontractor to provide Employer's Liability Insurance with a limit of at least **[$1,000,000]** for each accident for the protection of such of his employees as are not otherwise protected.

B. Contractor's General Liability and Property Damage Insurance: Procure and maintain during the life of this Contract, Comprehensive Contractor's General Liability Insurance, with the Owner as additional named insured, covering bodily injury, including accidental death, with limits of **[$1,000,000]** per person, **[$1,000,000]** per occurrence; and property damage insurance with limits of **[$1,000,000]** per occurrence, including products and completed operations, explosion, collapse, undermining and damage to underground utilities (X.C.U) and Broad Form Property Damage Coverage. Before any blasting is done, Contractor shall present evidence that blasting damage is included in his insurance coverage. Provide a separate policy for completed operations for a period of two (2) years from date of Final Completion of the Project. Any policy issued shall include permission for partial or total occupancy by Owner within the scope of this Contract. Coverage shall also include Owner's and Contractor's protective liability favoring the Owner and an umbrella of excess liability in the amount of **[$10,000,000 (ten million dollars)**] minimum.

C. Contractor's Automobile Liability Insurance: Procure and maintain during the life of this Contract Comprehensive Automobile Liability Insurance, including all owned, non-owned, and hired automobiles, with the Owner as additional named insured, covering bodily injury, including accidental death, with limits of **[$1,000,000]** per person, **[$1,000,000]** per occurrence and property damage insurance with limits of **[$1,000,000]** per occurrence.

D. All-Risk Insurance: Procure and maintain during the life of this Contract All-Risk builder's Risk Insurance on a 100% completed value basis, with the Owner named as an additional insured as his interests may appear. In the event of paid claims, the Contractor shall bear the costs of any amounts deductible under the policy.

E. Boiler and Machinery Insurance: Procure and maintain boiler and machinery insurance which shall specifically cover such insured objects during installation and until final acceptance by Owner.

END OF DOCUMENT

THE COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF LABOR AND WORKFORCE DEVELOPMENT
DEPARTMENT OF LABOR STANDARDS

Prevailing Wage Rates

DEVAL L. PATRICK
Governor

TIMOTHY P. MURRAY
Lt. Governor

As determined by the Director under the provisions of the Massachusetts General Laws, Chapter 149, Sections 26 to 27H

JOANNE F. GOLDSTEIN
Secretary

HEATHER E. ROWE
Director

Awarding Authority: City of Quincy

Contract Number:

City/Town: QUINCY

Description of Work: Project will involve the construction of an 1800 s.f. masonry addition to existing garage, including mechanical, electrical & plumbing work, & connections to utilities, paving & exterior lighting.

Job Location: 55 Sea Street, Quincy, MA

Information about Prevailing Wage Schedules for Awarding Authorities and Contractors

- This wage schedule applies only to the specific project referenced at the top of this page and uniquely identified by the "Wage Request Number" on all pages of this schedule.
- Awarding authorities must request an updated wage schedule from the Department of Labor Standards ("DLS") if it has not opened bids or selected a contractor within 90 days of the date of issuance of the wage schedule.
- The wage schedule shall be incorporated in any advertisement or call for bids for the project as required by M.G.L. c. 149, § 27. Once a contractor has been selected by the awarding authority, the wage schedule shall be made a part of the contract for that project. The wage schedule must be posted in a conspicuous place at the work site during the life of the project in accordance with M.G.L. c. 149, § 27. The wages listed on the wage schedule must be paid to employees performing construction work on the project regardless of whether they are employed by the prime contractor, a filed sub-bidder, or any sub-contractor.
- All apprentices working on the project are required to be registered with the Massachusetts Division of Apprentice Training (DAT). Apprentices must keep his/her apprentice identification card on his/her person during all work hours on the project. If an apprentice rate is listed on the prevailing wage schedule for the trade in which an apprentice is registered with the DAT, the apprentice may be paid the lower apprentice wage rate at the applicable step as provided on the prevailing wage schedule. **If an apprentice rate is not listed on the prevailing wage schedule for the trade in which an apprentice is registered with the DAT, the apprentice must be paid the journeyworker's rate for the trade.**
- The wage rates will remain in effect for the duration of the project, except in the case of multi-year public construction projects. For construction projects lasting longer than one year, awarding authorities must request an updated wage schedule. Awarding authorities are required to request these updates no later than two weeks before the anniversary of the date the contract was executed by the awarding authority and the general contractor. Contractors are required to obtain the wage schedules from awarding authorities, and to pay no less than these rates to covered workers. The annual update requirement is not applicable to 27F "rental of equipment" contracts.
- Every contractor or subcontractor which performs construction work on the project is required to submit weekly payroll reports directly to the awarding authority and keep them on file for three years. Each weekly payroll report must contain: the employee's name, address, occupational classification, hours worked, and wages paid. Do not submit weekly payroll reports to DLS. A sample of a payroll reporting form may be obtained at http://www.mass.gov/dols/pw.
- Contractors with questions about the wage rates or classifications included on the wage schedule have an affirmative obligation to inquire with DLS at (617) 626-6953.
- Employees not receiving the prevailing wage rate set forth on the wage schedule may report the violation to the Fair Labor Division of the office of the Attorney General at (617) 727-3465.
- Failure of a contractor or subcontractor to pay the prevailing wage rates listed on the wage schedule to all employees who perform construction work on the project is a violation of the law and subjects the contractor or subcontractor to civil and criminal penalties.

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Construction						
(2 AXLE) DRIVER - EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE A*	12/01/2012	$31.55	$8.91	$8.00	$0.00	$48.46
(3 AXLE) DRIVER - EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE A*	12/01/2012	$31.62	$8.91	$8.00	$0.00	$48.53
(4 & 5 AXLE) DRIVER - EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE A*	12/01/2012	$31.74	$8.91	$8.00	$0.00	$48.65
ADS/SUBMERSIBLE PILOT *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2012	$82.32	$9.80	$17.67	$0.00	$109.79
	08/01/2013	$85.47	$9.80	$17.67	$0.00	$112.94
	08/01/2014	$88.62	$9.80	$17.67	$0.00	$116.09
	08/01/2015	$91.77	$9.80	$17.67	$0.00	$119.24
AIR TRACK OPERATOR *LABORERS - ZONE 1*	06/01/2013	$33.80	$7.10	$12.45	$0.00	$53.35
	12/01/2013	$34.55	$7.10	$12.45	$0.00	$54.10
	06/01/2014	$35.30	$7.10	$12.45	$0.00	$54.85
	12/01/2014	$36.05	$7.10	$12.45	$0.00	$55.60
	06/01/2015	$36.80	$7.10	$12.45	$0.00	$56.35
	12/01/2015	$37.55	$7.10	$12.45	$0.00	$57.10
	06/01/2016	$38.30	$7.10	$12.45	$0.00	$57.85
	12/01/2016	$39.30	$7.10	$12.45	$0.00	$58.85
For apprentice rates see "Apprentice- LABORER"						
ASBESTOS REMOVER - PIPE / MECH. EQUIPT. *HEAT & FROST INSULATORS LOCAL 6 (BOSTON)*	06/01/2013	$29.88	$10.40	$5.95	$0.00	$46.23
	12/01/2013	$30.68	$10.40	$5.95	$0.00	$47.03
	06/01/2014	$31.58	$10.40	$5.95	$0.00	$47.93
	12/01/2014	$32.48	$10.40	$5.95	$0.00	$48.83
	06/01/2015	$33.43	$10.40	$5.95	$0.00	$49.78
	12/01/2015	$34.38	$10.40	$5.95	$0.00	$50.73
ASPHALT RAKER *LABORERS - ZONE 1*	06/01/2013	$33.30	$7.10	$12.45	$0.00	$52.85
	12/01/2013	$34.05	$7.10	$12.45	$0.00	$53.60
	06/01/2014	$34.80	$7.10	$12.45	$0.00	$54.35
	12/01/2014	$35.55	$7.10	$12.45	$0.00	$55.10
	06/01/2015	$36.30	$7.10	$12.45	$0.00	$55.85
	12/01/2015	$37.05	$7.10	$12.45	$0.00	$56.60
	06/01/2016	$37.80	$7.10	$12.45	$0.00	$57.35
	12/01/2016	$38.80	$7.10	$12.45	$0.00	$58.35
For apprentice rates see "Apprentice- LABORER"						
ASPHALT/CONCRETE/CRUSHER PLANT-ON SITE *OPERATING ENGINEERS LOCAL 4*	06/01/2013	$40.34	$10.00	$13.55	$0.00	$63.89
	12/01/2013	$41.12	$10.00	$13.55	$0.00	$64.67
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
BACKHOE/FRONT-END LOADER *OPERATING ENGINEERS LOCAL 4*	06/01/2013	$40.34	$10.00	$13.55	$0.00	$63.89
	12/01/2013	$41.12	$10.00	$13.55	$0.00	$64.67
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
BARCO-TYPE JUMPING TAMPER *LABORERS - ZONE 1*	06/01/2013	$33.30	$7.10	$12.45	$0.00	$52.85
	12/01/2013	$34.05	$7.10	$12.45	$0.00	$53.60
	06/01/2014	$34.80	$7.10	$12.45	$0.00	$54.35
	12/01/2014	$35.55	$7.10	$12.45	$0.00	$55.10
	06/01/2015	$36.30	$7.10	$12.45	$0.00	$55.85
	12/01/2015	$37.05	$7.10	$12.45	$0.00	$56.60
	06/01/2016	$37.80	$7.10	$12.45	$0.00	$57.35
	12/01/2016	$38.80	$7.10	$12.45	$0.00	$58.35
For apprentice rates see "Apprentice- LABORER"						
BLOCK PAVER, RAMMER / CURB SETTER *LABORERS - ZONE 1*	06/01/2013	$33.80	$7.10	$12.45	$0.00	$53.35
	12/01/2013	$34.55	$7.10	$12.45	$0.00	$54.10
	06/01/2014	$35.30	$7.10	$12.45	$0.00	$54.85
	12/01/2014	$36.05	$7.10	$12.45	$0.00	$55.60
	06/01/2015	$36.80	$7.10	$12.45	$0.00	$56.35
	12/01/2015	$37.55	$7.10	$12.45	$0.00	$57.10
	06/01/2016	$38.30	$7.10	$12.45	$0.00	$57.85
	12/01/2016	$39.30	$7.10	$12.45	$0.00	$58.85
For apprentice rates see "Apprentice- LABORER"						
BOILER MAKER *BOILERMAKERS LOCAL 29*	01/01/2010	$37.70	$6.97	$11.18	$0.00	$55.85

Apprentice - *BOILERMAKER - Local 29*

Effective Date - 01/01/2010

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	65	$24.51	$6.97	$11.18	$0.00	$42.66
2	65	$24.51	$6.97	$11.18	$0.00	$42.66
3	70	$26.39	$6.97	$11.18	$0.00	$44.54
4	75	$28.28	$6.97	$11.18	$0.00	$46.43
5	80	$30.16	$6.97	$11.18	$0.00	$48.31
6	85	$32.05	$6.97	$11.18	$0.00	$50.20
7	90	$33.93	$6.97	$11.18	$0.00	$52.08
8	95	$35.82	$6.97	$11.18	$0.00	$53.97

Notes:

Apprentice to Journeyworker Ratio:1:5

BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING) *BRICKLAYERS LOCAL 3 (QUINCY)*	02/01/2013	$47.41	$10.18	$17.83	$0.00	$75.42
	08/01/2013	$48.06	$10.18	$18.15	$0.00	$76.39
	02/01/2014	$48.62	$10.18	$18.15	$0.00	$76.95
	08/01/2014	$49.52	$10.18	$18.22	$0.00	$77.92
	02/01/2015	$50.08	$10.18	$18.22	$0.00	$78.48
	08/01/2015	$50.98	$10.18	$18.29	$0.00	$79.45
	02/01/2016	$51.55	$10.18	$18.29	$0.00	$80.02
	08/01/2016	$52.45	$10.18	$18.37	$0.00	$81.00
	02/01/2017	$53.02	$10.18	$18.37	$0.00	$81.57

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *BRICK/PLASTER/CEMENT MASON - Local 3 Quincy*

Effective Date - 02/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$23.71	$10.18	$17.83	$0.00	$51.72
2	60	$28.45	$10.18	$17.83	$0.00	$56.46
3	70	$33.19	$10.18	$17.83	$0.00	$61.20
4	80	$37.93	$10.18	$17.83	$0.00	$65.94
5	90	$42.67	$10.18	$17.83	$0.00	$70.68

Effective Date - 08/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.03	$10.18	$18.15	$0.00	$52.36
2	60	$28.84	$10.18	$18.15	$0.00	$57.17
3	70	$33.64	$10.18	$18.15	$0.00	$61.97
4	80	$38.45	$10.18	$18.15	$0.00	$66.78
5	90	$43.25	$10.18	$18.15	$0.00	$71.58

Notes:

Apprentice to Journeyworker Ratio:1:5

BULLDOZER/GRADER/SCRAPER *OPERATING ENGINEERS LOCAL 4*	06/01/2013	$39.96	$10.00	$13.55	$0.00	$63.51
	12/01/2013	$40.74	$10.00	$13.55	$0.00	$64.29
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
CAISSON & UNDERPINNING BOTTOM MAN *LABORERS - FOUNDATION AND MARINE*	06/01/2013	$34.20	$7.10	$12.60	$0.00	$53.90
	12/01/2013	$34.95	$7.10	$12.60	$0.00	$54.65
	06/01/2014	$35.70	$7.10	$12.60	$0.00	$55.40
	12/01/2014	$36.45	$7.10	$12.60	$0.00	$56.15
	06/01/2015	$37.20	$7.10	$12.60	$0.00	$56.90
	12/01/2015	$37.95	$7.10	$12.60	$0.00	$57.65
	06/01/2016	$38.70	$7.10	$12.60	$0.00	$58.40
	12/01/2016	$39.70	$7.10	$12.60	$0.00	$59.40
For apprentice rates see "Apprentice- LABORER"						
CAISSON & UNDERPINNING LABORER *LABORERS - FOUNDATION AND MARINE*	06/01/2013	$33.05	$7.10	$12.60	$0.00	$52.75
	12/01/2013	$33.80	$7.10	$12.60	$0.00	$53.50
	06/01/2014	$34.55	$7.10	$12.60	$0.00	$54.25
	12/01/2014	$35.30	$7.10	$12.60	$0.00	$55.00
	06/01/2015	$36.05	$7.10	$12.60	$0.00	$55.75
	12/01/2015	$36.80	$7.10	$12.60	$0.00	$56.50
	06/01/2016	$37.55	$7.10	$12.60	$0.00	$57.25
	12/01/2016	$38.55	$7.10	$12.60	$0.00	$58.25
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
CAISSON & UNDERPINNING TOP MAN *LABORERS - FOUNDATION AND MARINE*	06/01/2013	$33.05	$7.10	$12.60	$0.00	$52.75
	12/01/2013	$33.80	$7.10	$12.60	$0.00	$53.50
	06/01/2014	$34.55	$7.10	$12.60	$0.00	$54.25
	12/01/2014	$35.30	$7.10	$12.60	$0.00	$55.00
	06/01/2015	$36.05	$7.10	$12.60	$0.00	$55.75
	12/01/2015	$36.80	$7.10	$12.60	$0.00	$56.50
	06/01/2016	$37.55	$7.10	$12.60	$0.00	$57.25
	12/01/2016	$38.55	$7.10	$12.60	$0.00	$58.25
For apprentice rates see "Apprentice- LABORER"						
CARBIDE CORE DRILL OPERATOR *LABORERS - ZONE 1*	06/01/2013	$33.30	$7.10	$12.45	$0.00	$52.85
	12/01/2013	$34.05	$7.10	$12.45	$0.00	$53.60
	06/01/2014	$34.80	$7.10	$12.45	$0.00	$54.35
	12/01/2014	$35.55	$7.10	$12.45	$0.00	$55.10
	06/01/2015	$36.30	$7.10	$12.45	$0.00	$55.85
	12/01/2015	$37.05	$7.10	$12.45	$0.00	$56.60
	06/01/2016	$37.80	$7.10	$12.45	$0.00	$57.35
	12/01/2016	$38.80	$7.10	$12.45	$0.00	$58.35
For apprentice rates see "Apprentice- LABORER"						
CARPENTER *CARPENTERS -ZONE 2 (Eastern Massachusetts)*	03/01/2013	$33.92	$9.80	$15.61	$0.00	$59.33
	09/01/2013	$34.53	$9.80	$15.61	$0.00	$59.94
	03/01/2014	$35.13	$9.80	$15.61	$0.00	$60.54
	09/01/2014	$35.90	$9.80	$15.61	$0.00	$61.31
	03/01/2015	$36.67	$9.80	$15.61	$0.00	$62.08

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *CARPENTER - Zone 2 Eastern MA*

Effective Date - 03/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$16.96	$9.80	$1.57	$0.00	$28.33
2	60	$20.35	$9.80	$1.57	$0.00	$31.72
3	70	$23.74	$9.80	$10.90	$0.00	$44.44
4	75	$25.44	$9.80	$10.90	$0.00	$46.14
5	80	$27.14	$9.80	$12.47	$0.00	$49.41
6	80	$27.14	$9.80	$12.47	$0.00	$49.41
7	90	$30.53	$9.80	$14.04	$0.00	$54.37
8	90	$30.53	$9.80	$14.04	$0.00	$54.37

Effective Date - 09/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$17.27	$9.80	$1.57	$0.00	$28.64
2	60	$20.72	$9.80	$1.57	$0.00	$32.09
3	70	$24.17	$9.80	$10.90	$0.00	$44.87
4	75	$25.90	$9.80	$10.90	$0.00	$46.60
5	80	$27.62	$9.80	$12.47	$0.00	$49.89
6	80	$27.62	$9.80	$12.47	$0.00	$49.89
7	90	$31.08	$9.80	$14.04	$0.00	$54.92
8	90	$31.08	$9.80	$14.04	$0.00	$54.92

Notes:

Apprentice to Journeyworker Ratio:1:5

CEMENT MASONRY/PLASTERING *BRICKLAYERS LOCAL 3 (QUINCY)*	07/01/2013	$42.68	$10.90	$18.71	$1.30	$73.59
	01/01/2014	$43.60	$10.90	$18.71	$1.30	$74.51
	07/01/2014	$44.20	$10.90	$18.71	$1.30	$75.11
	01/01/2015	$45.14	$10.90	$18.71	$1.30	$76.05
	07/01/2015	$45.72	$10.90	$18.71	$1.30	$76.63
	01/01/2016	$46.64	$10.90	$18.71	$1.30	$77.55

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *CEMENT MASONRY/PLASTERING - Eastern Mass (Quincy)*

Effective Date - 07/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$21.34	$10.90	$12.21	$1.30	$45.75
2	60	$25.61	$10.90	$13.71	$1.30	$51.52
3	65	$27.74	$10.90	$14.71	$1.30	$54.65
4	70	$29.88	$10.90	$15.71	$1.30	$57.79
5	75	$32.01	$10.90	$16.71	$1.30	$60.92
6	80	$34.14	$10.90	$17.71	$1.30	$64.05
7	90	$38.41	$10.90	$18.71	$1.30	$69.32

Effective Date - 01/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$21.80	$10.90	$12.21	$1.30	$46.21
2	60	$26.16	$10.90	$13.71	$1.30	$52.07
3	65	$28.34	$10.90	$14.71	$1.30	$55.25
4	70	$30.52	$10.90	$15.71	$1.30	$58.43
5	75	$32.70	$10.90	$16.71	$1.30	$61.61
6	80	$34.88	$10.90	$17.71	$1.30	$64.79
7	90	$39.24	$10.90	$18.71	$1.30	$70.15

Notes:

Steps 3,4 are 500 hrs. All other steps are 1,000 hrs.

Apprentice to Journeyworker Ratio:1:3

CHAIN SAW OPERATOR *LABORERS - ZONE 1*	06/01/2013	$33.30	$7.10	$12.45	$0.00	$52.85
	12/01/2013	$34.05	$7.10	$12.45	$0.00	$53.60
	06/01/2014	$34.80	$7.10	$12.45	$0.00	$54.35
	12/01/2014	$35.55	$7.10	$12.45	$0.00	$55.10
	06/01/2015	$36.30	$7.10	$12.45	$0.00	$55.85
	12/01/2015	$37.05	$7.10	$12.45	$0.00	$56.60
	06/01/2016	$37.80	$7.10	$12.45	$0.00	$57.35
	12/01/2016	$38.80	$7.10	$12.45	$0.00	$58.35
For apprentice rates see "Apprentice- LABORER"						
CLAM SHELLS/SLURRY BUCKETS/HEADING MACHINES *OPERATING ENGINEERS LOCAL 4*	06/01/2013	$41.34	$10.00	$13.55	$0.00	$64.89
	12/01/2013	$42.12	$10.00	$13.55	$0.00	$65.67
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
COMPRESSOR OPERATOR *OPERATING ENGINEERS LOCAL 4*	06/01/2013	$28.19	$10.00	$13.55	$0.00	$51.74
	12/01/2013	$28.74	$10.00	$13.55	$0.00	$52.29
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
DELEADER (BRIDGE) *PAINTERS LOCAL 35 - ZONE 2*	01/01/2013	$45.01	$7.80	$15.60	$0.00	$68.41

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 - BRIDGES/TANKS*

Effective Date - 01/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$22.51	$7.80	$0.00	$0.00	$30.31
2	55	$24.76	$7.80	$3.52	$0.00	$36.08
3	60	$27.01	$7.80	$3.84	$0.00	$38.65
4	65	$29.26	$7.80	$4.16	$0.00	$41.22
5	70	$31.51	$7.80	$13.68	$0.00	$52.99
6	75	$33.76	$7.80	$14.00	$0.00	$55.56
7	80	$36.01	$7.80	$14.32	$0.00	$58.13
8	90	$40.51	$7.80	$14.96	$0.00	$63.27

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

DEMO: ADZEMAN *LABORERS - ZONE 1* For apprentice rates see "Apprentice- LABORER"	12/01/2011	$31.80	$7.10	$12.45	$0.00	$51.35
DEMO: BACKHOE/LOADER/HAMMER OPERATOR *LABORERS - ZONE 1* For apprentice rates see "Apprentice- LABORER"	12/01/2011	$32.80	$7.10	$12.45	$0.00	$52.35
DEMO: BURNERS *LABORERS - ZONE 1* For apprentice rates see "Apprentice- LABORER"	12/01/2011	$32.55	$7.10	$12.45	$0.00	$52.10
DEMO: CONCRETE CUTTER/SAWYER *LABORERS - ZONE 1* For apprentice rates see "Apprentice- LABORER"	12/01/2011	$32.80	$7.10	$12.45	$0.00	$52.35
DEMO: JACKHAMMER OPERATOR *LABORERS - ZONE 1* For apprentice rates see "Apprentice- LABORER"	12/01/2011	$32.55	$7.10	$12.45	$0.00	$52.10
DEMO: WRECKING LABORER *LABORERS - ZONE 1* For apprentice rates see "Apprentice- LABORER"	12/01/2011	$31.80	$7.10	$12.45	$0.00	$51.35
DIRECTIONAL DRILL MACHINE OPERATOR *OPERATING ENGINEERS LOCAL 4* For apprentice rates see "Apprentice- OPERATING ENGINEERS"	06/01/2013	$39.96	$10.00	$13.55	$0.00	$63.51
	12/01/2013	$40.74	$10.00	$13.55	$0.00	$64.29
DIVER *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2012	$54.88	$9.80	$17.67	$0.00	$82.35
	08/01/2013	$56.98	$9.80	$17.67	$0.00	$84.45
	08/01/2014	$59.08	$9.80	$17.67	$0.00	$86.55
	08/01/2015	$61.18	$9.80	$17.67	$0.00	$88.65
DIVER TENDER *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2012	$54.88	$9.80	$17.67	$0.00	$82.35
	08/01/2013	$56.98	$9.80	$17.67	$0.00	$84.45
	08/01/2014	$59.08	$9.80	$17.67	$0.00	$86.55
	08/01/2015	$61.18	$9.80	$17.67	$0.00	$88.65

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
DIVER TENDER (EFFLUENT) *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2012	$58.80	$9.80	$17.67	$0.00	$86.27
	08/01/2013	$61.05	$9.80	$17.67	$0.00	$88.52
	08/01/2014	$63.30	$9.80	$17.67	$0.00	$90.77
	08/01/2015	$65.55	$9.80	$17.67	$0.00	$93.02
DIVER/SLURRY (EFFLUENT) *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2012	$82.32	$9.80	$17.67	$0.00	$109.79
	08/01/2013	$85.47	$9.80	$17.67	$0.00	$112.94
	08/01/2014	$88.62	$9.80	$17.67	$0.00	$116.09
	08/01/2015	$91.77	$9.80	$17.67	$0.00	$119.24
DRAWBRIDGE OPERATOR (Construction) *ELECTRICIANS LOCAL 103*	03/01/2013	$43.52	$13.00	$14.16	$0.00	$70.68
	09/01/2013	$44.20	$13.00	$14.18	$0.00	$71.38
	03/01/2014	$44.92	$13.00	$14.20	$0.00	$72.12
	09/01/2014	$45.60	$13.00	$14.22	$0.00	$72.82
	03/01/2015	$46.32	$13.00	$14.24	$0.00	$73.56
	09/01/2015	$47.27	$13.00	$14.27	$0.00	$74.54
	03/01/2016	$48.23	$13.00	$14.30	$0.00	$75.53
For apprentice rates see "Apprentice- ELECTRICIAN"						
ELECTRICIAN *ELECTRICIANS LOCAL 103*	03/01/2013	$43.52	$13.00	$14.16	$0.00	$70.68
	09/01/2013	$44.20	$13.00	$14.18	$0.00	$71.38
	03/01/2014	$44.92	$13.00	$14.20	$0.00	$72.12
	09/01/2014	$45.60	$13.00	$14.22	$0.00	$72.82
	03/01/2015	$46.32	$13.00	$14.24	$0.00	$73.56
	09/01/2015	$47.27	$13.00	$14.27	$0.00	$74.54
	03/01/2016	$48.23	$13.00	$14.30	$0.00	$75.53

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *ELECTRICIAN - Local 103*

Effective Date - 03/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$17.41	$13.00	$0.52	$0.00	$30.93
2	40	$17.41	$13.00	$0.52	$0.00	$30.93
3	45	$19.58	$13.00	$10.53	$0.00	$43.11
4	45	$19.58	$13.00	$10.53	$0.00	$43.11
5	50	$21.76	$13.00	$10.85	$0.00	$45.61
6	55	$23.94	$13.00	$11.19	$0.00	$48.13
7	60	$26.11	$13.00	$11.51	$0.00	$50.62
8	65	$28.29	$13.00	$11.85	$0.00	$53.14
9	70	$30.46	$13.00	$12.17	$0.00	$55.63
10	75	$32.64	$13.00	$12.51	$0.00	$58.15

Effective Date - 09/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$17.68	$13.00	$0.53	$0.00	$31.21
2	40	$17.68	$13.00	$0.53	$0.00	$31.21
3	45	$19.89	$13.00	$10.54	$0.00	$43.43
4	45	$19.89	$13.00	$10.54	$0.00	$43.43
5	50	$22.10	$13.00	$10.86	$0.00	$45.96
6	55	$24.31	$13.00	$11.20	$0.00	$48.51
7	60	$26.52	$13.00	$11.53	$0.00	$51.05
8	65	$28.73	$13.00	$11.86	$0.00	$53.59
9	70	$30.94	$13.00	$12.19	$0.00	$56.13
10	75	$33.15	$13.00	$12.53	$0.00	$58.68

Notes: :

App Prior 1/1/03; 30/35/40/45/50/55/65/70/75/80

Apprentice to Journeyworker Ratio:2:3***

ELEVATOR CONSTRUCTOR *ELEVATOR CONSTRUCTORS LOCAL 4*	01/01/2012	$52.45	$8.78	$6.96	$0.00	$68.19

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *ELEVATOR CONSTRUCTOR - Local 4*

Effective Date - 01/01/2012

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$26.23	$8.78	$0.00	$0.00	$35.01
2	55	$28.85	$8.78	$6.96	$0.00	$44.59
3	65	$34.09	$8.78	$6.96	$0.00	$49.83
4	70	$36.72	$8.78	$6.96	$0.00	$52.46
5	80	$41.96	$8.78	$6.96	$0.00	$57.70

Notes:

Steps 1-2 are 6 mos.; Steps 3-5 are 1 year

Apprentice to Journeyworker Ratio:1:1

ELEVATOR CONSTRUCTOR HELPER *ELEVATOR CONSTRUCTORS LOCAL 4*	01/01/2012	$38.59	$8.78	$6.96	$0.00	$54.33
FENCE & GUARD RAIL ERECTOR *LABORERS - ZONE 1*	06/01/2013	$33.30	$7.10	$12.45	$0.00	$52.85
	12/01/2013	$34.05	$7.10	$12.45	$0.00	$53.60
	06/01/2014	$34.80	$7.10	$12.45	$0.00	$54.35
	12/01/2014	$35.55	$7.10	$12.45	$0.00	$55.10
	06/01/2015	$36.30	$7.10	$12.45	$0.00	$55.85
	12/01/2015	$37.05	$7.10	$12.45	$0.00	$56.60
	06/01/2016	$37.80	$7.10	$12.45	$0.00	$57.35
	12/01/2016	$38.80	$7.10	$12.45	$0.00	$58.35
For apprentice rates see "Apprentice- LABORER"						
FIELD ENG.INST.PERSON-BLDG,SITE,HVY/HWY *OPERATING ENGINEERS LOCAL 4*	05/01/2013	$38.50	$10.00	$13.02	$0.00	$61.52
	11/01/2013	$39.26	$10.00	$13.02	$0.00	$62.28
	05/01/2014	$40.03	$10.00	$13.02	$0.00	$63.05
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FIELD ENG.PARTY CHIEF-BLDG,SITE,HVY/HWY *OPERATING ENGINEERS LOCAL 4*	05/01/2013	$39.91	$10.00	$13.02	$0.00	$62.93
	11/01/2013	$40.68	$10.00	$13.02	$0.00	$63.70
	05/01/2014	$41.45	$10.00	$13.02	$0.00	$64.47
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FIELD ENG.ROD PERSON-BLDG,SITE,HVY/HWY *OPERATING ENGINEERS LOCAL 4*	05/01/2013	$21.17	$10.00	$13.02	$0.00	$44.19
	11/01/2013	$21.63	$10.00	$13.02	$0.00	$44.65
	05/01/2014	$22.08	$10.00	$13.02	$0.00	$45.10
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FIRE ALARM INSTALLER *ELECTRICIANS LOCAL 103*	03/01/2013	$43.52	$13.00	$14.16	$0.00	$70.68
	09/01/2013	$44.20	$13.00	$14.18	$0.00	$71.38
	03/01/2014	$44.92	$13.00	$14.20	$0.00	$72.12
	09/01/2014	$45.60	$13.00	$14.22	$0.00	$72.82
	03/01/2015	$46.32	$13.00	$14.24	$0.00	$73.56
	09/01/2015	$47.27	$13.00	$14.27	$0.00	$74.54
	03/01/2016	$48.23	$13.00	$14.30	$0.00	$75.53
For apprentice rates see "Apprentice- ELECTRICIAN"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
FIRE ALARM REPAIR / MAINTENANCE / COMMISSIONING *ELECTRICIANS LOCAL 103*	03/01/2013	$32.64	$13.00	$12.51	$0.00	$58.15
	09/01/2013	$33.15	$13.00	$12.52	$0.00	$58.67
	03/01/2014	$33.69	$13.00	$12.54	$0.00	$59.23
	09/01/2014	$34.20	$13.00	$12.56	$0.00	$59.76
	03/01/2015	$34.74	$13.00	$12.57	$0.00	$60.31
	09/01/2015	$35.45	$13.00	$12.59	$0.00	$61.04
	03/01/2016	$36.17	$13.00	$12.62	$0.00	$61.79
For apprentice rates see "Apprentice- TELECOMMUNICATIONS TECHNICIAN"						
FIREMAN (ASST. ENGINEER) *OPERATING ENGINEERS LOCAL 4*	06/01/2013	$33.73	$10.00	$13.55	$0.00	$57.28
	12/01/2013	$34.39	$10.00	$13.55	$0.00	$57.94
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FLAGGER & SIGNALER *LABORERS - ZONE 1*	06/01/2013	$20.50	$7.10	$12.45	$0.00	$40.05
	12/01/2013	$20.50	$7.10	$12.45	$0.00	$40.05
	06/01/2014	$20.50	$7.10	$12.45	$0.00	$40.05
	12/01/2014	$20.50	$7.10	$12.45	$0.00	$40.05
	06/01/2015	$20.50	$7.10	$12.45	$0.00	$40.05
	12/01/2015	$20.50	$7.10	$12.45	$0.00	$40.05
	06/01/2016	$20.50	$7.10	$12.45	$0.00	$40.05
	12/01/2016	$20.50	$7.10	$12.45	$0.00	$40.05
For apprentice rates see "Apprentice- LABORER"						
FLOORCOVERER *FLOORCOVERERS LOCAL 2168 ZONE I*	03/01/2013	$38.61	$9.80	$16.71	$0.00	$65.12
	09/01/2013	$38.61	$9.80	$16.71	$0.00	$65.12
	03/01/2014	$38.61	$9.80	$16.71	$0.00	$65.12

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *FLOORCOVERER - Local 2168 Zone I*

Effective Date - 03/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.31	$9.80	$1.79	$0.00	$30.90
2	55	$21.24	$9.80	$1.79	$0.00	$32.83
3	60	$23.17	$9.80	$11.34	$0.00	$44.31
4	65	$25.10	$9.80	$11.34	$0.00	$46.24
5	70	$27.03	$9.80	$13.13	$0.00	$49.96
6	75	$28.96	$9.80	$13.13	$0.00	$51.89
7	80	$30.89	$9.80	$14.92	$0.00	$55.61
8	85	$32.82	$9.80	$14.92	$0.00	$57.54

Effective Date - 09/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.31	$9.80	$1.79	$0.00	$30.90
2	55	$21.24	$9.80	$1.79	$0.00	$32.83
3	60	$23.17	$9.80	$11.34	$0.00	$44.31
4	65	$25.10	$9.80	$11.34	$0.00	$46.24
5	70	$27.03	$9.80	$13.13	$0.00	$49.96
6	75	$28.96	$9.80	$13.13	$0.00	$51.89
7	80	$30.89	$9.80	$14.92	$0.00	$55.61
8	85	$32.82	$9.80	$14.92	$0.00	$57.54

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

FORK LIFT/CHERRY PICKER *OPERATING ENGINEERS LOCAL 4*	06/01/2013	$40.34	$10.00	$13.55	$0.00	$63.89
	12/01/2013	$41.12	$10.00	$13.55	$0.00	$64.67
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
GENERATOR/LIGHTING PLANT/HEATERS *OPERATING ENGINEERS LOCAL 4*	06/01/2013	$28.19	$10.00	$13.55	$0.00	$51.74
	12/01/2013	$28.74	$10.00	$13.55	$0.00	$52.29
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR SYSTEMS) *GLAZIERS LOCAL 35 (ZONE 2)*	01/01/2013	$35.51	$7.80	$14.60	$0.00	$57.91

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *GLAZIER - Local 35 Zone 2*

Effective Date - 01/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$17.76	$7.80	$0.00	$0.00	$25.56
2	55	$19.53	$7.80	$3.25	$0.00	$30.58
3	60	$21.31	$7.80	$3.54	$0.00	$32.65
4	65	$23.08	$7.80	$3.84	$0.00	$34.72
5	70	$24.86	$7.80	$12.83	$0.00	$45.49
6	75	$26.63	$7.80	$13.13	$0.00	$47.56
7	80	$28.41	$7.80	$13.42	$0.00	$49.63
8	90	$31.96	$7.80	$14.01	$0.00	$53.77

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

HOISTING ENGINEER/CRANES/GRADALLS *OPERATING ENGINEERS LOCAL 4*	06/01/2013	$40.34	$10.00	$13.55	$0.00	$63.89
	12/01/2013	$41.12	$10.00	$13.55	$0.00	$64.67

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *OPERATING ENGINEERS - Local 4*

Effective Date - 06/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	$22.19	$10.00	$0.00	$0.00	$32.19
2	60	$24.20	$10.00	$13.55	$0.00	$47.75
3	65	$26.22	$10.00	$13.55	$0.00	$49.77
4	70	$28.24	$10.00	$13.55	$0.00	$51.79
5	75	$30.26	$10.00	$13.55	$0.00	$53.81
6	80	$32.27	$10.00	$13.55	$0.00	$55.82
7	85	$34.29	$10.00	$13.55	$0.00	$57.84
8	90	$36.31	$10.00	$13.55	$0.00	$59.86

Effective Date - 12/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	$22.62	$10.00	$0.00	$0.00	$32.62
2	60	$24.67	$10.00	$13.55	$0.00	$48.22
3	65	$26.73	$10.00	$13.55	$0.00	$50.28
4	70	$28.78	$10.00	$13.55	$0.00	$52.33
5	75	$30.84	$10.00	$13.55	$0.00	$54.39
6	80	$32.90	$10.00	$13.55	$0.00	$56.45
7	85	$34.95	$10.00	$13.55	$0.00	$58.50
8	90	$37.01	$10.00	$13.55	$0.00	$60.56

Notes:

Apprentice to Journeyworker Ratio:1:6

HVAC (DUCTWORK) *SHEETMETAL WORKERS LOCAL 17 - A*	02/01/2013	$42.32	$9.82	$18.24	$2.11	$72.49
For apprentice rates see "Apprentice- SHEET METAL WORKER"						
HVAC (ELECTRICAL CONTROLS) *ELECTRICIANS LOCAL 103*	03/01/2013	$43.52	$13.00	$14.16	$0.00	$70.68
	09/01/2013	$44.20	$13.00	$14.18	$0.00	$71.38
	03/01/2014	$44.92	$13.00	$14.20	$0.00	$72.12
	09/01/2014	$45.60	$13.00	$14.22	$0.00	$72.82
	03/01/2015	$46.32	$13.00	$14.24	$0.00	$73.56
	09/01/2015	$47.27	$13.00	$14.27	$0.00	$74.54
	03/01/2016	$48.23	$13.00	$14.30	$0.00	$75.53
For apprentice rates see "Apprentice- ELECTRICIAN"						
HVAC (TESTING AND BALANCING - AIR) *SHEETMETAL WORKERS LOCAL 17 - A*	02/01/2013	$42.32	$9.82	$18.24	$2.11	$72.49
For apprentice rates see "Apprentice- SHEET METAL WORKER"						
HVAC (TESTING AND BALANCING -WATER) *PIPEFITTERS LOCAL 537*	03/01/2013	$49.34	$8.75	$14.39	$0.00	$72.48
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HVAC MECHANIC *PIPEFITTERS LOCAL 537*	03/01/2013	$49.34	$8.75	$14.39	$0.00	$72.48

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HYDRAULIC DRILLS *LABORERS - ZONE 1*	06/01/2013	$33.80	$7.10	$12.45	$0.00	$53.35
	12/01/2013	$34.55	$7.10	$12.45	$0.00	$54.10
	06/01/2014	$35.30	$7.10	$12.45	$0.00	$54.85
	12/01/2014	$36.05	$7.10	$12.45	$0.00	$55.60
	06/01/2015	$36.80	$7.10	$12.45	$0.00	$56.35
	12/01/2015	$37.55	$7.10	$12.45	$0.00	$57.10
	06/01/2016	$38.30	$7.10	$12.45	$0.00	$57.85
	12/01/2016	$39.30	$7.10	$12.45	$0.00	$58.85
For apprentice rates see "Apprentice- LABORER"						
INSULATOR (PIPES & TANKS) *HEAT & FROST INSULATORS LOCAL 6 (BOSTON)*	09/01/2012	$41.46	$10.65	$11.50	$0.00	$63.61
	09/01/2013	$43.06	$10.65	$11.50	$0.00	$65.21
	09/01/2014	$45.06	$10.65	$11.50	$0.00	$67.21

Apprentice - *ASBESTOS INSULATOR (Pipes & Tanks) - Local 6 Boston*

Effective Date - 09/01/2012

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.73	$10.65	$8.60	$0.00	$39.98
2	60	$24.88	$10.65	$9.18	$0.00	$44.71
3	70	$29.02	$10.65	$9.76	$0.00	$49.43
4	80	$33.17	$10.65	$10.34	$0.00	$54.16

Effective Date - 09/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$21.53	$10.65	$8.60	$0.00	$40.78
2	60	$25.84	$10.65	$9.18	$0.00	$45.67
3	70	$30.14	$10.65	$9.76	$0.00	$50.55
4	80	$34.45	$10.65	$10.34	$0.00	$55.44

Notes:

Steps are 1 year

Apprentice to Journeyworker Ratio:1:4

IRONWORKER/WELDER *IRONWORKERS LOCAL 7 (BOSTON AREA)*	03/16/2013	$40.23	$7.70	$18.35	$0.00	$66.28

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *IRONWORKER - Local 7 Boston*

Effective Date - 03/16/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$24.14	$7.70	$18.35	$0.00	$50.19
2	70	$28.16	$7.70	$18.35	$0.00	$54.21
3	75	$30.17	$7.70	$18.35	$0.00	$56.22
4	80	$32.18	$7.70	$18.35	$0.00	$58.23
5	85	$34.20	$7.70	$18.35	$0.00	$60.25
6	90	$36.21	$7.70	$18.35	$0.00	$62.26

Notes:

** Structural 1:6; Ornamental 1:4

Apprentice to Journeyworker Ratio:**

JACKHAMMER & PAVING BREAKER OPERATOR *LABORERS - ZONE 1*	06/01/2013	$33.30	$7.10	$12.45	$0.00	$52.85
	12/01/2013	$34.05	$7.10	$12.45	$0.00	$53.60
	06/01/2014	$34.80	$7.10	$12.45	$0.00	$54.35
	12/01/2014	$35.55	$7.10	$12.45	$0.00	$55.10
	06/01/2015	$36.30	$7.10	$12.45	$0.00	$55.85
	12/01/2015	$37.05	$7.10	$12.45	$0.00	$56.60
	06/01/2016	$37.80	$7.10	$12.45	$0.00	$57.35
	12/01/2016	$38.80	$7.10	$12.45	$0.00	$58.35
For apprentice rates see "Apprentice- LABORER"						
LABORER *LABORERS - ZONE 1*	06/01/2013	$33.05	$7.10	$12.45	$0.00	$52.60
	12/01/2013	$33.80	$7.10	$12.45	$0.00	$53.35
	06/01/2014	$34.55	$7.10	$12.45	$0.00	$54.10
	12/01/2014	$35.30	$7.10	$12.45	$0.00	$54.85
	06/01/2015	$36.05	$7.10	$12.45	$0.00	$55.60
	12/01/2015	$36.80	$7.10	$12.45	$0.00	$56.35
	06/01/2016	$37.55	$7.10	$12.45	$0.00	$57.10
	12/01/2016	$38.55	$7.10	$12.45	$0.00	$58.10

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *LABORER - Zone 1*

Effective Date - 06/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$19.83	$7.10	$12.45	$0.00	$39.38
2	70	$23.14	$7.10	$12.45	$0.00	$42.69
3	80	$26.44	$7.10	$12.45	$0.00	$45.99
4	90	$29.75	$7.10	$12.45	$0.00	$49.30

Effective Date - 12/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$20.28	$7.10	$12.45	$0.00	$39.83
2	70	$23.66	$7.10	$12.45	$0.00	$43.21
3	80	$27.04	$7.10	$12.45	$0.00	$46.59
4	90	$30.42	$7.10	$12.45	$0.00	$49.97

Notes:

Apprentice to Journeyworker Ratio:1:5

LABORER: CARPENTER TENDER *LABORERS - ZONE 1*	06/01/2013	$33.05	$7.10	$12.45	$0.00	$52.60
	12/01/2013	$33.80	$7.10	$12.45	$0.00	$53.35
	06/01/2014	$34.55	$7.10	$12.45	$0.00	$54.10
	12/01/2014	$35.30	$7.10	$12.45	$0.00	$54.85
	06/01/2015	$36.05	$7.10	$12.45	$0.00	$55.60
	12/01/2015	$36.80	$7.10	$12.45	$0.00	$56.35
	06/01/2016	$37.55	$7.10	$12.45	$0.00	$57.10
	12/01/2016	$38.55	$7.10	$12.45	$0.00	$58.10
For apprentice rates see "Apprentice- LABORER"						
LABORER: CEMENT FINISHER TENDER *LABORERS - ZONE 1*	06/01/2013	$33.05	$7.10	$12.45	$0.00	$52.60
	12/01/2013	$33.80	$7.10	$12.45	$0.00	$53.35
	06/01/2014	$34.55	$7.10	$12.45	$0.00	$54.10
	12/01/2014	$35.30	$7.10	$12.45	$0.00	$54.85
	06/01/2015	$36.05	$7.10	$12.45	$0.00	$55.60
	12/01/2015	$36.80	$7.10	$12.45	$0.00	$56.35
	06/01/2016	$37.55	$7.10	$12.45	$0.00	$57.10
	12/01/2016	$38.55	$7.10	$12.45	$0.00	$58.10
For apprentice rates see "Apprentice- LABORER"						
LABORER: HAZARDOUS WASTE/ASBESTOS REMOVER *LABORERS - ZONE 1*	12/01/2011	$31.80	$7.10	$12.45	$0.00	$51.35
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
LABORER: MASON TENDER *LABORERS - ZONE 1*	06/01/2013	$33.30	$7.10	$12.45	$0.00	$52.85
	12/01/2013	$34.05	$7.10	$12.45	$0.00	$53.60
	06/01/2014	$34.80	$7.10	$12.45	$0.00	$54.35
	12/01/2014	$35.55	$7.10	$12.45	$0.00	$55.10
	06/01/2015	$36.30	$7.10	$12.45	$0.00	$55.85
	12/01/2015	$37.05	$7.10	$12.45	$0.00	$56.60
	06/01/2016	$37.80	$7.10	$12.45	$0.00	$57.35
	12/01/2016	$38.80	$7.10	$12.45	$0.00	$58.35
For apprentice rates see "Apprentice- LABORER"						
LABORER: MULTI-TRADE TENDER *LABORERS - ZONE 1*	06/01/2013	$33.05	$7.10	$12.45	$0.00	$52.60
	12/01/2013	$33.80	$7.10	$12.45	$0.00	$53.35
	06/01/2014	$34.55	$7.10	$12.45	$0.00	$54.10
	12/01/2014	$35.30	$7.10	$12.45	$0.00	$54.85
	06/01/2015	$36.05	$7.10	$12.45	$0.00	$55.60
	12/01/2015	$36.80	$7.10	$12.45	$0.00	$56.35
	06/01/2016	$37.55	$7.10	$12.45	$0.00	$57.10
	12/01/2016	$38.55	$7.10	$12.45	$0.00	$58.10
For apprentice rates see "Apprentice- LABORER"						
LABORER: TREE REMOVER *LABORERS - ZONE 1*	06/01/2013	$33.05	$7.10	$12.45	$0.00	$52.60
	12/01/2013	$33.80	$7.10	$12.45	$0.00	$53.35
	06/01/2014	$34.55	$7.10	$12.45	$0.00	$54.10
	12/01/2014	$35.30	$7.10	$12.45	$0.00	$54.85
	06/01/2015	$36.05	$7.10	$12.45	$0.00	$55.60
	12/01/2015	$36.80	$7.10	$12.45	$0.00	$56.35
	06/01/2016	$37.55	$7.10	$12.45	$0.00	$57.10
	12/01/2016	$38.55	$7.10	$12.45	$0.00	$58.10
This classification applies to the wholesale removal of standing trees including all associated trimming of branches and limbs, and applies to the removal of branches at locations not on or around utility lines. For apprentice rates see "Apprentice- LABORER"						
LASER BEAM OPERATOR *LABORERS - ZONE 1*	06/01/2013	$33.30	$7.10	$12.45	$0.00	$52.85
	12/01/2013	$34.05	$7.10	$12.45	$0.00	$53.60
	06/01/2014	$34.80	$7.10	$12.45	$0.00	$54.35
	12/01/2014	$35.55	$7.10	$12.45	$0.00	$55.10
	06/01/2015	$36.30	$7.10	$12.45	$0.00	$55.85
	12/01/2015	$37.05	$7.10	$12.45	$0.00	$56.60
	06/01/2016	$37.80	$7.10	$12.45	$0.00	$57.35
	12/01/2016	$38.80	$7.10	$12.45	$0.00	$58.35
For apprentice rates see "Apprentice- LABORER"						
MARBLE & TILE FINISHERS *BRICKLAYERS LOCAL 3 - MARBLE & TILE*	02/01/2013	$36.20	$10.18	$16.51	$0.00	$62.89
	08/01/2013	$36.66	$10.18	$16.83	$0.00	$63.67
	02/01/2014	$37.11	$10.18	$16.83	$0.00	$64.12
	08/01/2014	$37.82	$10.18	$16.90	$0.00	$64.90
	02/01/2015	$38.27	$10.18	$16.90	$0.00	$65.35
	08/01/2015	$38.98	$10.18	$16.97	$0.00	$66.13
	02/01/2016	$39.43	$10.18	$16.97	$0.00	$66.58
	08/01/2016	$40.13	$10.18	$17.05	$0.00	$67.36
	02/01/2017	$40.59	$10.18	$17.05	$0.00	$67.82

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *MARBLE & TILE FINISHER - Local 3 Marble & Tile*

Effective Date - 02/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$18.10	$10.18	$16.51	$0.00	$44.79
2	60	$21.72	$10.18	$16.51	$0.00	$48.41
3	70	$25.34	$10.18	$16.51	$0.00	$52.03
4	80	$28.96	$10.18	$16.51	$0.00	$55.65
5	90	$32.58	$10.18	$16.51	$0.00	$59.27

Effective Date - 08/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$18.33	$10.18	$16.83	$0.00	$45.34
2	60	$22.00	$10.18	$16.83	$0.00	$49.01
3	70	$25.66	$10.18	$16.83	$0.00	$52.67
4	80	$29.33	$10.18	$16.83	$0.00	$56.34
5	90	$32.99	$10.18	$16.83	$0.00	$60.00

Notes:

Apprentice to Journeyworker Ratio:1:3

MARBLE MASONS,TILELAYERS & TERRAZZO MECH *BRICKLAYERS LOCAL 3 - MARBLE & TILE*	02/01/2013	$47.45	$10.18	$17.83	$0.00	$75.46
	08/01/2013	$48.10	$10.18	$18.15	$0.00	$76.43
	02/01/2014	$48.66	$10.18	$18.15	$0.00	$76.99
	08/01/2014	$49.56	$10.18	$18.22	$0.00	$77.96
	02/01/2015	$50.12	$10.18	$18.22	$0.00	$78.52
	08/01/2015	$51.02	$10.18	$18.29	$0.00	$79.49
	02/01/2016	$51.59	$10.18	$18.29	$0.00	$80.06
	08/01/2016	$52.49	$10.18	$18.37	$0.00	$81.04
	02/01/2017	$53.06	$10.18	$18.37	$0.00	$81.61

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *MARBLE-TILE-TERRAZZO MECHANIC - Local 3 Marble & Tile*

Effective Date - 02/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$23.73	$10.18	$17.83	$0.00	$51.74
2	60	$28.47	$10.18	$17.83	$0.00	$56.48
3	70	$33.22	$10.18	$17.83	$0.00	$61.23
4	80	$37.96	$10.18	$17.83	$0.00	$65.97
5	90	$42.71	$10.18	$17.83	$0.00	$70.72

Effective Date - 08/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.05	$10.18	$18.15	$0.00	$52.38
2	60	$28.86	$10.18	$18.15	$0.00	$57.19
3	70	$33.67	$10.18	$18.15	$0.00	$62.00
4	80	$38.48	$10.18	$18.15	$0.00	$66.81
5	90	$43.29	$10.18	$18.15	$0.00	$71.62

Notes:

Apprentice to Journeyworker Ratio:1:5

MECH. SWEEPER OPERATOR (ON CONST. SITES) *OPERATING ENGINEERS LOCAL 4*	06/01/2013	$39.96	$10.00	$13.55	$0.00	$63.51
	12/01/2013	$40.74	$10.00	$13.55	$0.00	$64.29
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
MECHANICS MAINTENANCE *OPERATING ENGINEERS LOCAL 4*	06/01/2013	$39.96	$10.00	$13.55	$0.00	$63.51
	12/01/2013	$40.74	$10.00	$13.55	$0.00	$64.29
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
MILLWRIGHT (Zone 1) *MILLWRIGHTS LOCAL 1121 - Zone 1*	04/01/2013	$34.68	$9.80	$15.76	$0.00	$60.24
	10/01/2013	$35.45	$9.80	$15.76	$0.00	$61.01
	04/01/2014	$36.23	$9.80	$15.76	$0.00	$61.79
	10/01/2014	$37.18	$9.80	$15.76	$0.00	$62.74
	04/01/2015	$38.14	$9.80	$15.76	$0.00	$63.70

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *MILLWRIGHT - Local 1121 Zone 1*

Effective Date - 04/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	$19.07	$9.80	$4.32	$0.00	$33.19
2	65	$22.54	$9.80	$13.01	$0.00	$45.35
3	75	$26.01	$9.80	$13.80	$0.00	$49.61
4	85	$29.48	$9.80	$14.58	$0.00	$53.86

Effective Date - 10/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	$19.50	$9.80	$4.32	$0.00	$33.62
2	65	$23.04	$9.80	$13.01	$0.00	$45.85
3	75	$26.59	$9.80	$13.80	$0.00	$50.19
4	85	$30.13	$9.80	$14.58	$0.00	$54.51

Notes:

Steps are 2,000 hours

Apprentice to Journeyworker Ratio:1:5

MORTAR MIXER *LABORERS - ZONE 1*	06/01/2013	$33.30	$7.10	$12.45	$0.00	$52.85
	12/01/2013	$34.05	$7.10	$12.45	$0.00	$53.60
	06/01/2014	$34.80	$7.10	$12.45	$0.00	$54.35
	12/01/2014	$35.55	$7.10	$12.45	$0.00	$55.10
	06/01/2015	$36.30	$7.10	$12.45	$0.00	$55.85
	12/01/2015	$37.05	$7.10	$12.45	$0.00	$56.60
	06/01/2016	$37.80	$7.10	$12.45	$0.00	$57.35
	12/01/2016	$38.80	$7.10	$12.45	$0.00	$58.35
For apprentice rates see "Apprentice- LABORER"						
OILER (OTHER THAN TRUCK CRANES,GRADALLS) *OPERATING ENGINEERS LOCAL 4*	06/01/2013	$21.17	$10.00	$13.55	$0.00	$44.72
	12/01/2013	$21.59	$10.00	$13.55	$0.00	$45.14
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
OILER (TRUCK CRANES, GRADALLS) *OPERATING ENGINEERS LOCAL 4*	06/01/2013	$24.57	$10.00	$13.55	$0.00	$48.12
	12/01/2013	$25.06	$10.00	$13.55	$0.00	$48.61
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
OTHER POWER DRIVEN EQUIPMENT - CLASS II *OPERATING ENGINEERS LOCAL 4*	06/01/2013	$39.96	$10.00	$13.55	$0.00	$63.51
	12/01/2013	$40.74	$10.00	$13.55	$0.00	$64.29
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PAINTER (BRIDGES/TANKS) *PAINTERS LOCAL 35 - ZONE 2*	01/01/2013	$45.01	$7.80	$15.60	$0.00	$68.41

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 - BRIDGES/TANKS*

Effective Date - 01/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$22.51	$7.80	$0.00	$0.00	$30.31
2	55	$24.76	$7.80	$3.52	$0.00	$36.08
3	60	$27.01	$7.80	$3.84	$0.00	$38.65
4	65	$29.26	$7.80	$4.16	$0.00	$41.22
5	70	$31.51	$7.80	$13.68	$0.00	$52.99
6	75	$33.76	$7.80	$14.00	$0.00	$55.56
7	80	$36.01	$7.80	$14.32	$0.00	$58.13
8	90	$40.51	$7.80	$14.96	$0.00	$63.27

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (SPRAY OR SANDBLAST, NEW) *	01/01/2013	$35.91	$7.80	$15.60	$0.00	$59.31

* If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used.*PAINTERS LOCAL 35 - ZONE 2*

Apprentice - *PAINTER Local 35 Zone 2 - Spray/Sandblast - New*

Effective Date - 01/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$17.96	$7.80	$0.00	$0.00	$25.76
2	55	$19.75	$7.80	$3.52	$0.00	$31.07
3	60	$21.55	$7.80	$3.84	$0.00	$33.19
4	65	$23.34	$7.80	$4.16	$0.00	$35.30
5	70	$25.14	$7.80	$13.68	$0.00	$46.62
6	75	$26.93	$7.80	$14.00	$0.00	$48.73
7	80	$28.73	$7.80	$14.32	$0.00	$50.85
8	90	$32.32	$7.80	$14.96	$0.00	$55.08

Notes:

Apprentice to Journeyworker Ratio:1:1

PAINTER (SPRAY OR SANDBLAST, REPAINT)	01/01/2013	$33.97	$7.80	$15.60	$0.00	$57.37

PAINTERS LOCAL 35 - ZONE 2

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 Zone 2 - Spray/Sandblast - Repaint*

Effective Date - 01/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$16.99	$7.80	$0.00	$0.00	$24.79
2	55	$18.68	$7.80	$3.52	$0.00	$30.00
3	60	$20.38	$7.80	$3.84	$0.00	$32.02
4	65	$22.08	$7.80	$4.16	$0.00	$34.04
5	70	$23.78	$7.80	$13.68	$0.00	$45.26
6	75	$25.48	$7.80	$14.00	$0.00	$47.28
7	80	$27.18	$7.80	$14.32	$0.00	$49.30
8	90	$30.57	$7.80	$14.96	$0.00	$53.33

Notes:

Apprentice to Journeyworker Ratio:1:1

PAINTER (TRAFFIC MARKINGS) *LABORERS - ZONE 1*	06/01/2013	$33.05	$7.10	$12.45	$0.00	$52.60
	12/01/2013	$33.80	$7.10	$12.45	$0.00	$53.35
	06/01/2014	$34.55	$7.10	$12.45	$0.00	$54.10
	12/01/2014	$35.30	$7.10	$12.45	$0.00	$54.85
	06/01/2015	$36.05	$7.10	$12.45	$0.00	$55.60
	12/01/2015	$36.80	$7.10	$12.45	$0.00	$56.35
	06/01/2016	$37.55	$7.10	$12.45	$0.00	$57.10
	12/01/2016	$38.55	$7.10	$12.45	$0.00	$58.10
For Apprentice rates see "Apprentice- LABORER"						
PAINTER / TAPER (BRUSH, NEW) * * If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used.*PAINTERS LOCAL 35 - ZONE 2*	01/01/2013	$34.51	$7.80	$15.60	$0.00	$57.91

Apprentice - *PAINTER - Local 35 Zone 2 - BRUSH NEW*

Effective Date - 01/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$17.26	$7.80	$0.00	$0.00	$25.06
2	55	$18.98	$7.80	$3.52	$0.00	$30.30
3	60	$20.71	$7.80	$3.84	$0.00	$32.35
4	65	$22.43	$7.80	$4.16	$0.00	$34.39
5	70	$24.16	$7.80	$13.68	$0.00	$45.64
6	75	$25.88	$7.80	$14.00	$0.00	$47.68
7	80	$27.61	$7.80	$14.32	$0.00	$49.73
8	90	$31.06	$7.80	$14.96	$0.00	$53.82

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
PAINTER / TAPER (BRUSH, REPAINT) *PAINTERS LOCAL 35 - ZONE 2*	01/01/2013	$32.57	$7.80	$15.60	$0.00	$55.97

Apprentice - *PAINTER Local 35 Zone 2 - BRUSH REPAINT*

Effective Date - 01/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$16.29	$7.80	$0.00	$0.00	$24.09
2	55	$17.91	$7.80	$3.52	$0.00	$29.23
3	60	$19.54	$7.80	$3.84	$0.00	$31.18
4	65	$21.17	$7.80	$4.16	$0.00	$33.13
5	70	$22.80	$7.80	$13.68	$0.00	$44.28
6	75	$24.43	$7.80	$14.00	$0.00	$46.23
7	80	$26.06	$7.80	$14.32	$0.00	$48.18
8	90	$29.31	$7.80	$14.96	$0.00	$52.07

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PANEL & PICKUP TRUCKS DRIVER *TEAMSTERS JOINT COUNCIL NO. 10 ZONE A*	12/01/2012	$31.38	$8.91	$8.00	$0.00	$48.29
PIER AND DOCK CONSTRUCTOR (UNDERPINNING AND DECK) *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2012	$39.20	$9.80	$17.67	$0.00	$66.67
	08/01/2013	$40.70	$9.80	$17.67	$0.00	$68.17
	08/01/2014	$42.20	$9.80	$17.67	$0.00	$69.67
	08/01/2015	$43.70	$9.80	$17.67	$0.00	$71.17
PILE DRIVER *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2012	$39.20	$9.80	$17.67	$0.00	$66.67
	08/01/2013	$40.70	$9.80	$17.67	$0.00	$68.17
	08/01/2014	$42.20	$9.80	$17.67	$0.00	$69.67
	08/01/2015	$43.70	$9.80	$17.67	$0.00	$71.17

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PILE DRIVER - Local 56 Zone 1*

Effective Date - 08/01/2012

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.60	$9.80	$17.67	$0.00	$47.07
2	60	$23.52	$9.80	$17.67	$0.00	$50.99
3	70	$27.44	$9.80	$17.67	$0.00	$54.91
4	75	$29.40	$9.80	$17.67	$0.00	$56.87
5	80	$31.36	$9.80	$17.67	$0.00	$58.83
6	80	$31.36	$9.80	$17.67	$0.00	$58.83
7	90	$35.28	$9.80	$17.67	$0.00	$62.75
8	90	$35.28	$9.80	$17.67	$0.00	$62.75

Effective Date - 08/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.35	$9.80	$17.67	$0.00	$47.82
2	60	$24.42	$9.80	$17.67	$0.00	$51.89
3	70	$28.49	$9.80	$17.67	$0.00	$55.96
4	75	$30.53	$9.80	$17.67	$0.00	$58.00
5	80	$32.56	$9.80	$17.67	$0.00	$60.03
6	80	$32.56	$9.80	$17.67	$0.00	$60.03
7	90	$36.63	$9.80	$17.67	$0.00	$64.10
8	90	$36.63	$9.80	$17.67	$0.00	$64.10

Notes:

Apprentice to Journeyworker Ratio:1:3

PIPEFITTER & STEAMFITTER *PIPEFITTERS LOCAL 537*	03/01/2013	$49.34	$8.75	$14.39	$0.00	$72.48

Apprentice - *PIPEFITTER - Local 537*

Effective Date - 03/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$19.74	$8.75	$6.50	$0.00	$34.99
2	45	$22.20	$8.75	$14.39	$0.00	$45.34
3	60	$29.60	$8.75	$14.39	$0.00	$52.74
4	70	$34.54	$8.75	$14.39	$0.00	$57.68
5	80	$39.47	$8.75	$14.39	$0.00	$62.61

Notes:

** 1:3; 3:15; 1:10 thereafter / Steps are 1 yr.
Refrig/AC Mechanic **1:1;1:2;2:4;3:6;4:8;5:10;6:12;7:14;8:17;9:20;10:23(Max)

Apprentice to Journeyworker Ratio:**

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
PIPELAYER *LABORERS - ZONE 1*	06/01/2013	$33.30	$7.10	$12.45	$0.00	$52.85
	12/01/2013	$34.05	$7.10	$12.45	$0.00	$53.60
	06/01/2014	$34.80	$7.10	$12.45	$0.00	$54.35
	12/01/2014	$35.55	$7.10	$12.45	$0.00	$55.10
	06/01/2015	$36.30	$7.10	$12.45	$0.00	$55.85
	12/01/2015	$37.05	$7.10	$12.45	$0.00	$56.60
	06/01/2016	$37.80	$7.10	$12.45	$0.00	$57.35
	12/01/2016	$38.80	$7.10	$12.45	$0.00	$58.35
For apprentice rates see "Apprentice- LABORER"						
PLUMBERS & GASFITTERS *PLUMBERS & GASFITTERS LOCAL 12*	03/01/2013	$49.31	$9.32	$13.29	$0.00	$71.92

Apprentice - *PLUMBER/GASFITTER - Local 12*

Effective Date - 03/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	$17.26	$9.32	$4.97	$0.00	$31.55
2	40	$19.72	$9.32	$5.61	$0.00	$34.65
3	55	$27.12	$9.32	$7.53	$0.00	$43.97
4	65	$32.05	$9.32	$8.81	$0.00	$50.18
5	75	$36.98	$9.32	$10.09	$0.00	$56.39

Notes:

** 1:2; 2:6; 3:10; 4:14; 5:19/Steps are 1 yr
Step4 with lic$53.29 Step5 with lic$59.49

Apprentice to Journeyworker Ratio:**

PNEUMATIC CONTROLS (TEMP.) *PIPEFITTERS LOCAL 537*	03/01/2013	$49.34	$8.75	$14.39	$0.00	$72.48
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
PNEUMATIC DRILL/TOOL OPERATOR *LABORERS - ZONE 1*	06/01/2013	$33.30	$7.10	$12.45	$0.00	$52.85
	12/01/2013	$34.05	$7.10	$12.45	$0.00	$53.60
	06/01/2014	$34.80	$7.10	$12.45	$0.00	$54.35
	12/01/2014	$35.55	$7.10	$12.45	$0.00	$55.10
	06/01/2015	$36.30	$7.10	$12.45	$0.00	$55.85
	12/01/2015	$37.05	$7.10	$12.45	$0.00	$56.60
	06/01/2016	$37.80	$7.10	$12.45	$0.00	$57.35
	12/01/2016	$38.80	$7.10	$12.45	$0.00	$58.35
For apprentice rates see "Apprentice- LABORER"						
POWDERMAN & BLASTER *LABORERS - ZONE 1*	06/01/2013	$34.05	$7.10	$12.45	$0.00	$53.60
	12/01/2013	$34.80	$7.10	$12.45	$0.00	$54.35
	06/01/2014	$35.55	$7.10	$12.45	$0.00	$55.10
	12/01/2014	$36.30	$7.10	$12.45	$0.00	$55.85
	06/01/2015	$37.05	$7.10	$12.45	$0.00	$56.60
	12/01/2015	$37.80	$7.10	$12.45	$0.00	$57.35
	06/01/2016	$38.55	$7.10	$12.45	$0.00	$58.10
	12/01/2016	$39.55	$7.10	$12.45	$0.00	$59.10
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
POWER SHOVEL/DERRICK/TRENCHING MACHINE *OPERATING ENGINEERS LOCAL 4*	06/01/2013	$40.34	$10.00	$13.55	$0.00	$63.89
	12/01/2013	$41.12	$10.00	$13.55	$0.00	$64.67
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PUMP OPERATOR (CONCRETE) *OPERATING ENGINEERS LOCAL 4*	06/01/2013	$40.34	$10.00	$13.55	$0.00	$63.89
	12/01/2013	$41.12	$10.00	$13.55	$0.00	$64.67
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PUMP OPERATOR (DEWATERING, OTHER) *OPERATING ENGINEERS LOCAL 4*	06/01/2013	$28.19	$10.00	$13.55	$0.00	$51.74
	12/01/2013	$28.74	$10.00	$13.55	$0.00	$52.29
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
READY-MIX CONCRETE DRIVER *TEAMSTERS LOCAL 25b*	05/01/2011	$28.03	$7.75	$5.91	$0.00	$41.69
RECLAIMERS *OPERATING ENGINEERS LOCAL 4*	06/01/2013	$39.96	$10.00	$13.55	$0.00	$63.51
	12/01/2013	$40.74	$10.00	$13.55	$0.00	$64.29
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
RESIDENTIAL WOOD FRAME (All Other Work) *CARPENTERS -ZONE 2 (Residential Wood)*	04/01/2011	$24.24	$8.67	$15.51	$0.00	$48.42
RESIDENTIAL WOOD FRAME CARPENTER ** ** The Residential Wood Frame Carpenter classification applies only to the construction of new, wood frame residences that do not exceed four stories including the basement.*CARPENTERS -ZONE 2 (Residential Wood)*	05/01/2011	$24.24	$6.34	$6.23	$0.00	$36.81
As of 9/1/09 Carpentry work on wood-frame residential WEATHERIZATION projects shall be paid the RESIDENTIAL WOOD FRAME CARPENTER rate.						
RIDE-ON MOTORIZED BUGGY OPERATOR *LABORERS - ZONE 1*	06/01/2013	$33.30	$7.10	$12.45	$0.00	$52.85
	12/01/2013	$34.05	$7.10	$12.45	$0.00	$53.60
	06/01/2014	$34.80	$7.10	$12.45	$0.00	$54.35
	12/01/2014	$35.55	$7.10	$12.45	$0.00	$55.10
	06/01/2015	$36.30	$7.10	$12.45	$0.00	$55.85
	12/01/2015	$37.05	$7.10	$12.45	$0.00	$56.60
	06/01/2016	$37.80	$7.10	$12.45	$0.00	$57.35
	12/01/2016	$38.80	$7.10	$12.45	$0.00	$58.35
For apprentice rates see "Apprentice- LABORER"						
ROLLER/SPREADER/MULCHING MACHINE *OPERATING ENGINEERS LOCAL 4*	06/01/2013	$39.96	$10.00	$13.55	$0.00	$63.51
	12/01/2013	$40.74	$10.00	$13.55	$0.00	$64.29
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
ROOFER (Inc.Roofer Waterproofng &Roofer Damproofg) *ROOFERS LOCAL 33*	02/01/2013	$37.41	$10.50	$10.70	$0.00	$58.61

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *ROOFER - Local 33*

Effective Date - 02/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$18.71	$10.50	$3.38	$0.00	$32.59
2	60	$22.45	$10.50	$10.70	$0.00	$43.65
3	65	$24.32	$10.50	$10.70	$0.00	$45.52
4	75	$28.06	$10.50	$10.70	$0.00	$49.26
5	85	$31.80	$10.50	$10.70	$0.00	$53.00

Notes: ** 1:5, 2:6-10, the 1:10; Reroofing: 1:4, then 1:1
Step 1 is 2000 hrs.; Steps 2-5 are 1000 hrs.

Apprentice to Journeyworker Ratio:**

ROOFER SLATE / TILE / PRECAST CONCRETE *ROOFERS LOCAL 33*	02/01/2013	$37.66	$10.50	$10.70	$0.00	$58.86

For apprentice rates see "Apprentice- ROOFER"

SHEETMETAL WORKER *SHEETMETAL WORKERS LOCAL 17 - A*	02/01/2013	$42.32	$9.82	$18.24	$2.11	$72.49

Apprentice - *SHEET METAL WORKER - Local 17-A*

Effective Date - 02/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$16.93	$9.82	$4.00	$0.00	$30.75
2	40	$16.93	$9.82	$4.00	$0.00	$30.75
3	45	$19.04	$9.82	$8.00	$1.11	$37.97
4	45	$19.04	$9.82	$8.00	$1.11	$37.97
5	50	$21.16	$9.82	$8.75	$1.19	$40.92
6	50	$21.16	$9.82	$9.00	$1.20	$41.18
7	60	$25.39	$9.82	$10.24	$1.36	$46.81
8	65	$27.51	$9.82	$10.99	$1.45	$49.77
9	75	$31.74	$9.82	$12.49	$1.62	$55.67
10	85	$35.97	$9.82	$13.49	$1.78	$61.06

Notes:
Steps are 6 mos.

Apprentice to Journeyworker Ratio:1:4

SIGN ERECTOR *PAINTERS LOCAL 35 - ZONE 2*	06/01/2013	$25.81	$7.07	$7.05	$0.00	$39.93

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *SIGN ERECTOR - Local 35 Zone 2*

Effective Date - 06/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$12.91	$7.07	$0.00	$0.00	$19.98
2	55	$14.20	$7.07	$2.45	$0.00	$23.72
3	60	$15.49	$7.07	$2.45	$0.00	$25.01
4	65	$16.78	$7.07	$2.45	$0.00	$26.30
5	70	$18.07	$7.07	$7.05	$0.00	$32.19
6	75	$19.36	$7.07	$7.05	$0.00	$33.48
7	80	$20.65	$7.07	$7.05	$0.00	$34.77
8	85	$21.94	$7.07	$7.05	$0.00	$36.06
9	90	$23.23	$7.07	$7.05	$0.00	$37.35

Notes:

Steps are 4 mos.

Apprentice to Journeyworker Ratio:1:1

SPECIALIZED EARTH MOVING EQUIP < 35 TONS *TEAMSTERS JOINT COUNCIL NO. 10 ZONE A*	12/01/2012	$31.84	$8.91	$8.00	$0.00	$48.75
SPECIALIZED EARTH MOVING EQUIP > 35 TONS *TEAMSTERS JOINT COUNCIL NO. 10 ZONE A*	12/01/2012	$32.13	$8.91	$8.00	$0.00	$49.04
SPRINKLER FITTER *SPRINKLER FITTERS LOCAL 550 - (Section A)*	03/01/2013	$52.58	$8.42	$12.60	$0.00	$73.60

Apprentice - *SPRINKLER FITTER - Local 550*

Effective Date - 03/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	$18.40	$8.42	$8.00	$0.00	$34.82
2	40	$21.03	$8.42	$8.00	$0.00	$37.45
3	45	$23.66	$8.42	$8.00	$0.00	$40.08
4	50	$26.29	$8.42	$8.00	$0.00	$42.71
5	55	$28.92	$8.42	$8.00	$0.00	$45.34
6	60	$31.55	$8.42	$8.00	$0.00	$47.97
7	65	$34.18	$8.42	$8.00	$0.00	$50.60
8	70	$36.81	$8.42	$8.00	$0.00	$53.23
9	75	$39.44	$8.42	$8.00	$0.00	$55.86
10	80	$42.06	$8.42	$8.00	$0.00	$58.48

Notes:

Steps are 850 hours

Apprentice to Journeyworker Ratio:1:1

STEAM BOILER OPERATOR *OPERATING ENGINEERS LOCAL 4*	06/01/2013	$39.96	$10.00	$13.55	$0.00	$63.51
	12/01/2013	$40.74	$10.00	$13.55	$0.00	$64.29

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TAMPERS, SELF-PROPELLED OR TRACTOR DRAWN *OPERATING ENGINEERS LOCAL 4*	06/01/2013	$39.96	$10.00	$13.55	$0.00	$63.51
	12/01/2013	$40.74	$10.00	$13.55	$0.00	$64.29
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
TELECOMMUNICATION TECHNICIAN *ELECTRICIANS LOCAL 103*	03/01/2013	$32.64	$13.00	$12.51	$0.00	$58.15
	09/01/2013	$33.15	$13.00	$12.52	$0.00	$58.67
	03/01/2014	$33.69	$13.00	$12.54	$0.00	$59.23
	09/01/2014	$34.20	$13.00	$12.56	$0.00	$59.76
	03/01/2015	$34.74	$13.00	$12.57	$0.00	$60.31
	09/01/2015	$35.45	$13.00	$12.59	$0.00	$61.04
	03/01/2016	$36.17	$13.00	$12.62	$0.00	$61.79

Apprentice - *TELECOMMUNICATION TECHNICIAN - Local 103*

Effective Date - 03/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$13.06	$13.00	$0.39	$0.00	$26.45
2	40	$13.06	$13.00	$0.39	$0.00	$26.45
3	45	$14.69	$13.00	$10.77	$0.00	$38.46
4	45	$14.69	$13.00	$10.77	$0.00	$38.46
5	50	$16.32	$13.00	$11.02	$0.00	$40.34
6	55	$17.95	$13.00	$11.27	$0.00	$42.22
7	60	$19.58	$13.00	$11.52	$0.00	$44.10
8	65	$21.22	$13.00	$11.77	$0.00	$45.99
9	70	$22.85	$13.00	$12.02	$0.00	$47.87
10	75	$24.48	$13.00	$12.26	$0.00	$49.74

Effective Date - 09/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$13.26	$13.00	$0.40	$0.00	$26.66
2	40	$13.26	$13.00	$0.40	$0.00	$26.66
3	45	$14.92	$13.00	$9.79	$0.00	$37.71
4	45	$14.92	$13.00	$9.79	$0.00	$37.71
5	50	$16.58	$13.00	$10.04	$0.00	$39.62
6	55	$18.23	$13.00	$10.29	$0.00	$41.52
7	60	$19.89	$13.00	$10.54	$0.00	$43.43
8	65	$21.55	$13.00	$10.79	$0.00	$45.34
9	70	$23.21	$13.00	$11.04	$0.00	$47.25
10	75	$24.86	$13.00	$11.29	$0.00	$49.15

Notes:

Apprentice to Journeyworker Ratio:1:1

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TERRAZZO FINISHERS *BRICKLAYERS LOCAL 3 - MARBLE & TILE*	02/01/2013	$46.35	$10.18	$17.83	$0.00	$74.36
	08/01/2013	$47.00	$10.18	$18.15	$0.00	$75.33
	02/01/2014	$47.56	$10.18	$18.15	$0.00	$75.89
	08/01/2014	$48.46	$10.18	$18.22	$0.00	$76.86
	02/01/2015	$49.02	$10.18	$18.22	$0.00	$77.42
	08/01/2015	$49.92	$10.18	$18.29	$0.00	$78.39
	02/01/2016	$50.49	$10.18	$18.29	$0.00	$78.96
	08/01/2016	$51.39	$10.18	$18.37	$0.00	$79.94
	02/01/2017	$51.96	$10.18	$18.37	$0.00	$80.51

Apprentice - *TERRAZZO FINISHER - Local 3 Marble & Tile*

Effective Date - 02/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$23.18	$10.18	$17.83	$0.00	$51.19
2	60	$27.81	$10.18	$17.83	$0.00	$55.82
3	70	$32.45	$10.18	$17.83	$0.00	$60.46
4	80	$37.08	$10.18	$17.83	$0.00	$65.09
5	90	$41.72	$10.18	$17.83	$0.00	$69.73

Effective Date - 08/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$23.50	$10.18	$18.15	$0.00	$51.83
2	60	$28.20	$10.18	$18.15	$0.00	$56.53
3	70	$32.90	$10.18	$18.15	$0.00	$61.23
4	80	$37.60	$10.18	$18.15	$0.00	$65.93
5	90	$42.30	$10.18	$18.15	$0.00	$70.63

Notes:

Apprentice to Journeyworker Ratio:1:3

TEST BORING DRILLER *LABORERS - FOUNDATION AND MARINE*	06/01/2013	$34.45	$7.10	$12.60	$0.00	$54.15
	12/01/2013	$35.20	$7.10	$12.60	$0.00	$54.90
	06/01/2014	$35.95	$7.10	$12.60	$0.00	$55.65
	12/01/2014	$36.70	$7.10	$12.60	$0.00	$56.40
	06/01/2015	$37.45	$7.10	$12.60	$0.00	$57.15
	12/01/2015	$38.20	$7.10	$12.60	$0.00	$57.90
	06/01/2016	$38.95	$7.10	$12.60	$0.00	$58.65
	12/01/2016	$39.95	$7.10	$12.60	$0.00	$59.65

For apprentice rates see "Apprentice- LABORER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TEST BORING DRILLER HELPER *LABORERS - FOUNDATION AND MARINE*	06/01/2013	$33.17	$7.10	$12.60	$0.00	$52.87
	12/01/2013	$33.92	$7.10	$12.60	$0.00	$53.62
	06/01/2014	$34.67	$7.10	$12.60	$0.00	$54.37
	12/01/2014	$35.42	$7.10	$12.60	$0.00	$55.12
	06/01/2015	$36.17	$7.10	$12.60	$0.00	$55.87
	12/01/2015	$36.92	$7.10	$12.60	$0.00	$56.62
	06/01/2016	$37.67	$7.10	$12.60	$0.00	$57.37
	12/01/2016	$38.67	$7.10	$12.60	$0.00	$58.37
For apprentice rates see "Apprentice- LABORER"						
TEST BORING LABORER *LABORERS - FOUNDATION AND MARINE*	06/01/2013	$33.05	$7.10	$12.60	$0.00	$52.75
	12/01/2013	$33.80	$7.10	$12.60	$0.00	$53.50
	06/01/2014	$34.55	$7.10	$12.60	$0.00	$54.25
	12/01/2014	$35.30	$7.10	$12.60	$0.00	$55.00
	06/01/2015	$36.05	$7.10	$12.60	$0.00	$55.75
	12/01/2015	$36.80	$7.10	$12.60	$0.00	$56.50
	06/01/2016	$37.55	$7.10	$12.60	$0.00	$57.25
	12/01/2016	$38.55	$7.10	$12.60	$0.00	$58.25
For apprentice rates see "Apprentice- LABORER"						
TRACTORS/PORTABLE STEAM GENERATORS *OPERATING ENGINEERS LOCAL 4*	06/01/2013	$39.96	$10.00	$13.55	$0.00	$63.51
	12/01/2013	$40.74	$10.00	$13.55	$0.00	$64.29
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
TRAILERS FOR EARTH MOVING EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE A*	12/01/2012	$32.42	$9.07	$8.00	$0.00	$49.49
TUNNEL WORK - COMPRESSED AIR *LABORERS (COMPRESSED AIR)*	06/01/2013	$45.33	$7.10	$13.00	$0.00	$65.43
	12/01/2013	$46.08	$7.10	$13.00	$0.00	$66.18
	06/01/2014	$46.83	$7.10	$13.00	$0.00	$66.93
	12/01/2014	$47.58	$7.10	$13.00	$0.00	$67.68
	06/01/2015	$48.33	$7.10	$13.00	$0.00	$68.43
	12/01/2015	$49.08	$7.10	$13.00	$0.00	$69.18
	06/01/2016	$49.83	$7.10	$13.00	$0.00	$69.93
	12/01/2016	$50.83	$7.10	$13.00	$0.00	$70.93
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - COMPRESSED AIR (HAZ. WASTE) *LABORERS (COMPRESSED AIR)*	06/01/2013	$47.33	$7.10	$13.00	$0.00	$67.43
	12/01/2013	$48.08	$7.10	$13.00	$0.00	$68.18
	06/01/2014	$48.83	$7.10	$13.00	$0.00	$68.93
	12/01/2014	$49.58	$7.10	$13.00	$0.00	$69.68
	06/01/2015	$50.33	$7.10	$13.00	$0.00	$70.43
	12/01/2015	$51.08	$7.10	$13.00	$0.00	$71.18
	06/01/2016	$51.83	$7.10	$13.00	$0.00	$71.93
	12/01/2016	$52.83	$7.10	$13.00	$0.00	$72.93
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TUNNEL WORK - FREE AIR *LABORERS (FREE AIR TUNNEL)*	06/01/2013	$37.40	$7.10	$13.00	$0.00	$57.50
	12/01/2013	$38.15	$7.10	$13.00	$0.00	$58.25
	06/01/2014	$38.90	$7.10	$13.00	$0.00	$59.00
	12/01/2014	$39.65	$7.10	$13.00	$0.00	$59.75
	06/01/2015	$40.40	$7.10	$13.00	$0.00	$60.50
	12/01/2015	$41.15	$7.10	$13.00	$0.00	$61.25
	06/01/2016	$41.90	$7.10	$13.00	$0.00	$62.00
	12/01/2016	$42.90	$7.10	$13.00	$0.00	$63.00
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - FREE AIR (HAZ. WASTE) *LABORERS (FREE AIR TUNNEL)*	06/01/2013	$39.40	$7.10	$13.00	$0.00	$59.50
	12/01/2013	$40.15	$7.10	$13.00	$0.00	$60.25
	06/01/2014	$40.90	$7.10	$13.00	$0.00	$61.00
	12/01/2014	$41.65	$7.10	$13.00	$0.00	$61.75
	06/01/2015	$42.40	$7.10	$13.00	$0.00	$62.50
	12/01/2015	$43.15	$7.10	$13.00	$0.00	$63.25
	06/01/2016	$43.90	$7.10	$13.00	$0.00	$64.00
	12/01/2016	$44.90	$7.10	$13.00	$0.00	$65.00
For apprentice rates see "Apprentice- LABORER"						
VAC-HAUL *TEAMSTERS JOINT COUNCIL NO. 10 ZONE A*	12/01/2012	$31.84	$8.91	$8.00	$0.00	$48.75
WAGON DRILL OPERATOR *LABORERS - ZONE 1*	06/01/2013	$33.30	$7.10	$12.45	$0.00	$52.85
	12/01/2013	$34.05	$7.10	$12.45	$0.00	$53.60
	06/01/2014	$34.80	$7.10	$12.45	$0.00	$54.35
	12/01/2014	$35.55	$7.10	$12.45	$0.00	$55.10
	06/01/2015	$36.30	$7.10	$12.45	$0.00	$55.85
	12/01/2015	$37.05	$7.10	$12.45	$0.00	$56.60
	06/01/2016	$37.80	$7.10	$12.45	$0.00	$57.35
	12/01/2016	$38.80	$7.10	$12.45	$0.00	$58.35
For apprentice rates see "Apprentice- LABORER"						
WASTE WATER PUMP OPERATOR *OPERATING ENGINEERS LOCAL 4*	06/01/2013	$40.34	$10.00	$13.55	$0.00	$63.89
	12/01/2013	$41.12	$10.00	$13.55	$0.00	$64.67
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
WATER METER INSTALLER *PLUMBERS & GASFITTERS LOCAL 12*	03/01/2013	$49.31	$9.32	$13.29	$0.00	$71.92
For apprentice rates see "Apprentice- PLUMBER/PIPEFITTER" or "PLUMBER/GASFITTER"						
Outside Electrical - East						
CABLE TECHNICIAN (Power Zone) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	03/03/2013	$25.18	$8.20	$4.17	$0.00	$37.55
	09/01/2013	$25.66	$8.70	$4.48	$0.00	$38.84
For apprentice rates see "Apprentice- LINEMAN"						
CABLEMAN (Underground Ducts & Cables) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	03/03/2013	$35.67	$8.20	$4.98	$0.00	$48.85
	09/01/2013	$36.55	$8.70	$6.58	$0.00	$51.83
For apprentice rates see "Apprentice- LINEMAN"						
DRIVER / GROUNDMAN CDL *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	03/03/2013	$29.38	$8.20	$5.68	$0.00	$43.26
	09/01/2013	$29.94	$8.70	$6.05	$0.00	$44.69
For apprentice rates see "Apprentice- LINEMAN"						
DRIVER / GROUNDMAN -Inexperienced (<2000 Hrs) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	03/03/2013	$23.08	$8.20	$3.94	$0.00	$35.22
	09/01/2013	$23.52	$8.70	$5.24	$0.00	$37.46
For apprentice rates see "Apprentice- LINEMAN"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
EQUIPMENT OPERATOR (Class A CDL) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104* For apprentice rates see "Apprentice- LINEMAN"	03/03/2013	$35.67	$8.20	$8.98	$0.00	$52.85
	09/01/2013	$36.35	$8.70	$9.43	$0.00	$54.48
EQUIPMENT OPERATOR (Class B CDL) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104* For apprentice rates see "Apprentice- LINEMAN"	03/03/2013	$31.48	$8.20	$6.19	$0.00	$45.87
	09/01/2013	$32.08	$8.70	$6.59	$0.00	$47.37
GROUNDMAN *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104* For apprentice rates see "Apprentice- LINEMAN"	03/03/2013	$23.08	$8.20	$3.42	$0.00	$34.70
	09/01/2013	$23.52	$8.70	$3.72	$0.00	$35.94
GROUNDMAN -Inexperienced (<2000 Hrs.) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104* For apprentice rates see "Apprentice- LINEMAN"	03/03/2013	$18.89	$8.20	$2.61	$0.00	$29.70
	09/01/2013	$19.25	$8.70	$2.85	$0.00	$30.80
JOURNEYMAN LINEMAN *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	03/03/2013	$41.97	$8.20	$11.26	$0.00	$61.43
	09/01/2013	$42.77	$8.70	$11.78	$0.00	$63.25

Apprentice - *LINEMAN (Outside Electrical) - East Local 104*

Effective Date - 03/03/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$25.18	$8.20	$3.92	$0.00	$37.30
2	65	$27.28	$8.20	$4.36	$0.00	$39.84
3	70	$29.38	$8.20	$5.06	$0.00	$42.64
4	75	$31.48	$8.20	$5.76	$0.00	$45.44
5	80	$33.58	$8.20	$6.46	$0.00	$48.24
6	85	$35.67	$8.20	$7.17	$0.00	$51.04
7	90	$37.77	$8.20	$8.36	$0.00	$54.33

Effective Date - 09/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$25.66	$8.70	$4.24	$0.00	$38.60
2	65	$27.80	$8.70	$4.71	$0.00	$41.21
3	70	$29.94	$8.70	$5.43	$0.00	$44.07
4	75	$32.08	$8.70	$6.16	$0.00	$46.94
5	80	$34.22	$8.70	$6.88	$0.00	$49.80
6	85	$36.35	$8.70	$7.62	$0.00	$52.67
7	90	$38.49	$8.70	$8.83	$0.00	$56.02

Notes:

Apprentice to Journeyworker Ratio:1:2

TELEDATA CABLE SPLICER *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	07/16/2012	$26.33	$4.18	$2.79	$0.00	$33.30
TELEDATA LINEMAN/EQUIPMENT OPERATOR *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	07/16/2012	$24.78	$4.18	$2.74	$0.00	$31.70
TELEDATA WIREMAN/INSTALLER/TECHNICIAN *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	07/16/2012	$24.78	$4.18	$2.74	$0.00	$31.70

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TREE TRIMMER *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104* This classification applies only to the trimming of branches on and around utility lines.	01/29/2012	$17.18	$3.37	$0.00	$0.00	$20.55
TREE TRIMMER GROUNDMAN *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104* This classification applies only to the trimming of branches on and around utility lines.	01/29/2012	$15.15	$3.37	$0.00	$0.00	$18.52

Additional Apprentice Information:

Minimum wage rates for apprentices employed on public works projects are listed above as a percentage of the pre-determined hourly wage rate established by the Commissioner under the provisions of the M.G.L. c. 149, ss. 26-27D. Apprentice ratios are established by the Division of Apprenticeship Training pursuant to M.G.L. c. 23, ss. 11E-11L.

All apprentices must be registered with the Division of Apprenticeship Training in accordance with M.G.L. c. 23, ss. 11E-11L.

All steps are six months (1000 hours) unless otherwise specified.

* Ratios are expressed in allowable number of apprentices to journeymen or fraction thereof.
** Multiple ratios are listed in the comment field.
*** APP to JM; 1:1, 2:2, 2:3, 3:4, 4:4, 4:5, 4:6, 5:7, 6:7, 6:8, 6:9, 7:10, 8:10, 8:11, 8:12, 9:13, 10:13, 10:14, etc.
**** APP to JM; 1:1, 1:2, 2:3, 2:4, 3:5, 4:6, 4:7, 5:8, 6:9, 6:10, 7:11, 8:12, 8:13, 9:14, 10:15, 10:16, etc.

SECTION 011100

SUMMARY OF WORK

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. This Section includes the following:

1. Work covered by the Contract Documents
2. Contract Method
3. Contract Conditions
4. Work under other contracts
5. Work Sequence
6. Owner-furnished products
7. Permits, inspection and testing required by Governing Authorities
8. Specification formats and conventions.
9. Reference standards.
10. Miscellaneous Provisions

B. Related Sections include the following:

1. Section 013100 – PROJECT MANAGEMENT AND COORDINATION, for field engineering and coordination requirements.
2. Section 013119 – PROJECT MEETINGS, for pre-construction conference and regular site meetings.
3. Section 013200– CONSTRUCTION PROGRESS DOCUMENTATION, for requirements for preparing and submitting progress schedule, including preliminary submittal of sequencing plan.
4. Section 011400 – WORK RESTRICTIONS, for contractor's use of premises and other contract requirements during construction.
5. Section 015000 – TEMPORARY FACILITIES AND CONTROLS, for additional information on temporary measures required during construction.
6. Section 017400 – CONSTRUCTION WASTE MANAGEMENT, for removal of non-hazardous debris.
7. Section 017329 – CUTTING AND PATCHING, for requirements for cutting and patching.

1.3 WORK UNDER THIS CONTRACT

A. Project Identification:
Addition of Truck Wash Facility to the existing Department of Public Works Garage

B. Project Location:

55 Sea St.
Quincy, MA 02169

C. Owner:
City of Quincy
1305 Hancock Street
Quincy, MA 02169
Contact Person: Kathryn Hobin

D. Architect:
Holmes & Edwards, Inc.
26 Chestnut Street
Quincy, MA 02169
Contact Person: James Edwards

E. Description of the Work

1. Structural Work
2. New Addition
3. EPDM Roofing
4. Interior Construction
5. Site Work
6. New Mechanical Systems
7. New Electrical Systems
8. Plumbing

1.4 CONTRACT METHOD

A. Project will be constructed under a single prime contract. This Contract shall be a General Contract for Construction, bid as required by Public Bid Laws.

1.5 CONTRACT CONDITIONS

A. This Contract is subject to applicable State and local laws and all amendments thereto. Where any requirements contained herein do not conform to statutes governing the Work of this Contract, the statutes shall govern.

B. This Project will be constructed for a political subdivision of the Commonwealth of Massachusetts, and is therefore exempt from State Sales and Use Tax. All bids shall be prepared and purchase of materials for the Project made on the basis of such exemption. After execution of the Contract, the Owner will furnish the Contractor with the exemption number to be used.

C. The provisions of the Federal Occupational Safety and Health Act (OSHA) apply to the execution of the Work of this Contract, in addition to all other laws, ordinances, rules, regulations, and orders of any Federal, State, or local public authority bearing on the performance of the Work.

D. Each and every provision of law and clause required by law to be inserted in this Contract shall be deemed to be inserted herein and the Contract shall be read and enforced as though it were included herein, and if, through mistake or otherwise, any such provision is not inserted, or is not correctly inserted, then upon application of either part the Contract shall forthwith by physi-

cally amended to make such insertion or correction.

1.6 WORK UNDER OTHER CONTRACTS

A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract. Coordinate the Work of this Contract with work performed under separate contracts.

1.7 WORK SEQUENCE

A. General: The Contractor's attention is directed toward the critical activities and limitations listed in this Article to highlight unusual conditions present in this Project.

1. The Contractor shall be responsible for scheduling the Work accordingly, and in conformance with requirements of all other specifications for the Project.
2. Sequencing requirements shall be clearly identified on all construction schedules required under Section 013200 – CONSTRUCTION PROGRESS DOCUMENTATION.

B. Documentation of Existing Conditions: Due to the historic nature of the building, the Contractor is required to prepare extensive documentation of the existing construction. The following work must be complete prior to commencement of demolition and construction on the site:
1. Photography: Documentation of existing exterior facades and interior surfaces. Refer to Section 013200 – CONSTRUCTION PROGRESS DOCUMENTATION.
2. Field Engineering: Establishment of precise horizontal and vertical reference points of items identified below in this Section.
3. This report must be submitted prior to commencement of the Work.

C. Weather Protection: The Contractor's attention is directed to the fact that extensive weatherproofing will be required to protect interior and exterior construction during the period the building is without a roof. Particular care is required, due to the Owner's intent to preserve the historic fabric of the building. For additional requirements, refer to Section 015000 – TEMPORARY FACILITIES AND CONTROLS.

1.8 PERMITS, INSPECTION AND TESTING REQUIRED BY GOVERNING AUTHORITIES

A. If the Contract Documents, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction require any portion of the Work to be inspected, tested, or approved, the General Contractor shall give the Designer and such Authority timely notice of its readiness so the Designer may observe such inspection and testing.

B. Prior to the start of construction, the General Contractor shall complete application for a Building Permit to the Inspectional Services Department. Such Permit shall be displayed in a conspicuous location at the project site.

C. Payment requirements for this permit fee are waived by the Owner. Waiver of permit fee in this instance shall not be understood to apply to other permit and fee requirements for the Project.

1.9 REFERENCE STANDARDS

A. For products specified by association or trade standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. The date of the standard is that in effect as of the bid date, except when a specific date is specified.

C. Obtain copies of standards when required by Contract Documents. Maintain copy at job sit during progress of the specific work.

1.10 SPECIFICATION FORMATS AND CONVENTIONS

A. Specification Format: The Specifications are organized into Divisions and Sections using the 50-division format and CSI/CSC's "MasterFormat 2004 Edition" numbering system.

1. Section Identification: The Specifications use Section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete because all available Section numbers are not used. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of Sections in the Contract Documents.
2. Division 1: Sections in Division 1 govern the execution of the Work of all Sections in the Specifications.

B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
2. All instructions in the Specifications are addressed to the Contractor unless the responsibility of the Designer or Owner is clearly indicated.
   a. Where products are listed or described in outline form, the phrase “The Contractor shall furnish these products” is implied.
   b. Where installation instructions or performance criteria are listed or described in outline form, the phrase “The Contractor shall perform the Work in accordance with these requirements” is implied.
   c. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

C. Definitions:

1. Indicated: The word "indicated" refers to graphic representations, notes or schedules on Drawings, Paragraphs or schedules in Specifications, and similar requirements in Contract Documents. Terms such as "shown", "noted", "scheduled", and "specified" are used to help locate a reference. No limitation on location is intended except as specifically noted.
2. Directed: Terms such as "directed", "requested", "authorized", "selected", "approved", "required", and "permitted", are hereby defined as "directed by Designer", "requested by Designer", "authorized by Designer", etc. No implied meaning shall be interpreted to extend the Designer's responsibility into the Contractor's area of construction supervision.
3. Approve: The term "approved" when used in conjunction with the Designer's action on the Contractor's submittals, applications, and similar requests, is limited to the duties and responsibilities of the Designer as stated in GENERAL CONDITIONS. Such approval shall not release the Contractor from responsibility to fulfill Contract requirements unless

otherwise provided in the Contract Documents.

4. Furnish: Supply and deliver to the Project Site, ready for unloading, unpacking, assembly, installation, and similar operations.
5. Install: Operations at Project Site, including unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
6. Provide: To furnish and install, complete and ready for intended use.
7. Installer: The Contractor or entity engaged by the Contractor, either as an employee, subcontractor, or sub-subcontractor for performance of a particular construction activity, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform.
8. Owner: The Awarding Authority.
9. Authority having Jurisdiction: Any State, Local, or legal authority, as defined by statute.

D. “Or Equal”, “Or Equivalent”: clause:
1. Where products or materials are prescribed by manufacture name, trade name or cata-logue reference, the word “or approved equal” shall be understood to follow.
2. An item shall be considered equal or equivalent to the named item, if all of the following conditions are met:
   a. It is at least equal in appearance, quality, durability, strength and design.
   b. It meets or exceeds all performance requirements specified.
   c. It performs the function of the item to an equal or superior standard as does the named item.
3. All deviations from products specified shall be submitted as substitutions. For related procedures, refer to Section 013300 – Submittal Procedures.

1.11 MISCELLANEOUS PROVISIONS

A. Discovery: If during the excavation or other work, articles of unusual value, or of historical or archaeological significance are encountered the ownership of such articles is retained by the Owner, and information regarding their discovery shall be immediately furnished to the Designer.

1. If the nature of the article is such that the work cannot proceed without danger of damaging same, work in that area shall be immediately discontinued until the Designer has decided the proper procedure to be followed.
2. Any time lost thereby shall be a condition for which the time of the Contract may be extended.
3. All costs incurred after discovery in the salvaging of such articles shall be borne by the Owner.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 011400

WORK RESTRICTIONS

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. The Work of this Section includes, but is not limited to, requirements for the following procedures:

1. Contractor responsibility for Architect's additional services.
2. Construction Documents, Project Electronic Files and graphic reproduction of Contract Documents.
3. Interpretation and modification of Contract Documents.
4. Contractor's reports.
5. Storm water pollution protection plan
6. Cleaning materials
7. Safety and disposal requirements.
8. Conduct of the Work.
9. Hours of work.
10. Contractor use of premises.
11. Existing Utilities.
12. Noise control.
13. Safety and disposal requirements and accident prevention.
14. Welding and cutting.
15. Municipal police services
16. Storage of materials off-site
17. Dust control.
18. Cleaning during construction.
19. Debris control and removal of rubbish.
20. Pollution control.
21. Owner's occupancy requirements

B. Related work includes, but is not limited to, the following work under other Sections:

1. Section 013200 – CONSTRUCTION PROGRESS DOCUMENTATION: Preparation and execution of construction schedule.
2. Section 013100 – PROJECT MANAGEMENT COORDINATION: Procedures and responsibilities for coordinating the Work.
3. Section 013300 – SUBMITTAL PROCEDURES. Submittal procedures.
4. Section 015000 – TEMPORARY FACILITIES AND CONTROLS, for additional information on temporary measures required during construction.
5. Section 017400 – CONSTRUCTION WASTE MANAGEMENT, for removal of non-hazardous debris including provisions for recycling and disposal.

6. Section 017700 – CLOSEOUT PROCEDURES: Procedures for completing the Work.
7. Section 017839– PROJECT RECORD DOCUMENTS: Preparation of record drawings and other documents.

1.3 SUBMITTALS

A. General: Refer to Section 013300 – SUBMITTAL PROCEDURES, for submittal provisions and procedures.

B. Layout of Temporary Construction Facilities: Submit location plan showing office, trailer and storage layout.

C. Logistics Plan:

1. Contractor shall submit to the Owner's Project Manager, at the Pre-construction Meeting, a detailed Logistics Plan, which shall include:
   a. Delivery Hours and Delivery Routes
   b. Gate location, and wheel washing location.
   c. Hours of Work
   d. Trailer Area, and Layout of trailers
   e. Parking locations for use of Owner and Contractor within the area of work
   f. Temp fencing, erosion control, and metering locations
   g. Location for stockpiling of soil
   h. Location for stockpiling plowed snow
   i. Locations for waste management containers.
   j. Protection of existing curbs and walkways.
   k. Lighting Plan
2. Refer to Section 015000 – TEMPORARY FACILITIES AND CONTROLS, for specifications for temporary construction and other items to be shown on Logistics Plan.
3. No work shall commence until the Logistics Plan has been approved.

D. Reports:

1. Documentation of off-site storage facilities.
2. With each Application for Payment, submit the following reports, compiled on a monthly basis:
   a. Contractor's Reports
   b. Proof of submission of Certified weekly payrolls to Owner.

1.4 CONTRACTOR RESPONSIBILITY TO THE OWNER FOR ARCHITECT'S ADDITIONAL SERVICES

A. The Contract between the Owner and the Architect contains provisions for additional services that may be required of the Architect during construction due to unforeseen conditions.

1. Where such additional services become necessary due to the activities of the Contractor, as determined by the Owner's Project Manager, costs for such services will be the responsibility of the Contractor, and will be deducted from the Contract Amount.

B. Additional services for which the Contractor is responsible for cost to the Owner may include the following activities of the Architect:

1. Review of Requests for Information and Change Order Requests for work determined to

be covered in the Contract Documents. Refer to related Articles in this Section.

2. Continuation of construction administration beyond the dates specified for Final Completion of the Work: Refer to Section 013200 – CONSTRUCTION PROGRESS DOCUMENTATION.
3. Review of re-submitted submittals and Substitution Requests that have been rejected: Refer to Section 013300 – SUBMITTAL PROCEDURES.
4. Re-inspection of incomplete work: Refer to Section 017700 – CLOSEOUT PROCEDURES.
5. Design services for the resolution of non-conforming work.

1.5 CONSTRUCTION DOCUMENTS

A. The General Contractor and each Subcontractor shall retain copies of the Contract Documents issued to them for bidding purposes.

1. The Owner will furnish to the General Contractor, without additional charge, an additional ten (10) complete sets of the Contract Documents, including Drawings and Specifications, for use during the construction period.
2. The Owner will furnish to each Sub-Contractor, without additional charge, two (2) additional copies of those Drawings and Specifications directly related to the work of their respective trades for use during the construction period.
3. Extra sets returned by bidders and not required for other purposes, as determined by the Owner's Project Manager, will be made available to Contractor and Subcontractors for the Work.

B. All other hard copies of the Contract Documents required by the Contractor or Subcontractors for use during the construction period shall be purchased by the party requiring same. Owner's Project Manger will furnish approximate costs of such additional copies and will transmit originals to local printing companies with whom he regularly does business, but will not receive bills for such printing through his account. All negotiations for such printing shall be between Contractor and Printer.

1. Refer to provisions in this Section, for electronic copies of documents to be made available for the Contractor’s use during construction.
2. Refer to Section 017839 – PROJECT RECORD DOCUMENTS, for additional sets to be provided by the Owner to the Contractor for the purpose of maintaining record prints of the Work as construction proceeds.

1.6 PROJECT ELECTRONIC FILES

A. Definitions:

1. Contract Documents: Printed hard copies of drawings and other documents, as defined in the General Conditions and listed in the signed copy of the Form of Agreement between Owner and Contractor.
   a. In case of conflict between the Contract Documents and documents obtained through electronic means, the Contract Documents shall govern.
2. Project Electronic Files: Electronic copies of electronic documents for the Project, comprising drawings listed on Document 011401 – Electronic Release Form.

B. General Procedures: At the Pre-Construction Meeting, the Architect will present to the Contractor one compact disc (CD) with Project Electronic Files, for use in the preparation of coordination and record documents for the Project.

1. Release Forms Required:
   a. The Contractor shall sign a copy of Document 011401 – Electronic Release Form, to be filled out and issued by the Architect.
   b. By signing the release form, the Contractor is acting on behalf of all their subcontractors for the Work of this Project.
2. Additional copies of the compact disc with Project Electronic Files will be available from the Architect at an additional cost.

C. Electronic File Format:

1. Editable Files: Electronic files for drawings listed on Document 011401 – Electronic Release Form will be furnished in "*.DWG" format.
2. Printable, Non-Editable Files: Electronic files for all Drawings in the Bid Set and for Drawings issued as Addenda will be furnished in "*.PDF" format (Adobe Acrobat Reader, version 6.0).
3. The Architect does not warrant that these electronic documents are compatible with any software or hardware other than those on which they were produced.

D. Permitted Use of Project Electronic Files: Use of electronic files by the Contractor and Sub-Contractors is limited to the following activities:

1. Project Electronic Files may be used as a guide only for the preparation of Coordination Drawings and Record Drawings to be submitted as a requirement for the Project.
2. Project Electronic Files may be used as a guide only for preparation of shop drawings. Exact copies of Contract Documents will not be accepted if submitted for these purposes, unless specifically permitted by an individual specification Section.

E. Responsibilities of Contractor: Use and reproduction of Project Electronic Documents are subject to the following conditions:

1. The use of Project Electronic Files, reproduced either electronically or by other graphic reproduction methods, does not in any way alter the responsibilities of the Contractor for final system coordination. The Contractor shall incur all liability in this respect.
2. The Contractor and all Subcontractors are responsible for checking the dimensions and completeness of the Project Electronic Files, and for determining any possible errors and omissions, as required by the General Conditions.
3. The Contractor is responsible for updating Project Electronic Files as necessary to incorporate changes to the Work shown in Addenda and documents issued during construction.
4. In no event shall the Architect or any other Person or Firm involved in the creation, production or distribution of the reproducible or electronic documents, be liable to the persons utilizing the documents, on account of any claim for damages. Each Person or Firm utilizing these documents agrees to release, indemnify, hold harmless and defend the Architect, its officers, employees and consultants from an against all liability arising out of such firm's use of the electronic or reproduced documents or information referred to herein.

F. Ownership of Documents: By transferring copies of Project Electronic Files, the Architect does not in any way convey the copyright in the designs contained therein, nor do they convey a license to copy or use them for any purpose except as required for the construction of the Project.

G. License for Software: By transferring copies of Project Electronic Files, the Architect does not in

any way convey transfer license to use the software on which the documents were prepared. Each entity using Project Electronic Files is responsible for obtaining licenses as needed for its use of those files.

1.7 GRAPHIC REPRODUCTION OF CONTRACT DOCUMENTS

A. Reproduction of Contract Documents issued for the Project, by graphic reproduction methods, shall be subject to the conditions outlined for reproduction of Project Electronic Files.

1.8 INTERPRETATION AND MODIFICATION OF CONSTRUCTION DOCUMENTS

A. Refer to General and Supplementary Conditions for general information on Change Orders, Work Change Directives, Field Orders and Architect's written amendments and clarifications. The intent of this Article is to provide for additional procedures to be followed during construction.

B. Requests for Information: Each time the Contractor or Subcontractor has a reasonable question on the interpretation of the Contract Documents, they shall submit in writing a Request for Information (RFI) to the Architect for response.

1. The Contractor shall examine field conditions carefully and review the Drawings and Specifications thoroughly prior to issuing an RFI.
2. The Contractor shall keep a log of RFI's, numbering them in the order in which they are issued.
3. Each RFI shall contain a clear statement of the question, references to relevant Contract Documents and additional background information as needed to facilitate the Architect's review.
4. All requests for information from Subcontractors shall be made through the Contractor and addressed to the Architect, and the Architect will distribute them as needed to the appropriate Consultants. A copy of each RFI shall be given to the Clerk of the Works.
5. RFI's shall be issued in a timely manner to permit a thorough review and preparation of a response by the Architect and their Consultants.
6. The Architect will prepare a written response to each RFI within 10 workdays, or sooner if the Contractor provides a realistic date when the response will be needed.

C. Proposal Requests: During construction, it may become necessary or desirable to modify the Contract Drawings or Specifications in response to concealed existing conditions, changes in the Owner's program or other unforeseen circumstances.

1. Where such a modification may involve a change in the Contract price or time, the Architect will prepare a Proposal Request describing the modification under consideration, including sketches or drawings, specifications and other information to permit pricing by the Contractor.
2. Copies of each Proposal Request and its attachments will be distributed to the Owner, Clerk of the Works and Contractor.
3. The Contractor shall respond in a timely manner with a Proposed Change Order detailing the estimated costs and change in Contract duration, for review by the Architect and approval by the Owner.
4. A Proposal Request will not constitute direction to proceed with the modification unless accompanied by a Work Change Directive and an estimated price.

D. Change Order Requests: If the Contractor is required to perform Work that they consider to represent a change in the cost of the Project, they may submit Change Order Requests for such

work.

1. Each Change Order Request shall be accompanied by a document describing the modification under consideration, including sketches or drawings, specifications and other information to permit review of pricing by the Architect and Owner.
2. Distribute copies of each Change Order Request and its attachments to the Owner, Clerk of the Works and Architect.
3. The Architect and Owner will respond in a timely manner with a Proposed Change Order incorporating the Change Order Request if it is approved.
4. Verbal approval of a Change Order Request will not constitute direction to proceed with the modification unless accompanied by a Change Order, or a Construction Change Directive with an estimated price.

E. Architect Review of Contractor-Generated Requests for Information and Change Order Requests: The Architect will review and prepare written responses to the Contractor's Requests for Information and Change Order Requests that are submitted in accordance with the requirements of this section.

1. If the Contractor submits an excessive number of requests for information that are incomplete, or for which the information requested is available from a careful study and comparison of the Contract Documents, field conditions, other Owner-provided information, Contractor-prepared or other prior Project correspondence or documentation, then the Contractor shall be responsible to the Owner for costs for Additional Services of the Architect to review those requests for information.
2. If the Architect determines that the Work covered by a Change Order Request is covered by the scope of the Contract Documents, the Contractor shall be responsible to the Owner for costs for Additional Services of the Architect to evaluate proposals and prepare Instruments of Service associated with such Change Order Request.
3. Refer to other paragraphs in this Section for procedures required in cases where Contractor is responsible to the Owner for costs for Additional Services of the Architect.

1.9 CONTRACTOR'S REPORTS

A. A daily report summarizing the work performed, weather conditions, number of workers, amount and kinds of equipment, unusual occurrences, and the like shall be submitted by the Contractor's Field Superintendent to the Architect, the Owner, the Clerk of the Works, each working day covering the work performed on the previous working day.

B. Form of the daily report shall be as approved by the Architect.

C. Attention is directed to recent amendments to MGL Chapter 149, Section 27B requiring submission of certified weekly payrolls directly to the Awarding Authority by every contractor and subcontractor doing public work.

PART 2 - PRODUCTS

2.1 CLEANING MATERIALS

A. Use only those materials which will not create hazards to health or property and which will not damage surfaces. Refer to Section 018119 – Indoor Air Quality Requirements for additional requirements.

B. Use only those cleaning materials and methods recommended by manufacturer or surface material to be cleaned.

C. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

PART 3 - EXECUTION

3.1 CONDUCT OF WORK

A. The Contract Site shall be as shown on the Drawings, and shall include the entire area bound by the "Contract Limit" or "Limit of Work" lines as well as all areas outside of the Limit of Work Lines when required for performance of work under this Contract.

B. Contractor shall take all steps necessary to protect existing conditions to remain. Damage to existing work caused by Contractor's operations under this Contract shall be repaired at Contractor's expense.

C. Any street, paving, curb and/or sidewalk damaged as the result of work under this Contract, whether within or outside the limits of the Work, shall be repaired and/or replaced with new matching construction by the Contractor at his expense and in a manner satisfactory to the Architect and authorities having jurisdiction.

D. Protection of Curbs and Walkways: Where existing curbs or walks are to remain, or after new curbs or walks are constructed and trucking is required over them, they shall be suitably protected as shown on approved Logistics Plan.

E. Trenching and other work outside construction limits shall be expedited to the fullest and carried out with minimum of inconvenience to normal operations of Owner 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 with new construction. Temporary roadways shall be bridged over trenched areas.

F. Provide continuous, lawful, safe, adequate and convenient access to the site. Contractor shall construct and maintain in good, safe, usable condition temporary roads, capable of supporting emergency vehicles, and appurtenances as required, and when no longer required, remove temporary construction and restore such areas to their original condition, or as otherwise specified in the Contract Documents.

G. Conduct of Construction Personnel: Smoking is not permitted on project property, including the construction site.

3.2 HOURS OF WORK

A. Hours of work shall be from 7:00 AM until 6:00 PM, excluding Sundays, and Holidays, unless otherwise approved by the Owner.

B. The Contractor shall comply with applicable local ordinances.

3.3 CONTRACTOR USE OF PREMISES

A. General: Contractor shall have full use of premises for construction operations, including use of Project site, during construction period.

1. Confine operations at the site to areas permitted by laws, by-laws, permits and contract limit lines.
2. Do not unreasonably encumber the site with materials or equipment.
3. Coordinate with Owner and Architect work in connection with adjacent occupied buildings or areas, driveways, walks, and other facilities which would prevent access thereto or interrupt, restrict, or otherwise infringe upon use thereof.

B. General: Contractor will have limited use of premises for construction operations as indicated on Drawings by the Contract limits.

C. Use of Site: Limit use of premises to areas within the Contract limits indicated on Drawings. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Schedule any work that will obstruct adjacent streets in accordance with the requirements of the Owner.
2. Maintain access to existing walkways, streets and other adjacent occupied or used facilities. Do not close or obstruct walkways, streets or other occupied or used facilities without written permission from Owner and other authorities having jurisdiction.
3. Owner Occupancy: Allow for Owner occupancy of portions of Project site, including adjacent occupied buildings, and use by the public.
4. Driveways and Entrances: Keep driveways loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
   a. Schedule deliveries to minimize use of driveways and entrances.
   b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
5. Site Access: Owner will designate access roads to site and will define limits within which Contractor shall control movements of his personnel. Access to the site shall generally be via existing roadways and paved surfaces which Contractor shall maintain and restore to original condition.

D. Use of Existing Building: Maintain existing building in a weather tight condition throughout construction period. Repair damage caused by construction operations. Protect building and its occupants during construction period.

E. Contractor Parking: Parking of Contractor's vehicles and those of his Subcontractors will be allowed only within Limit of Work area located where shown on Drawings. Contractor shall be responsible for parking arrangements, regulation and control of such parking and resulting traffic. Each Subcontractor shall make arrangements with Contractor for required parking of his vehicles.

F. On-Site Delivery and Storage of Construction Materials: Do not permit materials and fabricated work to be stacked on, or be transported over, floor and roof construction in such a manner as to stress any construction beyond the designed live loads. Assume full responsibility for protection and safekeeping of products stored on premises. Obtain and pay for use of additional storage or work areas needed for operations. Limit use of site to work and storage of materials for this project.

1. Maintain clean, dry storage areas for construction materials and minimize their exposure to dust. Refer to Section 018119 – Indoor Air Quality Requirements and individual Division 3 through 50 Sections for additional requirements.

2. Do not store foamed polystyrene, polyurethane or like materials within the building. Take proper precautionary measures regarding the Storage of such materials outside the building.

G. Contractor shall be responsible for adequate site drainage during the entire construction period and shall use any appropriate temporary means that does not adversely affect construction progress or abutting property. Refer to Section

H. Contractor shall take all necessary safety precautions and maintain an adequate level of fire protection at all times.

I. Do not use areas outside the Limit of Work area for temporary storage or structures without specific written permission from the Architect and Owner.

3.4 EXISTING UTILITIES

A. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Owner not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Owner's written permission.

B. Immediately repair any active existing utility lines (cables, conduit, ducts, and piping), damaged during the course of construction. Protect and maintain such active existing utilities in use, until relocation of same has been completed or utilities have been cut, capped, or prepared for new service connections, as applicable. Perform such repair and protection work at no additional cost to the Owner.

C. If any existing active utility not indicated on the Drawings is unintentionally damaged, and such utility is to remain, immediately repair the damage and restore the utility to its original integrity. Reimbursement of cost for performing such repair will be made by an adjustment in the Contract Price in accordance with the General Conditions of the Contract.

D. Any adjustment as outlined above shall be based on the assumption that the Contractor has performed in a prudent manner at the time such damage occurred. If extra expense is incurred in protecting and maintaining any utility line not shown on the Drawings, nor revealed by a “Dig-Safe” inspection, an adjustment in the Contract Price shall be made.

E. The Owner will cooperate and assist the Contractor in locating and identifying underground utilities. Contractor shall cooperate and participate in "Dig Safe" programs, notifying proper authorities before proceeding.

F. If it becomes necessary to interrupt power, water line, sewer, gas or other utilities to adjacent buildings, notify the Architect and Owner's Project Manager at least four (4) days in advance. Schedule such interruptions at such times as will minimize disruption and inconvenience to users.

3.5 NOISE CONTROL

A. Develop and maintain a noise-abatement program and enforce strict discipline over all personnel to keep noise to a minimum. Submit noise abatement program to Owner's Project Manager and Architect for review prior to use of noise generating equipment.

B. Execute construction work by methods and by use of equipment that will reduce noise and which will provide minimum interference with neighborhood activities.

1. Employ construction methods and equipment that will produce the minimum amount of noise.
2. Equip air compressors with silencers, and power equipment with mufflers.
3. Handle vehicular traffic and scheduling to reduce noise.

C. Do not allow radio and electronic entertainment equipment to be operated at volume that makes ordinary conversation difficult at ten (10) feet from such equipment.

3.6 SAFETY AND DISPOSAL REQUIREMENTS

A. Standards: Maintain project in accordance with State Building Code and local ordinances.

B. Hazards Control: Store volatile wastes in covered metal containers and remove from premises. Prevent accumulation of wastes which create hazardous conditions. Provide adequate ventilation during use of volatile and noxious substances.

C. Disposal: Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws. Do not burn or bury rubbish and waste materials on project site. Do not dispose of hazardous wastes such as solvents, mineral spirits, oil, paint, paint thinner in storm or sanitary drains. Do not dispose of wastes into streams or waterways.

3.7 ACCIDENT PREVENTION

A. Comply with all Federal, State and municipal recommendations and requirements for safety and accident prevention, those of the Associated General Contractors of America and the American National Standards Institute (ANSI Standard A10.2). Conduct regular, frequent inspections of the site for compliance with safety regulations.

B. Neither the Owner nor the Architect will be responsible for providing a safe working place for the Contractor, Subcontractors, or their employees, or any individual responsible to them for the Work.

3.8 WELDING AND CUTTING

A. Where electric or gas welding or cutting work is done above or within ten (10) feet of combustible material or above space that may be occupied by persons, use interposed shields of incombustible material to protect against fire damage or injury due to sparks and/or hot metal.

B. 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 where practicable. Such tanks, when stored for use, shall be remote from any combustible material and free from exposure to the direct rays of the sun or high temperatures. Storage shall be secured under lock and key, to prevent unauthorized use of gas and equipment.

C. 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. Properly protect any new materials, stored or installed, that are subject to water damage.

D. Station a worker 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 to wall openings or lodge in any combustible material. Keep the worker at the source of work which offers special hazards for a minimum of thirty (30) minutes after the job is completed to make sure that smoldering fires have not been started.

E. Place a qualified electrician in charge of installing and repairing electric and arc welding equipment.

3.9 MUNICIPAL POLICE SERVICES

A. Make all necessary arrangements with the municipal police department in advance of times when regular, off-duty, or reserve police officers will be needed for traffic control or protection due to operations performed under this Contract.

B. Pay police officers in accordance with rates established by the municipality for such services:

C. Extend the Worker's Compensation Insurance and Employer's Liability Insurance required under the General Contract to cover police used on the Project.

3.10 STORAGE OF MATERIALS OFF SITE

A. The Contractor, Subcontractors and Sub-subcontractors shall obtain prior written approval from the Owner through the Architect for permission to store materials to be incorporated in the Work, for which Progress Payments will be requested, at off-site locations. Any and all charges for storage, including insurance, shall be borne solely by the Contractor. Before approval, Owner will require proper proof of insurance and a letter in which is furnished:

1. The names of the Contractor and/or Subcontractor or subordinate Subcontractor leasing the storage area.
2. The location of such leased space.
3. Description of the leased area: The entire premises or certain areas of a warehouse giving the number of floors or portions thereof.
4. The date on which the material is first stored.
5. The value of the material stored.
6. Transfer of title for such materials in a form acceptable to the Owner.

B. Requirements for storage facility at which materials will be stored off-site:

1. The storage facility shall be a bonded warehouse.
2. The Contractor shall permit access to the storage facility to the Clerk of the Works upon request.

C. Contractor, Subcontractors and subordinate Subcontractors shall provide prior to the request for payment for such stored materials, adequate advanced notice, to the Architect so that the Owner or Architect can inspect, at their convenience, the materials being stored at any location.

D. Each sealed carton shall be marked with the Project name, the Owner’s name and the Architect's name as they appear in the Agreement.

E. A perpetual inventory shall be maintained for all materials held in storage for which payment has been requested.

F. Payment for materials stored off site shall be at the sole discretion of the Owner. Any additional

costs to the Owner resulting from storage of material off site for which payment is requested, such as, but not limited to, travel expenses and time for inspectors shall be back charged to, and paid by, the Contractor.

3.11 DUST CONTROL

A. Maintain the construction site, stockpiles, access, detour, and haul roads, staging and parking area used for the Work, free of dust which would cause a hazard or a nuisance to those at the site or adjacent sites.

B. Provide environmentally safe and positive methods and dust control materials to minimize raising dust from construction operations, and provide positive means to prevent air-borne dust from dispersing into the atmosphere.

C. Wet down dry materials and rubbish to lay dust and prevent blowing dust.

D. Clean interior spaces prior to the start of finish painting and continue cleaning on an as-needed basis until painting is finished.

E. Schedule operations so that dust and other contaminants resulting from cleaning process will not fall on wet or newly-coated surfaces, including paint, coatings, sealants, caulking, adhesives.

F. Furnish, erect, and maintain for the duration of the work period, temporary fire-retardant dust proof coverings and partitions as required to prevent the spread of dust beyond the immediate area where work is being performed.

G. These provisions do not supersede any specific requirements for methods of construction or applicable regulations or general conditions set forth elsewhere in the Contract with regard to performance obligations of the Contractor.

3.12 CLEANING DURING CONSTRUCTION

A. Execute cleaning during progress of work and at Substantial Completion, as required by General Conditions and as herein specified.

B. Maintain premises and public properties 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 exposed surfaces; leave project clean and ready for occupancy.

C. Cleaning shall be in addition to cleaning specified under other sections and shall include all surfaces, interior and exterior in which or to which the Contractor has had access.

D. Refer to Sections of the Specifications for cleaning of specific products.

E. Execute cleaning to ensure that the building, the site, and adjacent properties are maintained free from accumulations of waste materials and rubbish and windblown debris, resulting from construction operations.

F. Provide on-site containers for collection of waste materials, debris and rubbish.

G. Remove waste materials, debris and rubbish from the site periodically and dispose of at legal

areas off site.

H. Handle materials in a controlled manner with as few handling as possible. Do not drop or throw materials from heights.

I. Schedule cleaning operations so that dust and other contaminants resulting from cleaning processes will not fall on wet newly painted surfaces, uncured caulking, sealants, adhesives, etc.

3.13 DEBRIS CONTROL AND REMOVAL OF RUBBISH

A. Ensure that each Subcontractor engaged in the Work bears full responsibility for cleaning up during on a daily bases and immediately upon completion of his work, and removes all rubbish, waste, tools, equipment, and appurtenances caused by and used in the execution of his work; but this shall in no way be construed to relieve the General Contractor of primary responsibility for maintaining a clean building and site free of debris, leaving all work broom clean and in a condition satisfactory to the Architect, Project Manager, and Owner.

B. Provide at least one tightly built chute serving each level which shall lead down to angle offset and sliding panel chute at a convenient loading point for trucks or dumpsters.

C. Do not permit any material to be thrown from open floors, windows or roof of the building.

D. Immediately after unpacking, remove all packing materials, case lumber, excelsior, wrapping and other rubbish, flammable and otherwise, from the building and premises.

E. Initiate and maintain a specific program to prevent the accumulation of debris at the construction site, storage and parking areas, or along access roads and haul routes:
Provide containers for deposit of debris and schedule periodic collection and disposal of debris. Prohibit overloading of trucks to prevent spillage on access and haul routes.

F. Contractor shall make provisions for snow and ice removal, as required. In addition Contractor shall provide wheel-washing stations at site egress gates, as directed by the Project Manager, to maintain clean neighborhood streets.

3.14 POLLUTION CONTROL, GENERAL

A. Provide methods, means and facilities required to prevent contamination of soil, water and atmosphere by the discharge of noxious substances from construction operations.

B. Remediation of Spills: Provide equipment and personnel, perform emergency measures required to contain any spillages, and to remove contaminated soils or liquids. Excavate and dispose of contaminated earth off site and replace with suitable uncontaminated compacted fill and topsoil, in accordance with the requirements of Section 312000 – EARTH MOVING.

C. Take special measures to prevent harmful substances from entering public waters. Prevent disposal of wastes, effluents, chemicals, or other such substances adjacent to streams or in sanitary or storm sewers.

D. Provide systems for control of atmospheric pollutants. Prevent toxic concentrations of chemicals. Prevent harmful dispersal of pollutants into the atmosphere.

E. Refer to construction phasing plans for information and to the Order of Conditions for sequence of operations for erosion control.

3.15 STORM WATER POLLUTION PREVENTION PLAN IMPLEMENTATION

A. Execute Storm Water Pollution Prevention Plan described in SWPPP as submitted to the EPA, in accordance with Federal and local regulations.

3.16 OWNER'S OCCUPANCY REQUIREMENTS

A. Full Owner Occupancy: Owner will occupy adjacent buildings during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing street and site access at all times, unless otherwise indicated.

1. Maintain access to existing walkways, streets and other adjacent occupied or used facilities. Do not close or obstruct walkways, streets or other occupied or used facilities without written permission from Owner, and authorities having jurisdiction.
2. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.

B. Owner Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed areas of building, before Substantial Completion, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and partial occupancy shall not constitute acceptance of the total Work.

1. Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied before Owner occupancy.
2. Obtain a Certificate of Occupancy from authorities having jurisdiction before Owner occupancy.
3. Before partial Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of building.
4. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of building.

C. If the Project is substantially complete by the specified date for Substantial Completion, the Owner at his election may from time to time, or permanently, occupy the building or any portion thereof as the work is completed to such a degree as will, in the opinion of the Owner, permit the use of the building or other portions of the Project for the purpose for which they are intended.

D. The Owner will, prior to any such partial occupancy, give notice to the Contractor thereof and such occupancy shall be predicated upon the following conditions:

1. In the case of partial occupancy prior to the stipulated completion date, the Owner shall secure endorsement from the Contractor’s insurance carrier and consent of the surety permitting occupancy of the building or use of the Project during the remaining period of construction.
2. In the case of partial occupancy after the stipulated completion date, the Contractor shall extend all the necessary insurance coverage as stipulated until the date of Final Acceptance of the Project. Owner's use and occupancy prior to final Acceptance shall not relieve the Contractor of his responsibility to maintain the insurance coverage as required by the Contract Documents.
3. In case of such partial occupancy, the guarantee period called for by the Contract Docu-

ments shall commence on the date of Substantial Completion of the Phase containing the guaranteed Work.

4. Occupancy of the building or any portion thereof by the Owner, shall not constitute an acceptance of the Work or of work not performed in accordance with the Contract Documents or relieve the Contractor of responsibility to perform any work required by the Contract but not completed at the time of occupancy.
5. If the Owner occupies the building as a result of the Contractor's failure to substantially complete the work by the specified date, the Contractor shall pay maintenance costs on the portion of the building occupied under this Agreement until Substantial Completion.
6. The Contractor shall be required to furnish heat, electricity and water used in the occupied portion of the building, from the time of the occupancy by the Owner until Substantial Completion.

END OF SECTION

FORM 011401

ELECTRONIC RELEASE FORM

To: [Contractor]
[Street]
[Town, State]

Date: [Date documents are transmitted]

Project: Addition of Truck Wash Facility to the existing Department of Public Works Garage

RE: Project Electronic Files

Project Electronic Files are made available to the undersigned with the following conditions:

The undersigned agrees to accept from Holmes & Edwards, Inc. the electronic files for the referenced project, as listed in the attached table, without any warranties, guarantees and/or representations of any nature whatsoever regarding the correctness, accuracy and/or completeness of any information contained therein.

The undersigned further agrees that such information shall be used as reference material only and then only for the referenced project and not for any other projects or future additions to the referenced project, without express written consent from Holmes & Edwards, Inc. for each instance.

The undersigned further agrees to release, indemnify, hold harmless and defend Holmes & Edwards, Inc. with respect to any claims, costs, losses, damages and/or liabilities arising out of, or relating to the use, misuse, modification, interpretation, misinterpretation and/or misrepresentation of any such information.

The undersigned further agrees to the requirements and limitations for the use of Project Electronic Files as stated in Section 011400 - Work Restrictions.

Sincerely,
Holmes & Edwards, Inc.

Accepted and Agreed to:

_____

(General Contractor)

By: _____

Title: _____

END OF FORM

SECTION 012200

UNIT PRICES

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. This Section includes administrative and procedural requirements for unit prices and estimated quantities.

B. Related Sections include the following:

1. Document 002113 – INSTRUCTIONS TO BIDDERS, for additional instructions regarding unit prices and estimated quantities and bids.
2. Document 004100 – FORM FOR GENERAL BID, for additional instructions regarding unit prices and estimated quantities and bids.
3. Appendix 012201 – UNIT PRICE PROPOSAL SHEET, for unit prices and estimated quantities.
4. DIVISION 02 through DIVISION 26 for procedures, materials, and execution requirements related to unit price work.

1.3 DEFINITIONS

A. Unit Price: A unit price is an amount proposed by Bidders on the Bid Form as a price per unit of measurement for materials or services added to the Contract Sum by appropriate modification, if estimated quantities of Work required by the Contract Documents are increased. If the estimated quantities of Work required are decreased, the value of the Unit Price will be reduced as described on the Unit Price Proposal Sheet.

1.4 PROCEDURES

A. Each unit price includes all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.

B. Measurement and Payment: Refer to individual Specification Sections and Appendix 012201 – UNIT PRICE PROPOSAL SHEET for work that requires establishment of unit prices and estimated quantities. Methods of measurement and payment for unit prices and estimated quantities are as follows:

1. For work covered by scheduled quantities, notify the Owner and Architect a minimum of 24 hours in advance of the performance of such work.
2. Document such work in writing, identifying type of work, quantity and location of work. Submit documentation on Contractor's letterhead.
3. All documentation of work covered by scheduled quantities will be subject to verification

and approval by the Owner and Architect.

4. In order to be considered for payment, documentation for work covered by scheduled quantities shall be submitted within one month of performance of such work. Requests for payment of such work submitted more than one month after the work has been performed will not be accepted.
5. Only Documentation signed and verified by the Contractor, Trade, and the Owner's Representative will be considered valid. Documentation not signed by all these parties will be considered invalid.

C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and estimated quantities and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.

D. Schedule of Unit Prices and Estimated Quantities:

1. Specification Sections referenced in the Unit Price Proposal Sheet contain requirements for materials described under each unit price.
2. A Schedule of unit prices and estimated quantities to be proposed by Bidders follows this section.

E. Refer to Document 002113– INSTRUCTIONS TO BIDDERS, Document 004100 – FORM FOR GENERAL BID, and Document 004113 – FORM FOR SUB-BID, for additional information regarding unit prices and estimated quantities.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF UNIT PRICES AND ESTIMATED QUANTITIES

A. See Appendix 012201 – UNIT PRICE PROPOSAL SHEET following this section.

END OF SECTION

SECTION 012201

UNIT PRICE PROPOSAL SHEET

DPW TRUCK WASH FACILITY
QUINCY, MA

1. The following unit prices as defined in the specifications are designated for items of work on the basis of unknown quantities or quantities estimated by the Designer. These unit prices will be used to add or to deduct from the dollar amounts shown, depending on whether the actual amount is greater or less than the estimated amount. UNIT PRICES GIVEN HEREIN SHALL BE FOR ADDITIONAL WORK ONLY. DECREASED WORK SHALL BE AT THE "ADD" PRICE LESS FIFTEEN PERCENT (15%).

UNIT PRICE NUMBER	SPECIFICATION SECTION AND DESCRIPTION	ESTIMATED QUANTITY	UNIT MEASURE	UNIT PRICE DOLLARS/CENTS	TOTAL AMOUNT FOR ESTIMATED QUANTITY - DOLLARS/CENTS

2. The unit prices requested herein shall include their pro-rata share of all costs for the indicated items of work, including such items as overhead, superintendence, general conditions, profit, bond, labor, materials, payments to and coordination of subcontractors, equipment costs, disposal fees, etc., and all other work incidental thereto.

3. Any unit price proposal that contains a unit price which is unduly high or low may be rejected as unbalanced, refer to Document 002113 – Instructions to Bidders.

4. The Base Bid shall include the estimated quantities listed above in addition to all work shown on the Drawings and as specified.

5. The total amount for estimated quantities above as applicable shall be included in the amount to be entered in the Form for General Bid, Paragraph B, and the Form for Sub-Bid, Paragraph A.

THIS FORM MUST BE SUBMITTED WITH THE GENERAL BID FORM AND SUB-BID FORMS

_____
NAME OF CONTRACTOR (PLEASE PRINT)

SECTION 012400

SCHEDULE OF VALUES

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. The Work of this Section includes requirements for the following procedures:

1. Preparation and submittal of the Preliminary and Final Schedule of Values

B. Related work includes, but is not limited to, the following work under other Sections:

1. Requirements for construction schedules: Section 013200 – Construction Progress Documentation.
2. General procedures for submittals: Section 013300 – Submittal Procedures.

1.3 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SUBMITTALS

A. Prepare and submit the following submittals in accordance with the requirements of Section 013300 – Submittal Procedures.

B. Schedule of Values:

1. Schedule of Values shall be typewritten on 8-1/2 by 11 inch white paper.
2. Submit to the Architect three (3) copies of each Schedule of Values within 7 days of receipt of Notice to Proceed.

C. List of Subcontractors and Sub-subcontractors: Attached to the Preliminary Schedule of Values shall be a list of the names, addresses (and whether individual, partnership or corporation) of each Subcontractor or Sub-Subcontractor who is to perform all or any part of each subdivision. In the event any Subcontractors, or Sub-subcontractors are not known at the time said schedule is prepared, an amended or supplementary list containing the names of the Subcontractors and Sub-Subcontractors involved and indicating their division of the Work shall be furnished to the Architect as soon as the information is available. A code number for identification on requisi-

tions shall be used to identify the Contractor, each of the Subcontractors and subordinate Subcontractors, and shall be shown in each requisition where any part of the Work performed by the Contractor, such Subcontractor, Sub-Subcontractors or material supplier is incorporated in the amount of the requisition for which payment is requested.

D. Monthly Updates: Submit to the Owner with the Schedule of Values on a monthly basis such schedules of quantities and costs, payrolls, reports, estimates, records, and other data as the Owner may request concerning work performed or to be performed under this Contract. The Schedule of Values shall be submitted at the same time as the updated CPM Schedule showing the current status of the work, as required under Section 013200 – Construction Progress Documentation.

1.5 SCHEDULE REQUIREMENTS

A. General: Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project CPM Schedule. Provide line items for principal subcontract amounts, where appropriate, and for portions of the work designated in this Section.

B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section. Identify each line item by Specification Number and Title, and by portion of the Work of that Section where the Work of a Section is allocated to more than one line item.

C. The Schedule of Values shall be arranged in vertical columns identified with titles, including Names Of Items; Original Amounts, Percent Completed To Date; Previous Payments; Current Requests; and Balance Not Yet Requested. A summary of the total amount due to date and the amount of the five percent retained shall be included in the statement which shall be signed by the Contractor. A separate sheet shall be included with each requisition showing status of work covered by approved Change Orders. The Schedule of Values shall be revised if later found by the Architect to be inaccurate.

D. In preparing the Schedule, each sub-division or classification of the Work shall be identified by code number referring to each individual Section (or Sub-Section where applicable) of the Specifications. The Schedule of Values shall be prepared in accordance with AIA Documents G702 and G703.

E. Initial values will be recognized to be an accurate accounting of the value of the work. Upon request by the Architect, support values given with data that will substantiate their correctness.

F. Identify quantities of designated materials or materials stored on which payment is expected to be made.

G. Use monthly submissions of Schedule of Values only as basis for Contractor's Application for Payment.

1.6 PREPARING SCHEDULE OF VALUES

A. General Procedures:

1. Prepare Preliminary Schedule of Values for review by Architect, Owner and Owner’s Project Manager.

2. Incorporate requested modifications to produce a Final Schedule of Values, which will become the basis for documenting the progress of the Work with each Application for Payment.
3. Update Final Schedule of Values as necessary to reflect changes in the Work.

B. Itemize separate line item cost for each of the general cost items as specified in this Section.

C. Breakdown installed costs into:

1. Delivered cost of product
2. Total installation cost, with overhead and profit.
3. Construction phase.
4. Note that the Owner is exempt from Sales and Use Tax for all materials incorporated into the Work.

D. For each line item which has installed value of more than $20,000.00 breakdown costs to list major products, components, or operations under each line.

E. Sum of costs of all items listed in schedule shall be equal to total Contract Sum.

F. Each item shown on an Application for Payment Schedule of Values shall also appear on the CPM Schedule.

1.7 LINE ITEMS FOR SCHEDULE OF VALUES

A. Work Covered in Division 1: Itemize separate line item cost for each of the following general cost items:

1. Builder's Risk Insurance
2. Performance and Payment Bonds for General Contractor and Filed Subcontractors.
3. Field engineering; photographic documentation.
4. Coordination; project management.
5. Preparation of schedule and periodic updates.
   a. If periodic updates of schedule are not performed in a timely manner, the amount shown on the Schedule of Values for this line item shall be forfeit.
6. Weather protection; temporary fence.
7. Temporary heat, water, power and lighting.
8. Temporary office facilities; temporary sanitary facilities.
9. Construction aids, including staging, scaffolding, shoring.
10. Project sign.
11. Indoor air quality provisions.
12. Construction waste management.
13. Cutting and patching; selective demolition
14. Final cleaning.
15. Punchlist preparation and response.
16. Maintenance of as-built documents for architectural and site work; preparation of closeout documents.
17. Commissioning activities.
18. Overhead.
19. Other items of work as requested by the Architect or Owner.

B. Work Covered in Divisions 2 through 26: Provide at least one separate line item for each Section of the Specifications. Section line items shall be further subdivided into separate line items

as follows:

1. Subdivide each line item into separate line items for individual floors of the project where applicable.
2. Identify material costs separately from labor costs.
3. Provide separate line items for the following where applicable:
   a. Submittals
   b. Maintenance of as-built documents for mechanical and electrical work
   c. Preparation of closeout documents
   d. Operations and Maintenance Manuals;
   e. Training
   f. Other items of work as requested by the Architect or Owner.
4. For mechanical and electrical work, provide the following additional separate line items where applicable:
   a. Commissioning activities other than demonstration of FPT to the Commissioning Firm
   b. Commissioning activities associated with demonstration of FPT to the Commissioning Firm
5. For each line item which has installed value of more than $20,000.00 break down costs to list major products, components, or operations under each line.

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 DESCRIPTION OF WORK

A. The Work of this Section includes, but is not limited to, requirements for the following procedures:

1. Responsibility for coordination of the Work.
2. Surveying and engineering.
3. Coordination Drawings.

B. Related work includes, but is not limited to, the following work under other Sections:

1. General requirements for submittals: Section 013300 – SUBMITTAL PROCEDURES.

1.3 SUBMITTALS

A. Prepare and submit documentation in accordance with Section 013300 – SUBMITTAL PROCEDURES.

B. Drawings:

1. Survey of existing project conditions: Submit a set of reproducible drawings and certificate signed by registered engineer or land surveyor, certifying that elevations and locations of improvements are in conformance, or non-conformance with Contract Documents.
2. Survey of as-built conditions: Certified survey showing all as-built dimensions, locations, angles and elevations of construction, to be submitted at Substantial Completion of the Work.
3. Coordination Drawings as described in this Section.

C. Certifications required for Work described in this Section:

1. Field Engineering: Submit name and address of surveyor and professional engineer to Architect.

1.4 COORDINATION

A. General: The Contractor shall be responsible for the proper fitting of all work and the coordination of the operations of all trades, Subcontractors, material installers and equipment engaged

upon the Work. He shall perform or cause Subcontractors to perform all cutting, fitting, adjusting and patching necessary to make the several parts of the Work come together properly and to fit the Work to receive or be received by that of other contractors.

B. Project Supervision: The Contractor shall give his personal supervision to the Work and shall assign the following site staff for the Project:

1. Full-time Superintendent: A superintendent licensed in the Commonwealth of Massachusetts, with the authority to act on behalf of the Contractor. The Superintendent shall supervise the Work at all times throughout the duration of the Project.
2. Quality Control Monitor: A member of Contractor's full-time on-site staff assigned to monitor the quality of the Work. The Quality Control Monitor may also be assigned to oversee and document construction waste removal.
3. The Contractor shall also provide an adequate staff for the proper coordination and expediting of the Work.

C. Coordination with Subcontractors: The Contractor shall be in charge of the entire Work and shall be responsible for the prompt coordination of all trades, including his own forces and his various Subcontractors, as well as the Owner's separate contractors, if they are on the job during the Contractor's operations, and shall become fully familiar with all work required under the Contract.

1. The above notwithstanding, each Subcontractor shall assume responsibility for the correctness and adequacy of his work. Each Subcontractor shall be responsible for and pay for all damage done by his work and his workers.
2. No Subcontractor shall be permitted on the site without the Superintendent present to supervise the Work.

D. Care shall be given to the proper scheduling, delivery, and installation of items to be built into rough construction which will affect the latter portions of the Work, such as anchors, pipe sleeves, inserts, conduit, pipes, lugs, clips, brackets, braces, hangers, bolts, miscellaneous metal, and similar items. These items are not necessarily specified under the trade Section under which they are to be installed. The Contractor shall ascertain that all are properly installed in their correct locations at the proper time, so as to prevent cutting and patching of finished work.

E. The Contractor shall be fully responsible for coordination of general construction work with that of Subcontractors for PLUMBING, ELECTRICAL, HEATING AND VENTILATING and all other specialized trades. He shall investigate, together with the Subcontractors involved, the routing of pipe, ductwork, and conduit with particular attention to interference of structural members, other pipes, ducts, and conduit cuts, headroom conditions, door and window openings and swings, pipe chases, and similar features of the building which may affect installation and proper functioning of such items.

F. Changes in design locations which may be necessary in the routing of pipes and ducts, or in the location of any mechanical, electrical or other equipment or in the location of other building elements, shall be anticipated and made prior to installation. Additional compensation will not be allowed for costs incurred as a result of the Contractor's failure to anticipate the necessity for such changes.

G. There shall be no change or variation in ceiling height, wall layout, shaft, chase, furring or other dimensions shown on Drawings without the specific written approval of the Architect.

H. The Contractor's responsibility for the coordination of all work under the Contract shall be complete, and shall extend to all modifications in the Work, whether or not such modifications entail a change in the Contract Price. Where the Contract Documents allow an optional material or method of performing a portion of the Work, or where the Contractor is ultimately allowed or directed to perform a part of the Work using a substitute material or method, the Contractor shall provide all other coordination and additional work that such change necessitates, without any additional cost to the Owner.

1.5 SURVEYING AND ENGINEERING, GENERAL

A. The Contractor shall employ a project engineer who is a qualified land surveyor registered to practice in the Commonwealth of Massachusetts, who shall establish and maintain grades and levels and permanent bench marks. In addition, the Contractor shall designate one person from within his organization, with engineering experience, who shall do the usual engineering work required, including leveling, checking, and verifying wall and partition lines, elevations, etc.

B. Prior to commencement of any excavation or filling work on the site, the project engineer shall check locations of all structures and other fixed items with regard to property lines and other existing conditions. The Contractor shall be fully responsible for reporting to the Architect discrepancies between the dimensions and/or locations indicated on the Contract Drawings and those as they actually exist on the site.

C. After verification of all dimensions and locations, the Contractor shall submit to the Architect such verification in written form bearing the professional stamp of the surveyor. Failure to do so shall mean that the Contractor assumes responsibility for all corrective measures required at no addition to the Contract amount.

D. The Contractor shall lay out the Work and shall be responsible for all lines, elevations, and measurements of the building, grading, paving and other work under the Contract. He shall exercise proper precaution to verify the dimensions shown on the Drawings before laying out the Work and will be held responsible for any error resulting from his failure to exercise such precaution.

1.6 FIELD ENGINEERING REQUIREMENTS

A. General: Provide professional field engineering services, establish grades, lines and levels, by use of recognized engineering survey practices.

1. The Contractor’s attention is directed to the fact that Drawings have been prepared based on the assumption that all existing walls are set in orthogonal relationship to each other. The Contractor will be responsible for verifying the precise angle between existing walls, and bring to the attention of the Architect any conditions that deviate from orthogonal.
2. Submit surveys and documentation as described herein.

B. Scope of Field Engineering:

1. Architectural features in the existing construction for which precise vertical and horizontal reference points are required include, but are not limited to, the following:
   a. Top of foundation wall.
   b. Windowsill heights at each floor level.
   c. Top of decorative masonry cornice and existing roof edge at perimeter of building.
   d. Horizontal layout of existing masonry openings in all exterior walls.

e. All other reference points shown on Drawings.

2. Site features:
   a. Existing grades, including grades immediately adjacent to existing building.
3. Structural elements: For each column, a precise base plate elevation and horizontal location shall be established. After the anchor bolts have been set in the foundations and leveling plates have been set in grout, the top surface of each leveling plate shall be surveyed to determine the following locations. Submit survey data to the Architect for review and approval prior to fabrication of structural steel.
   a. Elevation of top surface of each leveling plate.
   b. Precise position of the center of each anchor bolt in each leveling plate.

C. Qualifications of Surveyor or engineer: Qualified engineer or registered land surveyor, acceptable to Architect and the Owner.

1. Registered professional engineer of the discipline required for the specific service on the Project, licensed in the Commonwealth of Massachusetts.

D. Survey Reference Points:

1. Datum: Location of control datum to be used as reference point for horizontal and vertical survey measurements is shown on Drawings.
2. Locate and protect control and reference points prior to starting site work, and preserve all permanent reference points during construction.
   a. Make no changes or relocations of control points without prior written notice to Architect.
3. In the event that any reference point is lost or destroyed, or requires relocation due to necessary changes in grades or construction, perform the following actions without delay:
   a. Report change to Architect immediately.
   b. Replacement of reference point shall be performed by surveyor, as directed by Architect.
4. Project Survey Requirements:
   a. Establish a minimum of two permanent benchmarks on the site, referenced to data established by survey control points.
   b. Establish lines and levels, locate and lay out by instrumentation and other appropriate means.
   c. Verify layouts periodically using the same means as those by which they were established.

E. Records:

1. Maintain a complete, accurate log of all control and survey work as it progresses.
2. Prepare and submit a survey of existing conditions and a final survey of as-built conditions containing all relevant horizontal and vertical dimensions and reference point data.

1.7 COORDINATION DRAWINGS

A. The Contractor shall be responsible for the coordination of all mechanical and electrical work with architectural requirements including ceiling layouts. Well in advance of commencing work in any area and before materials are fabricated or work begun, he shall submit to the Architect complete Coordination Drawings in the form of reproducible transparencies in a scale not less than 1/4” = 1’-0”. Congested areas and sections through shafts shall be at a scale not less than 3/8” = 1’-0”.

B. Coordination Drawings shall indicate the necessary offsets for all ductwork, piping, conduit, and other items to clear the work of all other trades, and structure, and to maintain the required ceiling height, ceiling layout and partition layout.

C. Prepare Coordination Drawings as follows:

1. The background for coordination drawings shall show the reflected ceiling plan.
2. Contractor shall require HEATING AND VENTILATING Subcontractor to prepare original Drawings showing all ductwork, hot water and other heating lines, based on approved Sheet Metal Fabrication Drawings and related mechanical submittals.
3. Contractor shall have transparencies made there from, and shall distribute them to the Architect and the Plumbing Subcontractor for the next step.
4. Contractor shall then require PLUMBING Subcontractor to indicate all his equipment and plumbing lines on these transparencies.
5. Contractor shall require the ELECTRICAL Subcontractor to indicate his equipment and conduit lines on the same Drawings.
6. Contractor shall resolve conflicts and then submit these transparencies to the Architect for review.
7. Submit complete final set of coordination drawings for record purposes.

D. Coordination Drawings shall bear the signature of all subcontractors involved indicating that all space conditions have been satisfactorily resolved. In addition, the Drawings shall bear the Contractor's stamp bearing the notation "Drawings Have Been Checked and Coordinated with all Trades". Drawings without these notations, or Drawings submitted more than 120 days after the execution of the Contract, will not be accepted or reviewed by the Architect.

E. If any space conflicts cannot be resolved by the Contractor, he shall immediately notify the Architect.

F. Coordination Drawings are for the Contractor's and Architect's use during construction and shall not be construed as replacing any Shop, "As-Built", or other Record Drawings required elsewhere in these Contract Documents.

G. Architect's review of Coordination Drawings shall not relieve General Contractor from his overall responsibility for coordination of all work performed pursuant to the Contract or from any other requirements of the Contract.

H. Access panel coordination: Show locations and sizes of all access panels for all trades on Coordination Drawings.

PART 2 - PRODUCTS **[NOT USED]**

PART 3 - EXECUTION **[NOT USED]**

END OF SECTION

SECTION 013119

PROJECT MEETINGS

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. The Work of this Section includes, but is not limited to, requirements for the following procedures:

1. Organizational meetings.
2. Project meetings.
3. Pre-Installation conferences
4. Post-construction meetings

B. Related work includes, but is not limited to, the following work under other Sections:

1. Requirements for construction schedules: Section 013200 Construction Progress Documentation.

PART 2 - PRODUCTS

2.1 ORGANIZATIONAL MEETINGS

A. General: The Owner’s Project Manager will schedule pre-construction organizational meetings, periodic Project meetings, specially called meetings throughout the progress of the Work, and post-construction meetings. Representatives of the Contractor shall attend all such meeting. Subcontractors shall attend only if requested by the Architect or the Owner’s Project Manager.

B. Pre-Construction Meeting: Immediately following award of Contract, the Architect will call one or more preliminary organizational meetings, during which detailed procedures will be worked out for submission and review of Shop Drawings and samples, format and extent of the Progress Schedule and Schedule of Values, format and methods for progress payment requisitions, channels of communication between Owner, the Owner’s Project Manager, Architect's and Contractor's personnel, and other routines to be followed during construction. The Architect will then issue a directive summarizing such procedures.

2.2 PROJECT MEETINGS

A. The Architect shall schedule and meet regularly with the Owner, the Owner’s Project Manager and the Contractor at the site of the Work during the course of the Contract for the purpose of progress review, coordination of Shop Drawing schedules, sample submittals, and other items

of work requiring such coordination. The dates of such meetings shall be as mutually agreed upon between the Owner, the Owner's Project Manager, Contractor and the Architect. Contractor shall require Subcontractors to attend such meetings if requested by the Architect.

B. The Contractor shall take minutes of such meetings and shall distribute copies of the minutes to all concerned.

C. Contractor's and Subcontractor's representatives attending such meetings shall include the job superintendent or other responsible party approved by the Architect. Such representatives shall be empowered to make, at these meetings, definite decisions binding upon their respective employers regarding all matters pertaining to work under this Contract.

D. The Contractor shall furnish the Owner, the Owner's Project Manager and the Architect, in writing, the names, addresses, and telephone numbers of Contractor's and principal Subcontractors' personnel to be contacted in the event of an out-of-hours emergency at the building site. He shall also maintain a similar list readily visible from the outside of the field office.

2.3 PREINSTALLATION CONFERENCES

A. Pre-Installation Conferences: Conduct pre-installation conferences at site prior to construction activities that require coordination.

1. Schedule the conference to occur after submittals have been approved for the materials or systems.
2. Installers, manufacturer's representatives, and fabricators of materials or systems affected shall be required to attend. Advise Designer of scheduled meeting dates.
3. Do not allow affected work to proceed if the conference cannot be successfully concluded. Initiate actions necessary to resolve impediments to performance of the work and reconvene the conference at the earliest feasible date.

B. Work for which pre-installation conferences will be required include the following. Additional pre-installation conferences may be required by specifications in Sections 2 through 50, and by the Owner or Architect during the progress of the Work:

1. Air barrier system.
2. Roofing.

C. Refer to individual specifications sections for additional requirements.

2.4 POST-CONSTRUCTION MEETINGS

A. Not less often than every three months, starting with the date of Substantial Completion and continuing for one year thereafter, representatives of the Contractor and the Subcontractors for FIRE PROTECTION, PLUMBING, HVAC, and ELECTRICAL Work shall meet with the Architect and Owner's Project Manager at the site in accordance with an agreed-upon schedule in order to inspect the Work and to plan correction of any deficiencies or failures discovered during this period.

B. Representatives of the Contractor and Subcontractors attending such meetings shall be the same persons, or shall have the same powers and authority, as those attending job meetings prior to the date of Substantial Completion.

C. Post-Warranty Meeting: Refer to Section 018100 - COMMISSIONING, for meeting to be held

with Commissioning Agent.

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 SUMMARY

A. The Work of this Section includes, but is not limited to, requirements for the following procedures:

1. Time for Completion.
2. Sequencing requirements.
3. Phasing requirements.
4. Requirements for scheduling closeout activities.
5. Critical Path Method Schedule preparation and submission.
6. Photographic documentation of construction.

B. Related work includes, but is not limited to, the following work under other Sections:

1. Section 011400 – WORK RESTRICTIONS: Hours of work and related scheduling criteria.
2. Section 012400 – SCHEDULE OF VALUES: Allocation of portions of the Work as line items in applications for payment.
3. Section 013100 – PROJECT MANAGEMENT AND COORDINATION: Contractor responsibility for coordinating the Work.
4. Section 013119 – PROJECT MEETINGS: Scheduling construction-related meetings.
5. Section 013300 – SUBMITTAL PROCEDURES: Coordination of submittal schedule with construction.
6. Section 014000 – QUALITY REQUIREMENTS: Special sequencing requirements required for inspection of building components prior to concealment.
7. Section 017700 – CLOSEOUT PROCEDURES: Requirements for Substantial Completion and Final Completion.

1.3 SUBMITTALS

A. Preliminary Construction Schedule: Within 10 calendar days following receipt of the Notice to Proceed, submit a CD containing an electronic copy (PRX) and two paper copies for review by the Owner, Project Manager and the Architect. This preliminary schedule shall include the project contract dates, milestones, long lead items, major work activities and a critical path to completion. (approximately 100 to 150 schedule activities)

1. Acceptance of the Preliminary Construction Schedule by the Owner, Project Manager and Architect shall be a prerequisite to certification of the first Application for Payment.

B. Complete and Detailed Construction Schedule: Within 10 calendar days following receipt of the

Notice to Proceed, and at least 15 calendar days prior to submitting the second Application for Payment, submit a CD containing an electronic copy(PRX) and two paper copies of the complete and detailed schedule, to show entire schedule for entire construction period.

1. Acceptance of the Complete and Detailed Construction Schedule by the Owner, Project Manager and Architect shall be a prerequisite to certification of the second Application for Payment.

C. Monthly Schedule Update: With each monthly Application for Payment, submit a schedule update of the accepted Complete and Detailed Construction Schedule accompanied by a written narrative reporting on the progress of the Work and a CD containing an electronic copy(PRX) and two paper copies of the Monthly Schedule Update.

1. Acceptance of the Updated Schedule each month by the Owner, Project Manager and Architect shall be a prerequisite to certification of the monthly Application for Payment.

D. Daily Construction Field Reports: Submit two copies of the current week's field reports to the Owner's Project Manager and the Architect at the end of each week. (Electronic submission is acceptable)

E. Special Reports: Submit two copies of special reports of unusual events at the site directly to Owner’s Project Manager and a copy to the Architect, on the day of the occurrence. Distribute additional copies of report to parties affected by the occurrence.

F. Construction Photographs: Submit construction photographs as specified herein.

1.4 TIME FOR COMPLETION

A. It is understood and mutually agreed, by and between the Contractor and the Owner, that the date of beginning and the time for completion for each phase are essential conditions of this Contract, and it is further mutually understood and agreed that the Work embraced in this Contract shall be commenced by the date specified therein.

B. The Contractor agrees that said Work shall be prosecuted regularly, diligently, and uninterruptedly at such rate of progress as will insure full completion thereof within the time specified. It is expressly understood and agreed, by and between the Contractor and the Owner, that the time for the completion of the Work in each phase described herein is a reasonable time for the completion of the same, taking into consideration the usual industrial and climatic conditions prevailing in this locality.

C. It is further agreed that time is of the essence of each and every portion of the Contract and of the Contract Documents wherein a definite and certain length of time is fixed for the performance of any act whatsoever; and where under the Contract an additional time is allowed for the completion of any work, the new limit fixed by such extension shall be of the essence of this Contract.

1.5 SEQUENCING REQUIREMENTS

A. Exterior Envelope Construction and Inspection: Schedule the installation of materials comprising the exterior walls and roofs to minimize exposure of construction materials to damage by ultraviolet light, wind and weather. Notify the Architect prior to concealment of air barrier, to permit inspection and testing. Refer to Section 014000 – QUALITY REQUIREMENTS, and individual technical specification sections for specific requirements.

B. Indoor Air Quality Provisions: Refer to Section 018119 – INDOOR AIR QUALITY REQUIREMENTS, for the following activities that will have an impact on scheduling:

1. Sequencing required to minimize adsorption of airborne contaminants on new surfaces.
2. Sequence of building flush-out with respect to completion, testing and balancing of mechanical systems.

C. Commissioning: Refer to the Commissioning Section, for inspections, testing and related activities to be performed by Commissioning Agent during and after construction.

1.6 SCHEDULING REQUIREMENTS FOR CLOSEOUT

A. General: Closeout scheduling shall be carefully coordinated with activities required for Commissioning and the approved Indoor Air Quality Management Plan. The following sequence of activities is a summary of requirements of many trades. Refer to other Division 1 Sections and Technical Sections for additional information as indicated.

1. The Contractor's attention is brought to the fact that no HVAC system shall be started up before the completion of all major finishes, casework installation and final cleanup.

B. Initial Closeout Activities:

1. Commissioning Coordination Meeting: Schedule meeting well in advance of anticipated date for start-up of mechanical and electrical systems. At this meeting, the Commissioning Firm will distribute Pre-Functional Performance Test (PFPT) checklists, and scheduling requirements will be reviewed. Refer to Section 013119 – PROJECT MEETINGS.
2. Confirmation of Completion of Finishes, Casework and Cleaning: The Contractor submit a letter confirming that all major finishes have been applied, all casework is installed and final cleanup has been completed.

C. System Start-Up, Building Flush-out and Testing and Balancing.

1. The HVAC system shall be started up with new filters as specified in Section 230000 – Heating, Ventilating and Air Conditioning.
2. Building Flush-Out: As part of the Indoor Air Quality Plan, the HVAC system shall be run for 28 calendar days with 100 percent fresh air. Disable carbon dioxide sensors during this time. Refer to Section 230000 – Heating, Ventilating and Air Conditioning for additional requirements for system operation.
3. Testing and Balancing: After the building flush-out is complete, replace HVAC system filters, adjust HVAC system for normal operation and conduct tests for balancing the system.

D. Substantial Completion: When system start-up and the related activities specified above have been completed on all mechanical and electrical systems, notify the Architect that the Project is Substantially Complete. Refer to Section 017700 – PROJECT CLOSEOUT, for additional requirements for Substantial Completion.

PART 2 - PRODUCTS

2.1 CRITICAL PATH METHOD SCHEDULE (CPM) GENERAL

A. The purpose of the Construction Schedule shall be to:

1. Assure adequate planning, scheduling and reporting during execution of the work by the Contractor;
2. Assist the Contractor, Architect, Project Manager and Owner in monitoring the progress of the work and evaluating proposed changes to the Contract and the Construction schedule;
3. Assist the Owner, Project Manager, Architect and the Contractor in the preparation and evaluation of the Contractor's monthly progress payments.

B. The Construction Schedules shall employ the Critical Path Method (CPM) for the planning, scheduling and reporting of the work to be performed under the contract and shall meet the following requirements:

1. The schedule shall be produced utilizing the most current version of Primavera Project Planner software system or equivalent and the data fully transferable to Primavera Project Planner.
2. The type of schedule shall be time scaled Precedence Diagramming Method (PDM) with Finish to Start with zero (0) lag dependency relationship.
3. Activity duration shall be in units of whole working days and shall be limited to a minimum of one (1) and a maximum of twenty (20) working days for each activity.
4. The schedules and the corresponding completion dates shall meet the contract duration (remaining contract duration for the monthly updates) of the project. Failure by the Contractor to include any element of work required for performance of the Contract shall not excuse the General Contractor from completing all work within the Contract Time. Under no circumstances, shall the Contractor be entitled to an equitable adjustment in the event of failing to achieve an early completion schedule.
5. The Contractor shall review the planned activity coding and activity ID format with the Project Manager prior to the development of the Detailed Construction Schedule. At a minimum, the Project Manager will require the following coding: Area, Location/Phase/Shift, Work Type/Trade, CSI Code, and a separate code for each subcontractor.
6. Proposed durations assigned to each activity shall be the Contractor's best estimate of time required to complete the activity considering the scope and resources planned for the activity, utilizing the appropriate workday calendar.
7. Seasonal weather conditions shall be considered and included in the planning and scheduling of all work influenced by high or low ambient temperatures and/or precipitation to ensure completion of all work within the Contract time. Seasonal weather conditions shall be determined by an assessment of average historical climatic conditions based upon the preceding ten (10) year records published for the locality by the National Ocean and Atmospheric Administration (NOAA).
8. The OPM's acceptance of the Construction Schedule shall not relieve the Contractor of responsibility for timing, planning and scheduling of the Work, nor impose any duty on the Architect or Owner with respect to the timing, planning or scheduling of the Work.

2.2 PRELIMINARY CONSTRUCTION SCHEDULE

A. Within 10 calendar days following receipt of Notice to Proceed, prepare and submit for review prints and CD of the Preliminary Construction CPM Schedule covering the first 90 days of construction. The schedule shall be neatly organized and plotted, time-scaled from left to right on standard size sheets. The Preliminary Construction Schedule shall cover the following phases and/or activities:

1. Proposed mobilization, procurement and planned construction within the first 90 days after Notice To Proceed.

2. Include a summary bar for major areas of the remainder of the Work and a cash requirement prediction based on indicated activities.

B. The Preliminary Schedule shall be incorporated into the Complete and Detailed Schedule including all revisions directed by the Owner, Project Manager and Architect.

2.3 COMPLETE AND DETAILED CONSTRUCTION SCHEDULE

A. Prepare and submit a comprehensive, fully developed Complete and Detailed CPM Construction Schedule within 45 days after Notice to Proceed and at least 15 days prior to the second Monthly application.

1. The Complete and Detailed schedule shall incorporate the accepted Preliminary Construction Schedule with the Owner/Project Manager/Architect's comments
2. Schedule shall be neatly organized and plotted time scaled from left to right on Project standard size sheets with suitable notation relating the interface points among sheets.
3. The General Contractor's Schedule shall consist of, but not be limited to, the following:
   a. Proposed procurement, submittal preparation, submittal review, fabrication & delivery, construction, testing, commissioning, and permitting activities.
   b. Proposed durations for activities.
   c. Proposed sequencing of activities (predecessors & successors).
   d. Milestone events as required by the Contract Documents and Division 1 of the Specifications.
4. The following shall be depicted on the Schedule for each activity:
   a. Concise description of the work represented by the activity (maximum forty-eight (48) characters). The work related to each activity shall be limited to one work trade and one area. All descriptions shall include area designations.
   b. In developing the Schedule, the Contractor shall be responsible for assuring that subcontractor and supplier work at all tiers, as well as its own work, is included in the Schedule.
   c. The Schedule as developed shall show the sequence and interdependence of activities required for complete performance of the work. The Contractor shall be responsible for assuring that all work sequences are logical and the Schedule shows a coordinated plan of the work.
   d. Each activity shall have only one responsible party and will be coded accordingly.
5. For the purposes of utilizing schedule targets, activity id's shall not be modified.
6. The schedule shall employ retained logic.
7. Any float suppression techniques identified shall be corrected by the Contractor.
8. The Contractor shall utilize logic, durations, and appropriate calendar assignment to forecast dates, not activity constraints.

2.4 MONTHLY SCHEDULE UPDATE REPORTS

A. Monthly Schedule Update Report: Evaluate the status of the work as of the 25th of each month to show actual progress and to identify problem areas. Update the Complete and Detailed Construction schedule and print a schedule summary. Include approved Change Orders and Construction Change Directives within the updated schedule

B. The Contractor shall furnish sufficient forces, offices, facilities and equipment at no additional cost to the Owner, and shall work such hours as necessary, within any local restrictions or agreements incorporated into the Contract, to ensure the prosecution of the work in accordance with the current monthly Project Schedule Update. Should the monthly update show that the Contractor is fourteen (14) or more work days behind schedule, the Contractor shall prepare a

Recovery Schedule at no additional cost to the Owner explaining and displaying how the General Contractor intends to reschedule the work in order to regain compliance with the contract. The provision of this paragraph may include the Contractor increasing the hours of work, the number of shifts, overtime operations and/or the amount of construction plant and equipment or working on Saturdays, Sundays and holidays, within agreed working hours or variance granted, provided the General Contractor gives reasonable notice to the Owner.

2.5 RECOVERY SCHEDULE

A. When directed by the Project Manager/Architect, the Contractor shall develop a Recovery Schedule with a detailed narrative for all the remaining work based on the last accepted Monthly Schedule Update. The Recovery Schedule shall represent the Contractors current work sequence plan and shall forecast completion of the remaining work within remaining contract durations. The Recovery Schedule narrative shall enumerate the Contractor's work plan including increases to crew sizes and/or extended shifts to complete work with in remaining contract durations. The Recovery Schedule shall conform to requirements set forth in Paragraph 1.04 (Complete and Detailed Construction Schedule).

B. The Contractor shall be responsible to develop mitigation measures for all delays, regardless of the responsibility for the delays, and to identify all time and cost impacts to the work associated with those mitigation measures. Whenever it is possible for the Contractor to mitigate delay without added cost, the Contractor shall do so. The Contractor shall mitigate all delays as efficiently and economically as possible, with the objective of minimizing both the time and cost impact of the delay, regardless of the responsibility of the delay.

C. Unless circumstances otherwise require, the Contractor shall not pursue mitigation action for which it expects the Owner/Architect to be liable, prior to notifying the Owner/Architect and receiving Owner/Architect authorization to proceed with the mitigation action. Any action taken by the Contractor prior to receiving approval from the Owner/Architect shall be at the Contractor's risk.

2.6 DAILY CONSTRUCTION REPORTS

A. Prepare a daily construction report, recording events at the site. Report the following information, as applicable.

1. List of subcontractors at the site, and approximate count of personnel.
2. High and low temperatures, general weather conditions (when exterior work is in progress)
3. Meetings and significant decisions.
4. Accidents, unusual events, and emergency procedures.
5. Stoppages, delays, shortages, losses.
6. Meter readings and similar recordings.
7. Services connected, disconnected.
8. Orders and requests of governing authorities.
9. Change Orders received, implemented.
10. Equipment or system tests and start-ups.
11. Partial Completions, occupancies.
12. Substantial Completions authorized.

B. At the end of each week, compile the daily reports for the preceding week. Have the Contractor's Superintendent sign the daily reports and prepare a brief outline of the Work anticipated for the coming work week. Submit 1 copy to the Owner/Owner's Project Manager and place 1 copy

in the Project Record Documents file.

2.7 CONSTRUCTION PHOTOGRAPHS

A. Digital Images: Provide images in JPG format, produced by a digital camera with minimum sensor size of 8 megapixels, and at an image resolution of not less than 3200 by 2400 pixels.

B. Photographer: Engage a qualified photographer to take construction photographs.

C. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.

1. Maintain key plan with each set of construction photographs that identifies each photographic location.

D. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.

1. Date and Time: Include date and time in file name for each image.
2. Field Office Images: Maintain one set of images accessible in the field office at Project site, available at all times for reference. Identify images in the same manner as those submitted to Architect and Owner.

E. Preconstruction Photographs: Before commencement of demolition, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Architect.

1. Flag construction limits before taking construction photographs.
2. Take 20 photographs to show existing conditions adjacent to property before starting the Work.
3. Take 20 photographs of existing buildings either on or adjoining property to accurately record physical conditions at start of construction.
4. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.

F. Periodic Construction Photographs: Take [30] thirty photographs [monthly, coinciding] [weekly, with timing each month adjusted to coincide] <Insert time interval> with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.

G. Final Completion Construction Photographs: Take 20 color photographs after date of Substantial Completion for submission as project record documents. Architect and Owner will inform photographer of desired vantage points.

PART 3 - EXECUTION

3.1 SCHEDULING THE WORK

A. The Contractor shall perform the Work in accordance with the approved CPM Schedule.

1. If during the progress of the job the Contractor misses a start date of an activity on the critical path, the Contractor shall, within five (5) working days, advise the Architect in writing of action proposed to bring the Work up to schedule, and shall submit a revised CPM

Schedule indicating such action, together with a typed list of such revisions.

2. If the Contractor fails to submit a revised schedule within the specified time or if the Architect is not convinced of the efficacy of the measures proposed, the Owner may, at its option, require the Contractor to accelerate the progress of the Work, without additional cost to the Owner, by increasing the work force or the hours of work, or by other reasonable means approved by the Architect.

END OF SECTION

SECTION 013300

SUBMITTAL PROCEDURES

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. The Work of this Section includes, but is not limited to, requirements for the following procedures:

1. Submittal schedule
2. Product data
3. Shop drawings
4. Samples
5. Colors and finishes
6. Calculations
7. Informational submittals
8. Action on submittals.
9. Substitution requests.

B. Related work includes, but is not limited to, the following work under other Sections:

1. Availability and restrictions for use of electronic copies of Contract Document: Section 011400 – Work Restrictions.
2. Specific requirements for submittal of construction schedules: Section 013200 Construction Progress Documentation.
3. Specific requirements for submittal of schedule of values: Section 012400 – Schedule of Values.
4. Requirements for submittal of coordination drawings: Section 013100 – Project Management and Coordination.
5. Submittal of final record drawings and other documents: Section 017839 – Project Record Documents.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information that requires Architect's responsive action. Action submittals include product date, shop drawings and samples.

B. Informational Submittals: Written information that does not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals include calculations and other informational submittals described in this Section.

C. Substitutions: Changes in products, materials, equipment and methods of construction from those required by the Contract Documents, as proposed by the Contractor and not considered

"or equal". Refer to definition of "or equal" in Section 011100 – Summary of Work.

1.4 SUBMITTALS

A. Submittal Schedule:

1. Within 21 calendar days after signing the Agreement, prepare and submit for the Architect's approval a schedule of Shop Drawings, Product Data and Samples required to be submitted for the Work.
   a. 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 work, subject to the Architect's approval.
   b. The schedule shall be derived from the Contractor's CPM Schedule.
2. The Architect's review, including Consultant's review period, will not exceed 21 working days (excluding weekends & holidays) from the date on which the Architect receives the submission. Contractor shall strictly adhere to the established dates set forth by the Schedule of Submittals specified above in paragraph 2.01 A.
3. Each submittal shall be made no later than 60 days prior to the time for incorporation of the item into the Work, or earlier under the following conditions:
   a. As required to furnish and deliver to the site the specific item or items required, with sufficient time to allow proper examination and review of such submittals.
   b. If the item in question is to be incorporated in the work prior to the expiration of 60 calendar days from the time of execution of the Contract, the aforesaid written notice shall be submitted to the Architect immediately following the execution of the Contract.
   c. Substitutions: Each request for a substitution shall be made no later than 90 days prior to the time for incorporation of the item into the Work.
4. No item, material, article, system or piece of equipment requiring approval of the Architect shall be ordered or installed until such approval has been obtained.
5. Contractor shall provide the Owner's Project Manager and Clerk of the Works with software and training for programs used to schedule, and track Shop Drawings, Samples, and RFI's.

B. Product List for Color Selection: To facilitate the preparation of the color schedule, the Contractor shall submit, within forty-five (45) calendar days following date of Award of Contract, unless otherwise extended by the Architect, a list of the names of the manufacturers whose products he proposes to use.

1. List products for which color, finish, pattern, texture, or other related information is a consideration, including, but not limited to the following:
   a. Exterior materials: Face brick; exterior concrete masonry units; factory-finished metal siding; factory finish for doors, windows and louvers.
   b. Casework finishes: Solid and veneer wood with transparent finish; plastic laminate.
   c. Interior finishes: Ceramic tile, acoustical ceiling tile, resilient flooring, carpet, paint.
   d. Specialties available in a choice of colors: Toilet partitions; lockers; operable panel finishes.
   e. Other items for which the above properties affect the design.
2. Products listed shall be as specified, unless substitution has been approved.

C. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Substitution Request Form: Use facsimile of form provided at end of Section.
2. Documentation: Show compliance with requirements for substitutions listed on the Substitution Request form, and additional requirements as may be requested by the Architect or as otherwise applicable.

D. Product Data, Shop Drawings, Samples, Schedules and other Submittals: Refer to individual Specification Sections for submittals required.

E. Confirmation of contract between Contractor and printing company for reproduction of shop drawings as specified in this Section.

PART 2 - PRODUCTS

2.1 SUBMITTAL PREPARATION, GENERAL

A. Preparation of Submittals: To receive consideration by the Architect, submittals shall be accompanied by a letter of transmittal. Each submittal shall contain the following information on the Drawing title block or a cover sheet stapled to the submittal:

1. Project identification
2. Architect's name
3. Date of preparation of submission, and of revision if applicable
4. Submittal number and title of item the Drawings refers to
5. Architect's Drawing numbers and Specification paragraph number used as a reference in preparing submittal
6. Contractor's and Subcontractor's names, & addresses and phone numbers
7. Name of person or firm preparing Drawings
8. Statement on stamp of approval by the Contractor, signifying that he has seen and examined the submittal and that requirements of the General Conditions have been complied with

B. Each submittal cover sheet shall contain a clear space approximately 80 square inches for stamps and Architect's comments. Each drawing shall contain a similar space as an additional border on the right or bottom.

C. Distribution:

1. Contractor shall electronically deliver submittals to the Architect and its consultants in a format acceptable to the Architect.
2. Simultaneously, Contractor shall deliver 1 hard copy print to the Architect and its consultants.
3. Architect and consultants will review submittals, and the Architect will post reviewed submittals on FTP site and/or email to Contractor.
4. Architect will hand deliver Owner Representative and Contractor hard copies at the weekly site meeting.
5. Contractor is responsible for distribution to all trades.

2.2 PRODUCT DATA

A. Manufacturers' Product Literature: For standard manufactured items, submit manufacturer's catalog sheets with illustrated cuts of the items to be furnished.

1. Include scale details, sizes, dimensions, performance characteristics, capacities and other pertinent information.
2. Each submittal of product data shall be accompanied by an appropriate transmittal form with specific reference to the applicable paragraph in the Specifications.
3. Indicate clearly on such printed matter which of several items is being submitted for approval.

B. If catalog cuts of standard manufactured items show different types, options, finishes, performance requirements, or other variations, those features that the Contractor proposes to furnish shall be clearly circled or otherwise indicated, and all irrelevant diagrams, notes, or other information deleted or canceled.

1. If any variations from the catalog description are proposed or required, such variations shall be clearly noted on the cut by the Contractor.
2. Wiring diagrams shall be produced to address specific project requirements. Catalog cuts of wiring diagrams will not be acceptable.

2.3 SHOP DRAWINGS

A. The Contractor shall prepare shop drawings showing such features as required by the Technical Specifications Sections, to demonstrate an understanding of the particular conditions unique to this Project.

1. Prepare shop drawings at a scale of at least twice the scale of contract drawings showing the same work.
2. Reproduction of Contract Documents in any form will not be accepted for use as Shop Drawings, unless specifically allowed in writing by the Architect for a particular portion of the Work.
3. Refer to Section 011400 –WORK RESTRICTIONS for permissible use of electronic documents for the purpose of preparation of shop drawings. Use of Project Electronic Files for shop drawing preparation will be subject to the requirements specified in that Section.

B. Shop Drawings related to various units comprising a proposed assembly shall be submitted simultaneously so that such units may be checked individually and as an assembly.

C. Shop Drawing Distribution:

1. Shop Drawings shall be submitted through the Contractor directly to the applicable consultant and the Architect.
2. Drawings submitted directly from Subcontractors, manufacturers or vendors, or directly to the Architect's consultants, will be returned to the Contractor without action.
3. The Architect will forward copies of submittals to the Clerk of the Works when so requested for their use. However, it is the responsibility of only the Architect and their Consultants to review and respond to submittals.

D. Each drawing and print shall have a clear space approximately 80 square inches as an additional border on the right or bottom for stamps and Architect's comments.

E. Shop Drawings shall clearly indicate all details, sectional views, arrangements, working and erection dimensions, kinds and quality of materials and their finishes, and other information necessary for proper checking and for fabrication and installation of the items, and shall include all information required for making connections to other work and/or adjacent materials.

F. If any information on previously submitted Shop Drawings, aside from notations made by the Architect is revised in any way, such revision shall be circled or otherwise graphically brought to the Architect's attention. If approved Drawings are subsequently revised, they shall be resubmitted to the Architect with all revisions clearly marked for the Architect's attention. Whenever drawings are revised, the latest revisions shall be circled or otherwise indicated to distinguish them clearly from all previous revisions (and from the information on the original drawing).

2.4 SAMPLES

A. Submit samples as required under the various Sections of the Specifications. Each sample shall be accompanied by a transmittal and cover sheet as required for all submittals.

B. Before submitting samples, consult with Architect to determine whether samples are to be submitted to Architect's office, field, or other location.

C. Samples shall be submitted in triplicate, unless otherwise specified or directed by the Architect.

D. Samples may be submitted to Architect directly from manufacturers, vendors, suppliers, Subcontractors, or others, but a separate transmittal letter shall be submitted through the Contractor in each such case.

E. Approved samples of major or expensive items or assemblies, if in good condition and meeting all requirements of the Contract, may be properly marked for identification and used in the Work, provided that all shipping and handling charges are paid by the Contractor.

F. Each sample shall have a label indicating the material represented, its place of origin, and the names of the producer, the Architect, the Contractor, the Subcontractor and the building or Work for which the material is intended. Samples shall be marked to indicate the Drawing numbers or Specification Paragraph requiring the materials represented.

G. Approval of samples for color, texture, and other aesthetic qualities shall not be construed as approval of other characteristics.

H. Approved samples, unless specifically stated by the Contractor as slated for incorporation in the Work, will be kept on file (and accessible for inspection) by the Architect until Final Acceptance of the Project. Any sample not reclaimed by the Contractor within thirty (30) days after Substantial Completion of the Project will be considered unclaimed material, and may be disposed of by the Architect.

2.5 COLORS AND FINISHES

A. The Architect will prepare a master color schedule indicating the required color, finish, pattern, material, texture, and other pertinent information in connection with interior and exterior finishes.

B. Color chips shall be submitted for all items having color unless otherwise directed or approved by the Architect. Upon the expiration of such 45-day period, the Architect will proceed with color selection and preparation of final color schedule.

C. The Architect will select the colors and finishes of a manufacturer within the framework of the Specifications, for each item where the Contractor fails to submit the name of a specific manufacturer within the allotted time, and the Contractor shall provide such materials without additional compensation.

2.6 CALCULATIONS

A. Calculations Based on Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, submit calculations demonstrating that products and systems comply with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit three copies of a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents.
2. Include list of codes, loads, and other factors used in performing these services

2.7 INFORMATIONAL SUBMITTALS

A. General: Informational submittals comprise written information that does not require Architect's responsive action. Submit to the Architect two copies, or more if specified, for each informational submittal. The Architect will distribute copies to the Owner for their records.

B. Informational submittals required for the Work include, but are not limited to, the following:

1. Storm Water Pollution Prevention Plan Documentation, as specified in Section 011400 – WORK RESTRICTIONS
2. Calculations for Contractor-engineered work, as specified in particular specification sections in Divisions 2 through 26.
3. Research/evaluation reports and test data as specified in particular specification sections in Divisions 2 through 26.
4. Certifications and other qualification data, as specified in particular specification sections in Divisions 2 through 26.
5. Maintenance data, as specified in particular specification sections in Divisions 2 through 26.
6. Confirmation of contract with printing company as specified in this Section.

PART 3 - EXECUTION

3.1 CONTRACTOR ACTION ON SUBMITTALS

A. Should the Architect in checking shop drawings or other submittals make changes which the Contractor deems will increase the Contract Price, the Contractor shall so inform the Architect in writing within fourteen (14) days following receipt of the checked submittals and prior to starting fabrication of the item or items. Failing this, the Contractor shall be deemed to have waived all claims for extra compensation for the work involved.

B. Notes or other information on submittals that are contrary to provisions of the Contract Documents shall be deemed to be addressed to the applicable Contractor, Subcontractor, material supplier or other parties involved, and shall have no force or effect with respect to this Contract,

even though the Shop Drawing or Sample involved is approved by the Architect. In particular the terms "By Others", "N.I.C." or words of similar meaning and import on submissions shall not be deemed to imply that the referenced items are to be omitted from this Contract.

C. The Contractor shall obtain and distribute copies of approved Shop Drawings and other Submittals to his subcontractors and material suppliers needing such information, at no additional cost to the Owner.

D. The Contractor shall keep on the site, in good order, a complete up-to-date set of all approved Shop Drawings and other Submittals.

E. 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 Drawings is withheld due to failure of the Contractor to submit, revise, or resubmit Shop Drawings in adequate time to allow the Architect reasonable time, not to exceed twenty-one (21) working days (excluding weekends & holidays), for normal checking and processing of each submission and resubmission. The Architect will not be limited to twenty-one (21) days when the Shop Drawing Schedule has not been submitted or is not current.

3.2 ARCHITECT ACTION ON SUBMITTALS

A. Product Data and Shop Drawings: After reviewing product data submittals, the Architect will mark each submittal with one of the following responses

1. The Architect will annotate the transparency or an original copy and apply a stamp including the following information: "Reviewed as required by the Construction Contract Documents and approved, but only for conformance to the design concept of the Work, and subject to further limitations and requirements contained in the Contract Documents."
2. "Rejected". Two copies of each rejected submittal will be returned to the Contractor. Rejected copies shall be resubmitted in the same manner until approval is obtained.
3. The stamp will also contain notes indicating possible actions, namely; "rejected"; "revise and resubmit"; and "furnish as corrected". Architect will check one of the actions.
4. Corrections or comments made on the submittals during this review shall not relieve Contractor from compliance with requirements of the Contract Drawings and Specifications. This check is only for review of general conformance with the design concept of and general conformance with the information given in the Contract Documents. The Contractor is responsible for confirming and correlating all quantities and dimensions; selecting fabrication processes and techniques of construction; coordinating his work with that of all other trades; and performing his work in a safe and satisfactory manner.
5. For Submittals marked "Rejected", or "Revise and Resubmit", the Architect will have prints made from the marked reproducible Drawings at the Contractor's expense. Such prints shall be used for record purposes and for comparison with subsequent resubmissions. One will be retained by the Architect, one furnished to the applicable consultants, if any, and the transparency returned to the Contractor. Such procedures shall be followed until the Shop Drawing is marked "Furnish as Corrected", or "Reviewed as required by the Construction Contract Documents and approved, but only for conformance to the design concept of the work, and subject to further limitations and requirements contained in the Contract Documents."
6. Submittals marked "Furnish as Corrected" shall be treated in the same manner as Drawings marked "Reviewed as required by the Construction Contract Documents...and requirements contained in the Contract Documents." The Architect's comments shall be considered part of the original Drawings. Should the Contractor disagree with such comments, he shall so notify the Architect in writing within fourteen (14) days after receipt

of such Drawings and before commencing work on the items in question. Failing this, the Contractor shall be deemed to have accepted full responsibility for implementing such comments at no additional cost to the Owner.

7. Transparencies for all Drawings marked "Furnished as Corrected" or "Reviewed as required by the Construction Contract Documents..." will be returned to the Contractor.
8. Before the transparency is returned by the Architect with the stamp "Reviewed as required by the Construction Contract Documents..." or "Furnish as Corrected", the Architect will have made at the Contractor's expense, four (4) prints of the corrected original for the Architect's and Owner's use.

B. Informational Submittals: Architect will review each informational submittal and will review it for general compliance with submittal requirements

1. Architect will process and distribute each informational submittal as for other submittals.
2. Compliant informational submittals will be marked “Reviewed” and stamped copies will be distributed to Owner’s Project Manager, Clerk of the Works and Contractor.
3. Informational submittals that do not comply with submittal requirements specified herein and in the section whose work they cover will be returned without any action or stamp. Re-submittal will be required.

C. Repeated Re-submittals: The Architect will review the initial submittal for each product, and one re-submittal if revisions are required.

1. If the first re-submittal is rejected or requires further revision, the Contractor shall be responsible to the Owner for costs for Additional Services of the Architect to perform review of an extensive number of repeated submittals, until a submittal for that product is accepted by the Architect with no need for further revision.
2. Refer to Section 011400 –WORK RESTRICTIONS, for procedures required in cases where Contractor is responsible to the Owner for costs for Additional Services of the Architect.

3.3 SUBSTITUTIONS

A. Definition: Substitutions are changes proposed by Contractor for products, materials, equipment, and methods of construction differing from those required by the Contract Documents.

B. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

1. Substitution is requested by completing a copy of Form 013301 – SUBSTITUTION REQUEST FORM, attached to the end of this Section.
2. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
3. Requested substitution does not require extensive revisions to the Contract Documents.
4. Requested substitution is consistent with the Contract Documents and will produce indicated results.
5. Substitution request is fully documented and properly submitted.
6. Requested substitution will not adversely affect Contractor's Construction Schedule.
7. Requested substitution has received necessary approvals of authorities having jurisdic-

tion.

8. Requested substitution is compatible with other portions of the Work.
9. Requested substitution has been coordinated with other portions of the Work.
10. Requested substitution provides specified warranty.
11. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

C. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within 7 working days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 working days of receipt of request, or 7 working days of receipt of additional information or documentation, whichever is later.

1. Use product specified if Architect cannot make a decision on use of a proposed substitution within time allocated.

D. Review of Substitution Requests: The Architect will review Substitution Requests that are submitted in accordance with the requirements of this section, and are shown to be of benefit to the Project.

1. If a request for substitution is incomplete, the Contractor shall be responsible to the Owner for costs for Additional Services of the Architect to perform additional review, until the substitution has been either accepted with no need for further revision, or rejected.
2. If a request for substitution is shown to be of benefit to the Contractor only and not to the Project, the Contractor shall be responsible to the Owner for costs for Additional Services of the Architect to perform review, redesign or coordination due to such substitution.
3. Refer to Section 011400 –WORK RESTRICTIONS, for procedures required in cases where Contractor is responsible to the Owner for costs for Additional Services of the Architect.

E. Form of Acceptance of Substitution: Change Order

END OF SECTION

Attachment: Form 013301 – SUBSTITUTION REQUEST FORM

FORM 013301

SUBSTITUTION REQUEST FORM

Project: Addition of Truck Wash Facility to the existing Department of Public Works Garage

To: **Holmes & Edwards, Inc.**

We hereby submit for your consideration the following product as a substitution for the item specified for the above referenced project:

Drawing Number: _____ Drawing Title: _____

Specification Section: _____ Section Title:_____

Paragraph: _____Specified Item: _____

Proposed Substitution: _____

Attach complete information on changes to Drawings and Specifications, including related work on other Drawings and under other Sections of the Specifications necessary for the proper installation of the proposed substitution, including proper coordination and finishing.

Submit with request complete Product Data, samples and other data necessary to substantiate that the proposed item is equal to or exceeds the specified item in all respects. Include a comparison chart showing material features and properties of the specified item and the proposed substitute, paying particular attention to requirements specifically mentioned in the Specifications or shown on the Drawings, and guarantee/warranty information. Clearly mark manufacturer's literature to indicate equality in performance. In the case of operating equipment or systems, provide information as to servicing and maintenance requirements, and anticipated service life in the indicated application.

Fill in the blanks below (attach additional sheets as necessary):

A. Does the substitute affect dimensions shown on the Drawings: Yes ☐ No ☐
(if yes, clearly indicate changes on enclosures)

B. Will the undersigned pay for changes to the building design, including architectural/engineering detailing costs caused by the requested substitution: Yes ☐ No ☐
(if no, please explain)

C. What effect does the substitution have on other Contracts or other trades? _____

D. What effect does the substitution have on construction schedule? _____

_____

E. Manufacturer's warranties of the specified and proposed items are: Same ☐ Different ☐

Explain: _____

_____

F. Itemized comparison of specified item with proposed substitute is attached.

G. This substitution will amount to a credit or extra cost to the Owner of: _____

_____ Dollars

($_____).

Notes:

Submission of this form by the Contractor will not require the Owner to accept the proposed substitution unless the substituted product or system meets the requirements of Massachusetts General Law, Chapter 30, Section 39M and is acceptable to the Architect.

The Owner's acceptance of any substitution will not change the Contract Price, unless the Owner, Contractor and any other required parties execute a Change Order in accordance with the terms and provisions of the Contract Documents.

Refer to Section 013300 – SUBMITTAL PROCEDURES, for additional requirements for the submittal and processing of substitution requests.

Submitted By:_____
(signature)

Title: _____

Firm:_____

END OF FORM

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 DESCRIPTION OF WORK

A. This Section includes administrative and procedural requirements for

1. Quality assurance
2. Quality control

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

1.3 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.

C. Mockups: Full-size, physical assemblies that are constructed on-site. Mockups are used to verify selections made under sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Approved mockups establish the standard by which the Work will be judged.

D. Laboratory Mockups: Full-size, physical assemblies that are constructed at testing facility to verify performance characteristics.

E. Preconstruction Testing: Tests and inspections that are performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.

F. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.

G. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.

H. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

I. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

J. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to trades people of the corresponding generic name.

K. Experienced: When used with an entity, "experienced" means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.4 CONFLICTING REQUIREMENTS

A. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.5 SUBMITTALS

A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate

their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

B. Testing and Inspection Log: Submit updated copy of log each month with the Application for Payment.

C. Reports: Prepare and submit certified written reports that include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.6 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work 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.

C. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.

F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1. Requirement for specialists shall not supersede building codes and regulations governing the Work.

G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 548; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.

1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

H. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

1. Contractor responsibilities include the following:
   a. Provide test specimens representative of proposed products and construction.
   b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
   c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
   d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
   e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
   f. When testing is complete, remove test specimens, assemblies, mockups, and laboratory mockups; do not reuse products on Project.
2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

J. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
2. Coordinate the work of multiple subcontractors as needed to build complete mockups of multi-component systems.
3. Notify Architect seven days in advance of dates and times when mockups will be constructed.
4. Demonstrate the proposed range of aesthetic effects and workmanship.

5. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
   a. Allow seven days for initial review and each re-review of each mockup.
6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
7. Demolish and remove mockups when directed, unless otherwise indicated.

K. Laboratory Mockups: Comply with requirements of preconstruction testing and those specified in individual Sections in Divisions 2 through 50.

1.7 QUALITY CONTROL – OWNER RESPONSIBILITIES

A. General: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.

1. Testing, inspections and commissioning performed by the Owner or the Owner's agents in no way reduce the responsibility of the Contractor to meet performance requirements, descriptive criteria and all other requirements of the specifications, nor do these activities on the part of the Owner relieve the Contractor from performing Quality Assurance and Quality Control measures specified.

B. Tests and Inspections: The Owner reserves the right to employ consultants and testing agencies to test the performance of the Work and to inspect the Work for conformance with the Contract Documents.

1. Notice for Testing: The Contractor shall give the Owner a minimum 24-hour notice when installations that require testing are ready for testing or inspection.
   a. Earlier notice shall be given where specified in a given technical section of the Specifications.
   b. If the Owner's testing agency arrives at the site to test the performance of the work, and determines that the installation is not ready for testing or inspections, then the Contractor shall be responsible for the costs of the testing agency's site visit
2. Availability of Test Results: The results of such tests and inspections will be made available to the Architect and Contractor.
3. Correction of Work:
   a. Where results demonstrate deficiencies in the Work, the Contractor shall take all actions necessary to correct the Work in a timely manner at their own expense.
   b. When the Contractor considers the Work to be corrected, further tests and inspections will be performed by the Owner's consultants and testing agencies at the Contractor's expense.

C. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.

D. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.

1.8 QUALITY CONTROL – CONTRACTOR RESPONSIBILITIES

A. Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Unless

otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.

1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
   a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

B. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 1 Section "Submittal Procedures."

C. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

D. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform any duties of Contractor.

E. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.

7. Security and protection for samples and for testing and inspecting equipment at Project site.

F. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
Schedule times for tests, inspections, obtaining samples, and similar activities.

G. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Submit schedule within 30 days of date established for the Notice to Proceed.

1. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

H. Air Leakage Testing:

1. Air leakage (determined by pressurization testing) must be less than 2.5 square inches/100 square feet surface area leakage ratio (CGSB, calculated at a 10 Pa pressure differential); or 1.25 square inches/100 square feet leakage ratio (ASTM, calculated at a 4 Pa pressure differential); or 0.25 CFM/square foot of building enclosure surface area at a 50 Pascal air pressure differential. The calculation of the building enclosure area includes the foundation or below-grade surface areas. If the house is divided into multiple conditioned zones, such as conditioned attics or conditioned crawl space, the blower door requirement must be met with the access to the space open, connecting the zones.
2. Blower Door Test for Overall Air Infiltration:
   a. Target: 1127 CFM 50 / 3.6 ACH 50 (cfm 50 = cubic feet per minute at 50 Pa).
3. Provide blower door testing assemblies equal to Minneapolis Blower Door by the Energy Conservatory.
   a. Model 3 Blower Door Fan
      1) Maximum Flow:
         a) 6,300 CFM at free air (2,973 l/s, 10,700 m3/h).
         b) 5,350 CFM at 50 Pa (2,524 l/s, 9,090 m3/h).
      2) Minimum Flow: 300 CFM with Ring B (141 l/s, 510 m3/h).
         a) 85 CFM with Ring C (40 l/s, 144m3/h).
         b) 30 CFM with Rings D (14 l/s, 51 m3/h).
         c) 11 CFM with Rings E (5 l/s, 18 m3/h).
   b. Dimensions: 20 in. (50 cm) inlet diameter, 10.25 in (26 cm) length.
   c. Weight: 33 lbs. (15 kg) with Flow Rings A & B.
   d. Flow Accuracy: +/- 3% using DG-700 or APT system, Rings D & E +/- 4% or 1 CFM.
   e. Calibration: Meets ASTM Standard E779-03, E1554-07, CGSB-149.10-M86, EN 13829, ATTMA Technical Standard 1 and NFPA 2001.
   f. Power 110V or 220V.
   g. Adjustable Frame and Frame Material:
      1) Extruded Aluminum.
      2) Frame Material Width: 28 in. to 40 in. (71 cm to 101 cm).
      3) Heignt: 52 in. to 96 in. (132 cm to 244 cm).
      4) Seal: EPDM flexible gasket.
      5) Panel Material: Nylon w/built-in vinyl window.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.
2. Comply with the Contract Document requirements for Section 017329 – CUTTING AND PATCHING.

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION

SECTION 015000

TEMPORARY FACILITIES AND CONTROLS

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. The Work of this Section includes, but is not limited to, requirements for the following:
1. Temporary facilities and services.
2. Temporary water.
3. Weather protection
4. Temporary heating and ventilating
5. Temporary humidity control.
6. Temporary electricity and lighting
7. Temporary telephone
8. Temporary sanitary facilities
9. Temporary fire protection
10. Temporary stairs and ladders
11. Temporary hoists and chutes
12. Staging and scaffolding
13. Temporary use of elevators
14. Temporary enclosures
15. Protection of work, property and the public
16. Security of the work
17. Rodent control.
18. Water control
19. Snow and ice control
20. Construction fence
21. Project signs
22. Temporary offices

1.3 SUBMITTALS

A. General: Refer to Section 013300 – SUBMITTAL PROCEDURES, for submittal provisions and procedures.

B. Informational Submittals: Submit the following plans for temporary protection and facilities as specified in this Section:

1. Weather protection plan
2. Temporary humidity control procedures
3. Temporary heating plan
4. Temporary fire protection plan.

1.4 TEMPORARY FACILITIES AND SERVICES

A. Contractor shall be responsible for arranging and providing temporary facilities and general services at the site as specified herein and as otherwise required for proper and expeditious prosecution of work. Except as otherwise specified, the Contractor shall pay costs for all temporary facilities and general services until Final Acceptance of the Work and shall remove same at completion of the Work.

B. All such services and facilities shall comply with applicable Federal, State and local regulations.

C. Contractor shall make all connections to existing services and sources of supply, shall provide all necessary installations, labor, materials, and equipment, in a manner subject to the approval of the Architect and the Owner, shall remove temporary installations and conditions when no longer required, and shall restore the services and sources of supply to proper operating condition as approved by the Architect.

D. Discontinuance of any temporary service prior to the completion of any portions of the Work shall not render the Owner liable for any additional cost resulting therefrom.

E. Should a change in location of any temporary equipment be necessary in order for the Work to progress properly, Contractor shall remove and relocate such equipment as required without additional cost to the Owner.

F. Temporary Parking Lot: Construct temporary parking lot shown on approved Logistics Plan for temporary use of Owner and Contractor during construction. Demolish temporary parking lot and restore area for permanent use as shown on Drawings.

1.5 TEMPORARY WATER

A. Furnish potable water for construction purposes for trades at a point within 10 feet of building being constructed. Make arrangements and pay charges for water service installation, maintenance, and removal thereof, and pay costs of water for all trades.

B. After installation, permanent water supply and distribution system may be used as source of water for construction purposes, provided that the Contractor pays applicable municipal water costs and assumes responsibility for damage to water distribution system and pays costs of restoration of system where so damaged.

C. Temporary pipe lines and connections from the permanent service line, 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 Contractor.

D. In addition to temporary lines and connections, the Contractor, if required by the Owner, shall at the Contractor's expense install a temporary meter in a frostproof box in such location and in such manner as may be approved by the Architect.

E. Provide an adequate supply of drinking water from approved sources of acceptable quality, satisfactorily cooled, for Contractor's employees and those of his Subcontractors. Where required, furnish drinking water in suitable containers and provide single-service cups for use of employees. Drinking water dispensers shall be conveniently located in building where work is in progress.

F. At completion of construction work, temporary water service equipment and piping shall be re-

moved by Contractor.

1.6 WEATHER PROTECTION

A. It is the intent of these Specifications to require the Contractor to provide temporary enclosures and heat to permit construction work to be carried on during the months of November through March in compliance with Massachusetts General Laws. These Specifications are not to be construed as requiring enclosures or heat for operations that are economically infeasible to protect in the judgment of the Architect. Included in this category, without limitation, are such items as site work, excavation, pile driving, 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 the Architect 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 temperature of 40 degrees F. at the working surface. This provision does not supersede any specific requirements for methods of construction, curing of materials or to performance obligations of the Contractor.

C. Within 30 calendar days after award of Contract, the Contractor shall submit in writing to the Architect for approval, three (3) copies of his proposed methods for weather protection.

D. Installation of weather protection shall comply with all safety regulations including provisions for adequate ventilation and fire protection.

E. Determination of extent of work to be performed during winter months shall be by the Contractor, with Owner's approval provided that work shall proceed at such a rate as to insure Substantial Completion on or before the stipulated date in accordance with the Progress Schedule.

F. Be responsible for providing protection against damage to materials and work installed in freezing weather by providing special heat and coverings to prevent damage by the elements, in a manner approved by the Architect. Protect the ground surfaces under footings, under pipelines, under masonry, under concrete and other work subject to damage, against freezing or ice formation. If low temperature makes it impossible to continue operations safely in spite of cold weather precautions, cease work, and so notify the Architect.

1.7 TEMPORARY HEATING AND VENTILATING

A. Within thirty (30) calendar days after commencement of work under this Contract, the Contractor shall submit in writing to the Architect for approval, three (3) copies of his method and time schedule for heating during construction, which shall concur with his general Progress Schedule.

B. Temporary weather-tight enclosures and temporary heating shall be provided by the Contractor as required during construction to make the building weather-tight and to protect work from freezing and frost damage. All costs of closing in buildings, and all costs of temporary heat shall be paid for by the Contractor until Substantial Completion.

C. Contractor shall provide for temporary heating and shall pay fuel costs for heating directly to the utility company. Contractor may not tie into the Owner's permanent heating and ventilating sys-

tem. In areas of building where work is being conducted, temperature shall be continuously maintained as specified in Sections of Specifications but not less than 50 degrees F. nor more than 75 degrees F.

D. Furnish and install one accurate recording Fahrenheit thermometer at a place designated by the Owner, located as directed by the Owner in order to determine that the specified temperatures are being maintained.

E. When work has progressed sufficiently for installation of glazing, Contractor may, if approved by Architect, use glazed windows in place of temporary enclosures. Permanent windows shall be protected against damage from mortar, cement, plaster, etc., and from damage by other trades; and upon completion of work shall be thoroughly cleaned, damaged component parts including glass shall be satisfactorily repaired or replaced, and windows left in perfect condition, prior to Substantial Completion.

F. Where building systems are inoperable, temporary heating shall be by smokeless portable unit heaters, steam generators or forced warm air heaters (UL, Factory Mutual, Fire Marshall approved), located outside building or vented to the outside. Contractor shall pay for fuel, maintenance and attendance required in connection with temporary heat. Surfaces, interior or exterior, damaged by use of these space heaters shall be replaced by new materials or be refinished to the satisfaction of the Architect without additional cost to the Owner. Use of oil burning "salamanders" is forbidden and nonvented open flame heaters will not be permitted inside after the building is closed in. Do not use propane-fueled heaters inside building or near stockpiles of combustible materials.

G. When new heating system, or suitable portion thereof, is in operating condition, such system may be used for temporary heating, provided that the Contractor obtains written approval of Architect and Owner.

H. Use of permanent air handling facilities for construction heating purposes will not be permitted.

I. Make periodic inspections of the equipment and controls to insure proper operation of the system, as conditions require, and report any failings. Installation and operation of weather protection and heating devices shall comply with all safety regulations including provisions for adequate ventilation and fire protection.

J. Upon conclusion of temporary heating period, Contractor shall remove temporary piping, temporary radiators, other equipment and pay costs in connection with repairing damaged caused by installation or removal of temporary heating equipment and shall thoroughly clean and recondition those parts of permanent heating system used for temporary service.

K. Provide adequate ventilation as required to keep temperature of building within 10 degrees of ambient outdoor temperature when such. ambient temperature exceeds 70 degrees F., and to prevent accumulation of excess moisture in building. Refer to Section for Indoor Air Quality Control, for additional requirements for ventilation during construction

1.8 TEMPORARY HUMIDITY CONTROL

A. Humidity Control of Enclosed Building: The contractor shall install the following equipment to monitor and regulate relative humidity as required for the installation of all interior products. Humidity control equipment shall include, but not be limited to, the following:

1. Hygrometer: Provide one device to measure temperature and relative humidity in each

construction area.

2. Dehumidifier, as required to maintain humidity of enclosed areas below 70%:
3. Fans: As required to eliminate significant variation in humidity levels within enclosed spaces.

B. Schedule for Humidity Control: Relative humidity shall be maintained within the limits set by manufacturers of all interior materials and equipment. Refer to individual specification sections in Divisions 6, 9, 10, 11 and 12 for additional environmental requirements. No interior construction product shall be installed or applied prior to enclosure of building and installation of temporary humidity control measures.

C. Within 30 calendar days after award of Contract, the Contractor shall submit in writing to the Architect for approval, three (3) copies of his proposed methods for humidity control.

1.9 TEMPORARY ELECTRICITY AND LIGHTING

A. Make arrangements as required with local electric company for temporary electric service, pay expenses in connection with installation, operation, and removal thereof, and pay cost of energy consumed by all trades until Substantial Completion of the building. Contractor shall make payments for electrical service directly to the electric company.

B. Take care not to overload equipment and lines. Provide and relocate temporary electric meters as required.

C. Power: Provide power distribution as required throughout new structure 120/208 volt, 3 phase, 60 cycle AC. Termination of power distribution shall be at one location in each major section of building, approximately at center. Termination shall be provided complete with circuit breakers, disconnect switches and other electrical devices as required to protect power supply system. Submit plan showing electrical distribution locations for Architect's approval.

D. Lighting: Temporary lighting system shall be furnished, installed and maintained by Contractor as required to satisfy minimum requirements of safety and security. Temporary lighting system shall afford general illumination in building areas and supply not less than one (1) watt per square foot of floor area for illumination in areas of building where work is being performed. Provide adequate outdoor lighting to illuminate staging, stockpiles, trenches, projections, office trailers etc., to the satisfaction of the Architect, and general illumination throughout adequate for watchmen and emergency personnel.

E. Safety: All temporary equipment and wiring for power and lighting shall be furnished and installed in conformity with the National Electrical Code and in accordance with local ordinances and requirements of the municipal power authority. All temporary wiring and accessories shall be maintained in a safe manner and utilized so as not to constitute hazard to persons or property and shall be removed after they have served their purposes.

F. When permanent electrical power and lighting systems are in operating condition, they may be used for temporary power and lighting for construction purposes, provided that Contractor obtains written approval of Architect and Owner. If permanent lighting fixtures are used in temporary light, provide new lamps for fixtures used for temporary light before Substantial Completion of the Work.

G. At completion of construction work, or at such time as Contractor makes use of permanent electrical installation, temporary wiring, lighting and other temporary electrical equipment and devices shall be removed by Contractor.

1.10 TEMPORARY TELEPHONE

A. Arrange with local telephone company to provide direct line telephone service at each construction site. Provide:

1. One direct line instrument in Field Office for the Contractor with electronic answering machine.
2. Two direct line instruments in Field Office of the Clerk of the Works equipped with electronic answering machine; plus one direct line for facsimile machine in office. Turn over keys to Clerk of the Works and Architect.
3. Two (2) Nextel Motorola i530 Mobile Phones with Nextel National 500 Plans for use by the Clerk of the Works.
4. High Speed internet access and router via DSL, Broadband, Cable, or equal with unlimited internet access to the Field offices of the Contractor and Clerk of the Works.
5. Other instruments at the option of the Contractor, or as required by regulations.
6. Each Subcontractor shall make his own arrangements for telephone service.

B. Pay for installation and removal of temporary telephones and facsimile lines and for all calls and fixed charges in connection therewith; including unlimited long-distance calling.

C. Temporary telephone services shall be maintained until Substantial Completion of the Work.

1.11 TEMPORARY SANITARY FACILITIES

A. Contractor shall provide an adequate number of toilet facilities with chemical type toilets and temporary lighting rented from and serviced by an approved company, as necessary for all persons engaged on the Work. Provide separate facilities for male and female workers.

B. Toilets shall be erected in location approved by the Architect, shall be maintained by the Contractor in a clean and orderly condition in compliance with all local and State health requirements, and shall be removed at Substantial Completion of the Work.

C. Permanent toilet facilities shall not be used by the Contractor, Subcontractors or any persons engaged by them during the course of work under this Contract.

1.12 TEMPORARY FIRE PROTECTION

A. Provide and maintain adequate temporary fire protection in the form of barrels of water with buckets, fire bucket tanks, fire extinguishers, or other effective means of extinguishing fire, ready for instant use, distributed around the Project and in and about temporary inflammable structures during construction of the Work.

B. Within 30 calendar days after award of Contract, the Contractor shall submit in writing to the Architect, three (3) copies of his proposed methods for fire protection that have been reviewed and approved by the local Fire Department. Post a copy of the approved fire protection plan in the Field Office for reference.

C. Gasoline and other flammable liquids shall be stored in and dispensed from UL listed safety containers in conformance with National Board of Fire Underwriter's recommendations. Storage shall not be within building.

D. Make arrangements for periodic inspection by local fire protection authorities and insurance underwriter's inspectors. Cooperate with said authorities and promptly carry out their recommen-

dations.

E. Tarpaulins used during construction work shall be made of material that is resistant to fire, water, and weather. Tarpaulins shall have UL approval and comply with FS-CCC-D-746.

F. Torch-cutting and welding operations performed by Subcontractors shall have approval of Contractor before such work is started and chemical extinguisher shall be available within sight and not over ten (10) feet from location where such work is in progress.

G. Do not light fires in or about premises.

1.13 TEMPORARY STAIRS AND LADDERS

A. Each trade shall provide its own ladders where such ladders do not exceed a height of eight feet. Where ladders over eight feet, or stairs, steps or ramps of any height are required, the Contractor shall provide the entire installation, including the first eight feet.

B. All such apparatus, equipment and construction shall meet all requirements of Federal, State and local laws applicable thereto.

C. As soon as permanent stairs are erected, Contractor shall provide temporary protective treads, handrails, and shaft protection at stair locations.

1.14 TEMPORARY HOISTS AND CHUTES

A. Each trade shall provide its own hoists, including associated rigging, conveyance apparatus and chutes, where the maximum elevation of such hoists does not exceed a height of eight feet. Where hoists with elevations over eight feet are required, the Contractor shall provide the entire installation, including the first eight feet, and also including associated rigging, conveyance apparatus and chutes.

B. Construction, maintenance and operation of material hoists shall conform to applicable requirements of the "Standard Safety Code for Building Construction", ANSI; to AGC "Manual" requirements and to State and local regulations.

C. Temporary ladders, ramps, runways, chutes, derricks, stairs, and similar items required for proper execution of Contractor's work and that of his Subcontractors shall be properly maintained. Use of such facilities by other contractors, subcontractors and trades shall be permitted as required by construction schedule. Hoists and chutes shall be so constructed as to prevent damage, staining and marring of permanent work.

D. No materials, rubbish or debris, shall be permitted to drop free, but shall be removed by the use of material hoist and/or fully enclosed rubbish chute.

E. Provide openings in slabs, roofs, walls and partitions, where required, for moving in large pieces of equipment. Close and restore openings and finish them after equipment is in place. Structural modification, if required, shall be subject to prior written approval by the Architect.

1.15 STAGING AND SCAFFOLDING

A. Responsibility for Staging:

1. Staging eight feet or less in height: Each trade shall provide staging and scaffolding required for its work, where such staging and scaffolding does not exceed a height of eight feet.
2. Staging greater than eight feet in height: Where staging or scaffolding over eight feet high is required, the General Contractor shall provide the entire installation, including the first eight feet.
3. The General Contractor shall coordinate the use of staging and scaffolding as required to permit trades to perform the Work in a timely manner.

B. Construction Requirements for Staging: The General Contractor is responsible for safety of staging and scaffolding, including but not limited to the following requirements:

1. Staging shall be of approved design, erected and removed by experienced stage builders, and shall comply with all applicable OSHA standards.
2. Provide accident prevention devices required by State and local laws.

1.16 TEMPORARY ENCLOSURES

A. Provide temporary weather tight enclosure of exterior walls as necessary to provide acceptable working conditions, provide weather protection for interior materials, allow for effective temporary heating, and to prevent entry of unauthorized persons.

B. Provide temporary exterior doors with self-closing hardware and padlocks. Permanent door enclosures shall not be used as temporary enclosures. Other enclosures shall be removable as necessary for work and for handling of materials.

C. Refer to Section INDOOR AIR QUALITY CONTROL, for requirements for temporary interior partitions to enclose portions of the work where required for protection of indoor air quality.

D. Relocate temporary enclosures as required by progress of construction, by operations of the building, or work requirements, and to accommodate legitimate requirements of Owner and Subcontractors employed at the site.

E. Completely remove temporary materials, equipment and services when enclosure needs can be met by use of permanent construction and at completion of the Project.

1.17 PROTECTION OF WORK, PROPERTY AND THE PUBLIC

A. Furnish, erect, and maintain, until such time as removal is approved by the Architect, temporary fencing and barricades to extent recommended by OSHA and as otherwise required for the protection of life and property during operations under the Contract.

B. Construct barricades and protective facilities in accordance with local and State regulations. Furnish and install all signs, lights, reflectors, and all such protection facilities as may be required.

C. Contractor shall save the Owner harmless from all claims arising from the use of public streets, sidewalks, and adjoining premises for construction purposes.

D. Keep all access roads and walks clear of debris, materials, construction plant and equipment during building operation. Repair streets, drives, curbs, sidewalks, fences, poles and the like where disturbed in building operation and leave them in as good condition after completion of the Work as before operations started.

E. Protect all planting, landscaping, trees and site improvements to remain.

F. The Contractor shall be responsible for the maintenance of construction barriers and traffic barriers in order to maintain traffic around the Work with the maximum of safety and practical convenience to such traffic during the life of the Contract, and whether or not work has been suspended temporarily. He shall take all precautions for preventing injuries to persons or damage to property on or about the Work.

G. Work shall be carried on and barriers erected in such a manner as to provide safe passage at all times for public travel and with least obstruction to traffic. The Contractor shall provide and maintain at his own expense in a safe and passable condition such temporary bypasses created by the barriers as may be necessary to accommodate both pedestrian and vehicular traffic.

H. Whenever gale or high winds are forecast, take proper measurements to secure all loose material, equipment or other items that could blow about and be damaged or cause damage to other work. No such loose items shall be left unsecured at end of working day. Particular attention shall be taken with scaffolding and items placed or stored on roofs or within the structure prior to being enclosed.

I. Remove all snow and ice which may impede work, damage the finishes or materials, be detrimental to workers, or impede trucking, delivery, or moving of materials at the job site, or prevent adequate drainage of the site or adjoining areas.

J. Be responsible for all breakage of glass from the time construction operations commence in each portion of the Project until each portion of the Project is occupied by the Owner. Unless glass has been broken by the Owner or his representatives, or by other separate prime contractors, the cost of glass replacement shall be borne by Contractor.

1.18 SECURITY OF THE WORK

A. The Contractor shall be responsible for providing any and all security precautions necessary to insure adequate protection of his and the Owner's interests.

B. Take all required measures to protect the Work at all times against fire, storm, theft, vandalism and other losses.

C. The Contractor shall be wholly responsible for patrolling and protecting the work under construction and the materials stored on the site; and shall reimburse the Owner for any losses, damage or injury not compensated by insurance, except those directly caused by the Owner, his agents or his employees.

D. The Contractor shall rebuild, repair, restore and make good all damage to any portion of the Work occasioned by any of the above causes before completion and written acceptance of the completed Work, and shall bear the expense thereof. No extension of time will be allowed in such cases.

E. Should the Contractor fail to take prompt action whenever conditions make it necessary, the Owner may make emergency repairs or cause the same to be made, with the stipulation that the costs for such repairs shall be charged against the Contractor and deducted from monies due to him.

1.19 RODENT CONTROL

A. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents and to perform extermination and control procedures at regular intervals so Project will be free of rodents and their residues at Substantial Completion.

1. Obtain extended warranty for Owner.
2. Perform control operations lawfully, using environmentally safe materials.
3. The Contractor's attention is brought to the fact that the building will be occupied by children. Every effort shall be made to avoid applications of materials that will in any way compromise their health.

1.20 WATER CONTROL

A. Take over responsibility for site drainage in work areas upon entering the premises and maintain such drainage during the life of this Contract in a manner approved by the Architect and so as not to adversely affect adjacent areas or abutting property.

B. During the progress of the Work, provide and maintain all required pumps, suction and discharge lines, and power in sufficient number and capacity to keep all excavations, pits, trenches, foundations, and the entire property area free from accumulation of water from any source whatsoever, at all times, and under any and all circumstances and contingencies that may arise.

1.21 SNOW AND ICE CONTROL

A. De-icing Materials:

1. General: Comply with state and local regulations.

B. Snow Storage:

1. General: Comply with state and local regulations.

PART 2 - PRODUCTS

2.1 CONSTRUCTION FENCE

A. Furnish, install, maintain, and pay for temporary fencing and other protection required for the safety of the Work and of stored materials and equipment. Provide temporary construction fence as required for public safety and protection around entire construction area at the Limit of Work line, at each site as shown on Drawings. Fence shall be installed in a manner that will not impact wetlands.

B. Construction fence shall be eight (8) feet high and of chain link construction with 6 gauge wire at the top and the bottom of the fencing material, erected in a substantial manner, straight, plumb and true.

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 keys to Owner to facilitate emergency access by Owner's Security Forces and local Police and Fire Department.

D. All fencing shall be in accordance with local ordinances and shall be removed at such time be-

fore Final Acceptance as the Architect directs. Restore site to acceptable condition after removing fence.

E. Vehicular access to the site, and parking for Contractor's employees' vehicles shall be restricted to the specific areas designated by the Owner.

2.2 PROJECT SIGNS

A. Provide in a location designated by the Architect one (1) sign, 4 feet by 8 feet in size, with three 4-inch by 4-inch post supports. Sign shall be fabricated from 3/4 inch thick medium density overlaid exterior plywood, edged continuously with 3/4 inch square pine banding. Apply one coat of exterior primer and two coats of exterior gloss enamel to all surfaces of sign and supports.

B. Sign shall be professionally produced and shall indicate: (1) the name of the Project, (2) the name of the Owner, (3) the name of the Contractor, (4) names and addresses of the Architect and Consulting Engineers, and (5) MSBA information. Graphic images and lettering, including type size, style and colors, will be provided by the Architect prior to beginning of construction. Architect will provide layout in electronic disc format or printed copy for sign production.

C. Provide directional signs as required to properly control construction traffic at each site.

D. No other signs or advertisements will be allowed on building or premises.

E. Erect where required for DEP File No. in accordance with Wetland Regulations and the Order of Conditions where applicable.

2.3 TEMPORARY OFFICES

A. Provide, maintain, and pay all costs in connection with temporary offices; including but not limited to office furniture, office equipment, and exhaustible office supplies.

B. In addition to his own requirements, the Contractor shall provide and bear all costs for completely enclosed weathertight structure equal to Williams Scotsman Model MO6012; not less than 60'-0" x 12'-0" in area for use of the Owner, the Architect, and their representatives. The trailer shall have two offices and a conference room, a reasonable amount of natural light, adjustable natural ventilation, and two exterior doors with dead bolt locks accessible and keyed from the outside. In addition include the following equipment:

1. One private toilet facility with running water within the structure.
2. Heat during cold weather below 55 degrees F.
3. One layout table, approximately 36" x 84" with one drafting stool and two drafting lamps with bulbs.
4. Two desks (30x60 standard double pedestal)and two desk chairs (swivel type with arms) in separate offices. One desk and one desk chair in the main area.
5. Twelve straight back folding chairs.
6. Four metal file cabinets (4 drawers each) with locks.
7. One plan rack to accommodate at least 6 sets of drawings.
8. Two desk-type telephones.
9. One electronic telephone answering machine.
10. One coat rack, two wastepaper baskets, and one 30"x40" wall-mounted tackboard.
11. One exterior high quality mercury thermometer.
12. Air conditioning during weather above 75 degrees F.

13. Two conference tables, 36" x 72" and 8'-0" of 12" deep shelving.
14. Sufficient number of electric lights (50 fc at desk level over entire area) and outlets.
15. One electrostatic copying machine, capable of copying, sorting, stapling, and collating equal to Xerox model XC830 or Sharp Z-820 with toner and drum cartriges. The copier shall have a 100-sheet paper drawer, able to reduce 30%, enlarge 40% and produce letter and legal size copies. Provide letter and legal size paper supply for the duration of the work
16. One facsimile transmitting and receiving machine with dedicated telephone line.
17. Once digital camera equal to USA PowerShot S45 and direct interface data cable.
18. Supplies: Office supplies, including toners for all equipment, four (4) pairs of boots, four hard hats, and raincoats, one water-cooler with refrigerator, paper cups, and weekly bottle replacement for the duration of the project.
19. One industrial quality wall-mounted first aid kit sized and supplied for 10 people.
20. One automatic coffee machine.
21. One new computer equal to or better than a Dell Dimension 4550 Series Pentium 4 processor at 2.66 GHz w/ 533 MHz front side bus/512K L2 Cache, 333MHz DDR SDRAM, 512mb RAM. Include a Dell quitekey keyboard, a new 17 in E171 FPb Flat Panel Display, a Video Card equal to or better than 64mb DDR NVIDIA GeForce MX Graphics Card with TV-Out, a Hard Drive with a minimum of 60 GB Ultra ATA/100 7200 RPM, a 3.5 floppy disk drive, an operating system equal to MS Windows XP Professional, a Logitech Optical USB or equal mouse, a Network to include Integrated Intel Pro 10/100 Ethernet or equal and related cord, a 56K PCI Data/Fax Modem and related cord, a CD/DVD Drive equal to 48x/24x/40x Max CD-RW/DVD Combo Drive, a Sound Card equal to Sound Blaster Live 5.1 Digital Sound Card, a Speaker equal to Harmon Kardon HK-206, a zip drive equal to 250 mb lomega ZIP Built-in Drive, and Software equal to MS Office XP Small Business. All items, including related power cords, adapters, surge suppressors, and other misc items necessary to operate the equipment are to be installed and made operational for use by the Owner.
22. One printer equal to the HP Officejet all-in-one printer/scanner/fax; include all related cables and driver software.

C. Heat and Air Conditioning shall be maintained to provide an indoor air temperature of 76 degrees F at 72 inches above the floor and throughout the space during the cooling season and 70 degrees F at 30 inches above the floor during the heating season.

D. Electrical Convenience Power: Provide convenience outlets for at least 2400 watts and at least 2 convenience circuits independent of the lighting, equipment power, and heating needs.

E. Offices shall be located in location approved by the Architect, shall be maintained by the Contractor in a clean and orderly condition, and shall be removed at Substantial Completion. The Contractor shall provide a cleaning service in each office at regular intervals (at least weekly).

F. Provide routine emergency service for office equipment specified and reasonable quantities of expendable supplies as required for job related use. When the sitework and building has been completed to the extent that removal of the temporary structures is required, the Contractor shall provide a fully organized and connected temporary office spaces within the building located in and area approved by the Architect.

G. All office equipment provided under this Section shall be the property of the Contractor and shall be removed at Substantial Completion; except the computer, camera, printer, and associated hardware and software for which the titles and licenses shall be transferred to the Awarding Authority before final acceptance of the Project.

PART 3 - EXECUTION (NOT USED])

END OF SECTION

SECTION 017329

CUTTING AND PATCHING

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. This Section covers procedural requirements for cutting and patching, including but not limited to the following:

1. Standard requirements for all cutting and patching to be done on the Project, whether by the General Contractor, Filed Sub-Contractors or other subcontractors.

B. Refer to the following Sections for related work:

1. Section 015000 – TEMPORARY FACILITIES AND CONTROLS, for temporary protection, shoring and construction aids.
2. Section 017400 – CONSTRUCTION WASTE MANAGEMENT, for disposal of demolished materials.
3. Division 2 through Division 14 Sections, for specific requirements and limitations applicable to cutting and patching individual parts of the Work.
4. Section 033000 – CAST-IN-PLACE CONCRETE, for cutting, patching and repair of concrete.
5. Section 042000 – UNIT MASONRY, for cutting and patching of existing masonry for the work of all trades, unless otherwise provided herein.
6. Section 042000 – UNIT MASONRY, for installation of lintels where required for all penetrations through new and existing masonry.
7. Section 055000 – METAL FABRICATIONS, for furnishing of lintels where required for all penetrations through new and existing masonry.
8. Division 9 – FINISHES, for all patching of new and existing construction, except for masonry and concrete.
9. Section 090007 – PAINTING AND COATING, for final preparation of existing, new and patched surfaces as required for application of paint, and for paints and coatings applied to patched surfaces.
10. Division 22, 23 – PLUMBING AND MECHANICAL and Division 26 – ELECTRICAL, for coring and drilling for all items to be installed by mechanical and electrical trades, except as otherwise indicated.
11. Division 22, 23 – PLUMBING AND MECHANICAL and Division 26 – ELECTRICAL, for items to be installed by mechanical and electrical trades, except as otherwise indicated.

1.3 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other Work.

B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

C. Coring: Any new penetration cut through existing or new construction using core drill and measuring no more than 6 inches in diameter, or 6 inches by 6 inches. Larger cores are considered under cutting.

1.4 RESPONSIBILITY FOR CUTTING AND PATCHING

A. General: All cutting and patching shall conform to the requirements of this Section, whether or not the work is to be done by the Contractor, a Filed Subcontractor or other Subcontractor.

1. Patching shall be performed so as to maintain the integrity of acoustical rating of adjacent construction.
2. Refer to Section 078410 – FIRESTOPPING, for requirements for maintaining the integrity of fire-rated construction at penetrations.

B. Coordination: The General Contractor shall be responsible for the following:

1. Obtain locations and dimensions of penetrations required through walls and floors from trades requiring penetrations.
2. Coordinate those penetrations with the requirements of other trades.
3. Forward locations and dimensions of requested penetrations to the trades responsible for performing the cutting and patching work.

C. Modifications with Structural Implications:

1. Non-masonry construction: Provide new penetrations and other work where modification to existing structural elements is shown on the Drawings.
2. Masonry construction: Coordinate the work of Subcontractors as required where modification to existing load-bearing masonry is shown on the Drawings.
3. Do not perform any work that will alter existing structural elements unless it is shown on the Drawings or proposed alterations have been approved in writing by the Architect.
4. Structural elements include, but are not limited to, the following: Steel beams and columns, structural masonry walls, reinforced concrete slabs.

D. Coring: All coring shall be performed by the trade requiring the new penetration.

E. New Penetrations in Masonry Construction:

1. Exposed masonry and all masonry bearing walls: All cutting and patching shall be performed under Section 042000 – UNIT MASONRY, with lintels furnished under Section 055000 – METAL FABRICATIONS where required.
2. Concealed portions of non-bearing masonry walls:
   a. Small penetrations where no lintel will be required shall be provided under Section 042000 – UNIT MASONRY.
   b. Larger penetrations requiring a lintel shall be provided under Section 042000 – UNIT MASONRY, with lintels furnished under Section 055000 – METAL FABRICATIONS.
3. Structural criteria for new openings in masonry walls: Bring the following conditions to the attention of the Structural Engineer for determination of whether a lintel or other reinforcement will be required.
   a. Non-load-bearing masonry walls: Any opening wider than one block or 16 inches.

b. Load-bearing masonry walls: Any opening wider than 6 inches.

F. New Penetrations in Non-Masonry Construction:

1. Exposed locations: Cutting and patching shall be provided by the trade(s) responsible for surrounding construction.
2. Concealed locations: Cutting and patching shall be provided by the trade(s) responsible for surrounding construction.
3. Locations at roof: Cutting and patching of roof deck and substrate shall be coordinated with the work of Section 075300 – ELASTOMERIC MEMBRANE ROOFING.

1.5 QUALITY ASSURANCE

A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio. Structural elements include but are not limited to the following:

1. Reinforced concrete columns and beams. Coring of concrete foundation walls and slabs will be permitted where shown on drawings or required for mechanical and electrical work.
2. Reinforced masonry bearing walls.
3. Steel columns, beams, joists and connections.

B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operating elements include but are not limited to the following:

1. Primary operational systems and equipment.
2. Air or smoke barriers.
3. Partitions and other construction required to provide acoustical separation.
4. Fire-suppression systems.
5. Mechanical systems piping and ducts.
6. Control systems.
7. Communication systems.
8. Conveying systems.
9. Electrical wiring systems.

C. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Miscellaneous elements include but are not limited to the following:

1. Water, moisture, or vapor barriers.
2. Membranes and flashings.
3. Exterior curtain-wall construction.
4. Equipment supports.
5. Piping, ductwork, vessels, and equipment.
6. Noise- and vibration-control elements and systems.

D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic

qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

1.6 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.

1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.

B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations. Refer to Section 015000 – Temporary Facilities and Controls for additional requirements.

C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

3.3 PERFORMANCE

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance

of other construction, and subsequently patch as required to restore surfaces to their original condition.

2. Cutting of openings in roofs shall be delayed as long as feasible, and preferably until the Roofing Subcontractor is at the site and can provide permanent roof covering immediately. Otherwise, protect roof openings so made in a weather tight manner until permanent roof is installed. Protect existing roofing to remain. Do not damage or alter existing roofing and flashing to remain when doing work under this Section. Refer to Section 015000 – TEMPORARY FACILITIES AND CONTROLS, for additional requirements for protection from the weather.

B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces, in such a manner as to ensure a minimal difference between the cut area and new materials when patched..
3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
5. Mechanical and Electrical Services: Use extreme care when cutting through construction containing concealed mechanical and electrical lines. Coordinate cutting and patching work with the following work to be performed under Division 21, 22, 23 and 26 Sections.
   a. Cut off pipe or conduit in walls or partitions to be removed.
   b. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
6. Hazardous Materials: If unanticipated hazardous materials which would be disturbed by cutting and patching are discovered at any time during the course of work, cease work in the affected area only and continue work in other areas, and notify Architect and the Owner of such discovery. Do not proceed with work in such affected areas until written instructions are received.
7. Proceed with patching after construction operations requiring cutting are complete.

C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
   a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
3. Restore damaged pipe covering to its original condition.
4. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even

surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

5. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
6. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weather tight condition.

3.4 DEBRIS REMOVAL AND CLEANING

A. Dispose of all materials under Section 017400 – CONSTRUCTION WASTE MANAGEMENT.

B. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION

SECTION 017400

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 DESCRIPTION OF WORK

A. This Section includes administrative and procedural requirements for the following waste handling operations for the Work of the Contractor and all Subcontractors:

1. Salvaging nonhazardous construction and demolition waste.
2. Recycling nonhazardous construction and demolition waste.
3. Disposing of nonhazardous construction and demolition waste.

B. Related Sections include the following:

1. Section 015000 – TEMPORARY FACILITIES AND CONTROLS, for environmental-protection measures during construction.
2. Section 042000 – UNIT MASONRY, for disposal requirements for masonry waste.

1.3 DEFINITIONS

A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.

C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.4 SUBMITTALS

A. Waste Management Plan: Submit 3 copies of plan within 21 days of date established for the Notice to Proceed.

B. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit three copies of report. Include separate reports for demolition and construction waste. Include the following information:

1. Material category.
2. Generation point of waste.
3. Total quantity of waste in tons.
4. Quantity of waste salvaged, both estimated and actual in tons.
5. Quantity of waste recycled, both estimated and actual in tons.
6. Total quantity of waste recovered (salvaged plus recycled) in tons.
7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.

C. Waste Reduction Calculations: Before request for Substantial Completion, submit three copies of calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.

D. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.

E. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.

F. 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, receipts, and invoices.

G. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

H. Qualification Data: For Waste Management Coordinator and refrigerant recovery technician.

I. 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.

1.5 QUALITY ASSURANCE

A. Waste Management Coordinator Qualifications: 5 years minimum experience.

B. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.

C. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

D. Waste Management Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to waste management including, but not limited to, the following:

1. Review and discuss waste management plan including responsibilities of Waste Management Coordinator.
2. Review requirements for documenting quantities of each type of waste and its disposition.
3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
5. Review waste management requirements for each trade.

1.6 WASTE MANAGEMENT PLAN

A. General: Develop plan consisting of waste identification, waste reduction work plan, and cost/revenue analysis. Include separate sections in plan for demolition and construction waste. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.

B. Waste Identification: Indicate anticipated types and quantities of demolition site-clearing and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.

C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.

1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
6. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location on Project site where materials separation will be located.

D. Cost/Revenue Analysis: Indicate total cost of waste disposal as if there was no waste management plan and net additional cost or net savings resulting from implementing waste management plan. Include the following:

1. Total quantity of waste.
2. Estimated cost of disposal (cost per unit). Include hauling and tipping fees and cost of collection containers for each type of waste.
3. Total cost of disposal (with no waste management).

4. Revenue from salvaged materials.
5. Revenue from recycled materials.
6. Savings in hauling and tipping fees by donating materials.
7. Savings in hauling and tipping fees that are avoided.
8. Handling and transportation costs. Include cost of collection containers for each type of waste.
9. Net additional cost or net savings from waste management plan.

E. Forms: Prepare waste management plan on forms included at end of Part 3.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

A. General: Implement waste management plan as approved by Architect. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.

1. Comply with Division 1 Section "Temporary Facilities and Controls" for operation, termination, and removal requirements.

B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan. Coordinator shall be present at Project site full time for duration of Project.

C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.

1. Distribute waste management plan to everyone concerned within three days of submittal return.
2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.

D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
2. Comply with Division 1 Section "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.2 SALVAGING DEMOLITION WASTE

A. Salvaged Items for Reuse in the Work:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until installation.

4. Protect items from damage during transport and storage.
5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.

B. Salvaged Items for Owner's Use:

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 Owner.
4. Transport items to Owner's storage area designated by Owner.
5. Protect items from damage during transport and storage.

C. Doors and Hardware: Brace open end of doorframes. Except for removing door closers, leave door hardware attached to doors.

3.3 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

A. General: Recycle paper and beverage containers used by on-site workers.

B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Contractor.

C. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical.

1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
   a. Inspect containers and bins for contamination and remove contaminated materials if found.
2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.
5. Remove recyclable waste off Owner's property and transport to recycling receiver or processor.

3.4 RECYCLING DEMOLITION WASTE

A. Asphaltic Concrete Paving: Grind asphalt to maximum 1-1/2-inch (38-mm) size.

1. Crush asphaltic concrete paving and screen to comply with requirements in earthwork specification for use as general fill.

B. Asphaltic Concrete Paving: Break up and transport paving to asphalt-recycling facility.

C. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.

1. Pulverize concrete to maximum 1-1/2-inch (38-mm) size.
2. Crush concrete and screen to comply with requirements in earthwork specification for use as satisfactory soil for fill or subbase.

D. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.

1. Pulverize masonry to maximum 1-1/2-inch (38-mm) size.
   a. Crush masonry and screen to comply with requirements in earthwork specification for use as general fill.
   b. Crush masonry and screen to comply with requirements in landscape specification for use as mineral mulch.
2. Clean and stack undamaged, whole masonry units on wood pallets.

E. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.

F. Metals: Separate metals by type.

1. Structural Steel: Stack members according to size, type of member, and length.
2. Remove and dispose of bolts, nuts, washers, and other rough hardware.

G. Asphalt Shingle Roofing: Separate organic and glass-fiber asphalt shingles and felts. Remove and dispose of nails, staples, and accessories.

H. Gypsum Board: Stack large clean pieces on wood pallets and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.

I. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.

1. Separate suspension system, trim, and other metals from panels and tile and sort with other metals.

J. Carpet and Pad: Roll large pieces tightly after removing debris, trash, adhesive, and tack strips.

1. Store clean, dry carpet and pad in a closed container or trailer provided by Carpet Reclamation Agency or carpet recycler.

K. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.

L. Plumbing Fixtures: Separate by type and size.

M. Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.

N. Lighting Fixtures: Separate lamps by type and protect from breakage.

O. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.

P. Conduit: Reduce conduit to straight lengths and store by type and size.

3.5 RECYCLING CONSTRUCTION WASTE

A. Packaging:

1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
2. Polystyrene Packaging: Separate and bag materials.
3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

B. Site-Clearing Wastes: Chip brush, branches, and trees on-site.

1. Comply with landscape specification requirements for use of chipped organic waste as organic mulch.

C. Wood Materials:

1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.
   a. Comply with landscape specification requirements for use of clean sawdust as organic mulch.

D. Gypsum Board: Stack large clean pieces on wood pallets and store in a dry location.

1. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.
   a. Comply with landscape specification requirements for use of clean ground gypsum board as inorganic soil amendment.

3.6 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

C. Disposal: Transport waste materials off Owner's property and legally dispose of them.

END OF SECTION

SECTION 017700

CLOSEOUT PROCEDURES

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. The Work of this Section includes, but is not limited to, requirements for the following procedures:

1. Final cleaning
2. Temporary and trial usage
3. Warranties and bonds
4. Closeout requirements
5. Inspection and Submittals for Substantial Completion
6. Monetized Punch List Inspections
7. Final Inspection and Submittals
8. Final application and certificate for payment
9. Post-construction inspection

B. Related Work includes, but is not limited to, the following Work under other Sections:

1. Dates for Substantial Completion and Final Completion: Section 002113 – INSTRUCTIONS TO BIDDERS.
2. Procedures related to Architect's additional services if required to complete closeout of Project: Section 011400 – WORK RESTRICTIONS
3. Construction schedule requirements: Section 013200 – CONSTRUCTION PROGRESS DOCUMENTATION.
4. Temporary facilities to be removed at the end of the Project: Section 015000 – TEMPORARY FACILITIES AND CONTROLS.
5. Documents to be submitted as part of Closeout Requirements: Section 017839 – PROJECT RECORD DOCUMENTS

1.3 SUBMITTALS

A. Warranties and Bonds: As specified herein.

B. Punch Lists: As specified herein.

C. Submittals for Substantial Completion: As specified herein.

D. Final Submittals: As specified herein.

PART 2 - PRODUCTS

2.1 CLEANING MATERIALS

A. Refer to Section 011400 WORK RESTRICTIONS for cleaning materials.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. Before final inspection, thoroughly clean the entire exterior and interior areas of the building where construction work has been performed, the immediate surrounding areas, and corridors, stairs, halls, storage areas, temporary offices, and toilets.

1. Allow adequate time in Construction Schedule to perform thorough final cleaning of entire Project.

B. Refer to Section 011400 WORK RESTRICTIONS for general requirements for cleaning and for cleaning products, and refer to individual specification sections for cleaning requirements for particular products.

C. Employ experienced workmen or professional cleaners for final cleaning operations.

D. Remove all construction facilities, debris, and rubbish from the Owner's property and legally dispose of same beyond site limits.

E. Broom clean exterior paved surfaces, and rake clean other surfaces of the grounds.

F. Sweep, dust, wash, and polish all finished surfaces. This includes cleaning of the Work of all finished trades where needed, whether or not cleaning for such trades is included in their respective Sections.

G. Remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels, and other foreign materials from exposed interior and exterior surfaces.

H. Leave pipe and duct spaces, chases, and furred spaces thoroughly clean.

I. Wash and polish all new glass on both sides, such Work shall be performed by a contractor specializing in a window cleaning work.

J. Clean all ceilings, wall surfaces, floors, window and door frames, hardware, metal work, glass, glazing, enameled metals, and the like.

K. Repair, patch and touchup marred surfaces to specified finish, to match adjacent surfaces.

L. Each Subcontractor for mechanical and electrical work, including Plumbing, HVAC, Fire Protection, and Electrical Work shall clean materials and equipment for which they are responsible,

leaving the Work in a finished and clean state.

M. For each mechanical unit that has been in operation during construction, Contractor shall clean permanent filters and replace disposable filters with new filters as specified for that mechanical unit, and shall also clean ducts, blowers and coils associated with that unit.

N. Prior to final completion, Contractor shall conduct an inspection of sight-exposed interior and exterior surfaces and all work areas, to verify that the entire Work is clean.

O. Owner will assume responsibility for cleaning as of time designated on Certificate of Substantial Completion for Owner's acceptance of Work or portion thereof.

3.2 TEMPORARY AND TRIAL USAGE

A. Temporary or trial usage by Owner of any mechanical device, machinery, apparatus, equipment, or any Work or materials supplied under the Contract before final completion and written acceptance by the Architect shall not be construed as evidence of acceptance as same.

B. The Owner reserves the privilege of such temporary or trial usage for such reasonable time as required to properly test such item. Claims for damages due to injury to or breaking of any parts of such Work, when the determined cause is weakness or inaccuracy of structural parts, defective material or workmanship, will not be allowed.

C. If the Owner so requests, place an approved person or persons to instruct and assist in such trial usage and bear the costs therefore. Trials shall be made under the Architect's supervision.

3.3 WARRANTIES AND BONDS

A. Compile specified warranties and bonds, review to verify compliance with Contract Documents, and submit to Architect for review and subsequent transmittal, if approved, to the Owner.

B. Assemble two original signed copies of warranties, bonds and service and maintenance contracts executed by Officers of each of the respective manufacturers, suppliers and subcontractors.

C. Neatly type Table of Contents in orderly sequence. Provide complete information for each item:

1. Product or work item identification.
2. Manufacturing or supplying firm, with name of principal, address and telephone number.
3. Scope of work and of warranty provided.
4. Date of beginning of warranty, bond or service and maintenance contract. Commence upon date of Substantial Completion.
5. Duration of warranty, bond or service maintenance contract. (In no case less than one (1) year).
6. Information for Owner's personnel:
   a. Proper procedure in case of failure.
   b. Instances which might affect validity of warranty or bond.
7. Contractor, name of responsible principal, address and telephone number.

D. Form of Submittals: Prepare in duplicate packets and in the following format:

1. Size: 8-1/2" x 11". Punch sheets for 3-ring binder. Z-Fold larger sheets to fit into binders.
2. Cover: Identify each packet with types or printed title "WARRANTIES AND BONDS". List Title of Project, Date and Name of Contractor.
3. Binders: Commercial quality, three-”D”-ring, with durable and cleanable plastic covers.

E. Time of Submittals:

1. For equipment or component parts of equipment put into service during progress of construction, submit documents within ten (10) days after inspection and acceptance. Otherwise, make submittals before Date of Substantial Completion.
2. For items of Work where acceptance is delayed materially beyond the Date of Substantial Completion, provide updated submittal within ten days after acceptance, listing the date of acceptance as the start of the warranty period.

F. Submittals Required: Submit warranties, bond, service and maintenance contracts as specified in the respective Sections of the Specifications.

3.4 CLOSEOUT REQUIREMENTS

A. Punch List: When the Contractor submits a complete list of items to be completed or corrected in accordance with subparagraph 9.8.2 of the GENERAL CONDITIONS and the Architect receives the list, the Architect will make an inspection to determine whether the Work or designated portion is substantially complete. The Contractor shall submit a schedule indicating when each item will be completed.

B. If the Architect determines that the Contractor's list is not complete, the Architect will notify the Contractor. The Contractor shall provide a complete list before the Architect will complete his inspection.

C. If the Architect's inspection discloses any item whether or not included on the Contractor's list, which is not in accordance with the requirements of the Contract Documents, the Architect will add the item to the list and will issue a punch list of items to be completed or corrected before final payment will be made. Such punch list shall not be construed as all-inclusive of the work which the Contractor will be required to perform before final payment.

D. Substantial Completion: Architect will prepare and issue a Certificate of Substantial Completion, AIA G704, complete with signatures of Owner and Contractor, accompanied by list of items to be completed or corrected, as verified and amended by the Architect. Architect will not issue certificates of Substantial Completion until the items listed below in Articles 3.05 and 3.06 have been completed and submitted.

3.5 INSPECTION FOR SUBSTANTIAL COMPLETION

A. In preparation for Substantial Completion, the Contractor shall submit written certification that:

1. Contract Documents have been reviewed.
2. Work has been inspected for compliance with Contract Documents.
3. Work has been completed in accordance with Contract Documents.
4. Equipment and systems have been tested in presence of Owner's Representative and are operational.
5. Work is completed, and ready for inspection.

B. Architect will begin inspection within seven (7) days after receipt of above referenced Contractor's Certification.

C. Should the Architect consider the Work is substantially complete in accordance with requirements of Contract Documents, the Architect will request Contractor to make Project Closeout submittals.

D. Should the Architect consider that the Work is not substantially complete:

1. The Architect will notify Contractor, in writing, stating reasons.
2. Contractor shall take immediate steps to remedy the stated deficiencies, and send second written notice to the Architect certifying that the Work is complete.

3.6 SUBMITTALS FOR SUBSTANTIAL COMPLETION

A. Contractor shall submit the following items at Substantial Completion:

1. Operating and Maintenance Data.
2. Schedule for training and instruction on new mechanical and electrical systems.
3. Guarantees and Warranties.
4. Keys and keying schedule.
5. Spare Parts and Maintenance Materials.
6. Roofing Guarantee and Flashing Endorsement.
7. Evidence of Compliance with requirements of governing authorities.
8. Punch list with schedule.
9. Final Record Documents

B. Evidence of compliance with authorities' requirements shall include:

1. Certificates of compliance for flame and smoke, and fire rating.
2. Certificates of Inspection:
   a. Mechanical
   b. Electrical
3. Certificate of Occupancy

C. Submit Certificate of Insurance for products and completed operations.

D. Instructions: Instruct Owner's personnel in the operation of all systems, mechanical, electrical and other equipment.

3.7 MONETIZED PUNCHLIST INSPECTIONS

A. Within 30 days of Substantial Completion, the Architect will produce a Monetized Punch List that assigns a monetary value to each item remaining incomplete or incorrect.

B. The Contractor may request two inspections by the Architect after receipt of the Monetized Punch List, for the purpose of documenting progress toward completion of items on the List.

1. If the Architect is required to inspect the Work more than twice prior to establishment of Final Completion, the Contractor shall be responsible to the Owner for costs for Additional Services of the Architect to perform additional inspections, until the Work is considered

Finally Complete.

2. Refer to Section 011400 WORK RESTRICTIONS, for procedures required in cases where Contractor is responsible for costs for Additional Services of the Architect.

3.8 FINAL INSPECTION

A. The Contractor shall complete or correct all remaining items on the Monetized Punch List in accordance with the time limits stated in the General Conditions.

B. Certification of Final Completion: When the Contractor considers that all of the items on the Monetized Punch List have been completed or corrected, the Contractor shall submit written certification that the items on the Monetized Punch List have been completed and corrected. This certification shall include a copy of the Monetized Punch List with the following information added:

1. Indicate beside each item the date when the item was completed or corrected and,
2. In the case of items completed by subcontractors or sub-subcontractors, the name of the Subcontractor or Sub-subcontractor.

C. The Architect will begin inspection within seven (7) days after receipt of such certification, to determine whether items on the Punch List have been completed.

1. Should the Architect determine that the Work is not complete after receipt of the certification of Final Completion, the Contractor shall be responsible to the Owner for costs for Additional Services of the Architect to perform additional inspections, until all items on the Punch List are completed.
2. Refer to Section 011400 WORK RESTRICTIONS, for procedures required in cases where Contractor is responsible for costs for Additional Services of the Architect.

3.9 FINAL SUBMITTALS

A. Contractor's Affidavit of Payment of Debts and Claims, AIA G706.

B. Contractor's Affidavit of Release of Liens, AIA G706A, with:

1. Consent of Surety to Final Payment: AIA G707.
2. Contractor's release or waiver of liens.
3. Separate releases or waivers of liens for subcontractors, suppliers and others with lien rights against property of Owner, together with list of those parties.

C. All submittals shall be duly executed before delivery to the Architect.

3.10 FINAL APPLICATION AND CERTIFICATE FOR PAYMENT

A. Contractor shall submit final application for payment in accordance with requirements of the GENERAL CONDITIONS.

B. Architect will issue final certificate in accordance with provisions of Conditions of the Contract.

C. Prior to issuance of the Certificate for Final Payment by the Architect, all requirements con-

tained in this Paragraph entitled "Closeout Requirements" and other requirements of the Conditions of the Contract shall be executed, received and approved by the Architect.

3.11 POST-CONSTRUCTION INSPECTION

A. Prior to expiration of one year from Date of Substantial Completion, the Owner's Project Manager will make visual inspection of Work in company with Owner and Contractor to determine whether correction of Work is required, in accordance with provisions of GENERAL CONDITIONS.

B. For guarantees beyond one year, the Owner's Project Manager will make inspection at request of Owner after notification to Contractor.

C. Owner's Project Manager will promptly notify Contractor in writing of any observed deficiencies.

END OF SECTION

SECTION 017839

PROJECT RECORD DOCUMENTS

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. The Work of this Section includes, but is not limited to, requirements for the following procedures:

1. Record prints
2. Final record drawings
3. Operations and maintenance submittals and instructions.

B. Related work includes, but is not limited to, the following work under other Sections:

1. Availability and restriction for use of project electronic files: Section 011400 Work Restrictions.
2. Availability of electronic files for preparation of record documents: Section 011400 Work Restrictions.
3. Surveying and field engineering: Section 013100 Project Management and Coordination.
4. Photographic documentation of construction: Section 013200 Construction Progress Documentation.
5. General requirements for submittals: Section 013300 Submittal Procedures.
6. Other submittals required at the completion of the Work: Section 017700 Closeout Procedures.

1.3 DEFINITIONS

A. Record Prints are full sets of black-line or blue-line prints of Contract Drawings, kept at the Project Site and marked regularly to record as-built conditions as specified herein.

B. Final Record Drawings: Reproducible drawings or electronic files prepared from completed and approved Record Prints.

C. Final Record Coordination Drawings: Reproducible drawings or electronic files prepared from updated prints of approved coordination drawings, to record as-built conditions.

1.4 SUBMITTALS

A. Record Prints: Periodic submittal of prints of Drawings marked to indicate Work completed and changes in the Work, as specified in this Section:

1. Record Prints
2. Coordination Drawing Record Prints

B. Final Record Drawings: Reproducible drawings, as specified in this Section:

1. Final Record Drawings
2. Final Record Coordination Drawings

C. Operations and Maintenance Submittals:

1. Maintenance Manuals
2. Schedule of Training and Instruction for mechanical and electrical systems.

PART 2 - PRODUCTS

2.1 RECORD DOCUMENTS, GENERAL

A. The General Contractor shall maintain Record Prints of site plans, landscape drawings, architectural drawings, and structural drawings.

B. Filed Sub-Contractors shall maintain Record Prints of the Work of the following Sections:

1. Section 220000 – Plumbing.
2. Section 230000 – Heating, Ventilating, and Air Conditioning.
3. Section 260000 – Electrical Work.

2.2 RECORD PRINTS

A. During the progress of the Work, the General Contractor shall keep on file at all times two (2) complete and separate sets of black line prints of the entire set of Contract Drawings. Each set shall be updated daily to record the following information:

1. Status of Work: One set shall be used to indicate the progress of the Work installed by coloring in the various pipelines, ducts, and apparatus as erected.
2. Revisions: The second set shall be accurately and promptly updated with colored inks, daily as the Work progresses, to accurately record all revisions to the Work, including, but not limited to, the following:
   a. Fire Protection, Plumbing, Heating and Ventilating, and Electrical Work, wherever Work was installed other than as shown on the Contract Drawings or described in the Specifications
   b. Locations, elevations, sizes, etc. of all concealed and buried utilities, ducts, and services, including exterior utility and storm drainage lines.
   c. The General Contractor shall be responsible for assuring that the various revisions are delineated by the specific trades involved.
3. Both sets shall be kept available at all times for use and inspection by the Architect and the Owner.

B. Refer to Section 011400 Work Restrictions for Project Electronic Files to be made available for use by the Contractor in the preparation of Final Record Drawings.

C. Transfer all information from the updated Record Prints to the electronic files at least once every

three months.

1. Submit three prints of each updated drawing to the Architect at least three times during construction: when the work is approximately 1/4, 1/2, and 3/4 complete.
2. When roughing in for any particular area is completed, it shall be shown on the Record Prints and a copy submitted for Architect's review.

2.3 FINAL RECORD DRAWINGS

A. Before completion of the Work, and when directed by the Architect, the General Contractor and all indicated subcontractors shall perform the following:

1. Transcribe all previously recorded information from Record Prints onto the electronic files.
2. Make all final changes and corrections to the electronic files for the Final Record Drawings.
3. Signatures Required: The General Contractor or Filed Sub-Contractor shall sign each drawing for which they are responsible, as certification that the work was installed as shown.
4. Deliver signed, completed Final Record Drawings to Architect.

B. Acceptance by the Architect of the completed Final Record Drawings shall be a prerequisite for Substantial Completion.

C. Shop Drawings will not be acceptable as Final Record Drawings for the Project.

D. The Architect shall be the sole judge of the acceptability of Final Record Drawings.

E. Special Requirements for Final Record Drawings of Site Work:

1. Record Drawings for exterior utilities and other items below grade shall include accurate locations of the following:
   a. The points where such items enter the building and property lines.
   b. All turns, offsets, and other changes in direction below grade.
   c. All valves and other appurtenances.
2. Indicate locations of these items using dimensions to adjacent permanent benchmarks or structures as approved by the Architect. Reliance on scale only to locate any temporary or concealed construction will not be acceptable.
3. Final Record Drawings for work below grade shall be submitted immediately upon completion of utility line installation and prior to concealment of the work
4. Refer to Division 2 Sections for additional requirements for Final Record Drawings of site work.

2.4 RECORD COORDINATION DRAWINGS

A. Record progress of the Work and modifications and corrections on a set of prints of approved coordination drawings. Follow procedures as for Record Prints.

B. Final Record Coordination Drawings shall be prepared using information from approved record copies of coordination drawings as for Final Record Drawings.

2.5 MAINTENANCE MANUALS

A. Upon Substantial Completion of the Work, submit maintenance schedules, maintenance manuals, and all approved Shop Drawings, presenting full details for care and maintenance of visible surfaces and all equipment furnished and installed under the Contract.

B. Maintenance manuals shall consist of manufacturer's catalog cuts with descriptive information, lubricating and maintenance instructions, parts lists, usage instructions, names, addresses and telephone numbers where replacement parts and service can be quickly obtained, and all other information required for the Owner to use, maintain, and service the items properly.

C. Upon Architect's approval of drafts, submit two (2) corrected copies properly bound in a logical and well arranged order, with index, to the Architect for transmittal to the Owner.

PART 3 - EXECUTION

3.1 TRAINING AND INSTRUCTIONS

A. The Contractor shall arrange for instruction for the Owner's employees, to insure proper operation of the equipment furnished.

1. It is the intent of this paragraph to require the Contractor and the applicable Subcontractors to furnish as much detailed instruction as is necessary to educate the Owner’s on-site personnel in the proper use of the equipment.
2. This instruction shall be provided by a qualified trainer who is also a manufacturer’s certified technician with expertise with the specific system or equipment for which training is required. In some cases, this may require more than one visit to the Project by those responsible for the instruction.
3. The Contractor and, in particular, the Plumbing, Heating and Ventilating, and Electrical Subcontractors shall not assume that the Owner's employees possess special expertise or have had any previous experience whatsoever in the operation and maintenance of sophisticated mechanical and electrical equipment.
4. Submit the schedule for instructional sessions to the Owner. Do not proceed with instruction until Owner has approved schedule.
5. Refer to specific technical sections for additional requirements specific to particular equipment and systems.

B. For major items of mechanical and electrical equipment, instructions and demonstrations shall be performed during the initial start-up period and, if necessary, during one or more return visits as may be required.

C. Videotape: Instruction sessions and demonstrations shall be videotape-recorded by professional videographers in VHS format, using tripods, broadcast-quality video cameras and proper lighting. Close-ups of items being demonstrated shall be included. Sound recording shall be clear and perfectly intelligible. Tapes shall be edited as required to provide a permanent reference. Each session and demonstration shall be included, except where waived by the Architect, and all tapes shall be properly labeled as to date, subject, and presenter. Provide two (2) copies of each tape.

END OF SECTION

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. 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.
4. Maintenance, watering and care of trees designated to remain by a certified arborist during the construction period.
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 interruption to utilities serving occupied areas. If interruption is required, obtain written permission from the utility company and the Owner. Provide temporary services as necessary to serve occupied and usable facilities when permanent utilities must be interrupted, or 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 are specified under the designated Sections:

1. Section 011000 - GENERAL REQUIREMENTS for Temporary Facilities And Controls:
   a. Maintenance of access, cleaning during construction, dust and noise control.
2. Section 017400 - CONSTRUCTION WASTE MANAGEMENT:
   a. Waste management and recycling.
3. Division 21 - FIRE PROTECTION:

a. 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 21 - FIRE PROTECTION. Removal and storage of such materials shall be then done under this Section 024100 - DEMOLITION.
b. Disconnect and reinstallation of fire protection equipment temporarily interrupted during construction.

4. Division 22 - PLUMBING:
   a. 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 - PLUMBING. Removal and storage of such materials shall be then done under this Section 024100 - DEMOLITION.
   b. Disconnect and reinstallation of plumbing equipment temporarily interrupted during construction.
5. Division 23 - HEATING, VENTILATING AND AIR CONDITIONING:
   a. 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 this Section 024100 - DEMOLITION.
   b. Disconnect and reinstallation of HVAC equipment temporarily interrupted during construction.
6. Division 26 - ELECTRICAL:
   a. Disconnecting, capping and otherwise making inactive existing electrical services in areas where demolition and removal work is required. Electrical tradesmen will disconnect, cap, inactivate and lower to floor such items where required to be removed under Division 26 - ELECTRICAL. Removal and storage of such materials shall be then done under this Section 024100 - DEMOLITION.
   b. Disconnect and reinstallation of electrical equipment temporarily interrupted during construction.
7. Division 31 - EARTHWORK:
   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 Owner ready for reuse, at a location designated by the Owner. Protect from weather until accepted by Owner.

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 Owner that may be encountered during selective demolition remain property of the Owner as applicable. Carefully remove each item or object in a manner to prevent damage and deliver promptly to a location acceptable to the Owner.

1.5 SUBMITTALS

A. 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 Owner'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 Owner's continuing occupancy of portions of existing building and of Owner’s partial occupancy of completed Work.
7. Means of protection for items to remain and items in path of waste removal from building.

B. Inventory: After selective demolition is complete, submit a list of items that have been removed and salvaged, and turned over the Owner.

C. 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.

D. 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 017400 - CONSTRUCTION WASTE MANAGEMENT.

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 011000 - GENERAL REQUIREMENTS, Project Meetings. 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 Architect.

E. Engage a professional engineer registered in the state that the project is located 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 Owner.
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 Architect. Do not proceed with work in such areas until instructions are issued by the Architect. 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 011000 - GENERAL REQUIREMENTS, 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 Architect 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 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 017400 - CONSTRUCTION WASTE MANAGEMENT.

B. 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 and cleaned and reinstalled in their original locations after selective demolition operations are complete.

C. 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 Architect and the Owner. 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 Architect, to the satisfaction of the Owner.
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 Owner'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 Architect, and to the satisfaction of the Owner.

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, 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.

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 Architect and the Owner of such discovery. Do not proceed with work in such areas until instructions are issued by the Architect. 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 Architect and the Owner of such discovery. Do not

proceed with work in such areas until instructions are issued by the Architect. 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 017400 - CONSTRUCTION WASTE MANAGEMENT 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 312000 - EARTH MOVING

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. Excavating and filling for rough grading the Site.
2. Preparing subgrades for slabs-on-grade, walks, pavements, Excavating and backfilling for buildings and structures.
3. Drainage course for concrete slabs-on-grade.
4. Subbase course for concrete walks and pavements.
5. Subbase course and base course for asphalt paving.
6. Subsurface drainage backfill for walls and trenches.
7. Excavating and backfilling trenches for utilities and pits for buried utility structures.

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for granular course if placed over vapor retarder and beneath the slab-on-grade.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of the following manufactured products required:

1. Geotextiles.
2. Controlled low-strength material, including design mixture.

B. Samples for Verification: For the following products, in sizes indicated below:

1. Geotextile: 12 by 12 inches (300 by 300 mm).

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Material Test Reports: For each on-site and borrow soil material proposed for fill and backfill as follows:

1. Classification according to ASTM D 2487.

C. Preexcavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by earth-moving operations. Submit before earth moving begins.

1.5 FIELD CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth-moving operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Utility Locator Service: "Dig Safe System" for area where Project is located before beginning earth-moving operations.

C. Do not commence earth-moving operations until temporary site fencing and erosion- and sedimentation-control measures specified in Section 015000 "Temporary Facilities and Controls."

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D 2487 or a combination of these groups; free of rock or gravel larger than 3 inches (75 mm) in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487. Groups A-2-6, A-2-7, A-4, A-5, A-6, and A-7 according to AASHTO M 145, or a combination of these groups.

1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; with at least 90 percent passing a 1-1/2-inch (37.5-mm) sieve and not more than 12 percent passing a No. 200 (0.075-mm) sieve.

E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 294/D 2940M 0; with at least 95 percent passing a 1-1/2-inch (37.5-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.

F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; with at least 90 percent passing a 1-1/2-inch (37.5-mm) sieve and not more than 12 percent passing a No. 200 (0.075-mm) sieve.

G. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; except with 100 percent passing a 1-inch (25-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.

H. Drainage Course: Narrowly graded mixture of washed crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch (37.5-mm) sieve and zero to 5 percent passing a No. 8 (2.36-mm) sieve.

I. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch (25-mm) sieve and zero to 5 percent passing a No. 4 (4.75-mm) sieve.

J. Sand: ASTM C 33/C 33M; fine aggregate.

K. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.2 GEOTEXTILES

A. Subsurface Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 2; AASHTO M 288.
2. Survivability: As follows:

   a. Grab Tensile Strength: 157 lbf (700 N); ASTM D 4632.
   b. Sewn Seam Strength: 142 lbf (630 N); ASTM D 4632.
   c. Tear Strength: 56 lbf (250 N); ASTM D 4533.
   d. Puncture Strength: 56 lbf (250 N); ASTM D 4833.

3. Apparent Opening Size: [No. 40 (0.425-mm)] sieve, maximum; ASTM D 4751.
4. Permittivity: 0.5, 0.2, 0.1 per second, minimum; ASTM D 4491.
5. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.

B. Protect and maintain erosion and sedimentation controls during earth-moving operations.

C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

3.3 EXPLOSIVES

A. Explosives: Do not use explosives.

B. Explosives: Obtain written permission from authorities having jurisdiction before bringing explosives to Project site or using explosives on Project site.

1. Perform blasting without damaging adjacent structures, property, or site improvements.
2. Perform blasting without weakening the bearing capacity of rock subgrade and with the least-practicable disturbance to rock to remain.

3.4 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
2. Remove rock to lines and grades indicated to permit installation of permanent construction.

B. Classified Excavation: Excavate to subgrade elevations. Material to be excavated will be classified as earth and rock. Do not excavate rock until it has been classified and cross sectioned by Architect. The Contract Sum will be adjusted for rock excavation according to unit prices included in the Contract Documents. Changes in the Contract Time may be authorized for rock excavation.

1. Earth excavation includes excavating pavements and obstructions visible on surface; underground structures, utilities, and other items indicated to be removed; and soil, boulders, and other materials not classified as rock or unauthorized excavation.

3.5 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch (25 mm). If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.

B. Excavations at Edges of Tree- and Plant-Protection Zones:

1. Excavate by hand or with an air spade to indicated lines, cross sections, elevations, and subgrades. If excavating by hand, use narrow-tine spading forks to comb soil and expose

roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.

2. Cut and protect roots according to requirements in Section 015639 "Temporary Tree and Plant Protection."

3.6 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.7 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches (300 mm) higher than top of pipe or conduit unless otherwise indicated.

1. Clearance: 12 inches (300 mm) each side of pipe or conduit as indicated.

C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.

1. For pipes and conduit less than 6 inches (150 mm) in nominal diameter, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
2. For pipes and conduit 6 inches (150 mm) or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe or conduit circumference. Fill depressions with tamped sand backfill.
3. For flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support conduit on an undisturbed subgrade.
4. Excavate trenches 6 inches (150 mm) deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

D. Trench Bottoms: Excavate trenches 4 inches (100 mm) deeper than bottom of pipe and conduit elevations to allow for bedding course. Hand-excavate deeper for bells of pipe.

1. Excavate trenches 6 inches (150 mm) deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

E. Trenches in Tree- and Plant-Protection Zones:

1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.
3. Cut and protect roots according to requirements in Section 015639 "Temporary Tree and Plant Protection."

3.8 SUBGRADE INSPECTION

A. Notify Architect when excavations have reached required subgrade.

B. If Architect determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

3.9 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

3.10 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
2. Surveying locations of underground utilities for Record Documents.
3. Testing and inspecting underground utilities.
4. Removing concrete formwork.
5. Removing trash and debris.
6. Removing temporary shoring, bracing, and sheeting.
7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.11 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

C. Trenches under Footings: Backfill trenches excavated under footings and within 18 inches (450 mm) of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Section 033000 "Cast-in-Place Concrete."

D. Backfill voids with satisfactory soil while removing shoring and bracing.

E. Initial Backfill:

1. Soil Backfill: Place and compact initial backfill of subbase material , free of particles larger than 1 inch (25 mm) in any dimension, to a height of 12 inches (300 mm) over the pipe or conduit.

a. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.

2. Controlled Low-Strength Material: Place initial backfill of controlled low-strength material to a height of 12 inches (300 mm) over the pipe or conduit. Coordinate backfilling with utilities testing.

F. Final Backfill:

1. Soil Backfill: Place and compact final backfill of satisfactory soil to final subgrade elevation.
2. Controlled Low-Strength Material: Place final backfill of controlled low-strength material to final subgrade elevation.

G. Warning Tape: Install warning tape directly above utilities, 12 inches (300 mm) below finished grade, except 6 inches (150 mm) below subgrade under pavements and slabs.

3.12 SOIL FILL

A. Place and compact fill material in layers to required elevations as follows:

1. Under grass and planted areas, use satisfactory soil material.
2. Under walks and pavements, use satisfactory soil material.
3. Under steps and ramps, use engineered fill.
4. Under building slabs, use engineered fill.
5. Under footings and foundations, use engineered fill.

B. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.13 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 8 inches (200 mm) in loose depth for material compacted by heavy compaction equipment and not more than 4 inches (100 mm) in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 698:

1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches (300 mm) of existing subgrade and each layer of backfill or fill soil material at 95 percent.
2. Under walkways, scarify and recompact top 6 inches (150 mm) below subgrade and compact each layer of backfill or fill soil material at 92 percent.
3. For utility trenches, compact each layer of initial and final backfill soil material at 85 percent.

3.14 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between adjacent existing grades and new grades.

2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to elevations required to achieve indicated finish elevations, within the following subgrade tolerances:

1. Walks: Plus or minus 1 inch (25 mm).
2. Pavements: Plus or minus 1/2 inch (13 mm).

C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot (3-m) straightedge.

3.15 SUBSURFACE DRAINAGE

A. Subsurface Drain: Place subsurface drainage geotextile around perimeter of subdrainage trench. Place a 6-inch (150-mm) course of filter material on subsurface drainage geotextile to support subdrainage pipe. Encase subdrainage pipe in a minimum of 12 inches (300 mm) of filter material, placed in compacted layers 6 inches (150 mm) thick, and wrap in subsurface drainage geotextile, overlapping sides and ends at least 6 inches (150 mm).

1. Compact each filter material layer to 85 percent of maximum dry unit weight according to ASTM D 698.

B. Drainage Backfill: Place and compact filter material over subsurface drain, in width indicated, to within 12 inches (300 mm) of final subgrade, in compacted layers 6 inches (150 mm) thick. Overlay drainage backfill with one layer of subsurface drainage geotextile, overlapping sides and ends at least 6 inches (150 mm).

1. Compact each filter material layer to 85 percent of maximum dry unit weight according to ASTM D 698.
2. Place and compact impervious fill over drainage backfill in 6-inch- (150-mm-) thick compacted layers to final subgrade.

3.16 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

A. Place subbase course and base course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place subbase course and base course under pavements and walks as follows:

1. Install separation geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
2. Place base course material over subbase course under hot-mix asphalt pavement.
3. Shape subbase course and base course to required crown elevations and cross-slope grades.
4. Place subbase course and base course 6 inches (150 mm) or less in compacted thickness in a single layer.
5. Place subbase course and base course that exceeds 6 inches (150 mm) in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick.

6. Compact subbase course and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

C. Pavement Shoulders: Place shoulders along edges of subbase course and base course to prevent lateral movement. Construct shoulders, at least 12 inches (300 mm) wide, of satisfactory soil materials and compact simultaneously with each subbase and base layer to not less than 95 percent of maximum dry unit weight according to ASTM D 698, ASTM D 1557.

3.17 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

A. Place drainage course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:

1. Install subdrainage geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
2. Place drainage course 6 inches (150 mm) or less in compacted thickness in a single layer.
3. Place drainage course that exceeds 6 inches (150 mm) in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick.
4. Compact each layer of drainage course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

3.18 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:

1. Determine prior to placement of fill that site has been prepared in compliance with requirements.
2. Determine that fill material classification and maximum lift thickness comply with requirements.
3. Determine, during placement and compaction, that in-place density of compacted fill complies with requirements.

B. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.

C. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.

D. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.

E. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2937, and ASTM D 6938, as applicable.

F. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.19 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.20 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

B. Transport surplus satisfactory soil to designated storage areas on Owner's property. Stockpile or spread soil as directed by Architect.

1. Remove waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 312000

SECTION 033000

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. General Notes, Sections, Plans, Typical Details, and other notes indicated on the structural drawings. In all cases of conflict, information indicated on the structural drawings and included in the structural General Notes shall govern.

1.2 SUMMARY

A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:

1. Footings.
2. Foundation walls.
3. Slabs-on-grade.

B. Related Sections include the following:

1. Division 1 Section “Sustainable Design”
2. Division 1 Section “Sustainable Design Reporting”
3. Division 1 Section “Construction Waste Management”
4. Division 1 Section “IAQ Testing”
5. Division 1 Section “Indoor Air Quality Requirements”
6. Division 2 Section "Earthwork" for drainage fill under slabs-on-grade.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1. Indicate amounts of mixing water to be withheld for later addition at Project site.

C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

D. Qualification Data: For Installer, manufacturers, and testing agency.

E. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:

1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.

F. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Form materials and form-release agents.
4. Steel reinforcement and accessories.
5. Waterstops.
6. Curing compounds.
7. Floor and slab treatments.
8. Bonding agents.
9. Adhesives.
10. Vapor retarders.
11. Semirigid joint filler.
12. Repair materials.

G. Floor surface flatness and levelness measurements to determine compliance with specified tolerances.

H. Field quality-control test and inspection reports.

I. Minutes of preinstallation conference.

J. Submittal for approval in addition to the requirements of ACI 301:

1. Schedule for concrete placement
2. Written description of hot and cold weather concreting procedures
3. Written description of method for curing concrete.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

B. 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."

C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.
2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.

D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.

E. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301, "Specification for Structural Concrete," Sections 1 through 5 and Section 7, "Lightweight Concrete."
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

F. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:

a. Contractor's superintendent.
b. Independent testing agency responsible for concrete design mixtures.
c. Ready-mix concrete manufacturer.
d. Concrete subcontractor.

2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips,

semirigid joint fillers, forms and form removal limitations, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

H. LEED Credit MRc4: Submit documentation demonstrating percentage of pre- and post-consumer content used in concrete mix for compliance with credit.

I. LEED Credit MRc5: Submit documentation demonstrating percentage of materials extracted, harvested, or recovered, as well as manufactured within a 500 mile radius of the project site for compliance with credit.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

1. Plywood, metal, or other approved panel materials.
2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:

   a. High-density overlay, Class 1 or better.
   b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
   c. Structural 1, B-B or better; mill oiled and edge sealed.
   d. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.

D. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.

E. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

F. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.
3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.2 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

B. Weldable reinforcing bars: A706/A706M-05a Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement

C. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets.

2.3 REINFORCEMENT ACCESSORIES

A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.4 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:

1. Portland Cement: ASTM C 150, Type I/II, gray.

2. Fly Ash, Slag, & Similar Pozzolans: Cement replacement by fly ash, slag, & similar pozzolans shall not exceed 25% by weight total. Where restricted by local building code, use the maximum permissible amount. Use of fly ash, slag, & similar pozzolans shall be in compliance with ASTM C 618 and ACI 318-05 Sections 4.1-4.2. Evaluate and classify fly ash, slag, & similar pozzolans in accordance with ASTM D 5759.

B. Normal-Weight Aggregates: ASTM C 33, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.

1. Maximum Coarse-Aggregate Size: 3/4 inch nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Lightweight Aggregate: ASTM C 330, 1/2-inch nominal maximum aggregate size.

D. Water: ASTM C 94/C 94M and potable.

2.5 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.

2.6 WATERSTOPS

A. Flexible PVC Waterstops: CE CRD-C 572, with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.

2.7 VAPOR RETARDERS

A. Plastic Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.

B. Granular Fill: Clean mixture of crushed stone or crushed or uncrushed gravel; ASTM D 448, Size 57, with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.

2.8 CURING MATERIALS

A. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

B. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

2.9 RELATED MATERIALS

A. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 aromatic polyurea with a Type A shore durometer hardness range of 90 to 95 per ASTM D 2240.

B. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

C. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:

1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

D. Dovetail Anchor Slots: Hot-dip galvanized steel sheet, not less than 0.0336 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.10 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109/C 109M.

B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109/C 109M.

2.11 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

C. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing or high-range water-reducing admixture in concrete, as required, for placement and workability.
2. Use water-reducing admixture in pumped concrete, concrete for heavy-use slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.

2.12 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Footings: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 4000 psi at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.45.
3. Slump Limit: 4 inches, plus or minus 1 inch.
4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch nominal maximum aggregate size (applies to footings and foundation walls, and all other concrete exposed to freeze/thaw action).

2.13 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.14 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:

1. Class A, 1/8 inch for smooth-formed finished surfaces.
2. Class B, 1/4 inch for rough-formed finished surfaces.

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

1. Install keyways, reglets, recesses, and the like, for easy removal.
2. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
2. Install dovetail anchor slots in concrete structures as indicated.

3.3 REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete, if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.

1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 VAPOR RETARDERS

A. Plastic Vapor Retarders: Place, protect, and repair vapor retarders according to ASTM E 1643 and manufacturer's written instructions.

1. Lap joints 6 inches and seal with manufacturer's recommended tape.

B. Granular Course: Cover vapor retarder with granular fill, moisten, and compact with mechanical equipment to elevation tolerances of plus 0 inch or minus 3/4 inch.

3.5 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.6 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
7. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.

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 concrete develops random contraction cracks.

3.7 WATERSTOPS

A. Flexible Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of the Work. Field fabricate joints in waterstops according to manufacturer's written instructions.

3.8 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.

C. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

D. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.
4. Slope surfaces uniformly to drains where required.
5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

E. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

F. Hot-Weather Placement: Comply with ACI 301 and as follows:

1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

G. Concrete placing shall be continuous and in compliance with ACI except where more restrictive requirements are specified.
1. All concrete interfaces are to be bonded by preparing the surface of first placement per Sections 6.1.1, 6.1.2, and 6.1.3 ACI 301 followed by wetting and applying a 1/16 in. thick layer of neat cement grout immediately prior to concrete placement.
2. Finishes are to be “smooth trowel” except where otherwise noted. Float surface once it has sufficiently stiffened. Check planeness of surface with a straightedge in all directions. Cut down high spots and fill low spots. Immediately refloay to a uniform non-directional sandy texture.

H. Use only moist curing as specified in paragraphs 12.2.1.1, 12.2.1.2, 12.2.1.3, 12.2.1.4, and 12.2.1.5 of ACI 301.
1. Protect concrete against rapid drying and damage by rain and frost.
2. Keep concrete moist for at least 7 days. Protect with liquid curing compound or a covering that will not stain or discolor finished concrete surfaces.
3. Spraying: Spray concrete during the curing period as frequently as drying conditions may require.
4. During curing period, maintain concrete above 70°F for at least 3 days or above 50°F for at least 5 days.

3.9 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces exposed to public view,.

C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:

1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.10 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces indicated by architect.

C. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces indicated by architect.
2. Finish surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:

a. Specified overall values of flatness, F(F) 25; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 17; and of levelness, F(L) 15.

3.11 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel-finish concrete surfaces.

3.12 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.

C. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

D. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.13 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.

1. Defer joint filling until concrete has aged at least one month(s). Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.14 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension in solid concrete, but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.15 FIELD QUALITY CONTROL

A. Testing and Inspecting: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

B. Inspections:

1. Steel reinforcement placement.
2. Headed bolts and studs.
3. Verification of use of required design mixture.
4. Concrete placement, including conveying and depositing.
5. Curing procedures and maintenance of curing temperature.

C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.

   a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173/C 173M, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
5. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
6. Compression Test Specimens: ASTM C 31/C 31M.

   a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.

7. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.

   a. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

8. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
9. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
10. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
11. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
12. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
13. Correct deficiencies in the Work that test reports and inspections indicate does not comply with the Contract Documents.

D. Measure floor and slab flatness and levelness according to ASTM E 1155 within 24 hours of finishing.

END OF SECTION

SECTION 040001

MASONRY 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 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 filed in a sealed envelope with the City of Quincy at a time and place as stipulated in the "NOTICE TO CONTRACTORS".

   The following should appear on the upper left hand corner of the envelope:

   NAME OF SUB-BIDDER: (Insert name of sub-bidder)

   MASS. STATE PROJECT: ((Insert project number from top of page))

   SUB-BID FOR SECTION: 040001 – MASONRY WORK

2. Each sub-bid submitted for work under this Section shall be on forms furnished by the City of Quincy as required by Section 44F of Chapter 149 of the General Laws, as amended. Sub-bid forms may be obtained at the office of the Purchasing Department or may be obtained by written or telephone request; telephone 617-376-1060

3. Sub-bids filed with the City of Quincy 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 City of Quincy 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: *To be inserted with final documents.*

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 042000 – UNIT MASONRY

B. Alternates: Not Applicable.

END OF SECTION

SECTION 042000

UNIT MASONRY

(Part of Work of Section 040001 - MASONRY 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 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. Concrete masonry units.
2. Face brick.
3. Embedded flashing.
4. Mortar and grout.
5. Reinforcing steel, masonry joint reinforcement, ties and anchors.
6. Hoisting Equipment: The Masonry subcontractor shall furnish, install, and maintain in safe and adequate condition, all mechanical hoisting equipment, operating personnel, and rigging that is necessary for the proper execution of the Work of this Section. The requirements of Section 015000 - Temporary Facilities and Controls, in relation to hoisting and rigging being the responsibility of the General Contractor, do not apply to the work of this Section.
7. Staging, Planking and Scaffolding: The Masonry subcontractor shall furnish, install and maintain in safe and adequate condition, all staging, planking and scaffolding up to eight feet in height that is necessary for the proper execution of the Work in this Section. The General Contractor shall furnish, install, and maintain in safe and adequate condition all staging, planking, and scaffolding above eight feet in height.

B. Alternates: Not Applicable.

C. Items To Be Installed Only:

1. Section 055000 - METAL FABRICATIONS:
   a. Lintels, miscellaneous metal and iron sleeves, anchors, inserts and plates to be built into masonry walls.
2. Section 061000 - ROUGH CARPENTRY:
   a. Wood nailers and blocking built into masonry.

D. Items To Be Furnished Only:

1. Section 033000 - CAST-IN-PLACE CONCRETE:
   a. Dovetail slots for masonry anchors.

2. Section 051200 - STRUCTURAL STEEL FRAMING:
   a. Anchor sections of adjustable masonry anchors for connecting to structural frame.

E. Related Work: The following items are not included in this Section and are specified under the designated Sections:

1. Section 072100 - THERMAL INSULATION for cavity wall insulation.
2. Section 079200 - JOINT SEALANTS for sealing control and expansion joints in unit masonry.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For the following:

1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
2. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement."

C. Samples for Verification: For each type and color of the following:

1. Exposed concrete masonry units.
2. Face brick, in the form of straps of five or more bricks.
3. Pigmented mortar. Make Samples using same sand and mortar ingredients to be used on Project. Label Samples to indicate types and amounts of pigments used.
4. Weep holes/vents.
5. Accessories embedded in masonry.

D. Qualification Data: For testing agency.

E. Material Certificates: Include statements of material properties indicating compliance with requirements including compliance with standards and type designations within standards. Provide for each type and size of the following:

1. Masonry units:

   a. Include material test reports substantiating compliance with requirements.
   b. For bricks, include size-variation data verifying that actual range of sizes falls within specified tolerances.
   c. For exposed brick, include material test report for efflorescence according to ASTM C 67.
   d. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.

2. Cementitious materials. Include brand, type, and name of manufacturer.
3. Mortar mixes. Include description of type and proportions of ingredients.
4. Grout mixes. Include description of type and proportions of ingredients.
5. Reinforcing bars.
6. Joint reinforcement.
7. Anchors, ties, and metal accessories.

F. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1. Include test reports, per ASTM C 780 for mortar mixes required to comply with property specification.
2. Include test reports, per ASTM C 1019 for grout mixes required to comply with compressive strength requirement.

G. Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with cold-weather requirements.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1093 for testing indicated, as documented according to ASTM E 548.

B. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, through one source from a single manufacturer for each product required.

C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from a single manufacturer for each cementitious component and from one source or producer for each aggregate.

D. Preconstruction Testing Service: The Owner will engage a qualified independent testing agency to perform preconstruction testing indicated below. Payment for these services will be made by the Owner. Retesting of materials that fail to meet specified requirements shall be done at Contractor's expense.

1. Prism Test: For each type of construction required, per ASTM C 1314.

E. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire-resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

F. Sample Panels: Build sample panels to verify selections made under sample submittals and to demonstrate aesthetic effects. Comply with requirements in Division 01 for mockups.

1. Build sample panels for typical exterior and interior walls in sizes approximately 48 inches long by 48 inches high by full thickness.
2. Where masonry is to match existing, erect panels adjacent and parallel to existing surface.
3. Clean one-half of exposed faces of panels with masonry cleaner indicated.
4. Protect approved sample panels from the elements with weather-resistant membrane.
5. Approval of sample panels is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Architect in writing.

a. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels unless such deviations are specifically approved by Architect in writing.

G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01. Agenda shall include protection of air barrier membrane during construction.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver preblended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.6 PROJECT CONDITIONS

A. Protection of Air Barrier Membrane: During construction, protect air barrier membrane from penetrations which allow air to pass through air barrier assemblies. Engage original installer to repair damage promptly using identical materials and methods of installation, and to the satisfaction of the Architect.

B. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
2. Where 1 wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.

C. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.

D. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.

2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

E. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.

F. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 MASONRY UNITS, GENERAL

A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to exceed tolerances and to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not uses units where such defects, including dimensions that vary from specified dimensions by more than stated tolerances, will be exposed in the completed Work or will impair the quality of completed masonry.

2.2 CONCRETE MASONRY UNITS (CMUs)

A. Concrete Masonry Units: ASTM C 90, normal weight unless indicated otherwise manufactured to dimensions 3/8 inch less than nominal dimensions.

B. Shapes: Provide standard shapes indicated and as required for building configuration. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.

2.3 BRICK

A. Face Brick: ASTM C 216, Grade SW, Type FBS.

1. Trade Reference and Color: Match existing, as approved by Architect.
2. Size (Actual Dimensions): Match existing, as approved by Architect.
3. Initial Rate of Absorption: Less than 30 g/30 sq. in. per minute when tested per ASTM C 67.
4. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
5. Where shown to "match existing," provide face brick matching color range, texture, and size of existing adjacent brickwork.

B. Building (Common) Brick where Concealed: ASTM C 62, Grade SW.

C. General: Provide shapes indicated and as follows:

1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
3. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces.
4. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.
5. Units which are sawn and less than one-half full size shall not be used.

2.4 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

B. Hydrated Lime: ASTM C 207, Type S.

C. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortar.

1. Available Products:
   a. LanXess; Bayferrox Iron Oxide Pigments.
   b. Davis Colors; True Tone Mortar Colors.
   c. Solomon Grind-Chem Services, Inc.; SGS Mortar Colors.

D. Aggregate for Mortar: ASTM C 144. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.

E. Aggregate for Grout: ASTM C 404.

F. Water: Potable.

2.5 REINFORCEMENT

A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60.

B. Masonry Joint Reinforcement, General: ASTM A 951.

1. Interior Walls: Mill-galvanized, carbon steel.
2. Exterior Walls: Hot-dip galvanized, carbon steel.
3. Wire Size and Spacing: As required by Code.
4. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.

C. Masonry Joint Reinforcement for Multiwythe Masonry:

1. Ladder type with 1 side rod at each face shell of hollow masonry units more than 4 inches in width, plus 1 side rod at each wythe of masonry 4 inches or less in width.

2.6 TIES AND ANCHORS

A. Materials: Provide ties and anchors specified in subsequent paragraphs that are made from materials that comply with subparagraphs below, unless otherwise indicated.

1. Mill-Galvanized, Carbon-Steel Wire: ASTM A 82; with ASTM A 641/A 641M, Class 1 coating.
2. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82; with ASTM A 153/A 153M, Class B-2 coating.
3. Stainless-Steel Wire: ASTM A 580/A 580M, Type 316.
4. Galvanized Steel Sheet: ASTM A 653/A 653M, Commercial Steel, G60 zinc coating.
5. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
6. Stainless Steel Bars: ASTM A 276 or ASTM A 666, Type 304.

B. Adjustable Anchors for Connecting to Structure: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch-diameter, hot-dip galvanized steel. Mill-galvanized wire may be used at interior walls, unless otherwise indicated.

C. Partition Top Anchors: 0.097-inch-thick metal plate with 3/8-inch-diameter metal rod 6 inches long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication.

D. Stone Anchors: Fabricate dowels, cramps, and other stone anchors from stainless steel.

E. Adjustable Masonry-Veneer Anchors:

1. General: Provide anchors that allow vertical adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to wood or metal studs, with structural performance capable of withstanding a 100-lbf load in both tension and compression without deforming or developing play in excess of 0.05 inch.
2. Screw-Attached, Masonry-Veneer Anchors: Units, equal to Pos-I-Tie Brick Veneer Anchoring System by Heckmann Building Products Inc., consisting of a wire tie and a metal anchor section.
   a. Anchor Section: Zinc-alloy barrel section with flanged head with wing-nut eye and corrosion-resistant, self-drilling screw. Eye designed to receive wire tie and to serve as head for drilling fastener into framing. Barrel length to suit sheathing thickness, allowing screw to seat directly against framing with flanged head covering hole in sheathing.
   b. Wire Ties: Triangular-, rectangular-, or T-shaped wire ties fabricated from 0.188-inch-diameter, hot-dip galvanized steel wire.

2.7 MISCELLANEOUS ANCHORS

A. Anchor Bolts: L-shaped steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153/A 153M, Class C; of dimensions indicated.

2.8 EMBEDDED FLASHING MATERIALS

A. Metal Flashing: Provide metal flashing complying with Section 076200 - SHEET METAL FLASHING AND TRIM and as follows:

1. Stainless Steel: ASTM A 240/A 240M, Type 304, 0.016 inch (0.40 mm) thick.
2. Configuration: Provide continuous flashing including preformed outside, inside corners, and end dams with smooth uninterrupted soldered seams and hemmed edges to maintain continuity. See drawings for profiles required.

B. Solder and Sealants for Sheet Metal Flashings: As specified in Section 076200 – SHEET METAL FLASHING AND TRIM.

C. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates. Verify compatibility between flashing materials and substrates.

D. Drip Edge: Provide type 316, 0.016 inch (0.40 mm) thick stainless steel drip edge plates with factory applied adhesive strip for all through-wall flashing conditions. Provide preformed outside and inside corner drip plate corners with smooth uninterrupted soldered seams and hemmed drip edges to maintain continuity. Custom sizes will be required see drawings for profiles required.

2.9 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.

B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

D. Weep/Vent Products: Free-draining mesh; made from polyethylene strands, full height and width of head joint and depth 1/8 inch less than depth of outer wythe; in color selected from manufacturer's standard.

E. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity. Provide strips, full-depth of cavity and 10 inches wide, with dovetail shaped notches 7 inches deep that prevent mesh from being clogged with mortar droppings or equivalent. Available products:

1. Advanced Building Products Inc.; Mortar Break II.
2. Archovations, Inc.; CavClear Masonry Mat.
3. Hohmann & Barnard, Dur-O-Wal Division; Polytite MortarStop.
4. Mortar Net USA, Ltd.; Mortar Net.

2.10 MASONRY CLEANERS

A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

1. Available Manufacturers:

a. Diedrich Technologies, Inc.
b. EaCo Chem, Inc.
c. ProSoCo, Inc.

2.11 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.
2. Limit cementitious materials in mortar to portland cement and lime.

B. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.

1. For masonry below grade or in contact with earth, use Type M.
2. For reinforced masonry, use Type S.
3. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.

C. Pigmented Mortar: Use colored cement product. Pigments shall not exceed 10 percent of portland cement by weight.

D. Grout for Unit Masonry: Comply with ASTM C 476.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
2. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
2. Verify that foundations are within tolerances specified.

B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.

B. Build chases and recesses to accommodate items specified in this and other Sections.

C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.

D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed. Do not use units cut to less than one-half size.

E. Do not install concrete masonry units with more than 5 percent damage to the face. Do not install brick units which will show defects after installation.

F. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Mix units from several pallets or cubes as they are placed.

G. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.

H. Comply with construction tolerances in ACI 530.1/ASCE 6/TMS 602 and with the following:

1. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
2. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
3. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
4. For exposed bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch. Do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
5. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.
6. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.

3.3 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in bond pattern indicated on Drawings; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs. Prior to installation review bond pattern with Architect.

C. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

D. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

E. Fill space between steel frames and masonry solidly with mortar, unless otherwise indicated.

F. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

G. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above, unless otherwise indicated.

1. Install compressible filler in joint between top of partition and underside of structure above.
2. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2-inch clearance between end of anchor rod and end of tube. Space anchors 48 inches o.c., unless otherwise indicated.
3. Wedge non-load-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.

3.4 MORTAR BEDDING AND JOINTING

A. Lay hollow brick and concrete masonry units as follows:

1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.

B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.

D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint), unless otherwise indicated.

3.5 CAVITY WALLS

A. Bond wythes of cavity walls together using one of the following methods:

1. Masonry Joint Reinforcement: Installed in horizontal mortar joints. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable (two-piece) type reinforcement with continuous horizontal wire in facing wythe attached to ties to allow for differential movement regardless of whether bed joints align.
2. Masonry Veneer Anchors: Comply with requirements for anchoring masonry veneers.

B. Bond wythes of cavity walls together using bonding system indicated on Drawings.

C. Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity. Do not attempt to trowel or remove mortar fins protruding into cavity.

3.6 MASONRY JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches. Space reinforcement not more than 16 inches o.c.

B. Interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.

C. Provide continuity at wall intersections by using prefabricated T-shaped units.

D. Provide continuity at corners by using prefabricated L-shaped units.

3.7 ANCHORING MASONRY TO STRUCTURAL MEMBERS

A. Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:

1. Provide an open space not less than 1 inch in width between masonry and structural member, unless otherwise indicated. Keep open space free of mortar and other rigid materials.
2. Anchor masonry to structural members with anchors embedded in masonry joints and attached to structure.
3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.8 ANCHORING MASONRY VENEERS

A. Anchor masonry veneers with masonry-veneer anchors to comply with the following requirements:

1. Fasten screw-attached anchors through insulation and sheathing to wall framing and to concrete and masonry backup as applicable with metal fasteners of type indicated.
2. Embed tie sections in masonry joints. Provide air space indicated on the Drawings between back of masonry veneer and face of insulation.
3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
4. Space anchors as required by Code.

3.9 CONTROL AND EXPANSION JOINTS

A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.

B. Form control joints in concrete masonry using one of the following methods:

1. Fit bond-breaker strips into hollow contour in ends of concrete masonry units on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.
2. Install preformed control-joint gaskets designed to fit standard sash block.
3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar or rake out joint for application of sealant.
4. Install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete for application of sealant.

C. Form expansion joints in brick made from clay or shale as follows:

1. Build flanges of metal expansion strips into masonry. Lap each joint 4 inches in direction of water flow. Seal joints below grade and at junctures with horizontal expansion joints if any.
2. Build flanges of factory-fabricated, expansion-joint units into masonry.
3. Build in compressible joint fillers where indicated.
4. Form open joint full depth of brick wythe and of width indicated, but not less than 3/8 inch for installation of sealant and backer rod specified in Section 079200 - JOINT SEALANTS.

D. Provide horizontal, pressure-relieving joints by either leaving an air space or inserting a compressible filler of width required for installing sealant and backer rod specified in Section 079200 - JOINT SEALANTS but not less than 3/8 inch.

1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

3.10 LINTELS

A. Install steel lintels where indicated.

B. Provide minimum bearing of 8 inches at each jamb, unless otherwise indicated.

3.11 FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND VENTS

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.

B. Install flashing as follows, unless otherwise indicated:

1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
2. At multiwythe masonry walls, including cavity walls, extend flashing through outer wythe, turned up a minimum of 8 inches, and 1-1/2 inches into the inner wythe. Form 1/4-inch hook in edge of flashing embedded in inner wythe.
3. At masonry-veneer walls, extend flashing through veneer, across air space behind veneer, and up face of sheathing at least 8 inches; with upper edge covered with elastomeric membrane, lapping at least 4 inches.
4. At lintels and shelf angles, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.

C. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.

D. Install metal drip edge plate in accordance with architectural details and manufacturer's requirements.

E. Install weep holes in head joints in exterior wythes of first course of masonry immediately above embedded flashing and as follows:

1. Use specified weep/vent products to form weep holes.
2. Space weep holes 24 inches o.c., unless otherwise indicated.

F. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in Part 2 "Miscellaneous Masonry Accessories" Article.

G. Install vents in head joints in exterior wythes at spacing indicated.

3.12 REINFORCED UNIT MASONRY INSTALLATION

A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.

1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.

C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.

3.13 FIELD QUALITY CONTROL

A. Inspectors: Engage qualified independent inspectors to perform inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform inspections. Place grout only after inspectors have verified compliance of grout spaces and grades, sizes, and locations of reinforcement.

B. Testing Agency: Engage a qualified independent testing and inspecting agency to perform field tests and inspections indicated below and prepare test reports. Retesting of materials failing to comply with specified requirements shall be done at Contractor's expense.

C. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof. Test types as determined by the independent testing and inspection agency.

3.14 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, around penetrations and where indicated.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
5. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
6. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

3.15 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.

1. Crush masonry waste to less than 4 inches in each dimension.
2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Division 31 - EARTHWORK.
3. Do not dispose of masonry waste as fill within 18 inches of finished grade.

C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off the Site.

END OF SECTION

SECTION 050001

MISCELLANEOUS AND ORNAMENTAL IRON

(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 filed in a sealed envelope with the City of Quincy at a time and place as stipulated in the "NOTICE TO CONTRACTORS".

   The following should appear on the upper left hand corner of the envelope:

   NAME OF SUB-BIDDER: (Insert name of sub-bidder)

   MASS. STATE PROJECT: ((Insert project number from top of page))

   SUB-BID FOR SECTION: 050001 –MISCELLANEOUS AND ORNAMENTAL IRON

2. Each sub-bid submitted for work under this Section shall be on forms furnished by the City of Quincy as required by Section 44F of Chapter 149 of the General Laws, as amended. Sub-bid forms may be obtained at the office of the Purchasing Department or may be obtained by written or telephone request; telephone 617-376-1060

3. Sub-bids filed with the City of Quincy 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 City of Quincy 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: *To be inserted with final documents*

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 in Section 055000 - METAL FABRICATIONS.

B. Alternates: Not Applicable.

END OF SECTION

SECTION 055000

METAL FABRICATIONS

(Part of Work of Section 050001 - MISCELLANEOUS AND ORNAMENTAL IRON, 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. Requirements for materials, hot-dip galvanizing, and shop-applied primers are included with each item as applicable.

1. Loose steel bearing and leveling plates, including bearing plates for steel joists, galvanized at exterior locations and in exterior walls.
2. Galvanized steel lintels with shop-applied primer at exterior locations.
3. Steel lintels with shop-applied zinc-rich primer at interior locations.
4. Galvanized shelf angles with shop applied primer at exterior locations.
5. Shelf angles with zinc-rich shop-applied primer at interior locations.
6. Miscellaneous steel framing and supports:
   a. Galvanized steel framing and supports for overhead doors.
   b. Galvanized steel framing and supports for mechanical and electrical equipment.
   c. Steel framing and supports for applications where framing and supports are not specified in other Sections; galvanized at exterior locations and in exterior walls.
   d. Prefinished slotted steel channel support framing.

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. Lintels, sleeves, anchors, inserts, plates and similar items.
2. Section 042000 - UNIT MASONRY:
   a. Lintels, miscellaneous metal and iron sleeves, anchors, inserts and plates to be built into masonry walls.

E. Related Work: The following items are not included in this Section and are specified under the designated Sections:

1. Section 033000 - CAST-IN-PLACE CONCRETE for lintels, sleeves, anchors, inserts, plates and similar items.
2. Section 042000 - UNIT MASONRY for lintels, miscellaneous metal and iron sleeves, anchors, inserts and plates to be built into masonry walls.
3. Section 051200 - STRUCTURAL STEEL FRAMING for structural steel items.
4. Section 099000 - PAINTING AND COATING for field painting work of this section.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design miscellaneous framing and supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance of Ladders: Provide ladders capable of withstanding the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.

C. Thermal Movements: Provide exterior metal fabrications that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. 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 (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Nonslip aggregates and nonslip-aggregate surface finishes.
2. Paint products.
3. Grout.

B. Shop Drawings: Show fabrication and installation details for metal fabrications.

1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
2. Provide templates for anchors and bolts specified for installation under other Sections.
3. Where fabrications are to receive sprayed-on fireproofing, include statement that primer is compatible with fireproofing proposed for use.

C. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

D. Welding certificates.

E. Qualification Data: For professional engineer.

1.5 QUALITY ASSURANCE

A. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of metal fabrications that are similar to those indicated for this Project in material, design, and extent.

C. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."
2. AWS D1.3, "Structural Welding Code--Sheet Steel."

D. Metal Surfaces, General: Provide materials with smooth, flat surfaces, unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications 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 metal fabrications without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.
2. Provide allowance for trimming and fitting at site.

1.7 COORDINATION

A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

B. Coordinate installation of steel weld plates and angles for casting into concrete that are specified in this Section but required for work of another Section. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 FERROUS METALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.

C. Steel Tubing: ASTM A 500, cold-formed steel tubing.

D. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.

1. Provide Schedule 80 pipe for bollards.

E. Slotted Channel Framing: Cold-formed metal channels with continuous slot complying with MFMA-4.

F. Cast Iron: ASTM A 48/A 48M, Class 30, unless another class is indicated or required by structural loads.

2.2 FASTENERS

A. General: Unless otherwise indicated, provide Type 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, at exterior walls. Provide stainless-steel fasteners for fastening aluminum. Select fasteners for type, grade, and class required.

B. Anchor Bolts: ASTM F 1554, Grade 36. Provide hot-dip or mechanically deposited, zinc-coated anchor bolts where item being fastened is indicated to be galvanized.

C. Cast-in-Place Anchors in Concrete: Anchors capable of sustaining, without failure, a load equal to four times the load imposed, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

1. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per ASTM A 153/A 153M.

D. Expansion Anchors: Anchor bolt and sleeve assembly with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

1. Acceptable Manufacturers: Kwik-Bolt 3 by Hilti, Inc., TruBolt Wedge Anchor by ITW Red Head or Power-Stud by Powers Fasteners.

E. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches by length indicated with anchor straps or studs not less than 3 inches long at not more than 8 inches o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B 633, Class Fe/Zn 5, as needed for fastening to inserts.

2.3 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

C. Zinc-Rich Primer: Complying with SSPC-Paint 20 or SSPC-Paint 29 and compatible with topcoat.

D. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

F. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.4 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work true to line and level with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts, unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

2.5 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

2.6 LOOSE STEEL LINTELS

A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Weld adjoining members together to form a single unit where indicated.

B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span but not less than 8 inches, unless otherwise indicated.

2.7 SHELF ANGLES

A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inchbolts, spaced not more than 6 inches from ends and 24 inches o.c., unless otherwise indicated.

1. Provide mitered and welded units at corners.
2. Provide open joints in shelf angles at expansion and control joints. Make open joint approximately 2 inches larger than expansion or control joint.

B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.

C. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

2.8 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.

1. Fabricate units from slotted channel framing where indicated.
2. Furnish inserts if units are installed after concrete is placed.

2.9 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal fabrications after assembly.

2.10 STEEL PRIMERS AND FINISHES

A. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:

1. Exteriors (SSPC Zone 1B) and Items Indicated to Receive Zinc-Rich Urethane Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. Interiors (SSPC Zone 1A): SSPC-SP 7, "Brush Off Blast Cleaning."
3. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be field welded, embedded in concrete or masonry, unless otherwise indicated. Extend priming of partially embedded members to a depth of 2 inches.
4. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
5. Comply with SSPC-PA 2, "Measurement of Dry Coating Thickness with magnetic Gages."

B. Zinc-Rich Primer: Urethane zinc rich primer compatible with topcoat Specified in Section 099000 - PAINTS AND COATINGS. Provide primer with a VOC content of 340 g/L (2.8 lb/gal.) or less per OTC and HAPS COMPLIANT STANDARDS PER 2007 standards when calculated according to 40 CFR 59, Subpart D (EPA Method 24). Provide Tnemec Series 394 Perimerprime at 3.0 mils DFT or approved equal by DuPont or Carboline.

2.11 HOT-DIP GALVANIZING

A. Hot-Dip Galvanizing: For steel exposed to the elements, weather or corrosive environments and other steel indicated to be galvanized, provide coating for iron and steel fabrications applied by the hot-dip process.

1. Basis-of-Design: Duragalv by Duncan Galvanizing.
2. Comply with ASTM A 123 for fabricated products and ASTM A 153 for hardware.
3. Provide thickness of galvanizing specified in referenced standards.
4. Galvanizing bath shall contain special high grade zinc and other earthly materials.
5. Fill vent holes after galvanizing, if applicable, and grind smooth.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag bolts, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

F. Corrosion Protection: Coat concealed surfaces of steel that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

3.2 INSTALLING BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.

1. Use nonshrink grout, either metallic or nonmetallic, in concealed locations where not exposed to moisture; use nonshrink, nonmetallic grout in exposed locations, unless otherwise indicated.
2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.3 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

B. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.

1. Where grout space under bearing plates is indicated for girders supported on concrete or masonry, install as specified in this Section.

C. Install pipe columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified in this Section.

1. Grout baseplates of columns supporting steel girders after girders are installed and leveled.

3.4 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

B. Touch-Up and Repair for Galvanized Surfaces: For damaged and field-welded metal coated surfaces, clean welds, bolted connections and abraded areas.

1. For galvanized surfaces, apply organic zinc repair paint complying with requirements of ASTM A 780, modified to 95 percent zinc in dry film. Galvanizing repair paint shall have 95 percent zinc by weight, ZiRP by Duncan Galvanizing. Thickness of applied galvanizing repair paint shall be not less than coating thickness required by ASTM A 123 or A 153 as applicable. Touch-up of galvanized surfaces with silver paint, brite paint, or aluminum paints is not acceptable.
2. For factory-applied finish coatings, field-touch-up shall be performed by factory approved personnel for warranties to apply. Touch-up shall be such that repair is not visible from a distance of 6 feet. If non factory-approved technicians are used for field touch-up, no warranties shall exist.
3. A touch-up repair kit or touchup instructions shall be provided to the Owner for each type of factory-applied finish.

END OF SECTION

SECTION 061000

ROUGH CARPENTRY

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. Wood blocking, cants, and nailers.
2. Plywood backing panels.

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 are specified under the designated Sections:

1. Section 042000 - UNIT MASONRY for wood nailers and blocking built into masonry.

1.3 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used, net amount of preservative retained, and chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials, both before and after exposure to elevated temperatures when tested according to ASTM D 5516 and ASTM D 5664.
3. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
4. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber, plywood, and other panels; place spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of lumber grading agencies certified by the American Lumber Standards Committee Board of Review.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
3. Provide dressed lumber, S4S, unless otherwise indicated.
4. Provide dry lumber with 15 percent maximum moisture content at time of dressing for 2-inch nominal thickness or less, unless otherwise indicated.

B. Plywood Panels:

1. Plywood: Either DOC PS 1 or DOC PS 2, unless otherwise indicated.
2. Thickness: As needed to comply with requirements specified but not less than thickness indicated.
3. Factory mark panels according to indicated standard.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.
2. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

B. Kiln-dry material after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark each treated item with the treatment quality mark of an inspection agency approved by the American Lumber Standards Committee Board of Review.

D. Application: Treat items indicated on Drawings, and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete in exterior walls.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: For all interior use materials, provide materials that are fire-retardant treated and comply with performance requirements in AWPA C20 (lumber) and AWPA C27 (plywood). Identify fire-retardant-treated wood with appropriate classification marking of UL, U.S. Testing, Timber Products Inspection, or another testing and inspecting agency acceptable to authorities having jurisdiction.

1. Use treatment for which chemical manufacturer publishes physical properties of treated wood after exposure to elevated temperatures, when tested by a qualified independent testing agency according to ASTM D 5664, for lumber and ASTM D 5516, for plywood.
2. Use treatment that does not promote corrosion of metal fasteners.

2.4 MISCELLANEOUS LUMBER

A. General: Provide lumber for support or attachment of other construction, including the following:

1. Rooftop equipment bases and support curbs.
2. Blocking.
3. Cants.
4. Nailers.
5. Furring.
6. Grounds.

B. For items of dimension lumber size, provide Construction, Stud, or No. 2 grade lumber with 15 percent moisture content.

2.5 PANEL PRODUCTS

A. Miscellaneous Concealed Plywood: Exposure 1 sheathing, span rating to suit framing in each location, and thickness as indicated but not less than 1/2 inch.

B. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2 inch thick.

2.6 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

1. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners of Type 304 stainless steel.

B. Nails, Wire, Brads, and Staples: FS FF-N-105.

C. Power-Driven Fasteners: CABO NER-272.

D. Wood Screws: ASME B18.6.1.

E. Screws for Fastening to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

F. Bolts: Steel bolts complying with ASTM A 307, Grade A with ASTM A 563 hex nuts and, where indicated, flat washers.

G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.

1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5; except provide Type 304 stainless steel where in contact with pressure-preservative treated wood.

2.7 MISCELLANEOUS MATERIALS

A. Adhesive, Including Gluing Furring and Sleepers to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Discard units of material with defects that impair quality of carpentry and that are too small to use with minimum number of joints or optimum joint arrangement.

B. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

C. Apply field treatment complying with AWPA M4 to cut surfaces of preservative-treated lumber and plywood.

D. Securely attach carpentry work as indicated and according to applicable codes and recognized standards.

E. Countersink fastener heads on exposed carpentry work and fill holes with wood filler.

F. Use fasteners of appropriate type and length. Predrill members when necessary to avoid splitting wood.

3.2 WOOD BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.

END OF SECTION

SECTION 061600

SHEATHING

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. Gypsum sheathing.
2. Plywood sheathing.

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 are specified under the designated Sections:

1. Section 061000 - ROUGH CARPENTRY for plywood backing panels.
2. Section 076200 - SHEET METAL FLASHING AND TRIM for flashing applied to sheathing.

1.3 DEFINITIONS

A. Gypsum Board Construction Terminology Standard: Refer to ASTM C 11 and GA-505 for definitions of terms for gypsum sheathing board construction not defined in this Section or in other referenced standards.

1.4 SUBMITTALS

A. Product Data: For each product specified.

B. Evaluation Reports: For following products, from ICC-ES:

1. Preservative-treated plywood.
2. Fire-retardant-treated plywood.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each sheathing product through one source from a single manufacturer.

B. Fire-Resistance-Rated Assemblies: Where sheathing boards are part of fire-resistance-rated assemblies, provide assemblies as follows:

1. Assemblies comply with requirements of fire-response-tested assemblies indicated by GA File Numbers in GA-600, "Fire Resistance Design Manual"; or by design designations in UL's "Fire Resistance Directory" or in certification listings of another testing and inspecting agency acceptable to authorities having jurisdiction.
2. Fire-resistance ratings were determined by fire-response testing assemblies according to ASTM E 119.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages, containers, or bundles, each bearing brand name and identification of manufacturer.

B. Store materials protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, or other causes.

1. Neatly stack gypsum sheathing board flat on leveled supports off the ground, under cover, and fully protected from weather.
2. Neatly stack plywood flat with spacers beneath and between each bundle to provide air circulation. Protect plywood from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

1.7 SEQUENCING AND SCHEDULING

A. Sequence installing sheathing with installing exterior cladding to comply with requirements indicated below:

1. Do not leave glass-mat gypsum sheathing board exposed to weather for more than 180 days.

PART 2 - PRODUCTS

2.1 GYPSUM SHEATHING BOARD

A. Glass-Mat Gypsum Sheathing Board: ASTM C 1177.

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. CertainTeed Corp.; GlasRoc.
b. Georgia-Pacific Gypsum LLC; Dens-Glass Gold.
c. National Gypsum Company; Gold Bond, e^2XP.
d. USG Corporation; Securock.

2. Type and Thickness: 5/8 inch, Type X.

2.2 PLYWOOD SHEATHING BOARD

A. Plywood: DOC PS 1, fire rated type at sheathing.

B. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.

C. Factory mark panels to indicate compliance with applicable standard.

2.3 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.
2. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

B. Kiln-dry material after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark each treated item with the treatment quality mark of an inspection agency approved by the American Lumber Standards Committee Board of Review.

2.4 FIRE-RETARDANT-TREATED MATERIALS

A. General: For all interior use materials, provide materials that are fire-retardant treated and comply with performance requirements in AWPA C20 (lumber) and AWPA C27 (plywood). Identify fire-retardant-treated wood with appropriate classification marking of UL, U.S. Testing, Timber Products Inspection, or another testing and inspecting agency acceptable to authorities having jurisdiction.

1. Use treatment for which chemical manufacturer publishes physical properties of treated wood after exposure to elevated temperatures, when tested by a qualified independent testing agency according to ASTM D 5664, for lumber and ASTM D 5516, for plywood.
2. Use treatment that does not promote corrosion of metal fasteners.

2.5 FASTENERS

A. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing board to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.

1. For steel framing from 0.033 to 0.112 inch thick, attach sheathing to comply with ASTM C 954.

B. Screws for Fastening Plywood Sheathing to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

1. For roof and wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M or Type 304 stainless steel.
2. For pressure-preservative treated sheathing, provide fasteners of Type 304 stainless steel only.

PART 3 - EXECUTION

3.1 INSTALLATION, GYPSUM SHEATHING

A. General: Install gypsum sheathing to comply with GA-253 and manufacturer's written instructions.

B. Cut boards at penetrations, edges, and other obstructions of the work; fit tightly against abutting construction, except provide a 3/8-inch setback where non-load-bearing construction abuts structural elements.

C. Coordinate sheathing installation with flashing and joint sealant installation so these materials are installed in the sequence and manner that prevent exterior moisture from passing through completed exterior wall assembly.

D. Apply fasteners so screw heads bear tightly against face of sheathing boards but do not cut into facing.

E. Do not bridge building expansion joints with sheathing; cut and space edges to match spacing of structural support elements.

F. Vertical Installation: Install 48-inch- wide gypsum sheathing boards vertically with vertical edges centered over flanges of steel studs. Abut ends and edges of each board with those of adjacent boards. Screw-attach boards at perimeter and within field of board to each steel stud:

1. Perimeter: 6 inches on center.
2. Field: 8 inches on center.

3.2 INSTALLATION, PLYWOOD SHEATHING

A. Discard units of material with defects that impair quality of carpentry and that are too small to use with minimum number of joints or optimum joint arrangement.

B. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

C. Apply field treatment complying with AWPA M4 to cut surfaces of preservative-treated lumber and plywood.

D. Securely attach carpentry work as indicated and according to applicable codes and recognized standards.

E. Countersink fastener heads on exposed carpentry work and fill holes with wood filler.

F. Use fasteners of appropriate type and length. Predrill members when necessary to avoid splitting wood.

END OF SECTION

SECTION 070001

WATERPROOFING, DAMPPROOFING AND CAULKING

(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 filed in a sealed envelope with the City of Quincy at a time and place as stipulated in the "NOTICE TO CONTRACTORS".

   The following should appear on the upper left hand corner of the envelope:

   NAME OF SUB-BIDDER: (Insert name of sub-bidder)

   MASS. STATE PROJECT: ((Insert project number from top of page))

   SUB-BID FOR SECTION: 070001 – WATERPROOFING, DAMPPROOFING AND CAULKING.

2. Each sub-bid submitted for work under this Section shall be on forms furnished by the City of Quincy as required by Section 44F of Chapter 149 of the General Laws, as amended. Sub-bid forms may be obtained at the office of the Purchasing Department or may be obtained by written or telephone request; telephone 617-376-1060

3. Sub-bids filed with the City of Quincy 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 City of Quincy 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: *To be inserted with final documents*

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 071400 - FLUID-APPLIED WATERPROOFING
2. All Work of Section 071610 - CRYSTALLINE WATERPROOFING

3. All Work of Section 079200 - JOINT SEALANTS

B. Alternates: Not Applicable.

END OF SECTION

SECTION 070002

ROOFING AND FLASHING

(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 filed in a sealed envelope with the City of Quincy at a time and place as stipulated in the "NOTICE TO CONTRACTORS".

   The following should appear on the upper left hand corner of the envelope:

   NAME OF SUB-BIDDER: (Insert name of sub-bidder)

   MASS. STATE PROJECT: ((Insert project number from top of page))

   SUB-BID FOR SECTION: 070002 – ROOFING AND FLASHING

2. Each sub-bid submitted for work under this Section shall be on forms furnished by the City of Quincy as required by Section 44F of Chapter 149 of the General Laws, as amended. Sub-bid forms may be obtained at the office of the Purchasing Department or may be obtained by written or telephone request; telephone 617-376-1060

3. Sub-bids filed with the City of Quincy 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 City of Quincy 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: *To be inserted with final documents.*

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 075323 - EPDM ROOFING
2. All Work of Section 076200 - SHEET METAL FLASHING AND TRIM

B. Alternates: Not Applicable.

END OF SECTION

SECTION 071400

FLUID-APPLIED WATERPROOFING

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. Latex-rubber waterproofing membrane.
2. Drainage board.

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 are specified under the designated Sections:

1. Section 072100 - THERMAL INSULATION for insulation at foundations and under slabs.
2. Section 079200 - JOINT SEALANTS for joint-sealant materials and installation.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include manufacturer's written instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties of waterproofing.

B. Samples: For the following products:

1. 12-by-12-inch square of waterproofing and reinforcing strip.
2. 12-by-12-inch square of drainage board.

C. Installer Certificates: Signed by manufacturers certifying that installers comply with requirements.

D. Sample Warranty: Copy of special waterproofing manufacturer's and Installer's warranty stating obligations, remedies, limitations, and exclusions before starting waterproofing.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who is acceptable to waterproofing manufacturer to install manufacturer's products.

B. Source Limitations: Obtain waterproofing materials, protection course, and molded-sheet drainage panels through one source from a single manufacturer.

C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01. Review requirements for waterproofing, including surface preparation specified under other Sections, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details and sheet flashings, installation procedures, testing and inspection procedures, and protection and repairs.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver liquid materials to Project site in original packages with seals unbroken, labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by waterproofing manufacturer.

C. Remove and replace liquid materials that cannot be applied within their stated shelf life.

D. Protect stored materials from direct sunlight.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate, or when temperature is below 0 deg F.

1. Do not apply waterproofing in snow, rain, fog, or mist.

B. Maintain adequate ventilation during application and curing of waterproofing materials.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace waterproofing and sheet flashings that do not comply with requirements or that fail to remain watertight within specified warranty period.

1. Warranty insulation will retain 80 percent of original published thermal value.
2. Warranty Period: Five years from date of Substantial Completion.

B. Special Installer's Warranty: Signed by Installer, covering Work of this Section, for warranty period of two years.

1. Warranty includes removing and reinstalling protection board, drainage panels, insulation, pedestals, and pedestal-mounted pavers on plaza decks.

PART 2 - PRODUCTS

2.1 LATEX-RUBBER WATERPROOFING

A. Two-Component, Unreinforced, Latex-Rubber Waterproofing: Comply with ASTM C 836 and with manufacturer's written physical requirements.

1. Products: Subject to compliance with requirements, provide the following:

a. Grace, W. R. & Co.; Procor.
b. Approved equal.

2.2 AUXILIARY MATERIALS

A. General: Provide auxiliary materials recommended by manufacturer to be compatible with one another and with waterproofing, as demonstrated by waterproofing manufacturer, based on testing and field experience.

B. Joint Reinforcing Strip: Manufacturer's recommended fiberglass mesh or polyester fabric.

C. Joint Sealant: Multicomponent polyurethane sealant, compatible with waterproofing, complying with ASTM C 920 Type M, Class 25; Grade NS for sloping and vertical applications or Grade P for deck applications; Use NT exposure; and as recommended by manufacturer for substrate and joint conditions.

1. Backer Rod: Closed-cell polyethylene foam.

2.3 MOLDED-SHEET DRAINAGE PANELS

A. Nonwoven-Geotextile-Faced, Molded-Sheet Drainage Panel: Manufactured composite subsurface drainage panels consisting of a nonwoven, needle-punched geotextile facing with an apparent opening size not exceeding No. 70 (0.21-mm) sieve laminated to 1 side and a polymeric film bonded to the other side of a 3-dimensional, nonbiodegradable, molded-plastic-sheet drainage core, with a vertical flow rate of 9 to 15 gpm per ft.

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.

1. Verify that concrete has cured and aged for minimum time period recommended by waterproofing manufacturer.
2. Verify that substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean and prepare substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for waterproofing application.

B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.

C. Close off deck drains and other deck penetrations to prevent spillage and migration of waterproofing fluids.

D. Remove grease, oil, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

E. Remove fins, ridges, and other projections and fill honeycomb, aggregate pockets, and other voids.

3.3 JOINTS, CRACKS, AND TERMINATIONS

A. Prepare and treat substrates to receive waterproofing membrane, including joints and cracks, deck drains, corners, and penetrations according to manufacturer's written instructions.

1. Rout and fill joints and cracks in substrate. Before filling, remove dust and dirt according to ASTM D 4258.
2. Adhere strip of elastomeric sheet to substrate in a layer of hot rubberized asphalt. Extend elastomeric sheet a minimum of 6 inches on each side of moving joints and cracks or joints and cracks exceeding 1/8 inch thick, and beyond deck drains and penetrations. Apply second layer of hot fluid-applied, rubberized asphalt over elastomeric sheet.
3. Embed strip of reinforcing fabric into a layer of hot rubberized asphalt. Extend reinforcing fabric a minimum of 6 inches on each side of nonmoving joints and cracks not exceeding 1/8 inch thick, and beyond roof drains and penetrations.

    a. Apply second layer of hot fluid-applied, rubberized asphalt over reinforcing fabric.

3.4 MEMBRANE APPLICATION

A. Apply waterproofing according to ASTM C 898 and manufacturer's written instructions.

B. Start installing waterproofing in presence of manufacturer's technical representative.

C. Apply primer over prepared substrate.

D. Unreinforced Waterproofing Applications: Mix materials and apply waterproofing by spray, roller, notched squeegee, trowel, or other application method suitable to slope of substrate.

1. Apply one or more coats of waterproofing to obtain a seamless membrane free of entrapped gases, with an average dry film thickness of 60 mils and a minimum dry film thickness of 50 mils at any point.
2. Apply waterproofing to prepared wall terminations and vertical surfaces.
3. Verify wet film thickness of waterproofing every 100 sq. ft.

3.5 MOLDED-SHEET DRAINAGE PANEL INSTALLATION

A. Place and secure molded-sheet drainage panels, with geotextile facing away from wall or deck substrate according to manufacturer's written instructions. Use methods that do not penetrate waterproofing. Lap edges and ends of geotextile to maintain continuity. Protect installed molded-sheet drainage panels during subsequent construction.

3.6 CLEANING AND PROTECTION

A. Protect waterproofing from damage and wear during remainder of construction period.

B. Protect installed waterproofing from damage due to UV light, harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where insulation will be subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

C. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

SECTION 071610

CRYSTALLINE WATERPROOFING

(Part of Work of Section 070001 - WATERPROOFING, DAMPPROOFING AND CAULKING, 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. Crystalline waterproofing for the following applications.
   a. Sump pits.

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 are specified under the designated Sections:

1. Section 033000 - CAST-IN-PLACE CONCRETE for concrete substrate and finishing concrete walls and slabs to receive waterproofing.
2. Section 079200 - JOINT SEALANTS for elastomeric and preformed sealants in concrete and masonry walls and floors.

1.3 SUBMITTALS

A. Product Data: Include construction details, and material descriptions and installation instructions for crystalline waterproofing.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01.

1.5 PROJECT CONDITIONS

A. Weather Limitations: Proceed with application only when existing and forecasted weather conditions permit crystalline waterproofing to be performed according to manufacturer's written instructions and warranty requirements.

B. Proceed with waterproofing work only after pipe sleeves, vents, curbs, inserts, drains, and other projections through the substrate to be waterproofed have been completed. Proceed only after concrete and masonry substrate defects, including honeycombs, voids, and cracks, have been repaired to provide a sound substrate free of forming materials, including reveal inserts.

C. Ambient Conditions: Proceed with waterproofing work only if temperature is maintained at 40 deg F or above during work and cure period, and space is well ventilated and kept free of water.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of crystalline waterproofing that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure to maintain watertight conditions within specified warranty period.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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. Crystalline Waterproofing:

a. Anti-Hydro International, Inc.; Hydro Cap.
b. Conproco Corp.; Super Seal.
c. Tamms Industries, Inc.; Hey'Di K-11.
d. ThoRoc, Div. of ChemRex; Tegraproof.
e. Vandex International Ltd.; Vandex Super.
f. Xypex Chemical Corporation; Xypex.

2.2 MATERIALS

A. Crystalline Waterproofing: A prepackaged, proprietary blend of Portland cement, specially treated sand, and active chemicals that, when mixed with water and applied, penetrates by capillary action into concrete or masonry and reacts chemically with free lime in the presence of water to develop crystalline growth within concrete or masonry capillaries to produce an impervious, dense, waterproof concrete or masonry with properties meeting or exceeding the following criteria:

1. Permeability: 0 for water at 33 feet when tested according to CE CRD-C 48.
2. Compressive Strength: Minimum 3000 psi when tested according to ASTM C 109/C 109M.

B. Patching Compound: Cementitious waterproofing and repair mortar for filling and patching tie holes, honeycombs, reveals, and other imperfections; with properties meeting or exceeding the following criteria:

1. Compressive Strength: 7600 psi at 28 days when tested according to ASTM C 109/C 109M.
2. Flexural Strength: 710 psi at 28 days when tested according to ASTM C 348.
3. Shrinkage: Minus 0.093 percent at 28 days and plus 0.073 percent at 90 days when tested according to ASTM C 596.

C. Plugging Compound: Cementitious compound with hydrophobic properties; resistant to water and moisture but vapor permeable for all standard applications (vertical, overhead and horizontal surfaces not exposed to vehicular traffic); with properties meeting or exceeding the following criteria:

1. Permeability: 30 feet when tested according to CE CRD-C 48.
2. Compressive Strength: 6000 psi at 28 days when tested according to ASTM C 109/C 109M.
3. Flexural Strength: 1000 psi at 28 days when tested according to ASTM C 348.
4. Bond Strength: 300 psi at 14 days when tested according to ASTM C 321.

D. Water: Potable.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Acceptance of Conditions: Examine substrates, with Applicator present, where waterproofing is to be applied.

1. Proceed with application only after unsatisfactory conditions have been corrected.
2. Notify Architect in writing of active leaks or structural defects that would affect system performance.

3.2 PREPARATION

A. Protect other work from damage from cleaning, preparation, and application of crystalline waterproofing. Provide temporary enclosure to confine spraying operation and to ensure adequate ambient temperatures and ventilation conditions for application.

B. Stop active water leaks according to waterproofing manufacturer's written instructions.

C. Repair damaged or unsatisfactory concrete or masonry according to manufacturer's written instructions.

D. Surface Preparation: Comply with waterproofing manufacturer's written instructions to remove efflorescence, chalk, dust, dirt, mortar spatter, grease, oils, curing compounds, and form-release agents to ensure that waterproofing bonds to concrete or masonry surfaces.

1. Clean concrete surfaces according to ASTM D 4258.

a. Scratch- and Float-Finished Concrete: Etch with 10 percent muriatic (hydrochloric) acid solution according to ASTM D 4260.
b. Prepare smooth-formed and trowel-finished concrete by mechanical abrading or abrasive-blast cleaning according to ASTM D 4259.

2. Concrete Joints: Clean reveals according to waterproofing manufacturer's written instructions.

3.3 APPLICATION

A. General: Comply with waterproofing manufacturer's written instructions for application.

1. Dampen surface with water and maintain damp condition until applying waterproofing.
2. Apply waterproofing to negative-side surfaces.
3. Number of Coats: Two coats.
4. Dampen surface between coats.

B. Final Coat Finish: Smooth

C. Moist-cure waterproofing for three days immediately after application has set, followed by two days of air drying as recommended in writing by manufacturer.

D. Waterproofing Treatment Extensions: Extend waterproofing treatment as follows:

1. Onto columns integral with treated walls.
2. Onto every substrate in areas indicated for treatment, including pipe trenches, pits, and sumps.

3.4 PROTECTION

A. Protect applied crystalline waterproofing from rapid drying, severe weather exposure, and water accumulation. Maintain completed Work in moist condition for not less than three days by procedures recommended in writing by waterproofing manufacturer. Protect waterproofing from temperatures below 36 deg F.

3.5 FIELD QUALITY CONTROL

A. Inspection: Engage manufacturer's representative to inspect completed application and to provide a written report that application complies with manufacturer's written instructions.

END OF SECTION

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. Insulation under slabs-on-grade.
2. Perimeter foundation wall insulation.
3. Cavity wall insulation.
4. Foam sealant insulation at gaps in exterior wall assemblies and around penetrations.

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 are specified under the designated Sections:

1. Section 075300 - EPDM ROOFING for roofing insulation.
2. Division 22 - PLUMBING for plumbing insulation.
3. Division 23 - HEATING, VENTILATING, AND AIR CONDITIONING for mechanical insulation.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Cavity Wall Insulation Certification: Submit manufacturer's certification that cavity wall insulation, as designed in the assemblies indicated on the Drawings, has been tested to meet the requirements of NFPA 285 and passed.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of building insulation through one source from a single manufacturer.

B. 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.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. Protect plastic insulation as follows:

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 FOUNDATION WALL AND UNDER SLAB INSULATION

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. DiversiFoam Products.
2. Dow Chemical Company.
3. Owens Corning.

B. Board Insulation: Extruded-polystyrene board insulation complying with ASTM C 578, square edged of type, density, and compressive strength indicated below:

1. For vertical applications, Type IV, 1.6-lb/cu. ft. minimum density and 25-psi minimum compressive strength.
2. For horizontal applications, pedestrian traffic, Type VII, 2.2-lb/cu. ft. minimum density and 60-psi minimum compressive strength.
3. For horizontal applications, vehicular traffic, Type V, 3-lb/cu. ft. minimum density and 100-psi minimum compressive strength.

C. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.

2.2 CAVITY WALL INSULATION

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. DiversiFoam Products.
2. Dow Chemical Company.
3. Owens Corning.

B. Extruded-Polystyrene Board Insulation: ASTM C 578, Type X, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, and ASTM D 1621 compressive strength of 15 pounds per square inch minimum.

C. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.

2.3 FOAM SEALANT INSULATION AT GAPS

A. Class A Foam Sealing Air System: Dow FROTH-PAK foam insulation, Class A, a two-component, quick–cure polyurethane foam for filling cavities, penetrations, cracks and expansion joints. Product shall be suitable for interior and exterior use, expand and be tack free in 40 seconds and cure in 90 seconds. Comply with the following:

1. UL Classified: Certificate R7813..
2. NFPA Testing: NFPA 286, can be left exposed in non-fire-rated roof/wall junctures, maximum 6 inches high and 2 inches deep, unlimited width.
3. Flame spread/smoke development ASTM E84: 25/350.
4. Nominal Density: ASTM D1622: 1.75
5. Thermal Resistance per inch ASTM C518: 6.3 initial, 5.35 at 90 days
6. Water Vapor Permeance ASTM E96: 3.9 at 1 inches thick, 2.0 at 2 inches.
7. Water Absorption, ASTM D2842, % by volume: 2.17.
8. Compressive Strength, ASTM D1621, lb per sq.in.: 21.1.
9. Flexural Strength, ASTM C203, lb/sq in.: 22.7.
10. Tensile Strength, ASTM D 1623, lb/sq.in.: 26.7.
11. Shear Strength, ASTM C273< lb/sq. in : 16.7.
12. Maximum Service Temperature, degrees F: 240 F.

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 Class A Foam Sealant Air Sealing System in miscellaneous voids and cavity spaces where indicate on Drawings and where required to prevent air infiltration.

3.4 INSTALLATION OF CAVITY-WALL INSULATION

A. On units of foam-plastic board insulation, install pads of adhesive spaced approximately 24 inches o.c. both ways on inside face, and as recommended by manufacturer. Fit courses of insulation between wall ties (if applicable) and other obstructions, with edges butted tightly in both directions. Press units firmly against inside substrates indicated. Fill gaps with compatible insulating material.

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 075300

EPDM ROOFING

(Part of Work of Section 070002 - ROOFING AND FLASHING, 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. Adhered membrane roofing system.
2. Cover board.
3. Roof insulation.
4. Substrate Board (thermal barrier).
5. Vapor retarder.
6. Flashing for equipment mounted on roofing and roofing penetrations.
7. Roof expansion joint cover.

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. Roof drains.
2. Section 230001 - HEATING, VENTILATING, AND AIR CONDITIONING:
   a. Roof curbs for HVAC equipment.

D. Items To Be Furnished Only: Not Applicable.

E. 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 nailers, curbs, and blocking.
2. Section 076200 - SHEET METAL FLASHING AND TRIM for metal roof penetration flashings, flashings, and counterflashings.
3. Section 079200 - JOINT SEALANTS for sealants.
4. Division 22 - PLUMBING for roof drains.
5. Division 23 - HEATING, VENTILATING, AND AIR CONDITIONING for roof curbs for HVAC equipment.

1.3 DEFINITIONS

A. Roofing Terminology: Refer to ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definition of terms related to roofing work in this Section.

1.4 PERFORMANCE REQUIREMENTS

A. General: Provide installed roofing membrane and base flashings that remain watertight; do not permit the passage of water; and resist specified uplift pressures, thermally induced movement, and exposure to weather without failure.

1. Accelerated Weathering: Roofing system shall withstand 2000 hours of exposure when tested according to ASTM G 152, ASTM G 154, or ASTM G 155.
2. Impact Resistance: Roofing system shall resist impact damage when tested according to ASTM D 3746 or ASTM D 4272.

B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by roofing manufacturer based on testing and field experience.

C. Roofing System Design: Roofing system shall be designed to withstand loads indicated on Drawings, but not less than loads required by Code.

D. Flashings: Provide base flashings, perimeter flashings, detail flashings and component materials that comply with requirements and recommendations in FMG 1-49 Loss Prevention Data Sheet for Perimeter Flashings; FMG 1-29 Loss Prevention Data Sheet for Above Deck Roof Components; NRCA Roofing and Waterproofing Manual (Fifth Edition) for Construction Details and SMACNA Architectural Sheet Metal Manual (Seventh Edition) for Construction Details, as applicable.

E. Exterior Fire-Test Exposure: ASTM E 108 or UL 790, Class A; for application and roof slopes indicated; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other Work.

1. Base flashings and membrane terminations.
2. Tapered insulation, including slopes.
3. Insulation fastening patterns.

C. Installer Certificates: Signed by roofing system manufacturer certifying that Installer is approved, authorized, or licensed by manufacturer to install roofing system.

D. Qualification Data: For Installer and manufacturer.

E. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.

1. Submit evidence of complying with performance requirements.

F. Product Test Reports: For components of roofing system, tests performed by manufacturer and witnessed by a qualified testing agency.

G. Inspection Report: Copy of roofing system manufacturer's inspection report of completed roofing installation.

H. Maintenance Data: For roofing system to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain components for roofing system from or approved by roofing system manufacturer.

B. Roofing Inspector: Owner may engage a full-time roofing inspector during installation of the deck, insulation assembly, membrane, flashing and other appurtenances, and when a survey of the roof and roof drains is conducted. Cooperate with Owner's roofing inspector and allow unlimited access to roofing during construction.

C. Roofing Signage: At entry points to roof, provide signage-listing type of roofing system, manufacturer, date installed, and holder of the warranty.

D. Preinstallation Conference: Conduct conference at Project site. Comply with requirements in Division 01. Review methods and procedures related to roofing system including, but not limited to, the following:

1. Meet with the Owner, Architect, Owner's insurer if applicable; testing and inspecting agency representative; roofing Installer; roofing system manufacturer's representative; deck Installer; and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
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. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.

1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.8 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.9 WARRANTY

A. Roofing Contractor’s Warranty: The roofing subcontractor shall supply Owner with a minimum two-year workmanship warranty for each roof. In the event any work related to the roofing, flashing, or metalwork is found to be defective within two years of substantial completion, the roofing contractor shall remove and replace such at no additional cost to the Owner. The roofing subcontractor’s warranty obligation shall run directly to the Owner, and a copy the roofing signed warranty shall be sent to the roofing system’s manufacturer.

1. The duration of the Roofing Contractor’s two-year warranty shall run concurrent with the roofing system’s manufacturer’s 20-year warranty.

B. Roofing Systems Manufacturer’s Warranty: The roofing manufacturer shall guarantee roof areas to be in a watertight condition, for a period of 20 years, from the date of final acceptance of the roofing system. The warranty shall be a 20-year no dollar limit (NDL), non-prorated total system labor and material warranty, for wind speed as required by Code or as indicated on the Drawings. Total system warranty shall include all roofing materials, related components and accessories including, but not limited to the substrate board, vapor retarder, insulation board, cover board, roofing membrane, membrane flashings, fasteners, adhesives, metal roof copings, metal roof edges and termination metals and roof drain assemblies. The manufacturer shall repair defects in materials and workmanship as promptly after observation as weather and site conditions permit.

PART 2 - PRODUCTS

2.1 EPDM ROOFING MEMBRANE

A. EPDM Roofing Membrane: ASTM D 4637, Type I, nonreinforced uniform, flexible sheet made from EPDM, and as follows:

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. Carlisle SynTec Incorporated.
    b. Firestone Building Products Company.
    c. Johns Manville International, Inc.
    d. Mule-Hide Products Co., Inc.
    e. Versico Inc.

2. Thickness: 60 mils (1.5 mm) nominal.
3. Exposed Face Color: White.

2.2 AUXILIARY MATERIALS

A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with membrane roofing.

    1. Liquid-type auxiliary materials shall meet VOC limits of authorities having jurisdiction.

B. Sheet Flashing: 60-mil-thick EPDM, partially cured or cured, according to application.

C. Bonding Adhesive: Manufacturer's standard bonding adhesive.

D. Seaming Material: Manufacturer's standard synthetic-rubber polymer primer and 3-inch- wide minimum with cover strip or 6-inch-wide, butyl splice tape with release film.

E. Lap Sealant: Manufacturer's standard single-component sealant, color to match roofing membrane.

F. Water Cutoff Mastic: Manufacturer's standard butyl mastic sealant.

G. Metal Termination Bars: Manufacturer's standard predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.

H. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening membrane to substrate, and acceptable to membrane roofing system manufacturer.

I. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, in-seam sealants, termination reglets, cover strips, and other accessories.

2.3 VAPOR RETARDER

A. Self-Adhering Sheet Vapor Retarder: ASTM D 1970, minimum 40-mil- thick film laminated to layer of rubberized asphalt adhesive; maximum permeance rating of 0.1 perm; cold-applied, with slip-resisting surface and release paper backing. Provide primer when recommended by vapor-retarder manufacturer.

2.4 ROOF INSULATION

A. General: Provide preformed roof insulation boards that comply with requirements and referenced standards, selected from manufacturer's standard sizes and of thicknesses indicated.

B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, felt or glass-fiber mat facer on both major surfaces.

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. Atlas Roofing Corporation.
b. Carlisle SynTec Incorporated.
c. Firestone Building Products Company.
d. GAF Materials Corp.
e. GenFlex Roofing Systems.
f. Johns Manville International Inc.

C. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches unless otherwise indicated.

D. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

2.5 INSULATION ACCESSORIES

A. General: Furnish roof insulation accessories recommended by insulation manufacturer for intended use and compatible with membrane roofing.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.

C. Cold Fluid-Applied Adhesive: Manufacturer's standard cold fluid-applied adhesive formulated to adhere roof insulation to substrate.

1. Cover Board Adhesive: Manufacturer’s cold fluid-applied adhesive formulated to adhere cover board to insulation substrate.

D. Cover Board: Provide one of the following, as required by roofing manufacturer to comply with performance requirements and provide specified warranty.

1. Cover Board: ASTM C 1278/C 1278M, cellulosic-fiber reinforced, water-resistant gypsum substrate, 1/2 or 5/8 inch thick.
2. Cover Board: DOC PS 2, Exposure 1, oriented strand board, 7/16 inch (11 mm) thick.

E. Substrate Board (Thermal Barrier): ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, Type X, 5/8 inch (16 mm) thick, factory primed.

2.6 BELLOWS-TYPE ROOF EXPANSION JOINTS

A. Source Limitations: Obtain bellows-type roof expansion joints approved by roofing manufacturer and that are part of roofing membrane warranty.

B. Flanged Bellows Roof Expansion Joint: Manufactured, continuous, waterproof, joint-cover assembly, consisting of exposed membrane bellows, laminated to flexible, closed-cell support foam, and secured along each edge to a 3- to 4-inch-wide metal flange for nailing to substrate. Provide each size and type indicated, factory-fabricated units for corner and joint intersections and horizontal and vertical transitions including those to other building expansion joints, splicing units, adhesives, and other components as recommended by roof-expansion-joint manufacturer for complete installation. Fabricate each assembly specifically for installation configuration indicated on Drawings.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Johns Manville; a Berkshire Hathaway company.
   b. MM Systems Corporation.
   c. Watson Bowman Acme Corp.
2. Basis-of-Design: Expand-O-Flash Expansion Joint Cover by Johns Manville.

2.7 WALKWAYS

A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, solid-rubber, slip-resisting, surface-textured walkway pads or rolls approximately 3/16 inch thick, and acceptable to membrane roofing system manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:

1. Verify that roof openings and penetrations are in place and set and braced and that roof drains are securely clamped in place.
2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
3. Verify that surface plane flatness and fastening of steel roof deck comply with requirements in Section 053100 - STEEL DECKING.
4. Verify that minimum concrete drying period recommended by roofing system manufacturer has passed.
5. Verify that concrete substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
6. Verify that concrete curing compounds that will impair adhesion of roofing components to roof deck have been removed.
7. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

C. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

3.3 SUBSTRATE BOARD INSTALLATION

A. Install substrate board with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt substrate boards together.

1. Fasten substrate board to top flanges of steel deck to resist uplift pressure at corners, perimeter, and field of roof according to roofing system manufacturers' written instructions and as required to comply with performance requirements.

3.4 VAPOR-RETARDER INSTALLATION

A. Self-Adhering Sheet Vapor Retarder: ASTM D 1970, minimum 40-mil- thick film laminated to layer of rubberized asphalt adhesive; maximum permeance rating of 0.1 perm; cold-applied, with slip-resisting surface and release paper backing. Provide primer when recommended by vapor-retarder manufacturer.

B. Completely seal vapor retarder at side laps, end laps, terminations, obstructions, and penetrations to prevent air movement into roofing system.

3.5 INSULATION AND COVERBOARD INSTALLATION

A. Coordinate installing membrane roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.

B. Comply with membrane roofing system manufacturer's written instructions for installing roof insulation.

C. Install tapered insulation under area of roofing to conform to slopes indicated.

D. Install one or more layers of insulation under area of roofing to achieve required thickness. Install 2 or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.

E. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.

F. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation.

1. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.

G. Mechanically Fastened Insulation: Install each layer of insulation and secure to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.

1. Fasten insulation to resist uplift pressure at corners, perimeter, and field of roof.
2. For insulation applied in multiple layers, loose-lay first layer and mechanically fasten top layer.

H. Mechanically Fastened Cover Boards: Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction. Loosely butt cover boards together and mechanically fasten to roof deck.

1. Mechanically fasten cover boards, unless otherwise indicated.
2. Fasten insulation to resist uplift pressure at corners, perimeter, and field of roof.

I. Adhered Cover Boards: Install cover boards over mechanically-fastened insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction. Adhere cover boards to mechanically-fastened insulation in ribbons of bead-applied adhesive or full-spread adhesive, as required to comply with performance and warranty requirements.

1. Locations for Adhered Cover Board Installation: Provide under green roof areas and elsewhere, where indicated.
2. Fasten insulation to resist uplift pressure at corners, perimeter, and field of roof.

3.6 ADHERED ROOFING MEMBRANE INSTALLATION

A. Install roofing membrane over area to receive roofing according to membrane roofing system manufacturer's written instructions. Unroll roofing membrane and allow to relax before installing.

B. Start installation of roofing membrane in presence of membrane roofing system manufacturer's technical personnel.

C. Accurately align roofing membrane and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

D. Bonding Adhesive: Apply bonding adhesive to substrate and underside of roofing membrane at rate required by manufacturer and allow to partially dry before installing roofing membrane. Do not apply bonding adhesive to splice area of roofing membrane.

E. Mechanically or adhesively fasten roofing membrane securely at terminations, penetrations, and perimeter of roofing.

F. Apply roofing membrane with side laps shingled with slope of roof deck where possible.

G. Tape Seam Installation: Clean and prime both faces of splice areas, apply splice tape, and firmly roll side and end laps of overlapping roofing membranes according to manufacturer's written instructions to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of roofing membrane terminations.

H. Repair tears, voids, and lapped seams in roofing that does not meet requirements.

I. Spread sealant or mastic bed over deck drain flange at deck drains and securely seal roofing membrane in place with clamping ring.

3.7 BASE FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply bonding adhesive to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

D. Clean splice areas, apply splicing cement, and firmly roll side and end laps of overlapping sheets to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of sheet flashing terminations.

E. Terminate and seal top of sheet flashings.

3.8 WALKWAY INSTALLATION

A. Flexible Walkways: Install walkway products in locations indicated. Adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

3.9 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform roof tests and inspections and to prepare test reports.

B. Manufacturer’s Technical Representative: Engage a qualified manufacturer’s technical representative to perform roof tests and inspections and to prepare test reports.

C. Final Roof Inspection: Engage roofing system manufacturer's technical personnel to inspect roofing installation on completion and submit report to Architect.

1. Notify Architect and the Owner 48 hours in advance of date and time of inspection.

D. Repair or remove and replace components of membrane roofing system where test results or inspections indicate that they do not comply with specified requirements.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.10 PROTECTING AND CLEANING

A. Protect membrane roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and the Owner.

B. Correct deficiencies in or remove membrane roofing system that does not comply with requirements, repair substrates, and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

SECTION 076200

SHEET METAL FLASHING AND TRIM

(Part of Work of Section 070002 - ROOFING AND FLASHING, 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. Sheet metal flashing and trim for the following applications:
   a. Through-wall flashing.
   b. Formed wall flashing and trim.
   c. Formed low-slope roof flashing and trim.

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 042000 - UNIT MASONRY:
   a. Through-wall flashings.

E. Related Work: The following items are not included in this Section and are specified under the designated Sections:

1. Section 042000 - UNIT MASONRY for through-wall flashings in masonry.
2. Section 061000 - ROUGH CARPENTRY for wood nailers, curbs, and blocking.
3. Section 075300 - EPDM ROOFING for installing sheet metal flashing and trim integral with roofing membrane.
4. Section 079200 - JOINT SEALANTS for field-applied sheet metal flashing and trim sealants.
5. Section 079500 - EXPANSION CONTROL for manufactured sheet metal expansion-joint covers.

1.3 PERFORMANCE REQUIREMENTS

A. General: Install sheet metal flashing and trim to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failing, rattling, leaking, and fastener disengagement.

B. Fabricate and install roof edge flashing and copings capable of resisting Wind Zone forces required by Code according to recommendations in FMG Loss Prevention Data Sheet 1-49.

C. Thermal Movements: Provide sheet metal flashing and trim that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of sheet metal and trim thermal movements. 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.

D. Water Infiltration: Provide sheet metal flashing and trim that do not allow water infiltration to building interior.

1.4 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: Show layouts of sheet metal flashing and trim, including plans and elevations. Distinguish between shop- and field-assembled work. Include the following:

1. Identify material, thickness, weight, and finish for each item and location in Project.
2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
3. Details for fastening, joining, supporting, and anchoring sheet metal flashing and trim, including fasteners, clips, cleats, and attachments to adjoining work.
4. Details of expansion-joint covers, including showing direction of expansion and contraction.

C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:

1. Sheet Metal Flashing: 12 inches long. Include fasteners, cleats, clips, closures, and other attachments.
2. Trim: 12 inches long. Include fasteners and other exposed accessories.
3. Accessories: Full-size Sample.

1.5 QUALITY ASSURANCE

A. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual." Conform to dimensions and profiles shown unless more stringent requirements are indicated.

B. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01.

1. Meet with the Owner, Architect and Owner's insurer if applicable, Installer, and installers whose work interfaces with or affects sheet metal flashing and trim including installers of roofing materials, roof accessories, unit skylights, and roof-mounted equipment.
2. Review methods and procedures related to sheet metal flashing and trim.
3. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
4. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver sheet metal flashing materials and fabrications undamaged. Protect sheet metal flashing and trim materials and fabrications during transportation and handling.

B. Unload, store, and install sheet metal flashing materials and fabrications in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack materials on platforms or pallets, covered with suitable weathertight and ventilated covering. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage.

1.7 COORDINATION

A. Coordinate installation of sheet metal flashing and trim with interfacing and adjoining construction to provide a leakproof, secure, and noncorrosive installation.

PART 2 - PRODUCTS

2.1 SHEET METALS

A. Aluminum Sheet: ASTM B 209, Alloy 3003, 3004, 3105, or 5005. Thickness as specified in this Section. Temper suitable for forming and structural performance required, but not less than H14, finished as follows:

1. 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.
   a. Fluoropolymer 3-Coat System: 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, with a minimum total dry film thickness of 1.5 mil; complying with AAMA 2605.

      1) Color: As selected by Architect from manufacturer's full range.

B. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, with No. 2D dull, cold rolled finish. Thickness as specified in this Section.

2.2 UNDERLAYMENT MATERIALS

A. Felts: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.

B. Slip Sheet: Rosin-sized paper, minimum 3 lb/100 sq. ft.

2.3 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads.

1. Exposed Fasteners: Heads matching color of sheet metal by means of plastic caps or factory-applied coating.
2. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws, gasketed, with hex washer head.
3. Blind Fasteners: High-strength aluminum or stainless-steel rivets.

C. Solder for Stainless Steel: ASTM B 32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.

D. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape.

E. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

F. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.

G. 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.

H. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.4 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated. Shop fabricate items where practicable. Obtain field measurements for accurate fit before shop fabrication.

B. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.

C. Fabricate sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.

1. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
2. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.

D. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA recommendations.

E. Expansion Provisions: Where lapped or bayonet-type expansion provisions in the Work cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with elastomeric sealant concealed within joints.

F. Conceal fasteners and expansion provisions where possible on exposed-to-view sheet metal flashing and trim, unless otherwise indicated.

G. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

1. Thickness: As recommended by SMACNA's "Architectural Sheet Metal Manual" for application but not less than thickness of metal being secured.

2.5 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Roof Edge Flashing (Gravel Stop) and Fascia Caps: Fabricate in minimum 96-inch-long, but not exceeding 10-foot- long, sections. Furnish with 6-inch-wide joint cover plates.

1. Joint Style: Butt, with 12-inch-wide concealed backup plate.
2. Fabricate from the following material:
   a. Aluminum: 0.050 inch (1.27 mm) thick.

B. Copings: Fabricate in minimum 96-inch-long, but not exceeding 10-foot-long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and drill elongated holes for fasteners on interior leg. Miter corners, seal, and solder or weld watertight.

1. Joint Style: Butt, with 12-inch-wide concealed backup plate.
2. Fabricate copings from the following material:
   a. Aluminum: 0.050 inch (1.27 mm) thick.

C. Roof and Roof to Wall Transition Expansion-Joint Cover: Fabricate from the following material:

1. Stainless Steel: 0.025 inch (0.64 mm) thick.

D. Base Flashing: Fabricate from the following material:

1. Stainless Steel: 0.019 inch (0.48 mm) thick.

E. Counterflashing: Fabricate from the following material:

1. Stainless Steel: 0.019 inch (0.48 mm) thick.

F. Roof-Penetration Flashing: Fabricate from the following material:

1. Stainless Steel: [0.019 inch (0.48 mm) thick.

G. Roof-Drain Flashing: Fabricate from the following material:

1. Stainless Steel: 0.016 inch (0.40 mm) thick.

H. Splash Pans: Fabricate from the following material:

1. Stainless Steel: 0.0187 inch thick.

2.6 WALL SHEET METAL FABRICATIONS

A. Through-Wall Flashing, In Masonry: Through-wall flashing in masonry is specified in Section 042000 – UNIT MASONRY.

2.7 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. 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 substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of work.

1. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Torch cutting of sheet metal flashing and trim is not permitted.

B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by fabricator or manufacturers of dissimilar metals.

1. Coat side of stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim will contact wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip-sheet or install a course of polyethylene underlayment.
3. Bed flanges in thick coat of asphalt roofing cement where required for waterproof performance.

C. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.

D. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and elastomeric sealant.

E. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

1. Space cleats not more than 12 inches apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.

F. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with elastomeric sealant concealed within joints.

G. Fasteners: Use fasteners of sizes that will penetrate substrate not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.

1. Aluminum: Use aluminum or stainless steel fasteners.
2. Stainless Steel: Use stainless-steel fasteners.

H. Seal joints with elastomeric sealant as required for watertight construction.

1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F set joint members for 50 percent movement either way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
2. Prepare joints and apply sealants to comply with requirements in Section 079200 - JOINT SEALANTS.

I. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pretin edges of sheets to be soldered to a width of 1-1/2 inches except where pretinned surface would show in finished Work.

1. Do not solder aluminum sheet.
2. Stainless-Steel Soldering: Pretin edges of uncoated sheets to be soldered using solder recommended for stainless steel and phosphoric acid flux. Promptly wash off acid flux residue from metal after soldering.
3. Do not use open-flame torches for soldering. Heat surfaces to receive solder and flow solder into joints. Fill joints completely. Completely remove flux and spatter from exposed surfaces.

J. Aluminum Flashing: Rivet or weld joints in uncoated aluminum where necessary for strength.

3.3 ROOF FLASHING INSTALLATION

A. General: Install sheet metal roof flashing and trim to comply with performance requirements[, sheet metal manufacturer's written installation instructions,] and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight.

B. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending a minimum of 4 inches (100 mm) over base flashing. Install stainless steel draw band and tighten.

C. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints a minimum of 4 inches and bed with elastomeric sealant.

1. Secure in a waterproof manner by means of snap-in installation and sealant.

D. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Install flashing as follows:

1. Seal with elastomeric sealant and clamp flashing to pipes penetrating roof except for flashing on vent piping.

3.4 WALL FLASHING INSTALLATION

A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

B. Through-Wall Flashing In Masonry: Installation of through-wall flashing in masonry is specified in Section 042000 - UNIT MASONRY.

3.5 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder and sealants.

C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed. On completion of installation, clean finished surfaces, including removing unused

fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain in a clean condition during construction.

D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 078410

PENETRATION FIRESTOPPING

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. Through-penetration firestop systems for penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items.

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 standard joint sealers.
2. Division 21 - FIRE SUPPRESSION for fire-protection piping penetrations.
3. Division 22 - PLUMBING for piping penetrations.
4. Division 23 - HEATING, VENTILATING AND AIR CONDITIONING for duct and piping penetrations.
5. Division 26 - ELECTRICAL for cable and conduit penetrations.

1.3 PERFORMANCE REQUIREMENTS

A. General: For penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.

B. F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated, as determined per ASTM E 814.

C. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.

1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
2. For floor penetrations with annular spaces exceeding 4 inches in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved, either by installing floor plates or by other means.
3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For each through-penetration firestop system, show each type of construction condition penetrated, relationships to adjoining construction, and type of penetrating item. Include firestop design designation of qualified testing and inspecting agency that evidences compliance with requirements for each condition indicated.

1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop system configuration for construction and penetrating items.

C. Through-Penetration Firestop System Schedule: Indicate locations of each through-penetration firestop system, along with the following information:

1. Types of penetrating items.
2. Types of constructions penetrated, including fire-resistance ratings and, where applicable, thicknesses of construction penetrated.
3. Through-penetration firestop systems for each location identified by firestop design designation of qualified testing and inspecting agency.

D. Qualification Data: For Installer.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Either a firm that has been approved by FMG according to FMG 4991, "Approval of Firestop Contractors" or a firm experienced in installing through-penetration firestop systems similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction of a minimum of five projects with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements.

B. Source Limitations: Obtain through-penetration firestop systems, for each kind of penetration and construction condition indicated, through one source from a single manufacturer.

C. Fire-Test-Response Characteristics: Provide through-penetration firestop systems that comply with the following requirements and those specified in Part 1 "Performance Requirements" Article:

1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL or another agency performing testing and follow-up inspection services for firestop systems acceptable to authorities having jurisdiction.
2. Through-penetration firestop systems are identical to those tested per testing standard referenced in "Part 1 Performance Requirements" Article. Provide rated systems complying with the following requirements:

    a. Through-penetration firestop system products bear classification marking of qualified testing and inspecting agency.
    b. Through-penetration firestop systems correspond to those indicated by reference to through-penetration firestop system designations listed in the UL “Fire Resistance Directory.”

D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver through-penetration firestop system products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, lot number, shelf life if applicable, qualified testing and inspecting agency's classification marking applicable to Project, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials for through-penetration firestop systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install through-penetration firestop systems when ambient or substrate temperatures are outside limits permitted by through-penetration firestop system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Ventilate through-penetration firestop systems per manufacturer's written instructions by natural means or, where this is inadequate, forced-air circulation.

1.8 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.

C. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until each installation has been examined building inspector, if required by authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, through-penetration firestop systems that may be incorporated into the Work include, but are not limited to, those systems indicated in the Through-Penetration Firestop System Schedule at the end of Part 3.

1. Hilti, Inc.
2. BioFireshield; RectorSeal Corporation.
3. Specified Technologies, Inc. (STI).
4. 3M; Fire Protection Products Division.

2.2 FIRESTOPPING MATERIALS

A. Compatibility: Provide through-penetration firestop systems that are compatible with one another; with the substrates forming openings; and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.

B. Materials: Provide through-penetration firestop systems containing primary materials and fill materials which are part of the tested assemblies indicated in the Through-Penetration Firestop System Schedule at the end of Part 3. Fill materials are those referred to in directories of referenced testing and inspecting agencies as "fill," "void," or "cavity" materials.

C. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use only components specified by through-penetration firestop system manufacturer and approved by qualified testing and inspecting agency for firestop systems indicated

2.3 MIXING

A. For those products requiring mixing before application, comply with through-penetration firestop system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of work. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Clean out openings immediately before installing through-penetration firestop systems to comply with firestop system manufacturer's written instructions and with the following requirements:

1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of through-penetration firestop systems.
2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with through-penetration firestop systems. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by through-penetration firestop system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent through-penetration firestop systems from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestop system materials. Remove tape as soon as possible without disturbing firestop system's seal with substrates.

3.3 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

A. General: Install through-penetration firestop systems to comply with Part 1 "Performance Requirements" Article and with firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

C. Install fill materials for firestop systems by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 FIELD QUALITY CONTROL

A. Inspecting Agency: Engage a qualified, independent inspecting agency to inspect through-penetration firestops. Independent inspecting agency shall comply with ASTM E 2174 requirements including those related to qualifications, conducting inspections, and preparing test reports.

B. Where deficiencies are found, repair or replace through-penetration firestop systems so they comply with requirements.

C. Proceed with enclosing through-penetration firestop systems with other construction only after inspection reports are issued and firestop installations comply with requirements.

3.5 CLEANING AND PROTECTING

A. Clean off excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by through-penetration firestop system manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure that through-penetration firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated through-penetration firestop systems immediately and install new materials to produce systems complying with specified requirements.

3.6 THROUGH-PENETRATION FIRESTOP SYSTEM SCHEDULE

CONCRETE FLOORS		UL-CLASSIFIED SYSTEMS			
TYPE OF PENETRANT	**F-RATING HR**	**HILTI**	**STI**	**3M**	**BIO-FIRE**
CIRCULAR BLANK OPENINGS	1	FA 0006, CAJ 0070	C-AJ-0094, C-AJ-0100	CAJ 0009	CAJ 0056
	2	FA 0006, CAJ 0070	C-AJ-0094, C-AJ-0100	CAJ 0009	CAJ 0056
	3	CAJ 0055	C-AJ-0014	CAJ 0009	CAJ 0056
SINGLE METAL PIPES OR CONDUIT	1	CAJ 1226, CAJ 1278, FA 1017	C-AJ-1080, C-AJ-1240, F-A-1110	CAJ 1058	CAJ 1264
	2	CAJ 1226, CAJ 1278, FA 1017	C-AJ-1080, C-AJ-1240, F-A-1110	CAJ 1058	CAJ 1264
	3	CAJ 1226, CAJ 1278, FA 1017	C-AJ-1080, C-AJ-1240, F-A-1110	CAJ 1058	CAJ 1264
	4	CAJ 8095, CBJ 1034	C-AJ-1217	CAJ 1044	N/A
SINGLE NON-METALLIC PIPE OR CONDUIT (I.E. PVC, CPVC, ABS, ENT)	1	CAJ 2109, CAJ 2168, FA 2054, FA 2067	C-AJ-2297, F-A-2192, F-A-2210	CAJ 2189, CAJ 2117, CAJ 2027	CAJ 2131
	2	CAJ 2109, CAJ 2168, FA 2054, FA 2067	C-AJ-2297, F-A-2192, F-A-2210	CAJ 2189, CAJ 2117	CAJ 2131
	3	CAJ 2109, CAJ 2168, FA 2054,	C-AJ-2297, F-A-2192	CAJ 2005, CAJ 2117	CAJ 2152
	4	N/A*	C-AJ-2364	N/A*	N/A
SINGLE OR BUNDLED CABLES	1	FA 3007, CAJ 3095,	C-AJ-3154, F-A-3021, F-A-3037	CAJ 3021	CAJ 3103
	2	FA 3007, CAJ 3095,	C-AJ-3154, F-A-3021, F-A-3037	CAJ 3021	CAJ 3103
	3	FA 3007, CAJ 3095,	C-AJ-3154, F-A-3021, F-A-3037	CAJ 3030	CAJ 3103
	4	N/A*	C-AJ-3154, C-AJ-3214	N/A*	N/A
CABLE TRAY	1	CAJ 4034, CAJ 4054, CAJ 4017	C-AJ-4029, C-AJ-4088	CAJ 4003	CAJ 4048
	2	CAJ 4034, CAJ 4054, CAJ 4017	C-AJ-4029, C-AJ-4088	CAJ 4003	CAJ 4048
	3	CAJ 4034, CAJ 4017	C-AJ-4029, C-AJ-4060	CAJ 4003	CAJ 4048
	4	N/A*	N/A*	N/A*	N/A

CONCRETE FLOORS (CONTINUED)		UL-CLASSIFIED SYSTEMS			
TYPE OF PENETRANT	**F-RATING HR**	**HILTI**	**STI**	**3M**	**BIO-FIRE**
SINGLE INSULATED PIPES	1	FA 5016, FA 5017, CAJ 5090, CAJ 5091,	C-AJ-5079, C-AJ-5087, F-A-5041	CAJ 5080, CAJ 5024, CAJ 5017	CAJ 5082
	2	FA 5016, FA 5017 CAJ 5090, CAJ 5091,	C-AJ-5079, C-AJ-5087, F-A-5041	CAJ 5080, CAJ 5024, CAJ 5017	CAJ 5082
	3	FA5016, CAJ 5061, CAJ 5090,	C-AJ-5079, C-AJ-5029, F-A-5041	CAJ 5024, CAJ 5017	CAJ 5006
	4	CBJ 5006	N/A*	N/A*	N/A
ELECTRICAL BUSWAY	1	CAJ 6006, CAJ 6017	C-AJ-6003, C-AJ-6019	CAJ 6001, CAJ 6002	CAJ 6026
	2	CAJ 6006, CAJ 6017	C-AJ-6003, C-AJ-6019	CAJ 6001, CAJ 6002	CAJ 6026
	3	CAJ 6006, CAJ 6017	C-AJ-6003, C-AJ-6019	CAJ 6001, CAJ 6002	N/A
NON-INSULATED MECHANICAL DUCTWORK WITHOUT DAMPERS	1	CAJ 7046 CAJ 7051	C-AJ-7023, C-AJ-7027	CAJ 7003, CAJ 7021	CAJ 7036
	2	CAJ 7046 CAJ 7051	C-AJ-7023, C-AJ-7027	CAJ 7003, CAJ 7021	N/A
	3	CAJ 7046 CAJ 7051	C-AJ-7023, C-AJ-7027	CAJ 7003, CAJ 7021	N/A
MIXED PENETRANTS	1	CAJ 8056, CAJ 8095, CAJ 8099	C-AJ-8093, C-AJ-8113, C-AJ-8181	CAJ 8001, CAJ 8013	CAJ 8051
	2	CAJ 8056, CAJ 8095, CAJ 8099	C-AJ-8093, C-AJ-8113, C-AJ-8181	CAJ 8001, CAJ 8013	CAJ 8051
	3	CAJ 8056, CAJ 8095, CAJ 8099	C-AJ-8093, C-AJ-8113, C-AJ-8181	CAJ 8001, CAJ 8013	CAJ 8051
	4	CAJ 8095	N/A*	N/A*	N/A

CONCRETE OR BLOCK WALLS		UL-CLASSIFIED SYSTEMS			
TYPE OF PENETRANT	**F-RATING**	**HILTI**	**STI**	**3M**	**BIO-FIRE**
CIRCULAR BLANK OPENINGS	1	CAJ 0055, CAJ 0070	C-AJ-0094, C-AJ-0100	CAJ 0009	CAJ 0056
	2	CAJ 0055, CAJ 0070	C-AJ-0094, C-AJ-0100	CAJ 0009	CAJ 0056
	3	CAJ 0055	C-AJ-0014	CAJ 0009	CAJ 0056
SINGLE METAL PIPES OR CONDUIT	1	CAJ 1226, CAJ 1278,	C-AJ-1080	CAJ 1058	CAJ 1264
	2	CAJ 1226, CAJ 1278,	C-AJ-1080	CAJ 1058	CAJ 1264
	3	CAJ 1226, CAJ 1278,	C-AJ-1080	CAJ 1058	CAJ 1264
	4	CAJ 8095, CBJ 1034, WJ 1042	W-J-1170	CAJ 1044	WJ 1064
SINGLE NON-METALLIC PIPE OR CONDUIT (I.E. PVC, CPVC, ABS, ENT)	1	CAJ 2109, WJ 2108, WJ 2121	W-J-2076, C-AJ-2297	CAJ 2189, CAJ 2117, CAJ 2027	CAJ 2131
	2	CAJ 2109, WJ 2108, WJ 2121	W-J-2076, C-AJ-2297	CAJ 2189, CAJ 2117, CAJ 2027	CAJ2131
	3	CAJ 2109, CAJ 2168, WJ 2091	C-AJ-2297, W-J-2085	CAJ 2005, CAJ 2117, CAJ 2027	CAJ2152
	4	WJ 2091	W-J-2085, W-J-2217	N/A*	N/A
SINGLE OR BUNDLED CABLES	1	CAJ 3095, WJ 3060 WJ 3074	W-J-3090, W-J-3180	CAJ 3021	WJ 3071
	2	CAJ 3095, WJ 3060 WJ 3074	W-J-3090, W-J-3180	CAJ 3021	WJ 3071
	3	CAJ 3095, WJ 3050	C-AJ-3154, C-AJ-3214	CAJ 3030	CAJ 3103
	4	WJ 3050	C-AJ-3154, C-AJ-3214	N/A*	N/A
CABLE TRAY	1	CAJ 4034, CAJ 4054, WJ 4016,	C-AJ-4029, C-AJ-4088	CAJ 4003	CAJ 4048
	2	CAJ 4034, CAJ 4054, WJ 4016,	C-AJ-4029, C-AJ-4088	CAJ 4003	CAJ 4048
	3	CAJ 4034, WJ 8007	C-AJ-4029, W-J-4068	CAJ 4003	CAJ 4048
	4	WJ 8007	W-J-4066, W-J-4068	N/A*	N/A

CONCRETE OR BLOCK WALLS (CONT)		UL-CLASSIFIED SYSTEMS			
TYPE OF PENETRANT	**F-RATING**	**HILTI**	**STI**	**3M**	**BIO-FIRE**
SINGLE INSULATED PIPES	1	CAJ 5090, CAJ 5091, WJ 5042	W-J-5005, W-J-5012	CAJ 5080, CAJ 5024, CAJ 5017	CAJ 5082
	2	CAJ 5090, CAJ 5091, WJ 5042	W-J-5005, W-J-5012	CAJ 5080, CAJ 5024, CAJ 5017	CAJ 5082
	3	CAJ 5090, CAJ 5091,	C-AJ-5079, C-AJ-5029	CAJ 5024, CAJ 5017	CAJ 5006
	4	WJ 5028, CBJ 5006	W-J-5072	N/A*	N/A
ELECTRICAL BUSWAY	1	CAJ 6006, CAJ 6017	C-AJ-6003, C-AJ-6019	CAJ 6001, CAJ 6002	CAJ 6026
	2	CAJ 6006, CAJ 6017	C-AJ-6003, C-AJ-6019	CAJ 6001, CAJ 6002	CAJ 6026
	3	CAJ 6006, CAJ 6017	C-AJ-6003, C-AJ-6019	CAJ 6001, CAJ 6002	N/A
NON-INSULATED MECHANICAL DUCTWORK WITHOUT DAMPERS	1	CAJ 7046, WJ 7029, WJ 7022	W-J-7089, W-J-7005, W-J-7092	CAJ 7003, CAJ 7021	CAJ 7036
	2	CAJ 7046, WJ 7029, WJ 7022	W-J-7089, W-J-7005, W-J-7092	CAJ 7003, CAJ 7021	CAJ 7036
	3	CAJ 7046 CAJ 7051	C-AJ-7023, C-AJ-7027	CAJ 7003, CAJ 7021	N/A
MIXED PENETRANTS	1	CAJ 8096, CAJ 8099 WJ 8007	C-AJ-8093, C-AJ-8113, C-AJ-8181	CAJ 8001, CAJ 8013	CAJ 8051
	2	CAJ 8096, CAJ 8099 WJ 8007	C-AJ-8093, C-AJ-8113, C-AJ-8181	CAJ 8001, CAJ 8013	CAJ 8051
	3	CAJ 8099 WJ 8007	C-AJ-8093, C-AJ-8113, C-AJ-8181	CAJ 8001, CAJ 8013	CAJ 8051
	4	WJ 8007	N/A*	N/A*	N/A

NOTES:
1. Jobsite conditions of each through-penetration firestop system must meet all details of the UL-Classified System selected.
2. If jobsite conditions do not match any UL-classified systems in the schedules above, contact firestop manufacturer for alternative systems or Engineer Judgment Drawings.
3. Coordinate work with other trades to assure that penetration-opening sizes are appropriate for penetrant locations, and vice versa.
4. For 3-hour rated gypsum walls, contact the firestop manufacturer for a UL-classified system or engineer judgment drawing.
5. The Contractor shall verify that the schedule is current at the time of construction, and that each referenced system is suitable for the intended application.

END OF SECTION

SECTION 079200

JOINT SEALANTS

(Part of Work of Section 070001 - WATERPROOFING, DAMPPROOFING AND CAULKING, 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. Joint sealants and fillers.

B. This Section includes joint sealants for the applications specified with the products in this Section and as indicated on Drawings.

C. Alternates: Not Applicable.

D. Items To Be Installed Only: Not Applicable.

E. Items To Be Furnished Only: Not Applicable.

F. Related Work: The following items are not included in this Section and are specified under the designated Sections:

1. Section 042000 - UNIT MASONRY for masonry control and expansion joint fillers and gaskets.
2. Section 088000 - GLAZING for glazing sealants.

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.

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.
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 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 Architect.
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 Architect 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. 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 deg 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 date of Substantial Completion.

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 date of Substantial Completion.

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: Provide colors as selected by the Architect from manufacturer’s full range of standard and custom colors; maximum of five colors, three standard colors and two custom colors.

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. Suitability for Contact with Food: Where elastomeric sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

D. 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. Tremco Inc.; Spectrem 1.
   d. Pecora Corporation; 864.
   e. Bondaflex Technologies; Sil 290

2. Extent of Use: Joints in exterior vertical and soffit surfaces.

E. Multicomponent 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. Meadows, W. R., Inc.; POURTHANE.
c. Pecora Corporation; Urexpan NR-200.
d. Tremco Inc.; THC-901.
e. Bondaflex Technologies; PUR 2 SL

2. Extent of Use: Joints in exterior horizontal surfaces.

F. 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. Tremco Inc.; Tremsil 200.
d. Bondaflex Technologies; Sil 100 WF

2. Extent of Use: Sanitary joints at toilet rooms.

G. 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. Pecora Corporation; AC-20+.
c. Sonneborn, BASF Building Systems; Sonolac.
d. Tremco Inc.; Tremflex 834.
e. May National Bondaflex Sil-A 700

2. Extent of Use: Non-moving joints at interior locations.

2.3 JOINT-SEALANT BACKING

A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 26 deg F. Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and to otherwise contribute to 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 back of 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. 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.
3. Remove laitance and form-release agents from concrete.
4. 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 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 behind sealants where sealant backings are not used between sealants and backs of joints.

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.

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 discolor sealants or adjacent surfaces.
3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.

3.4 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.

3.5 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 or damage at time of Substantial Completion. If, despite such protection, damage 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 079500

EXPANSION CONTROL

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. Architectural expansion joint systems for interior and exterior joints as scheduled on the Drawings and specified in this Section.

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 are specified under the designated Sections:

1. Section 033000 - CAST-IN-PLACE CONCRETE for block-outs for architectural joint systems in concrete floors, decks, and walls.
2. Section 075300 – EPDM ROOFING for roof expansion joint covers.
3. Section 079200 - JOINT SEALANTS for elastomeric sealants and preformed compressed-foam sealants without metal frames.

1.3 DEFINITIONS

A. Architectural Joint System: Any filler or cover used to span, fill, cover, or seal a joint, except expanding foam seals and poured or foamed in-place sealants.

B. Cyclic Movement: Periodic change between widest and narrowest joint widths in an automatically mechanically controlled system.

C. Fire Barriers: Any material or material combination, when fire tested after cycling, designated to resist passage of flame and hot gases through a movement joint.

D. Maximum Joint Width: Widest linear gap a joint system tolerates and performs its designed function without damaging its functional capabilities.

E. Minimum Joint Width: Narrowest linear gap a joint system tolerates and performs its designed function without damaging its functional capabilities.

F. Movement Capability: Value obtained from the difference between widest and narrowest widths of a joint opening typically expressed in numerical values (mm or inches) or a percentage of nominal value of joint width.

G. Nominal Joint Width: Width of linear gap indicated as representing the conditions existing when architectural joint systems will be installed or, if no nominal joint width is indicated, a width equal to the sum of maximum and minimum joint widths divided by two.

1.4 PERFORMANCE REQUIREMENTS

A. General: Provide factory-fabricated architectural joint systems capable of withstanding the types of loads and of accommodating the kinds of movement, and the other functions for which they are designed including those specified below, without failure. Types of failure include those listed in Appendix X3 of ASTM E 1399.

1. Vehicular Traffic Joints: Support vehicular traffic across joint, including construction equipment and full-loaded fire apparatus.
2. Pedestrian Traffic Joints: Support pedestrian traffic across joint.
3. Exterior Joints: Maintain continuity of weather enclosure.
4. Joints in Fire-Resistance-Rated Assemblies: Maintain fire-resistance ratings of assemblies.
5. Joints in Smoke Barriers: Maintain integrity of smoke barrier.
6. Joints in Acoustically Rated Assemblies: Inhibit passage of airborne noise.
7. Other Joints: Where indicated, provide joint systems that prevent penetration of water, moisture, and other substances deleterious to building components or content.
8. Seismic Joints: Remain in place on exposure to seismic activity (movement).
9. Joints in Surfaces with Architectural Finishes: Serve as finished architectural joint closures.

1.5 SUBMITTALS

A. Product Data: Include manufacturer's product specifications, construction details, material and finish descriptions, and dimensions of individual components and seals.

B. Shop Drawings: For each joint system specified, provide the following:

1. Placement Drawings: Include line diagrams showing entire route of each joint system, plans, elevations, sections, details, joints, splices, locations of joints and splices, and attachments to other Work. Where joint systems change planes, provide Isometric Drawings depicting how components interconnect to achieve continuity of joint covers and fillers.

C. Samples for Verification: Full-size units 6 inches long of each type of joint system indicated; in sets for each finish, color, texture, and pattern specified, showing the full range of variations expected in these characteristics.

D. Product Test Reports: From a qualified testing agency indicating architectural joint systems comply with requirements, based on comprehensive testing of current products.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain architectural joint systems through one source from a single manufacturer. Coordinate compatibility with adjoining joint systems specified in other Sections.

B. Fire-Test-Response Characteristics: Where indicated, provide joint systems incorporating fire barriers that are identical to those of assemblies tested for fire resistance per ASTM E 119 and ASTM E 814, including hose-stream test of vertical wall assemblies, by a testing and inspecting agency acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum: ASTM B 221, alloy 6063-T5 for extrusions; ASTM B 209, alloy 6061-T6 for sheet and plate.

1. Apply manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious materials.

B. Stainless Steel: ASTM A 666, Type 304 with No. 2B finish, unless otherwise indicated, for plates, sheet, and strips.

C. Preformed Seals: Single or multicellular extruded elastomeric seals designed with or without continuous, longitudinal, internal baffles. Formed to be installed in frames or with anchored flanges, in color indicated or, if not indicated, as selected by Architect from manufacturer's standard colors.

D. Strip Seals: Elastomeric membrane or tubular extrusions with a continuous longitudinal internal baffle system throughout complying with ASTM E 1783; used with compatible frames, flanges, and molded-rubber anchor blocks.

E. Compression Seals: Preformed, elastomeric extrusions having internal baffle system complying with ASTM E 1612 in sizes and profiles indicated or as recommended by manufacturer.

F. Preformed Cellular Foams: Nonextruded, low-density, crosslinked, nitrogen-blown ethylene-vinyl-acetate copolymer extruded, compressible foam.

G. Fire Barriers: Any material or material combination, when fire tested after cycling, designated to resist the passage of flame and hot gases through a movement joint.

H. Accessories: Manufacturer's standard anchors, clips, fasteners, set screws, spacers, flexible moisture barrier and filler materials, drain tubes, lubricants, adhesives, and other accessories compatible with material in contact, as indicated or required for complete installations.

2.2 ARCHITECTURAL JOINT SYSTEMS

A. General: Provide joint systems of design, basic profile, materials, and operation indicated. Provide units with the capability to accommodate joint widths indicated and variations in adjacent surfaces.

1. Furnish units in longest practicable lengths to minimize number of end joints. Provide hairline mitered corners where joint changes directions or abuts other materials.
2. Include closure materials and transition pieces, tee-joints, corners, curbs, cross-connections, and other accessories as required to provide continuous joint systems.
3. Frames for Strip Seals: Designed with semiclosed cavity that provides a mechanical lock for seals of type indicated.
4. Public Area Seals: Non-slip seals designed for installation on treads and risers and to lie flat with adjacent surfaces, and complying with ADA guidelines for public areas.

2.3 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.

2.4 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. 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.

2.5 STAINLESS-STEEL FINISHES

A. Remove tool and die marks and stretch lines or blend into finish.

B. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.

C. Bright, Directional Polish: No. 4 finish.

D. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare substrates according to architectural joint system manufacturer's written instructions.

B. Coordinate and furnish anchorages, Placement Drawings, and instructions for installing joint systems to be embedded in or anchored to concrete or to have recesses formed into edges of concrete slab for later placement and grouting-in of frames.

C. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary to secure joint systems to in-place construction, including threaded fasteners with drilled-in expansion shields for masonry and concrete where anchoring members are not embedded in

concrete. Provide fasteners of metal, type, and size to suit type of construction indicated and to provide for secure attachment of joint systems.

D. Provide the services of a surveyor licensed in the state the project is located prior to and after paving substrate to confirm alignment of joint.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions for handling and installing architectural joint assemblies and materials, unless more stringent requirements are indicated.

B. Coordinate installation of architectural joint assembly materials and associated work so complete assemblies comply with assembly performance requirements.

C. Terminate exposed ends of exterior architectural joint assemblies with factory-fabricated termination devices to maintain waterproof system.

D. Install factory-fabricated transitions between building expansion-joint cover assemblies and roof expansion-joint assemblies to provide continuous, uninterrupted, watertight construction.

E. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required to install joint systems.

1. Install joint cover assemblies in true alignment and proper relationship to joints and adjoining finished surfaces measured from established lines and levels.
2. Allow adequate free movement for thermal expansion and contraction of metal to avoid buckling.
3. Set covers in horizontal surfaces at elevations that place exposed surfaces flush with adjoining finishes.
4. Locate covers in continuous contact with adjacent surfaces.
5. Securely attach in place with required accessories.
6. Locate anchors at interval recommended by manufacturer, but not less than 3 inches from each end and not more than 24 inches o.c.

F. Continuity: Maintain continuity of joint systems with a minimum number of end joints and align metal members. Cut and fit ends to produce joints that will accommodate thermal expansion and contraction of metal to avoid buckling of frames. Adhere flexible filler materials, if any, to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.

G. Extruded Preformed Seals: Install seals to comply with manufacturer's written instructions and with minimum number of end joints.

1. For straight sections, provide preformed seals in continuous lengths.
2. Vulcanize or heat-weld field splice joints in preformed seal material to provide watertight joints using procedures recommended by manufacturer.
3. Apply adhesive, epoxy, or lubricant adhesive approved by manufacturer to both frame interfaces before installing preformed seals.
4. Seal transitions according to manufacturer's written instructions.
5. Install foam seals with adhesive recommended by manufacturer and heat seal all splices.

H. Joint Systems with Seals: Seal end joints within continuous runs and joints at transitions according to manufacturer's written instructions to provide a watertight installation.

I. Seismic Seals: Install interior seals in continuous lengths. Install exterior seal in standard lengths and vulcanize or heat-weld field splice joints to provide watertight joints using manufacturer's recommended procedures. Seal transitions and end joints according to manufacturer's written instructions.

J. Fire Barriers: Install fire barriers to provide continuous, uninterrupted fire resistance throughout length of joint, including transitions and end joints.

3.3 CLEANING AND PROTECTION

A. Do not remove protective covering until finish work in adjacent areas is complete. When protective covering is removed, clean exposed metal surfaces to comply with manufacturer's written instructions.

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 filed in a sealed envelope with the City of Quincy at a time and place as stipulated in the "NOTICE TO CONTRACTORS".

   The following should appear on the upper left hand corner of the envelope:

   NAME OF SUB-BIDDER: (Insert name of sub-bidder)

   MASS. STATE PROJECT: ((Insert project number from top of page))

   SUB-BID FOR SECTION: 080002 – GLASS AND GLAZING

2. Each sub-bid submitted for work under this Section shall be on forms furnished by the City of Quincy as required by Section 44F of Chapter 149 of the General Laws, as amended. Sub-bid forms may be obtained at the office of the Purchasing Department or may be obtained by written or telephone request; telephone 617-376-1060

3. Sub-bids filed with the City of Quincy 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 City of Quincy 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: *to be inserted with final documents.*

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 088000 - GLAZING.

B. Alternates: Not Applicable.

END OF SECTION

SECTION 081110

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. 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 are specified under the designated Sections:

1. Section 042000 - UNIT MASONRY for building anchors into and grouting steel frames in masonry construction.
2. Section 087100 - DOOR HARDWARE for door hardware for steel doors.
3. Section 088000 - GLAZING for glazed lites.
4. 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.
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, removable stops, and glazing.
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 Door, 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. CURRIES Company; an ASSA ABLOY Group Company.
3. de LaFontaine
4. Mesker Door Inc.
5. Pioneer Industries, Inc.
6. Philipp Manufacturing Company.
7. Republic Builders Products Company.
8. 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. Glazing: Comply with requirements in Section 088000 - GLAZING.

J. 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 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 deg F x h x sq. ft./Btu when tested according to ASTM C 1363.
3. Top and Bottom Edges: Closed with flush or inverted 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 full profile welded 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 full profile welded 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 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. Compression Type: Not less than two anchors in each jamb.
   c. 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 Division 26 - ELECTRICAL.

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 epoxy 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.
2. Refer to Section 099000 – PAINTING AND COATING for field-applied coating.

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. 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.
8. 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: 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 081300

SANITARY AND WATERTIGHT STEEL DOOR AND FRAMES

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. Sanitary/watertight swinging doors and frames.
2. Steel sidelight, borrowed lite and transom panels and frames.

B. Related Sections:

1. Division 04 Section "Unit Masonry" for embedding anchors for sanitary/watertight steel work into masonry construction.
2. Division 08 Section "Glazing" for glass view panels in sanitary/watertight steel doors.
3. Division 08 Sections "Door Hardware" and "Access Control Hardware" for door hardware for sanitary/watertight steel doors and frames.
4. Division 26 "Electrical" Sections for electrical connections including conduit and wiring for door controls and operators installed on frames with factory installed electrical knock out boxes.
5. Division 28 Section "Access Control" for access control devices installed at door openings and provided as part of a security access system.

C. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI/SDI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
2. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frames Anchors and Hardware Reinforcing.
3. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
4. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
5. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.
6. ASTM A1008 - Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.

7. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
8. ASTM A924 - Standard Specification General Requirements for Steel Sheet, Metallic Coated by the Hot Dip Process.
9. ANSI/BHMA A156.15 - Hardware Preparation in Steel Doors and Frames.
10. ANSI/SDI 122 - Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
11. ANSI/NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.
12. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.
13. UL 10C (1998) - Positive Pressure Fire Tests of Door Assemblies; UL 1784 (2001) - Standard for Air Leakage Tests of Door Assemblies.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, hardware reinforcements, profiles, anchors, fire-resistance rating, and finishes.

B. Door hardware supplier is to furnish templates, template reference number and/or physical hardware to the steel door and frame supplier in order to prepare the doors and frames to receive the finish hardware items.

C. Shop Drawings: Include the following:

1. Elevations of each door design.
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, removable stops, and glazing.
9. Details of preparations for power, signal, and control systems.

D. Samples for Verification:

1. Samples are only required by request of the architect and for manufactures that are not current members of the Steel Door Institute.

E. Informational Submittals:

1. Certificates of Compliance: Submit any information necessary to indicate compliance with this specification section.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain sanitary/watertight steel doors and frames through one source from a single manufacturer wherever possible.

B. Sanitary/Watertight steel door and frames exposed to severe conditions are to be maintained in a sterile condition. Assemblies with ledges, pockets or concealed surfaces that cannot be cleaned by hand wiping are not acceptable.

C. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 (neutral pressure at 40" above sill) or UL 10C.

1. Oversize Fire-Rated Door Assemblies Construction: For units exceeding sizes of tested assemblies provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
2. Temperature-Rise Limit: Where indicated and at vertical exit enclosures (stairwell openings) and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire-test exposure.

D. Fire-Rated, Borrowed-Light Frame 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 indicated, based on testing according to NFPA 257. Label each individual glazed lite.

E. Smoke-Control Door Assemblies: Comply with NFPA 105.

F. Pre-Installation Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for installing sanitary/watertight steel doors and frames and to verify installation of electrical knockout boxes and conduit at frames with electrified or access control hardware.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver sanitary/watertight steel work palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use non-vented plastic.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store sanitary/watertight steel 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- (102-mm-) high wood blocking. Do not store in a manner that traps excess humidity.

1. Provide minimum 1/4-inch (6-mm) space between each stacked door to permit air circulation. Door and frames to be stacked in a vertical upright position.

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 sanitary/watertight steel 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.

1.8 WARRANTY

A. Provide manufacturer's written 5 year warranty against defects in materials and workmanship upon final completion and acceptance of Work in this section.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. National Custom Hollow Metal.
2. Next Door Company.
3. Security Metal Products.

B. Substitutions: Material from alternate sanitary/watertight steel door and frame fabricators will not be accepted on jobsite without prior written and sample approval in accordance with requirements specified in Division 01.

2.2 MATERIALS

A. General: Sanitary/watertight doors and frames to be manufactured of commercial quality galvanized steel complying with ASTM A924/A924M, or ASTM A653/A653M, with a minimum coating of G90. Door and frame corners, seams, closures and channels shall be welded and sealed watertight.

B. Frame Anchors: ASTM A 653/A 653M, Commercial Steel (CS), Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

C. Glazing: Comply with requirements in Division 08 Section, "Glazing."

2.3 SANITARY/WATERTIGHT STEEL DOORS

A. General: Provide 1-3/4 inch doors of type and 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/SDI A250.8.

1. Design: Flush panel.
2. Core Construction: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, mineral core, or vertical steel-stiffener core.

    a. Polystyrene and Polyurethane Doors: Manufacturer's standard polystyrene or polyurethane core permanently bonded to both faces.
    b. Standard Vertical Steel-Stiffener Core: Minimum 22 gage steel-stiffeners at 6 inches on-center construction attached by spot welds spaced not more than 5" on centers. Spaces inside and between stiffeners to be completely filled with inorganic non-combustible batt-type insulation. Organic materials including, but not limited to, wood, paper, cardboard, glue, mastics, resins or fillers are not acceptable.
    c. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.

3. Level/Model: Level 3 and Physical Performance Level A (Extra Heavy Duty), Minimum 16 gage (0.053-inch - 1.3-mm) thick steel, Model 2 (Fully welded, seamless face and edges).
4. Vertical Edges: Vertical edges to have the face sheets joined by a continuous weld extending the full height of the door. Welds are to be ground, filled and dressed smooth. Beveled Edge, 1/8 inch in 2 inches (3 mm in 50 mm).
5. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gage (0.053-inch - 1.3-mm), extending the full width of the door and welded to the face sheet. Finish top and bottom to provide a smooth flush condition.
6. Surface Applied Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets

2.4 SANITARY/WATERTIGHT STEEL FRAMES

A. General: Provide frames of the type and profile indicated, not less than thickness indicated; to comply with ANSI/SDI A250.8.

1. Fabricate frames with mitered corners.
2. Fabricate frames with "closed and tight" mitered, full depth continuously welded seams, finished smooth with no visible seam unless otherwise indicated. Knock down type frames are not permitted.
3. Minimum 16 gage (0.053-inch -1.3-mm) thick steel sheet
4. Provide where indicated cutoff stops not to exceed 6" in height and capped at a 45 degree angle. Filler shall be welded watertight.

B. Fire rated frames: Fabricate frames in accordance with NFPA 80, listed and labeled by a qualified testing agency, for fire-protection ratings indicated.

C. Surface Applied Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 Table 4 with reinforcement plates from same material as frames.

2.5 FRAME ANCHORS

A. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup anchors to suit frame size, not less than 16 (0.8 mm) gage thickness, with corrugated or perforated straps not less than 2 inches (50 mm) wide by 10 inches (250 mm) long; or wire anchors not less than 0.177 inch (4.5 mm) thick.
2. Stud Wall Type: Designed to engage stud and not less than 16 gage (0.8 mm) thickness.

B. Floor Anchors: Floor anchors to be provided at each jamb. Formed from same material as frames, not less than 14 gage (0.067-inch -1.7-mm) thick.

C. Mortar Guards: Provide minimum 26 gage mortar guards welded to the back of each hardware cutout.

2.6 STOPS AND GLAZED LITES

A. Moldings for Glazed Lites in Doors and Loose Stops for Glazed Lites in Frames: Minimum 16 gage (0.8 mm) thick, fabricated from same material as door face sheet in which they are installed.

2.7 FABRICATION

A. Fabricate sanitary/watertight steel 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. When shipping limitations so dictate, frames for large openings are to be fabricated in sections for splicing or splining in the field by others.

B. Tolerances: Fabricate sanitary/watertight steel work to tolerances indicated in ANSI/SDI A250.8.

C. Sanitary/Watertight Steel Doors and Frames:

1. Sanitary Water Tight Design Doors: Where indicated, provide optional sanitary design to completely seal door against water penetration. Hardware cutouts to be completely sealed to prevent water penetration inside of the door.
2. Glazed Lites: Factory cut openings in doors with fixed glass molding flush with the door skin and removable glass molding overlapping and welded into a single "picture frame" assembly. Glass cutouts to be completely sealed to prevent water penetration inside of the door.

3. Astragals: Provide overlapping astragals on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch (19 mm) beyond edge of door on which astragal is mounted.
4. Continuous Hinge Reinforcement: Provide welded continuous 12 gage strap for continuous hinges specified in hardware sets in Division 08, Section "Door Hardware".

D. Sanitary/Watertight Steel 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. Welded Frames: Full depth continuously weld frame seams; grind, fill, dress, and make smooth and flush.

   a. Welded frames are to be provided with two steel spreaders temporarily attached to the bottom of both jambs to serve as a brace during shipping and handling. Spreader bars are for bracing only and are not to be used to size the frame opening.

2. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
3. High Frequency Hinge Reinforcement: Provide 12 gage angle reinforcements for butt type hinges on every door and frame assembly.
4. Continuous Hinge Reinforcement: Provide welded continuous 12 gage straps for continuous hinges specified in hardware sets in Division 08 Section, "Door Hardware".
5. Electrical Knock Out Boxes: Factory weld 18 gage electrical knock out boxes to frame for electrical hardware preps; this includes but not limited to electric through wire transfer hardware, electrical raceways and wiring harnesses, door position switches, electric strikes, magnetic locks, and jamb mounted card readers as noted in door hardware sets in Division 08 Section, "Door Hardware".

   a. Provide electrical knock out boxes as required for Project.
   b. Conduit to be coordinated and installed in the field (Division 26) from middle hinge box and strike box to door position box.
   c. Electrical knock out boxes to comply with NFPA requirements and fit electrical door hardware as specified in hardware sets in Division 08 Section, "Door Hardware".
   d. Electrical knock out boxes for continuous hinges should be located in the center of the vertical dimension on the hinge jamb.

6. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
7. Jamb Anchors: Provide number and spacing of anchors as follows:

   a. Masonry and Stud Wall Types: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:

      1) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 84 inches (2137 mm) high.

E. Surface Hardware Preparation: Factory prepare sanitary/watertight steel work to receive template mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section, "Door Hardware."

1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
2. Reinforce doors and frames to receive non-template, 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 sanitary/watertight steel work for hardware.
4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

F. Stops and Moldings: Provide stops and moldings around glazed lites where indicated.

1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of sanitary/watertight steel work.
2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so glazed lites are capable of being removed independently.

3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.

2.8 STEEL FINISHES

A. Prime Finish: Doors and frames to be cleaned, and chemically treated to insure maximum finish paint adhesion. Surfaces of the door and frame exposed to view to receive a factory applied coat of rust inhibiting shop primer.

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. General Contractor to verify the accuracy of dimensions given to door and frame manufacturer for existing openings or existing frames (strike height, hinge spacing, hinge back set, etc.).

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 as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Prior to installation, adjust and securely brace welded sanitary/watertight steel frames for squareness, alignment, twist, and plumbness.

C. Tolerances shall comply with SDI-117 "Manufacturing Tolerances Standard Steel Doors and Frames."

D. Drill and tap doors and frames to receive non-template, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install sanitary/watertight steel work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Sanitary/Watertight Steel Frames: Install sanitary/watertight steel 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. Shim as necessary to comply with installation tolerances.

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. Seal all areas where frames come in contact with the wall or other surrounds.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with appropriate mortar.
4. Grout Requirements: Do not grout head of frames unless reinforcing has been installed in head of frame. Do not grout vertical or horizontal closed mullion members.

C. Sanitary/Watertight Steel Doors: Fit sanitary/watertight steel 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 (3 mm) plus or minus 1/16 inch (1.6 mm).
b. Between Edges of Pairs of Doors: 1/8 inch (3 mm) plus or minus 1/16 inch (1.6 mm).

c. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch (19 mm).

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

D. Glazing: Comply with installation requirements in Division 08 Section, "Glazing" and with door manufacturer's written instructions.

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 sanitary/watertight steel work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from sanitary/watertight steel 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.

END OF SECTION 081300

SECTION 083310

OVERHEAD COILING DOORS

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 and electric-motor-operated overhead coiling doors of the following types:
   a. Insulated service doors.

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 are specified under the designated Sections:

1. Section 055000 - METAL FABRICATIONS for miscellaneous steel supports.
2. Section 087100 - DOOR HARDWARE for lock cylinders and keying.
3. Division 26 - ELECTRICAL for electrical service and connections for powered operators and accessories.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide overhead coiling doors capable of withstanding the effects of gravity loads and the following loads and stresses without evidencing permanent deformation of door components:

1. Wind Load: Uniform pressure (velocity pressure) required by Code but not less than 20 lbf/sq. ft. acting inward and outward.

B. Operation-Cycle Requirements: Provide overhead coiling door components and operators capable of operating for not less than 20,000 cycles and for 10 cycles per day.

1.4 SUBMITTALS

A. Product Data: For each type and size of overhead coiling door and accessory. Include the following:

1. Summary of forces and loads on walls and jambs.
2. Fire-Rated Doors: Include description of fire-release system including testing and resetting instructions.

B. Shop Drawings: For special components and installations not dimensioned or detailed in manufacturer's product data.

C. 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 doors through one source from a single manufacturer.

1. Obtain operators and controls from overhead coiling door manufacturer.

C. Fire-Test-Response Characteristics: Provide assemblies complying with NFPA 80 that are identical to door and frame assemblies tested for fire-test-response characteristics per UL 10b and NFPA 252, and that are listed and labeled for fire ratings indicated by UL, FMG, ITS, or another testing and inspecting agency acceptable to authorities having jurisdiction.

D. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a testing agency acceptable to authorities having jurisdiction that doors comply with all standard construction requirements of tested and labeled fire-rated door assemblies except for size.

E. 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. Raynor Garage Door Co.
4. Wayne-Dalton Corp.

B. Basis-of-Design: Series 625 by Overhead Door.

2.2 DOOR CURTAIN MATERIALS AND CONSTRUCTION

A. Door Curtains: Fabricate overhead coiling door curtain of interlocking slats, designed to withstand wind loading indicated, in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:

1. Steel Door Curtain Slats: Zinc-coated (galvanized), cold-rolled structural steel (SS) sheet; complying with ASTM A 653/A 653M, G90 (Z275) coating designation.

   a. Minimum Base-Metal (Uncoated) Thickness: 0.0209 inch.
   b. Flat profile slats.

2. Insulation: Fill slat with manufacturer's standard rigid cellular polystyrene or polyurethane-foam-type thermal insulation complying with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E 84. Enclose insulation completely within metal slat faces.
3. Inside Curtain Slat Face: To match material of outside metal curtain slat.

B. Endlocks and Windlocks for Service Doors: Malleable-iron casings galvanized after fabrication, secured to curtain slats with galvanized rivets or high-strength nylon. Provide locks on not less than alternate curtain slats for curtain alignment and resistance against lateral movement.

C. Bottom Bar for Service Doors: Consisting of 2 angles, each not less than 1-1/2 by 1-1/2 by 1/8 inch thick; galvanized, stainless-steel, or aluminum extrusions to suit type of curtain slats.

D. Curtain Jamb Guides for Service Doors: Fabricate curtain jamb guides of steel angles or channels and angles, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Build up units with not less than 3/16-inch-thick galvanized steel sections complying with ASTM A 36/A 36M and ASTM A 123/A 123M. Slot boltholes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain, and a continuous bar for holding windlocks.

2.3 HOODS AND ACCESSORIES

A. Hood: Form to act as weatherseal and 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 steel doors of minimum 0.028-inch-thick, hot-dip galvanized steel sheet with G90 zinc coating, complying with ASTM A 653/A 653M.
2. Include automatic drop baffle to guard against passage of smoke or flame.

B. Weatherseals: Provide replaceable, adjustable, continuous, compressible weather-stripping gaskets fitted to bottom and top of exterior doors, unless otherwise indicated. At door head, use 1/8-inch-thick, replaceable, continuous sheet secured to inside of hood.

1. Provide motor-operated doors with combination bottom weatherseal and sensor edge.
2. In addition, provide replaceable, adjustable, continuous, flexible, 1/8-inch- thick seals of flexible vinyl, rubber, or neoprene at doorjambs for a weathertight installation.

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 door unit is power operated, provide safety interlock switch to disengage power supply when door is locked.

2.4 COUNTERBALANCING MECHANISM

A. General: Counterbalance doors by means of adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to door 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 curtain without distortion of slats and to limit barrel deflection to not more than 0.03 in./ft. (2.5 mm/m) 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 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 ELECTRIC DOOR OPERATORS

A. General: Provide electric door operator assembly of size and capacity recommended and provided by door manufacturer for door 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 door, 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. Door-Operator Type: Provide wall-, hood-, or bracket-mounted, jackshaft-type door operator unit consisting of electric motor, drive, and chain and sprocket secondary drive.

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 door 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 electrical characteristics of motors with building electrical system.

H. Remote-Control Station: Provide momentary-contact, three-button control station with push-button controls labeled "Open," "Close," and "Stop."

1. Provide interior units, full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.

I. 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.

J. Limit Switches: Provide adjustable switches, interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.

K. Provide electric operators with ADA-compliant audible alarm and visual indicator lights.

2.6 FINISHES

A. 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.

B. Powder-Coat Finish: Manufacturer's standard powder-coat finish consisting of primer and topcoat according to coating manufacturer's written instructions for cleaning, pretreatment, application, thermosetting, and minimum dry film thickness.

1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install coiling doors and operating equipment complete with necessary hardware, jamb and head molding strips, anchors, inserts, hangers, and equipment supports.

1. Install fire-rated doors to comply with NFPA 80.

3.2 ADJUSTING

A. Lubricate bearings and sliding parts; adjust doors to operate easily, free of warp, twist, or distortion and with weathertight fit around entire perimeter.

3.3 STARTUP SERVICES

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner’s maintenance personnel to adjust, operate, and maintain overhead coiling doors.

END OF SECTION

SECTION 084110

ALUMINUM STOREFRONT FRAMING

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. Exterior aluminum storefront framed windows.

B. Related Work: The following items are not included in this Section:

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 088000 - GLAZING for glazing requirements to the extent not specified in this Section.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design storefront system, 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. 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 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 required by Code.

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. 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.

F. 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.
2. Performance: Maximum air leakage shall not exceed the following: fixed storefront units, 1.0 cfm/sf.

G. 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.

H. 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.

I. 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 when tested according to AAMA 1503.

1.4 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of product indicated.

B. Shop Drawings: For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work.

1. Include structural analysis of story drift and deflection from anticipated live loads, and determination whether head receptors are required.

2. Include details of provisions for system expansion and contraction and for draining moisture occurring within the system to the exterior.

C. Delegated-Design Submittal: For storefront systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

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.

H. Maintenance Data: For aluminum-framed systems to include in maintenance manuals.

I. 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.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of 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.

1.6 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 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 date of Substantial Completion.

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. Storefront, Thermal Break, 2 inch by 4-1/2 inch profile :
   a. EFCO, a Pella Company, S-403 I.
   b. Kawneer North America, VG451T.
   c. Oldcastle BuildingEnvelope, 3000T.
   d. Tubelite Inc., E14000 IO.
   e. United States Aluminum, IT451.

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: As specified 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 ACCESSORY MATERIALS

A. Insulating Materials: As specified in Section 072100 - THERMAL INSULATION.

B. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Section 079200 - JOINT SEALANTS.

C. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil thickness per coat.

2.6 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. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.7 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 Architect from manufacturer's full range.

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 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.

G. 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. Testing Agency: Engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. 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 Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.

C. Repair or remove work where test results and inspections indicate that it does not comply with specified requirements.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

END OF SECTION

SECTION 088000

GLAZING

(Part of Work of Section 080002 - GLASS AND GLAZING, Trade 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. Glass and glazing for the following products and applications:
   a. Steel doors, frames and sidelights specified in Section 081110 - HOLLOW METAL DOORS AND FRAMES.
   b. Glazed window framing specified in Section 084110 - ALUMINUM STOREFRONT FRAMING.
   c. Interior borrowed lites.

B. Alternates: Not Applicable.

C. Items To Be Installed Only: Not Applicable.

D. Items To Be Furnished Only: Not Applicable.

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. 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.

c. 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.

d. 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 deg F, ambient; 180 deg 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 deg 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: For the following products, in the form of 12-inch- square Samples for glass.

1. Each color of tinted float glass.
2. Coated vision glass.
3. Ceramic-coated spandrel glass.
4. Each pattern and color of ceramic-coated vision glass.
5. Fire-resistive glazing products.
6. Each type of laminated glass with colored interlayer.
7. Insulating glass for each designation indicated.
8. For each color (except black) of exposed glazing sealant indicated.

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 of the following types of glazing products:

1. Tinted float glass.
2. Coated float glass.
3. Fire-resistive glazing products.
4. Insulating glass.
5. Glazing sealants.

6. Glazing 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, 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. Glazing for Fire-Rated 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 for door assemblies and NFPA 257 for window assemblies.

H. Safety Glazing Products: Comply with testing requirements in 16 CFR 1201.

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. IGMA Publication for Insulating Glass: SIGMA TM-3000, "Glazing Guidelines for Sealed Insulating Glass Units."

J. 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.

K. 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.

L. 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.

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 deg F.

1.9 WARRANTY

A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form, made out to the Owner 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 date of Substantial Completion.

B. Manufacturer's Special Warranty on Laminated Glass: Manufacturer's standard form, made out to the Owner 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 date of Substantial Completion.

C. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form, made out to the Owner 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 date of Substantial Completion.

PART 2 - PRODUCTS

2.1 INSULATING-GLASS UNITS

A. Insulating-Glass Units for Vertical Glazing: 1 inch thick (25.0 mm) insulating glass consisting of two lites of 1/4 inch (6 mm) 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.

2.2 GLASS PRODUCTS

A. Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.

B. Heat-Treated Float Glass: ASTM C 1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
2. For uncoated glass, comply with requirements for Condition A.
3. For coated vision glass, comply with requirements for Condition C (other coated glass).

C. Coated Float Glass: Pyrolytic and vacuum deposited coatings on glass in conformance with ASTM C 1376.

D. Uncoated Tinted Float Glass: Class 2, complying with other requirements specified.

1. Tint Color: As selected by the Architect.
2. Visible Light Transmittance: As standard with manufacturer.

E. Tempered Float Glass: ASTM C 1048; Type I (transparent flat glass); Quality-Q3; Kind FT; 1/4 inch thick unless indicated otherwise.

F. 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 inch (0.76 mm) thick for vertical glazing, 0.060 inch (1.52 mm) thick for sloped glazing.
4. Interlayer Color: Clear unless otherwise indicated.

G. Fire-Rated Monolithic Ceramic Glazing Material (Not for Temperature-Rise-Rated Doors): Proprietary product in the form of clear flat sheets of 3/16-inch nominal (5.0 mm) thickness weighing 2.5 lb/sq. ft. and as follows:

1. Fire-Protection Rating: As indicated for the fire window in which glazing material is installed, and permanently labeled by a testing and inspecting agency acceptable to authorities having jurisdiction.
2. Product: "Premium FireLite" (polished on both surfaces) by Nippon Electric Glass Co., Ltd., and distributed by Technical Glass Products.

H. 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.

I. Ceramic-Coated Spandrel Glass: ASTM C 1048, Condition B, Type I, Quality-Q3, and complying with other requirements specified.

1. Glass: Clear float.
2. Ceramic Coating Color: Custom color as selected by the Architect.

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 Architect from manufacturer's full range.

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:

   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.

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 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.

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.

2.6 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 089000

LOUVERS AND VENTS

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 extruded-aluminum louvers and frames.

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 are specified under the designated Sections:

1. Section 079200 - JOINT SEALANTS for sealants installed in perimeter joints between louver frames and adjoining construction.
2. Division 23 - HEATING, VENTILATING AND AIR CONDITIONING for louvers that are a part of mechanical equipment.

1.3 DEFINITIONS

A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.

B. Drainable-Blade Louver: Louver with blades having gutters that collect water and drain it to channels in jambs and mullions, which carry it to bottom of unit and away from opening.

1.4 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide louvers capable of withstanding the effects of gravity loads and wind loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act on vertical projection of louvers. Loads as required by Code.

B. Seismic Performance: Provide louvers capable of withstanding the effects of earthquake motions as required by code.

C. Thermal Movements: Provide louvers that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. 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.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other Work. Show blade profiles, angles, and spacing.

1. For installed louvers indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Samples for Verification: For each type of metal finish required.

D. Qualification Data: For professional engineer.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency or by manufacturer and witnessed by a qualified testing agency, for each type of louver.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain louvers and vents through one source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

B. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.2, "Structural Welding Code--Aluminum."

C. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify louver 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 louvers without field measurements. Coordinate construction to ensure that actual opening dimensions correspond to established dimensions.

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. Louvers and Vents:
   a. Airolite Company, LLC.
   b. Construction Specialties, Inc.
   c. Greenheck.
   d. Industrial Louvers, Inc.
   e. McDermott Metal Works Corporation
   f. Nystrom Building Products.
   g. Ruskin Company.

2.2 MATERIALS

A. Aluminum Extrusions: ASTM B 221, alloy 6063-T5 or T-52.

B. Aluminum Sheet: ASTM B 209, alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer for required finish.

C. Fasteners: Of same basic metal and alloy as fastened metal or 300 Series stainless steel, unless otherwise indicated. Do not use metals that are incompatible with joined materials.

D. Postinstalled Fasteners for Concrete and Masonry: Torque-controlled expansion anchors, made from stainless-steel components, with capability to sustain, without failure, a load equal to 4 times the loads imposed, for concrete, or 6 times the load imposed, for masonry, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.3 FABRICATION, GENERAL

A. Assemble louvers in factory to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

B. Maintain equal louver blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.

C. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.

D. Include supports, anchorages, and accessories required for complete assembly.

E. Provide vertical mullions of type and at spacings indicated, but not more than recommended by manufacturer, or 72 inches o.c., whichever is less.

1. Fully Recessed Mullions: Provide mullions fully recessed behind louver blades. Where length of louver exceeds fabrication and handling limitations, fabricate with close-fitting blade splices designed to permit expansion and contraction.

F. Join frame members to each other and to fixed louver blades with fillet welds concealed from view, unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.4 FIXED, EXTRUDED-ALUMINUM LOUVERS

A. Horizontal Storm-Resistant Louvers:

1. Louver Depth: 4 inches.
2. Frame and Blade Nominal Thickness: As required to comply with structural performance requirements, but not less than 0.080 inch.
3. Performance Requirements:

a. Free Area: Comply with requirements indicated on the Drawings.
b. Wind-Driven Rain Performance: Not less than 99 percent effectiveness when subjected to a rain fall rate of 3 inches per hour and a wind speed of 29 mph at a core area intake velocity of 300 fpm.

4. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

B. High-Performance Organic-Coating 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 Coating 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 Architect from manufacturer's full range.

2.5 LOUVER SCREENS

A. General: Provide screen at each exterior louver.

1. Screen Location for Fixed Louvers: Interior face.
2. Screening Type: Bird screening..

B. Secure screens to louver frames with stainless-steel machine screws, spaced a maximum of 6 inches from each corner and at 12 inches o.c.

C. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.

D. Louver Screening for Aluminum Louvers:

1. Bird Screening: Aluminum, 1/2-inch-square mesh, 0.063-inch wire.

2.6 BLANK-OFF PANELS

A. Insulated, Blank-off Panels: Laminated metal-faced panels consisting of insulating core surfaced on back and front with metal sheets.

1. Thickness: 1 inch.
2. Metal Facing Sheets: Aluminum sheet, not less than 0.032-inch nominal thickness.
3. Insulating Core: Rigid insulation board.
4. Seal perimeter joints between panel faces and louver frames with 1/8-by-l-inch PVC compression gaskets.
5. Panel Finish: Same finish applied to louvers.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and openings, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.3 INSTALLATION

A. Locate and place louvers and vents level, plumb, and at indicated alignment with adjacent work.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

C. Form closely fitted joints with exposed connections accurately located and secured.

D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

E. Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.

F. Protect galvanized and nonferrous-metal surfaces from corrosion or galvanic action by applying a heavy coating of bituminous paint on surfaces that will be in contact with concrete, masonry, or dissimilar metals.

G. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Section 079200 - JOINT SEALANTS for sealants applied during louver installation.

3.4 ADJUSTING AND CLEANING

A. Clean exposed surfaces of louvers and vents that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate until final cleaning.

B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.

C. Restore louvers and vents damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.

1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION

SECTION 090007

PAINTING

(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 filed in a sealed envelope with the City of Quincy at a time and place as stipulated in the "NOTICE TO CONTRACTORS".

   The following should appear on the upper left hand corner of the envelope:

   NAME OF SUB-BIDDER: (Insert name of sub-bidder)

   MASS. STATE PROJECT: ((Insert project number from top of page))

   SUB-BID FOR SECTION: 090007 – PAINTING

2. Each sub-bid submitted for work under this Section shall be on forms furnished by the City of Quincy as required by Section 44F of Chapter 149 of the General Laws, as amended. Sub-bid forms may be obtained at the office of the Purchasing Department or may be obtained by written or telephone request; telephone 617-376-1060

3. Sub-bids filed with the City of Quincy 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 City of Quincy 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: *to be inserted with final documents*.

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 099000 - PAINTING AND COATING

B. Alternates: Not Applicable.

END OF SECTION

SECTION 096110

VAPOR MITIGATION AT SLABS

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. Vapor mitigation at concrete slabs under the following finishes:
   a. Resilient flooring.
   b. Carpet flooring.
2. Underlayment over floors receiving vapor mitigation.

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 are specified under the designated Sections:

1. Section 033000 - CAST-IN-PLACE CONCRETE for concrete substrates.

1.3 SUBMITTALS

A. Product Data: For each product indicated.

B. Qualification Data: For Installer.

C. Field quality-control test reports.

D. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of vapor mitigation coatings required for this Project.

B. Source Limitations: Obtain coatings from a single manufacturer.

C. Prior to start of work the concrete substrates shall be tested by the Special Inspector in accordance with the manufacturer's recommendations. Tests shall be approved by the manufacturer's representative.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages and containers with seals unbroken and bearing manufacturer's labels showing the following information:

1. Manufacturer's brand name.
2. Type of material.
3. Directions for storage.
4. Date of manufacture and shelf life.
5. Lot or batch number.
6. Mixing and application instructions.

B. Store materials in a clean, dry location protected from exposure to direct sunlight. In storage areas, maintain environmental conditions within range recommended in writing by manufacturer.

1.6 PROJECT CONDITIONS

A. Do not apply moisture vapor reduction system to unprotected surfaces or when water is accumulated on the surface of the concrete.

B. Do not apply water vapor reduction system when temperature is lower than 50° F or expected to fall below this temperature within 24 hours from time of application.

C. Allow continuous ventilation and indirect air movement at all times during application and curing process of the water vapor reduction system.

D. Protection: Protect water vapor reduction system to prevent damage from active rain or topical water for a minimum period of 24 hours from time of application.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace systems that deteriorate during the specified warranty period.

1. Warranty Period: Ten years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Available Manufacturers: Provide products by one of the following:

1. Ardex Engineered Cements; Ardex MC Moisture Control System.
2. Koester American Corporation; Koester VAP 1 2000 System.
3. Laticrete International Inc.; Drytek MVB.

2.2 MATERIALS

A. General: Use materials of one manufacturer throughout the project as hereinafter specified.

B. Water-based primer/curing agent, 100% solids coating, containing specifically formulated chemicals and resins to provide the following characteristics:

1. ASTM E 96, Water Vapor Transmission (wet methods) Performance shall be documented by an independent testing laboratory at a minimum 90% for water vapor transmission reduction compared to untreated concrete.
2. ASTM D 1308; Insensitivity to alkaline environment up to pH 14.
3. Certify acceptance and exposure to continuous topical water exposure after final cure.

C. Sand (as required): Fine sand less than 1/50 in. in grain size or 98.5% passing sive size #30 or #35.

D. Underlayment (as required): Hydraulic-cement-based, polymer-modified, self-leveling product complying with ASTM C 387, that can be applied in minimum uniform thicknesses of 1/4 inch and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement, or hydraulic or blended hydraulic cement as defined by ASTM C 219.
2. Compressive Strength: Not less than 5500 psi at 28 days when tested according to ASTM C 109/C 109M.
3. Underlayment Additive: Resilient-emulsion product of underlayment manufacturer formulated for use with underlayment when applied to substrate and conditions indicated.

E. Water: Potable and at a temperature of not more than 70 deg F.

2.3 SYSTEM

A. Provide manufacturer’s standard system, consisting of one to three coats, applied to a properly prepared concrete surface.

1. The water vapor reduction system shall be required to reduce vapor emissions by a minimum of 90% after final cure.
2. Provide compatible crack filler for cracks in excess of 1/32 inch.

2.4 MIX DESIGNS FOR VAPOR MITIGATION COATING

A. Use clean containers and mix thoroughly as per Manufacturer's requirements to obtain a homogeneous mixture. Use a low speed motor less than 400 rpm and a two bladed Jiffy mixing blade only. DO NOT AERATE. Mix ratios are measured by volume.

B. Mix Ratio: Mix Component A and B at a ratio recommended by manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates for compliance with requirements and for other conditions affecting performance of traffic coatings.

1. Prepare written report listing conditions detrimental to performance.
2. Verify compatibility with and suitability of substrates.
3. Begin coating application only after minimum concrete curing and drying period recommended by manufacturer has passed, after unsatisfactory conditions have been corrected, and after surfaces are dry.
4. Application of coating indicates acceptance of surfaces and conditions.

B. Calcium Chloride Test Requirements:

1. Anhydrous calcium chloride testing shall be performed by the Special Inspector as outlined in Section 014320 - QUALITY CONTROL AND TESTING SERVICES.
2. Provide anhydrous calcium chloride tests in accordance with ASTM F 1869 for surface preparation methods outlined. Tests shall be installed onto freshly abraded contaminant free concrete
3. Conduct calcium chloride tests at the same temperature and humidity expected during normal use. Maintain these conditions 48 hours prior to and during tests. Water vapor transmission levels are directly affected by ambient room temperature and readings conducted without a sustained ambient temperature are NOT acceptable.
4. Special Inspector shall provide test results on a marked up floor finish plan showing test results. Owner's Special Inspector shall provide a written clarification on status of the ambient air temperature and humidity before and during the testing procedures.
5. Special Inspector shall provide a marked up floor plan showing areas with vapor reduction system recommendations.
6. Test for concrete deficiencies and contaminates such as un-reacted silicates, chlorides, A.S.R. (alkali-silica reaction); as recommended by manufacturer.

C. Adhesion Tests: The Special Inspector shall verify proper adhesion of flooring adhesives, coatings, and leveling compounds to the final vapor reduction coating system for acceptability.

3.2 PREPARATION

A. Manufacturer’s representative shall inspect surfaces with regard to their suitability to receive moisture vapor reduction system with manufacturer’s representative.

B. Repair concrete prior to moisture vapor reduction system installation as recommended by manufacturer.

C. Clean all surfaces to receive moisture vapor reduction system as recommended by manufacturer.

D. Mechanically scarify, shot or bead blast, the surface to obtain an ICRI profile of CSP 3 (Light shot-blast).

E. Clean surfaces with vacuum to remove residue off the substrate. Remove defective materials, and foreign matter such as dust, adhesives, leveling compounds, paint, dirt, floor hardeners,

bond breakers, oil, grease, curing agents, form release agents, efflorescence, laitance. Shot blast bee bees, etc. Repair cracks, expansion joint, control joints, and open surface honeycombs and fill in accordance with manufacturer's recommendations. Reinforcing fibers must be burned off, scraped and vacuumed, after shot blasting, leaving no fibers left on the concrete surfaces. Provide uncontaminated, sound surface.

F. Acid etching will not be accepted.

3.3 APPLICATION - VAPOR MITIGATION COATING

A. System Application: Apply as recommended by manufacturer at a rate recommended by manufacturer.

B. Primer: Apply a uniform coat at manufacturer's recommended rate of coverage with a paint roller working the primer into the surface.

C. Systems requiring sand broadcast at primer shall use fine sand spread uniformly over the entire area.

D. Top Coat: Apply a uniform coat at a 90 deg. angle to primer coat at manufacturer's recommended rate of coverage.

E. Systems requiring sand broadcast at top coat shall use fine sand spread uniformly over the entire area.

3.4 APPLICATION - UNDERLAYMENT

A. Preparation: After a minimum of 16 hours, broom sweep and vacuum the surface providing clean, prepared surface.

B. General: Mix and apply underlayment components according to manufacturer's written instructions.

1. Close areas to traffic during underlayment application and for time period after application recommended in writing by manufacturer.
2. Coordinate application of components to provide optimum underlayment-to-substrate and intercoat adhesion.
3. At substrate expansion, isolation, and other moving joints, allow joint of same width to continue through underlayment.

C. Apply underlayment to produce uniform, level surface.

1. Apply a final layer without aggregate to product surface.
2. Feather edges to match adjacent floor elevations.

D. Cure underlayment according to manufacturer's written instructions. Prevent contamination during application and curing processes.

E. Do not install floor coverings over underlayment until after time period recommended in writing by underlayment manufacturer.

F. Remove and replace underlayment areas that evidence lack of bond with substrate, including areas that emit a "hollow" sound when tapped.

3.5 CLEANING

A. Remove debris resulting from water vapor reduction system installation from project site.

3.6 PROTECTION

A. Protect each coat during specified cure period from any kind of traffic, topical water and contaminants.

END OF SECTION

SECTION 099000

PAINTING AND COATING

(Part of Work of Section 090007 - PAINTING, 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. 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 are specified 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 081110 - HOLLOW METAL DOORS AND FRAMES for factory priming steel doors and frames.

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, Architect 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. Finished mechanical and electrical equipment.
b. 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. Pipe spaces.
e. Duct 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 Architect'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. Architect 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: Architect 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, Architect 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.

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.
2. Colors: Refer to the Finish Schedule.

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 Architect 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. 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. Exterior Exposed Steel: Clean steel surfaces in accordance with SSPC-SP 6/NACE No. 3 Commercial Blast Cleaning. Abrasive blast cleaned surfaces shall exhibit a uniform, angular profile of 1.5-3.0 mils. Prime cleaned surfaces within 8 hours and prior to surface rusting.
b. Interior Exposed Steel, in Humid Environments: Clean steel surfaces in accordance with SSPC-SP 6/NACE No. 3 Commercial Blast Cleaning. Abrasive blast cleaned surfaces shall exhibit a uniform, angular profile of 1.5-3.0 mils. Prime cleaned surfaces within 8 hours and prior to surface rusting.
c. Interior Exposed Steel, in Dry Environments: Clean steel surfaces in accordance with SSPC-SP2 or SP3 Hand or Power Tool Cleaning.

4. Galvanized Surfaces: Clean galvanized surfaces in accordance with SSPC-SP16 Brush off Blast Cleaning of Galvanized Steel and NonFerrous Metals, to achieve a minimum 1 mil anchor profile.

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 backsides of access panels and removable or hinged covers to match exposed surfaces.
8. Finish exterior doors and doors in wet areas 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. 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 Owner reserves the right to invoke the following test procedure at any time and as often as the Owner deems necessary during the period when paint is being applied:

1. The Owner 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.
2. Testing agency will perform appropriate tests for the following characteristics as required by the Architect.
3. The Architect 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 Architect.

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. Paint Schedule:

1. Existing (Interior) Brick Masonry for Painted Finish:

a. One Coat:

1) Tnemec 156 Enviro-Crete at 6.0 to 10 mils DFT.
2) Dupont Tufcryl at 8.0 to 10.0 mils DFT.
3) RD Coatings Elasto-Flex at 6.0 to 10.0 mils DFT.

b. And One Coat:

1) Tnemec 156 Enviro-Crete at 8 to 10 mils DFT.
2) Dupont Tufcryl at 8.0 to 10.0 mils DFT.
3) RD Coatings Elasto-Flex at 6.0 to 10.0 mils DFT.

2. Steel Doors and Frames, Galvanized Metal (not shop-finished under Section 051200 - STRUCTURAL STEEL FRAMING or Section 055000 - METAL FABRICATIONS), Alliphatic Acrylic Polyurethane System:

a. Surface Preparation: SSPC-SP16 Brush-off Blast of Galvanized Steel.
b. One Coat:

1) Tnemec 66HS Hi-Build Epoxoline at 3.0 mils DFT.
2) PPG PMC Amerlock 400 Hi-Build Epoxy at 4.0-5.0 mils DFT.

3) Dupont 25P High Solids at 4.0 mils DFT.
4) International Intergard 475 HS at 5.0 to 10.0 mils DFT.

c. And One Coat:

1) Tnemec 73 Endura-Shield at 3.0 mils DFT.
2) PPG PMC Amercoat 450H Polyurethane at 3.0 mils DFT.
3) Dupont Imron 2.8 Urethane at 3.0 to 4.0 mils DFT.
4) International Interthane 990 HS at 3.0 to 4.0 mils DFT.

3. Steel Beams, Joists, Metals (Not galvanized, not specified to receive other coating systems/not shop finished), Epoxy Painted Finish:

a. One Coat: Approved primer, in shop under other Sections (where specified). If not shop primed, provide primer recommended by finish coating manufacturer.

b. And One Coat:

1) Tnemec 1029 Enduratone at 2.0 mils DFT.
2) Dupont 25P at 3.0 to 4.0 mils DFT.
3) International Interseal 670 HS at 3.0 mils DFT.

c. And One Coat:

1) Tnemec 1029 Enduratone at 2.0 to 3.0 mils DFT.
2) Dupont High Solids Acrylic Coating 3.0 mils DFT.
3) International Intercryl 530 at 3.0 to 4.0 mils DFT.

4. Concrete Masonry Units, Epoxy/Urethane Coating:

a. Surface Preparation: Allow mortar to cure for 28 days. Cured, clean and dry, free of surface contaminants.

b. One Coat Block Filler: Tnemec Series 1254 Epoxoblock WB at 2.0 to 3.0 mils DFT.

c. And One Coat: Tnemec 280 Tneme-Glaze at 6.0 to 8.0 mils DFT.

d. And Two Coats: Tnemec 281 Tneme-Glaze at 6.0 to 12.0 mils DFT.

5. Concrete Floors, Clear Exposed Sealer, High-Solids Modified Polyurethane Epoxy:

a. Two Coats: Tnemec 201 Epoxoprime at 3.0- 4.0 mils DFT or equal by Dupont or International.

6. 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

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SECTION 220000

PLUMBING

PART 1 – GENERAL

1.1 FILING OF SUB-BIDS

A. Sub-bids shall be submitted in accordance with the provisions of the General Laws, Chapter 149, Sections 44A to 44L, inclusive, as amended. The time and place for submission of Sub-bids shall be as set forth under “Instructions to Bidders”.

B. Each Sub-bid filed with the Awarding Authority shall be accompanied by a Bid Bond, Cash, Certified Check, Treasurer’s Check or Cashier’s Check issued by a responsible bank or trust company, payable to the City of Quincy in the amount stipulated on the “Instructions to Bidders”. A Sub-bid accompanied by any other form of bid deposit than those specified will be rejected.

C. Each Sub-bid submitted for the work under this section shall be on a form furnished by the Awarding Authority, as required by Section 44G of Chapter 149 of the General Laws, as amended.

1.2 GENERAL REQUIREMENTS AND REFERENCES

A. Include “General Requirements” and applicable parts of Division 1 as part of this section.

B. Examine all other sections of the Specifications for requirements which affect work under this Section whether or not such work is specifically mentioned in this section. Where paragraphs of this section conflict with similar paragraphs of Division 1, requirements of this section shall prevail.

C. Coordinate work with that of all other trades affecting, or affected by work of this section. Cooperate with such trades to assure the steady progress of all work under the Contract.

D. The Plumbing Subcontractor shall be responsible for filing all documents, payment of all fees, and securing of all inspections and approvals necessary for the work of this section.

E. The Plumbing Subcontractor 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 Plumbing Subcontractor 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 DEFINITIONS

A. As used in this section, “provide” means “furnish and install”, and “POS” means “Provided Under Other Sections”.

B. As used in the Drawings and Specifications for Plumbing work, certain non-technical words shall be understood to have specific meanings as follows, regardless of indications to the contrary in the General Conditions of other documents governing the Plumbing work.

1. “Furnish” means: Purchase and deliver to the project site complete with every necessary appurtenance and support, all as part of the Plumbing work. Purchasing shall include payment of all sales taxes and other surcharges as may be required to assure that purchased item(s) are free of all liens, claims, or encumbrances.

2. “Install” means: 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, all as part of the Plumbing work.

3. “Provide” means: “Furnish” and “Install”.

4. “New” means: Manufactured within the past two (2) years and never before used.

C. Except where modified by a specific notation to the contrary, it shall be understood that the indication and/or description of any plumbing item in the Drawings or Specifications for Plumbing work carries with it the instruction to furnish, install and connect the item as part of the Plumbing work, regardless of whether or not this instruction is explicitly stated.

D. It shall be understood that the Specifications and Drawings for Plumbing work are complimentary and are to be taken together for a complete interpretation of the Plumbing work except that indications on the Drawings, which refer to an individual element of work, take precedence over the Specifications where they conflict.

1.4 SCOPE

A. 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.

1. Domestic water piping system.

2. Exterior water service piping for domestic water beginning 10’-0” outside exterior wall of the building.

3. Non-potable water system including reduced pressure backflow preventor for Truck Wash.

4. Interior sanitary waste and vent piping system.

5. Interior sanitary drainage system extended to the outlet of the sand/gasoline trap.

6. Interior rainwater drainage system to a point 10’-0” outside wall of the building.

7. Roof drains.

8. Insulation.

9. Valves.

10. Fittings unions, flanges and couplings.

11. Flashing of floor drains.

12. Hangers, plates and inserts.

13. Cleaning, testing and disinfection of piping systems.

14. All supplementary steel for piping and equipment support.

15. Guarantees.

16. Drilling for installation of inserts.

17. Core drilling.

18. Fire seal off all penetrations in floors and walls to the rating of the barrier.

B. 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.

C. Give notices, file plans, obtain permits and licenses, pay fees and backcharges, and obtain necessary approvals from Authorities Having 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.

D. Work to be done under this section is shown on the following Drawings: P-101, Plumbing First Floor Plan.

1.5 RELATED WORK UNDER OTHER SECTIONS

A. The following items are not included in this section and will be performed under other sections.

1. Temporary Facilities.

2. Earthwork: Excavation and backfill.

3. Masonry: All openings in masonry walls.

4. Waterproofing, Dampproofing and Caulking.

5. Roofing and Flashing.

6. Painting: All painting except as specified herein.

7. Finish Carpentry and Millwork.

8. Steel Doors and Frames.

9. Finish Hardware.

10. Electrical.

11. HVAC.

12. Site drainage.

13. Utility structures.

1.6 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 Architect 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 Owners 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. 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 (AIA), formerly National Board of Fire Underwriters.
5. Occupational Safety and Health Act (OSHA).
6. Factory Mutual Association (FM).
7. Underwriter's Laboratories (UL).

E. All Plumbing work shall meet or exceed any other state and local codes and/or Authorities Having Jurisdiction including all other standards indicated herein.

1.7 SUBMITTALS

A. This paragraph shall supplement Division 1.

B. Definitions:

1. Shop Drawings: Information prepared by the Contractor to illustrate portions of the work in more detail than shown in the Contract Documents.

2. Coordination Drawings: Detailed, large-scale layout Shop Drawings showing HVAC, Electrical, Plumbing and Fire Protection work superimposed to identify conflicts and ensure inter-coordination of Mechanical, Electrical, Architectural, Structural and other work.

C. Submittals Procedures and Format:

1. Review submittal packages for compliance with Contract Documents and then submit to Architect for review. Submit transparency and two (2) blue or black-line reproductions of each Shop Drawing larger than 8-1/2" x 11". Submit eight (8) sets of each smaller shop drawing. After review, transparency original of each large Shop Drawing and six (6) sets

of each small shop drawing will be returned with reviewer's marks. Electronically submitted shop drawings are acceptable.

2. Each Shop Drawing shall indicate in title block, and each Product Data package shall indicate on cover sheet, the following information:
   a. Title.
   b. Name and location of project.
   c. Names of Architect, Engineer, Contractor and Subcontractor(s).
   d. Names of Manufacturer, Supplier, Vendor, etc.
   e. Date of submittal.
   f. Whether original submittal or resubmitted.

3. Shop Drawings showing manufacturer's product data shall contain detailed dimensional Drawings, accurate and complete description of materials of construction, manufacturer's published performance characteristics and capacity ratings (performance data alone is not acceptable), plumbing requirements and wiring diagrams. Drawings shall clearly indicate location (terminal block or wire number), voltage and function for all field terminations, and other information necessary to demonstrate compliance with all requirements of Contract Documents.

D. Acceptable Manufacturers:

1. The Architect's Plumbing design for each project is based on the single manufacturer listed in the schedule or shown on the Drawings. In Division 15 of these Specifications certain "Alternate Manufacturers" are listed as being acceptable. These are acceptable only if, as a minimum, they:
   a. Accepted by Architect and Engineer.
   b. Meet all performance criteria listed in the schedules and outlined in the Specifications.
   c. Have equivalent operating characteristics to those called for in the Specifications.
   d. Fit within the available space it was designed for, including space for maintenance and component removal, with no modifications to either the space or the product. Clearances to walls, ceilings and other equipment will be at least equal to those shown on the Contract Documents. The fact that a manufacturer's name appears as acceptable shall not be taken to mean the Architect has determined that the manufacturer's products will fit within the available space. This determination is solely the responsibility of the Contractor.
   e. For equipment mounted in areas where structural matters are a consideration, the products must have a weight no greater than the product listed in the schedules or Specifications.
   f. Products must adhere to all architectural considerations including, but not limited to, being the same size and of the same physical appearance as scheduled or specified products.

E. Substitutions:

1. Substitution of products by manufacturers other than those listed shall only be done in accordance with subparagraph "F" "Substitutions and Deviations".

F. Substitutions and Deviations:

1. Deviations from the Contract Documents and the substitution of materials or equipment relative to the "Acceptable Manufacturers" referred to above, shall be requested individually in writing whether deviations result from field conditions, standard shop practice, or other cause. Submit letter with transmittal of Shop Drawings which flags the

substitution or deviation to the attention of the Architect. The letter shall describe changes in the system shown and physical characteristics (connections to adjacent materials, plumbing services, service access requirements, and other characteristics), and differences in operating characteristics or cycles.

2. Without letters flagging the substitution or deviation to the Architect, it is possible that the Architect may not notice such substitution or deviation or may not realize its ramifications. Therefore, if such letters are not submitted to the Architect, the Contractor shall hold the Architect and his consultants harmless for any and all adverse consequences resulting from the deviations being implemented. Adverse consequences shall include, but not be limited to, excessive noise, excessive maintenance, shortened longevity, spatial coordination problems, and inadequate performance versus scheduled design. This shall apply regardless of whether the Architect has reviewed or approved Shop Drawings containing the deviation, and will be strictly enforced.

3. Do not request substitute materials or equipment unless identical material or equipment has been operated successfully for at least three (3) consecutive years. Such materials and equipment shall be a regular cataloged item shown in the current catalog of the manufacturer. When deviation or substitution is permitted, coordinate fully with related changes to Architectural, Structural, Plumbing, Fire Protection, Mechanical, and other work. Ensure that related changes necessary for coordination of substituted items are made within the Contract Price. Assume full responsibility for safety, operation and performance of the altered system.

4. Substitutions of equipment, systems, etc. requiring approval of local Authorities must comply with such regulations and be filed by the Contractor (should filing be necessary).

5. 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.

6. Approval of proposed deviations or substitutions, if any, will be made at discretion of Architect.

7. If equipment is proposed for substitution that is not tested and rated according to industry-wide standards, the Architect shall have the right to have performance tests completed, at the Contractor's expense, to confirm the manufacturer's performance claims.

G. Submittal Notations: Submittals will be returned from the Architect marked as illustrated below:

NO EXCEPTION TAKEN	ACCEPTED AS NOTED
NOT ACCEPTED	REVISE AND RESUBMIT

1. Checking is only for general conformance with the design concept of the project and general compliance with the information given in the Contract Documents. Any action shown is subject to the requirements of the Drawings and Specifications. Contractor is responsible for dimensions which shall be confirmed and correlated at the job site; fabrication process and techniques of construction; coordination of his work with that of all other trades; and the satisfactory performance of his work.

H. Schedule: Incorporated the Shop Drawing review period into the construction schedule so that work is not delayed. Contractor shall assume full responsibility for delays caused by not incorporating the following Shop Drawing review time requirements into his project schedule. Allow at least ten (10) working days, exclusive of transmittal time, for review each time a Shop Drawing is submitted or resubmitted with the exception that fifteen (15) working days, exclusive of transmittal time, are required for the following:

I. Schedule:

1. Copies of all backflow preventor permits.
2. Certification of domestic water system disinfection.
3. Coordination Drawings, if required by this Specification.
4. Adjustment and balancing certification.
5. If more than five (5) Shop Drawings of this trade are received in one (1) calendar week.

J. List of Proposed Equipment and Materials:

1. Within four (4) weeks after Award of Contract and before ordering materials or equipment, submit a complete list of proposed materials and equipment and indicate manufacturer's names and addresses. No consideration will be given to partial lists submitted out of sequence.

K. Responsibility:

1. The intent of submittal review is to check for capacity, rating, and certain construction features. Contractor shall ensure that work meets requirements of the Contract Documents regarding information that pertains to fabrication processes or means, methods, techniques, sequences and procedures of construction; and for coordination of work of this and other Sections. Work shall comply with submittals marked "REVIEWED" to extent that they agree with the Contract Documents. Submittal review shall not diminish responsibility under this Contract for dimensional coordination, quantities, installation, wiring, supports and access for service, nor the Shop Drawing errors or deviations from requirements of the Contract Documents. The Architect's noting of some errors while overlooking others will not excuse the Contractor for proceeding in error. Contract Documents requirements are not limited, waived, nor superseded in any way by review.

2. Inform Subcontractors, Manufacturers, Suppliers, etc. of scope and limited nature of review process and enforce compliance with the Contract Documents.

L. Material and equipment requiring Shop Drawing Submittals shall include but not be limited to:

1. Roof and floor drains.
2. Sand/Gasoline trap.
3. Piping.
4. Fittings, unions, flanges and couplings.
5. Insulation.
6. Sleeve packing.
7. Valves
8. Flashing of floor drains.
9. Backflow preventers.
10. Hangers, plates and inserts.
11. Fire-rated penetration assembles (ASTM E814, UL 1479).
12. Access panels.
13. Shop Drawings shall be submitted as a single bound package, organized and titled.

1.8 SURVEYS AND MEASUREMENTS

A. Base all required measurements, both horizontal and vertical, on reference points established by the General Contractor and be responsible for the correct laying out of the Plumbing work. In the event of a discrepancy between actual measurements and those indicated, notify the General Contractor in writing. Do not proceed with the work required until written instructions have been issued by the General Contractor.

1.9 COORDINATION

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 Structural 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. Furnish information and Shop Drawings necessary to allow trades affected by the work to install their work 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 Architect. Where the Plumbing work shall interfere with the work of other trades, assist in coordinating the space conditions to make satisfactory adjustments before installation. Without extra cost to the Owner, make reasonable modifications to the work as required by normal Structural interferences. Pay the General Contractor for additional openings, or relocating and/or enlarging existing openings through concrete floors, walls, beams and roof required for any work which was not properly coordinated. 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 Plumbing 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 plumbing trades involved without extra cost to the Owner.

F. Where conflicts or potential conflicts exist and engineering guidance is desired, submit sketch of proposed resolution to Architect for review and approval.

G. Protect all materials and work of other trades from damage which may be caused by the Plumbing work, and repair all damages without extra cost to the Owner.

1.10 MECHANICAL AND ELECTRICAL COORDINATION

A. Plumbing Subcontractor shall furnish and install various electrical items relating to the plumbing equipment and control apparatus. The Electrical Subcontractor shall be required to connect power wiring to this equipment unless noted otherwise.

B. The Plumbing and Electrical Subcontractors shall coordinate their respective portions of the work, as well as the electrical characteristics of the plumbing equipment.

C. All power wiring and local disconnect switches will be provided by the Electrical Subcontractor for the line voltage power. All control and interlocking wiring shall be the responsibility of the Plumbing Subcontractor.

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 Subcontractor. All low voltage thermostat, zone valve and any switch wiring shall be the responsibility of the HVAC Subcontractor.

E. Temperature control and equipment wiring shall be installed by the Plumbing Subcontractor.

F. Pipe heat tracing shall be furnished and installed by the Electrical Subcontractor. Power connections shall be by the Electrical Subcontractor.

G. The Electrical Subcontractor will provide all magnetic starters except those furnished as an integral part of packaged equipment.

1.11 MECHANICAL AND ELECTRICAL COORDINATION DRAWINGS

A. Coordination Drawings:

1. The Sheetmetal Subcontractor shall prepare a complete set of electronic Drawings at a scale not less than 3/8” equals 1’-0”, showing structure and other information as needed for coordination. He shall show sheetmetal layout thereon. These will be the Coordination Drawings.

2. The main paths of egress and for equipment removal, from main Mechanical and Electrical rooms must be clearly shown on the Coordination Drawings.

3. Each of the below specialty trades shall add its work to these background Drawings with appropriate elevations and grid dimensions. Specialty trade information is required for fan rooms and mechanical rooms, horizontal exits from duct shafts, crossovers, and for spaces in and above ceilings where congestion of work may occur such as corridors, and even entire floors. Drawings shall indicate horizontal and vertical dimensions, to avoid interference with structural framing, ceilings, partitions, and other services.
   a. Specialty Trades:
      1) Plumbing System.
      2) HVAC Piping and Associated Control System.
      3) Electrical.
      4) Sheet Metal Work.
      5) Sprinkler System.

4. Each specialty trade shall sign and date each electronic Coordination Drawing. Return Drawings to the Sheetmetal Subcontractor, who shall route them sequentially to all specialty trades.

5. Where conflicts occur with placement of materials of various trades, the Sheetmetal Subcontractor will be responsible to coordinate the available space to accommodate all trades. Any resulting adjustments shall be initialed and dated by the specialty trade. The Sheetmetal Subcontractor shall then final date and sign each Coordination Drawing. If he cannot resolve conflicts, the decision of the General Contractor shall be final, subject to the approval of the Architect.

6. A Subcontractor who fails to promptly review and incorporate his work on the Coordination Drawings shall assume full responsibility of any installation conflicts affecting his work and of any schedule ramifications.

7. The Sheetmetal Subcontractor shall make electronic copies of all Coordination Drawings. Fabrication shall not start until such transparencies of completed Drawings are received by the Architect/Engineer and have been reviewed.

8. Review of Coordination Drawings shall not diminish responsibility under this Contract for final coordination of installation and maintenance clearances of all systems and equipment with Architectural, Structural, Mechanical, and Electrical Contractors.

1.12 INSTALLATION REQUIREMENTS

A. The arrangement of all Plumbing 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. Review the Architectural Drawings and Specifications before ordering any material and equipment. Any discrepancies shall be brought to the attention of the Architect for his determination prior to proceeding with the work.

1.13 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 Architect.

1.14 SLEEVES, INSERTS

A. Furnish and install all sleeves, inserts, anchor bolts and similar items to be set into masonry or concrete, as required for Plumbing work. Internal diameter of sleeve ball shall be 1/2" larger than the outside diameter of the pipe or insulation covered line passing through it.

1.15 CORING, DRILLING

A. Core, cut and/or drill all small holes 4.5” diameter or less in walls and floors required for the installation of sleeves and supports for the Plumbing work.

1.16 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.

1.17 SUPPLEMENTARY SUPPORTING STEEL

A. Provide all supplementary (non-structural) steelwork required for mounting or supporting equipment and materials.

B. Steelwork shall be firmly connected to building construction as required. Locations and methods of attachment shall be approved by the Architect.

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.

1.18 TOOLS AND EQUIPMENT

A. Provide all tools and equipment required for the fabrication and installation of the plumbing equipment at the site.

1.19 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 the Owners.

1.20 RECORD DRAWINGS, PROJECT CLOSEOUT

A. As work progresses and for the duration of Contract, maintain a complete and separate set of prints of Contract Drawings at job site at all times. Record work completed and all changes from original Contract Drawings clearly and accurately including work installed as a modification or addition to the original design. Work shall be updated on a weekly basis and shall be made available for review by Architect. Failure to perform this work shall be reason for withholding requisition payments. In addition, take photographs of all concealed equipment in gypsum board ceilings, shafts, and other concealed, inaccessible work. At completion of work, make copies of photographs with written explanation on back. These shall become part of Record Documents.

B. At the completion of work, prepare a complete set of electronic Record Drawings showing all systems as actually installed. The electronic copies will be made available for the Plumbing Contractor's copying, at his expense. The quantity of copies which are made available shall in no way be interpreted as setting a limit to the number of Drawings necessary to show the required information. The Plumbing Contractor's professional Draft Person shall transfer changes to electronic copies. Submit three (3) electronic sets of prints to Architect for comments as to compliance with this section.

C. The Architect will <u>not</u> certify the accuracy of the Record Drawings. This is the <u>sole</u> responsibility of the Plumbing Contractor.

D. This trade shall submit the Record Drawings for approval by the Fire and Building Departments in a form acceptable to the departments, when required by the jurisdiction.

E. Record Drawings shall show record condition of details, sections, riser diagrams, control changes and corrections to schedules. Schedules shall show actual manufacturer, make and model numbers of final equipment installation.

1.21 GUARANTEE/WARRANTY

A. Guarantee and 24 hour service.

1. Guarantee Work of this Section in writing for not less than one (1) year following the date of acceptance by the Owner. If the equipment is used for temporary power etc, prior to acceptance by the Owner, the bid price shall include an extended period of warranty covering the one (1) year of occupancy, starting from the date of acceptance by the Owner. The guarantee shall repair or replace defective materials, equipment, workmanship and installation that develop within this period, promptly and to the Architect's satisfaction and correct damage caused in making necessary repairs and replacements under guarantee within Contract Price.

2. In addition to guarantee requirements of Division 1 and of Subparagraph A above, obtain written equipment and material warranties offered in manufacturer's published data without exclusion or limitation, in Owner's name.

3. Upon receipt of notice from the Owner 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.

4. Replace material and equipment that require excessive service during guarantee period as defined and as directed by Architect.

5. Provide 24 hour service beginning on the date the project is accepted by the Owner, whether or not fully occupied, and lasting until the termination of the guarantee period. Service shall be at no cost to the Owner. Service can be provided by this Contractor or a separate service organization. Choice of service organization shall be subject to Architect and Owner 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.

6. Submit copies of equipment and material warranties to Architect before final payment.

7. At end of guarantee period, transfer manufacturer's equipment and material warranties still in force to Owner.

8. This paragraph shall not be interpreted to limit Owner's rights under applicable codes and laws and under this Contract.

9. Part 2 paragraphs of this Specification may specify warranty requirements that exceed those of this paragraph. Those paragraphs shall govern.

10. Use of systems provided under this Section for temporary services and facilities shall not constitute Final Acceptance of Work by Owner, and shall not initiate the guarantee period.

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 Owner's satisfaction, advise the Architect in writing, describe efforts to rectify situation, and provide analysis of cause of problem. The Architect and/or Engineer will direct course of action.

1.22 OPERATING, INSTRUCTION AND MAINTENANCE MANUALS

A. Refer to Section 01700 – CONTRACT CLOSEOUT for submittal procedures pertaining to operating and maintenance manuals.

B. Each copy of the approved operating and maintenance manual shall contain copies of the 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 plumbing 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 (2) 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.

1.23 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 the 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 the Owner.

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 and labeled.

2. Be without blemish or defect.

3. Not be used for temporary purposes.

4. Be in accordance with the latest applicable ASME standards.

G. Products shall 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.

H. All items of equipment or material of one generic type shall be the product of one manufacturer throughout.

I. 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 until 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 the Contractor who originally purchased the item.

5. Field erection and internal wiring as necessary for their proper operation.

6. 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.

J. Items which are to be installed but not purchased as part of the Plumbing 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 Plumbing work will be considered only if presented in writing within one (1) week of the date of delivery to the project of the items in question. The Plumbing 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.

1.24 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.

PART 2 – PRODUCTS

2.1 PIPE MATERIALS

A. The table below indicates pipe class for each service. Refer to the following pages for expanded Specifications for the respective class.

PIPE MATERIALS SPEC INDEX

Service	Code	Maximum Operating (psig)	Service Limits (Temperature °F)	Pipe Material
Domestic Cold Water	CW	150 below grade	250	Copper
Non-Potable Water	NPW	100	250	Copper
Sanitary Waste & Vent	S	Gravity	120	Cast Iron
Storm Drain	D	Gravity	80	Cast Iron

B. Each valve type shall be the product of a single manufacturer. Each system shall be provided with valves as required by Code and shown on the Drawings and shall be installed to facilitate operation, replacement and repair.

C. Provide shut-off valves on supply piping to individual pieces of equipment.

D. Provide pipe dope, Teflon tape, wax rings, neoprene gaskets and other jointing compounds as required by best standard practice and only on service as recommended by manufacturer.

E. Apply putties and jointing compounds for plumbing fixtures and trim as recommended by manufacturers.

F. Valves on insulated piping system shall be equipped with extended handles to accommodate insulation thickness.

2.2 COPPER PIPE (FOR CW SYSTEMS)

	1/2” to 3”	4” and Larger
Pipe	Seamless copper water tube, drawn temper, Type L. ASTM B-88. See Note 1.	Seamless copper water tube, drawn temper, Type L. ASTM B-8. See Notes 2 & 5.
Fittings	Wrought copper, solder-joint. ASTM B-16.22.	Ductile iron coupling with copper alkyd enamel paint coating, ASTM A-536. Grade “E” EPDM elastomer gasket. ASTM D-2000. Equal to Victaulic Style 606 coupling. ASTM B-75 copper alloy fittings. ASTM B-584 grooved end cast bronze fittings for 6” pipe size.
Joints	ASTM B-32 solder filled material, Alloy Sb5 “95/5.” ASTM B-813 liquid or paste flux. Soldering procedures shall comply with ASTM B-828.	Rolled groove prepared and assembled in accordance with manufacturers instructions.

Mechanical Joints	Cast copper alloy unions, hexagonal stock with ball-and-socket joint, solder joint ends. ASME B-6.18.	ANSI Class 150 flange adapter equal to Victaulic Style 641 for connections to flanged equipment. ANSI B-16.1 flange dimensions. Watts G-4000-FDA series.
Valves Gate	Use ball valve.	Use ball valve.
Ball	All bronze, 3 piece, full port, PTFE seats, solder end connections. 600 psig WOG. Apollo 82-200, Milwaukee BA-350, Watts B-6801.	Class 125, cast iron body, epoxy coated. Full port, flanged ends, stainless steel ball and stem. ANSI B16.1 flange dimensions. Watts G-4000 FDA series.
Check	Bronze body and clapper, solder ends, 200 WOG. Jenkins 4093, WOG. Milwaukee 1509, Stockham B-309.	Iron body, bronze mounted, flanged ends, 200 Jenkins 625-C, Milwaukee F-2974-M, Stockham G-931.
Balancing	All bronze, 2 piece, RPTFE seats, solder end connections. 600 psig WOG. Apollo 70-100, Milwaukee BA-150, Watts B-6001. CamLock handle.	Cast iron lug body butterfly valve. Bronze disc, replaceable EPT liner and stainless steel stem, 200 psig CWP.

Notes:
1. Below grade water piping 3” and smaller be Type K copper with bituminous coating copper brazed joints, BcuP filler alloy. ANSI/AWS A5.8 procedures shall be per ANSI/AWS B2.2.
2. Below grade water piping 4” and larger shall be ductile iron with AWWA C104 cement lined Class AWWA C151 piping with push-on joints.
3. Contact between dissimilar metals shall be made with dielectric couplings or dielectric flanges. Contact between ferrous and stud bolts and bronze flanges shall be electrically insulated with non-metallic washers.
4. Provide mechanical joint connections to all equipment such as water heaters, pumps, compressors, etc.
5. Above grade water piping 8” and larger shall be Schedule 40 galvanized steel piping with galvanized fittings and grooved joints.

2.3 SANITARY WASTE AND VENT, STORM DRAIN (CAST IRON)

	Above Grade	**Below Grade**
Piping	3” and Larger: Hubless cast iron soil pipe, service weight. ASTM-A-888, CISPI 130. 2-1/2” and Smaller: Hubless cast iron soil pipe, service weight. ASTM A-88, CISPI 130 or type M copper tubing. ASTM B8872. See Note 1.	2” and Larger: Hub and spigot cast iron soil pipe, extra heavy. ASTM A-74 or service weight if Code approved. Piping shall be asphalt or coal tar pitch coated.
Fittings	3” and Larger: Hubless cast iron fittings, service weight. ASTM-A-888, CISPI 801. 2-1/2” and Larger: Hubless cast iron fittings, service weight,	2” and Larger: Hub and spigot cast iron fittings, extra heavy. ASTM A-74. Asphalt or coal tar pitch coated. DWV pattern.

	ASTM A-888, CISPI 301 or wrought copper DWV fittings. See Note 1.	
Joints	Hubless Cast Iron: Heavy-duty stainless steel band coupling with neoprene gasket. Bank torque of 80 foot/pounds 15 psig pressure rating. Husky SD 4000 or CLAMP-ALL HI-TORQUE 80.	Caulked with leak and oakum or neoprene compression gaskets conforming to ASTM C-564.
Backwater Valve	Cast iron gravity flow type, bronze mounted, hub end. Exterior shall be mastic coated, bolted or extended cover in accordance with installation parameters. J.R. Smith Co. 7012-7022, JOSAM 67500, Zurn Industries Z-1095.	

Notes:
1. CISPI 310 no-hub couplings will not be accepted as equal to manufacturer's listed.

2.4 INSULATION

A. Insulation shall be by Owens-Corning, Certain-Teed or Manville.

B. Insulation shall be installed by insulation firm regularly specializing in this work and employing men particularly skilled therein. No covering applied by plumber's "helpers" will be acceptable.

C. Insulation installation shall meet manufacturer's recommendations. No insulation shall be applied until piping has passed tests as required by Authorities Having Jurisdiction.

D. Insulation, jackets and adhesives shall be flame-retardant and shall have ASTM E-84 fire hazard ratings of 25 flame spread, 50 smoke developed and 50 fuel contributed.

1. Interior Applications – Jackets:
   a. Type a – Vapor Barrier Jackets: Kraft reinforced foil vapor barrier with self-sealing adhesive joints. Jacket shall be heavy duty fire retardant material with glass fiber reinforcing and self-sealing lap. Jacket will be factory applied to the insulation. Jacket shall have neat, white Kraft finish or white vinyl suitable for painting, with bead puncture resistance of 50 units minimum. Vapor barrier shall be .001" aluminum foil adhered to the inner surface of the jacket. Permeance shall not exceed 0.02 perms. Jacket shall be Owens-Corning Fiberglass "ASJ-SSL" or Manville Flamesafe "AP-T".
   b. Type b – PVC Jackets: One piece, pre-molded type.

E. Insulation and jacketing shall be in accordance with following:

1. Type A: Glass fiber insulation; ANSI/ASTM C547; "k" value of 0.24 at 75° F non-combustible.

2. Type B: Molded, flexible closed cell vinyl, ASTM D635; "k" value of 1.17 bacterial resistant.

F. Schedule: The following piping systems require insulation:

Piping System	Type	Insulation Thickness Inch (mm)	Jacket Type
Roof Drains and Horizontal Rainwater	A	1”	a, Note 1
Non-Potable Water	A	1/2”	a, b

Notes:
1. Insulation shall include drain sump body and all horizontal piping to and including the elbow down to vertical.

G. Pipe hangers shall be outside insulation and shall incorporate 12”, 26 gauge protection shields. Insulation on piping that passes through walls or partitions shall pass continuously through sleeves, except at firewalls, smoke partitions and floor penetrations where space between sleeves and piping shall be fire stopped with approved packing.

2.5 PIPE SUPPORTS

A. Provide adjustable clevis hangers for hanger sizes 4” and larger and cast brass split-ring hinged hangers or band type hangers for smaller. Support piping from building structure to maintain required grade and pitch of pipe lines, prevent vibration, secure piping in place and provide for expansion and contraction. Hangers on all insulated pipe shall be clevis type.

B. Provide vertical brackets and guides for horizontal piping where it is racked along walls. Trapeze hangers may be used where conditions permit. Provide all necessary pipe clips, anchors and sundries for proper alignment and support of piping. Hangers for copper piping shall be coated for dielectric isolation. Hangers for PVC, polypropylene and other plastic piping shall be extended V-shaped, with angle iron pipe supports as necessary.

C. Hanger rods shall have machine threads. Beam clamps, concrete inserts and expansion shields shall be provided as required. No ramset or shot shields will be allowed.

D. Hanger spacing shall meet requirements of State and Local Plumbing Codes. In no case shall horizontal piping be supported at intervals greater than 10’-0”.

E. Pipe supports shall not bear on sleeves.

F. Friction clamps shall be installed at base of plumbing risers and at each floor. Friction clamps shall not be supported from or rest on sleeves.

G. Horizontal piping shall be suspended from building structure by mild steel rod connecting pipe hanger to inserts, beam clamps, angle brackets and lag screws as required by Building Construction in accordance with the following:

Rod Size	Pipe Size
3/8”	1/2" to 2”
1/2"	2-1/2” to 4”
5/8”	5” to 12”
3/4"	15”

H. Hangers on insulated lines shall be sized to fit the outside diameter of pipe insulation. Provide hangers for insulated piping with 12” long, 18 gauge galvanized insulation shields.

I. Piping at equipment and control valves shall be supported to prevent strains or distortions in 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.

J. Piping installed under this Section shall be independently supported from building structure by means of beam attachments and not from piping, ductwork or conduit of other trades. Supplementary steel, including factory-fabricated channels, required to meet the requirements specified herein, shall be provided by the Plumbing Contractor.

K. Maximum spacing of hangers on runs of steel, copper or brass pipe shall be as follows:

Schedule: Hanger Spacing in Feet/Pipe Material		
Pipe Size (Inches)	**Steel (Feet)**	**Copper or Brass (Feet)**
½ to 1	7	5
1 to 1/4	10	6
1 to 1/2	10	8
2 to 8	10	10

L. Maximum spacing of hangers on no hub cast iron soil pipe and acid resisting pipe shall be 5’ and hangers shall be provided at all changes in direction. Hanger rods to support piping from the structure or supplementary steel shall not exceed 4’ in total length. Where pipe support assemblies exceed 4’ in total length, Plumbing Contractor shall provide factory-fabricated channels and associated accessories.

M. Hangers in areas exposed to weather or in unheated spaces shall be provided with a shop coat of rust inhibited paint. Hanger rods shall be hot dipped galvanized.

2.6 SLEEVES, INSERTS, FIRE STOPPING AND ESCUTCHEONS

A. All pipes passing through floors, walls or partitions shall be provided with sleeves having an internal diameter one inch larger than the outside diameter of pipe. Pipe Sleeve Materials:

1. Sleeves through floors and through exterior, structural and fire-rated construction, shall be hot dipped galvanized Schedule 40 steel pipe. Sleeves shall extend 1” above finished floor.

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. Fire stop penetration seals in fire-rated construction shall be products of STI SpecSeal, 3M, Proset Systems Firefill or Dow and shall be installed in accordance with the latest requirements of ASTM E814 (UL 1479). Fire stop penetration sealants for non-metallic and insulated piping shall be intumescent (STI SpecSeal Series 100 Sealant or SpecSeal Collar

or approved equal). Provide mineral fiberboard, matting or putty for damming and forming. Finish seals flush to wall surface and fill gaps with silicone adhesive sealant caulking (Dow 96-081 RTV or approved equal). Provide 1" thick ceramic fiberboard on both sides of penetrations in 2 and 3 hour rated walls and floors less than 8" thick.

C. Packing for sleeves that do not require maintenance of fire rating shall be oakum, silicate foam, ceramic fiber or mineral fiber with approved sealant. Pack or foam to within one inch of both wall surfaces. Seal penetration packing with approved caulking and paintable waterproof mastic surface finish or silicone caulking.

D. Waterproof Pipe Penetrations:

1. Sleeves through outside walls shall be provided with pipe to wall penetration closures equal to Link-Seal Thunderline Corporation. Seals shall be mechanical type of interlocking rubber links shaped to fill space between pipe and sleeve. Links shall be assembled with bolts to form a belt around the pipe with pressure plate under each bold head and nut. After seal assembly is positioned, tightening of bolts will provide watertight seal. This Contractor shall determine the required inside diameter of each individual sleeve before ordering, fabricating or installing. The inside diameter of each sleeve shall be sized as recommended by the manufacturer to fit the pipe and Link-Seal to assure a watertight joint.

2. Prefabricated modular sleeves shall be Mason Industries (SWS) or approved equal stiffened galvanized steel sleeves with preformed closed-cell elastometric 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.

E. Inserts shall be individual or strip type or pressed steel construction with accommodation for removable nuts and threaded rods up to 3/4" diameter, permitting lateral adjustment. Individual inserts shall have an opening at the top to allow reinforcing rods up to 1/2" 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.

2.7 TRAPS AND STRAINERS

A. Provide cleanouts in soil, waste and storm drainage piping on straight runs at changes in directions and at foot of stacks and other points where required by inspecting Authorities. Cleanouts shall suit construction in which they are to be installed.

B. Maximum horizontal distance on straight runs between cleanouts in piping 4" and smaller shall be 50 feet. In piping 5" and larger, maximum horizontal distance between cleanouts shall be 100 feet.

C. Cleanouts shall be same size as pipe 4" and smaller. Cleanouts for piping larger than 4" shall be sized per local code and in no circumstance shall they be less than 4" in diameter. No reduction in cleanout sizes for pipe 4" and smaller is permitted.

D. Traps not integral with fixtures and in accessible locations shall have brass trap screw protected by water seal and will be regarded as cleanout.

E. Bodies of cleanout ferrules in bell and spigot piping shall be standard pipe sizes conforming in thickness to that required for pipe and fittings and shall extend not less than 3/4" above hub of pipe.

   1. Cleanout plug shall be cast brass with raised nut 3/4" high.

   2. Cleanouts in copper waste piping shall be soldered brass cleanout fittings with extra heavy brass screw plugs of same size as line.

   3. Cleanouts in threaded waste piping shall be cast iron, drainage T pattern, 90 branch fitting with extra heavy brass screw plugs of same size as pipe.

   4. Floor cleanouts in finished areas shall be per schedules equivalent to J.R. Smith, Wade or Zurn.

   5. Floor cleanouts in unfinished areas shall be per schedules equivalent to J.R. Smith, Wade or Zurn.

F. Provide test tees with cleanout plugs at foot vertical soil, waste, acid waste and roof conductor lines and at each floor. Cleanouts on vertical lines concealed behind finished walls shall extend to back of finish wall; provide wall plate. Obtain Architect's approval for wall plate locations and reroute piping if necessary.

G. Cleanouts shall open in direction of flow of drainage line served or at right angles thereto.

H. Keep cleanout plugs clean and unimpeded. Prevent covering with cement, plaster or other permanent finished materials.

PART 3 – EXECUTION

3.1 COORDINATION

A. Cooperate and coordinate with work of other Sections in executing work of this Section.

3.2 PIPE IDENTIFICATION

A. Provide color-coded pipe identification markers on piping installed under this section. Pipe markers shall be snap-on laminated plastic protected by clean acrylic coating. Pipe markers shall be applied after Architectural painting where such is required.

B. 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.

C. Main 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'.

D. In general, 2" high legend shall be used for pipe lines 4" in diameter and larger, and 3/4" high legend shall be used for pipe lines 3" in diameter and smaller.

E. Markers shall be Seton, MIS or approved equivalent.

F. Color banding shall meet ANSI latest and OSHA requirements.

G. Markers shall have legends and color coding with black letters:

1. Markers are to be applied to all piping, regardless of under jacket colors per the following schedule:

Service	Legend	Background Color
Cold Water	Cold Water	Green
Non-Potable Water	Non-potable	Yellow
Sanitary	Sanitary Sewer	Green
Vent	Vent	Yellow
Rainwater	Storm Sewer	Green

H. In Truck Wash areas colored PVC jackets shall be used per the following schedule:

1. All insulated piping exposed shall be covered with a Ceel-Co plastic jacket.

2. This plastic jacket shall include fitting covers and piping covers.

3. Piping to be covered with this plastic jacket shall be insulated and finished as herein specified and then the plastic jacket shall be applied.

3.3 TAGS, VALVES, EQUIPMENT AND INSTRUMENTS

A. Upon completion of work, attach engraved laminated plastic tags to all valves and instrumentation. Equipment shall bear a stamped stainless tag. Tags shall have black characters on white face, consecutively numbered and prefixed with letter “P” for general valves. Tags shall bear the number used in the P&IDs for those items so marked.

B. Embossed or engraved aluminum or brass tags may be substituted if desired. Tags shall be at least 1/8” thick.

C. Tags shall be at least 1” diameter with numerals at least 3/8” high and attached by “S” hooks and chains.

D. Nameplates, catalog numbers and rating identifications shall be securely attached to electrical and mechanical equipment with screws or rivets. Adhesives or cements will not be permitted.

E. Non-potable water outlets shall be identified with permanently attached yellow color-code or 4” high triangle tag reading “Water Unsafe”.

F. Coordinate numbering system with existing piping tags as not to duplicate numbers.

3.4 FLASHING AND COUNTER FLASHING

A. Floor drains shall be flashed watertight with 20 ounce sheet copper flashing which shall extend 8” beyond drain flashing flange.

B. Provide counter flashing for roof penetrations required under this Section including vents and roof drains.

C. Flashing of vents, roof drains and other penetrations of roof required under this Section shall be done under other Sections.

3.5 JOINTS AND CONNECTIONS

A. Joints and connections shall be permanent and shall be gas and water-tight. Jointing shall be types specified for serviced indicated. Joints and connections shall meet requirements of manufacturer's best recommended practice. All transitions between different piping materials shall be made using approved adapters. Adapters for transitions between two (2) types of piping materials shall be manufactured for purpose intended.

3.6 INTERIOR WATER SUPPLY SYSTEM

A. Provide a complete, new (domestic and/or protected) hot and cold water piping system as indicated on Drawings and as specified, including supplies to fixtures and indicated equipment. Piping shall be pitched at least 1" in 40 feet so that it can be drained completely at low points with drain valves. Piping shall be pitched up toward fixtures for proper air relief. Provide automatic air vents with outlet piped to floor and gate valve ahead of air vents, where offsets cannot be vented by means of fixture connections.

1. Pipe used in piping assembly shall be clean and shall have ends square and reamed before putting into fittings.

2. Cut tube to required length with hacksaw or tube cutter designed for copper work.

3. Remove burrs from inside and outside of cut edge and clean end of tube with steel wool or sand cloth until discoloration is removed and metal is smooth and bright.

4. Oxides shall be removed by sand cloth and brush.

5. Removal of oxides or discoloration of pipe and fittings by acids or self-cleaning flux is forbidden.

6. Apply a thin, uniform and complete coating of reliable brand of soldering flux (Nokorode or Crest) to cleaned surfaces of tube and fittings.

7. When joints are soldered, remove excess solder with a cloth or brush leaving a fillet of solder in chamber at end of the fitting.

8. Where quick closing valves such as solenoid or flush valves are being used, piping shall be protected from water hammer by shock absorbers. Shock absorbers shall be installed at all batteries of fixtures that are operated by flush valves. Shock absorbers shall be as manufactured by PPP, J.R. Smith, or Zurn, and shall conform to the Plumbing and Drainage Institute (PDI) published requirements.

9. Connections to tanks and equipment shall be made with unions.

10. Water services supplying the building shall flow through in-line strainers and shall have containment backflow protection as indicated.

11. Shut-off and control valves on main distribution and branch lines shall be located for easy access and operation. Branch piping shall be valved with access panels provided as required at locations shown on Drawings and determined in field.

3.7 INTERIOR SANITARY WASTE, STORM, DRAINAGE AND VENT PIPING

A. Provide waste, drainage and vent lines shown in building as shown on Drawings. Vents shall extend through roof and shall increase to at least 4”. Piping shall be assembled and installed without undue strains and stresses and provision shall be made for expansion, contraction and structural settlement.

B. Interior horizontal sanitary waste and storm drainage piping shall be installed in practical alignment at uniform grade of at least 1/8” per foot, but 1/4" per foot where code dictates and as shown on Drawings.

C. Vents from fixtures or line of fixtures, when connected to vent line serving other fixtures, shall be extended at least 6” above flood level rim of highest of fixtures to prevent use of vent line as waste. No vent terminal shall be directly beneath door, window or other ventilating opening of building, nor shall any vent be within 12 feet horizontally of such opening.

D. Provide sleeves for pipe that pass through walls.

E. Provide 3” air gap on equipment and drains that discharge to floor drains.

F. Provide an air gap in which the vertical distance through the free atmosphere between the waste pipe and the floor rim of the receptacle into which it is discharging is a minimum of 2 pipe diameters greater.

G. Piping shall be run straight and plumb and offsets shall be made at an angle of not less than 45.

H. Carefully lay out work in advance so pipes pass through openings and permit proper pitch to stacks. Due to extensive ventilation and lighting systems all trades shall coordinate work with work of other trades.

I. Hub and spigot soil pipe shall be thoroughly assembled with joints of picked oil-free oakum packed tightly into space between pipes to a depth of 1-1/2”. Remaining space shall be filled in by pouring with molten lead, caulked to ensure tight joints without straining bell. After caulking, lead shall be flush with ends of bell.

J. No hub soil pipe shall be assembled with no hub heavy-duty stainless steel couplings and neoprene gaskets.

K. Cleanouts:

1. Provide cleanouts with brass caps and screws same size as pipe up to 4 inches and not less than 4 inches for larger piping at the ends of all branches on soil and waste piping and in such other portions of the piping where run is over 50 feet. Locate floor cleanouts as indicated on Drawings.

3.8 WATER ENTRANCE

A. Run exterior water service piping for domestic water, beginning 10’-0” outside building wall, as shown on Drawings.

B. When water pipe laying is not in progress, close ends of pipe with watertight plugs. If water enters pipe, flush and clean line.

C. Keep excavation for underground water main open until system has been tested, inspected and approved.

D. Piping shall be bedded as specified in Division 2.

3.9 EXTERIOR SANITARY SEWER

A. Sanitary line ending at the outlet of the sand/gasoline trap shall run by gravity as shown on Drawings.

B. Check line and grade of piping with laser designed for purpose intended.

C. Plug open ends of piping when work is not in progress.

D. Piping shall be bedded as specified in Division 2.

3.10 WATER SERVICE

A. Water service piping shall follow routing indicated on Drawings. Offset required to avoid conflicts with ledge or other unforeseen circumstance are permitted. Work associated with street main tapping and water service piping to building shall conform to requirement of local authority. When work is not in progress, open ends of pipe shall be closed by temporary watertight plugs or other approved method. Ensure that foreign matter does not enter piping system.

B. Tap existing main under pressure with saddle on services 1-1/2” and smaller and will full tapping sleeve on service 2” and larger. Tapping valve for 1-1/2” and smaller service shall be AWWA standard bronze corporation cock for copper service and 200 psi working pressure. Tapping valve for 2” and larger service shall be AWWA standard, iron body, bronze-mounted, non-rising stem, square head, with push-on joint end for 4” and larger and flanged end for 3” and smaller, and 200 psi working pressure. Tapping valves shall have valve box extensions to grade, box shall be approved by local Water Department.

C. Provide thrust block and tie rods as necessary, at fittings and changes in direction of water service piping; where adequate bearing cannot be obtained for thrust blocks, use tie rods. Refer to Drawing details for additional information regarding size of thrust blocks.

D. Pipe bedding shall meet requirements of Division 2. Coordinate with provision of proper bedding material and compaction. Excavation shall be kept open until system has been inspected, tested and approved.

E. Test water service piping at 200 psi for one (1) hour. Leakage shall not exceed 2 quarts per hour per 100 joints regardless of pipe diameter. Before connection to building domestic water system, flush and disinfect water service.

3.11 WATER METER

A. Provide compound water meters that meet AWWA C701-70 requirements for cold water meters and the Municipal Water Authority.

B. Registers shall be straight reading, hermetically sealed calibrated in cubic feet and shall meet Section 9.3 of AWWA standard requirements. Provide center swept test hands.

C. Meter shall register at least 98% and no more than 102% of water actually passing through meter at any rate of flow, within range of 15 gpm to 800 gpm.

D. Main casing shall be bronze. Bolts shall be stainless steel.

E. Meter shall permit easy removal of interior parts without disturbing meter connections to pipeline.

F. Provide magnetic couplings to transmit motion from measuring chamber to register unit.

G. Provide remote register. Remote register plug/jack to conform to and be compatible with Owner'' standard building automated system.

H. Measuring chamber shall be removable from main line case for repair and re-calibration.

I. Meter shall be by Rockwell, Hersey or Neptune Products, and shall be approved by local water and sewer authority.

3.12 CROSS CONNECTION PROTECTION

A. All potable water piping outlets and connections to equipment or machinery shall be protected against backflow by means of 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. Mount backflow preventers horizontally, unless device is approved for vertical installation, at heights and with clearances as required by DEP regulations.

1. Reduced pressure backflow preventers shall be installed between 36” to 48” above the floor with a minimum of 6” clear space all around.

D. Submit plans to DEP and obtain permit for each reduced pressure or double check valve backflow preventor installation and submit copies of permit to Architect for record.

E. Provide indirect waste piping with funnel to receive discharge from reduced pressure backflow preventor atmospheric vents and spill through air gap to floor.

3.13 CLEANING

A. Clean systems thoroughly before testing. Fixtures, equipment, pipe, valves and fittings shall be free of grease, metal cuttings, dirt and other foreign material.

B. Repair stoppage, discoloration and damage to parts of building, finish and furnishings due to failure to properly clean piping system within Contract Price.

C. After completion of project, clean the exterior surface of equipment included in this section, including concrete residue.

D. After the completion of the work, all materials and equipment surfaces shall be thoroughly cleaned and polished in accordance with the finish of the material. All chromed surfaces shall be highly polished.

E. Before the systems are tested and balanced, pipes and equipment shall be thoroughly cleaned so that no dirt, dust, or other foreign matter will be deposited in or carried through the systems.

F. Water systems shall be thoroughly flushed and cleansed of any and all deleterious materials at least once before system is placed in operation. At this time, these systems will be carefully checked for leaking and defects as hereinafter specified. An approved cleansing agent will be used in flushing.

G. At all times, keep the premises clear of undue accumulation of rubbish.

H. On completion of the work, remove all rubbish and debris resulting from this contract and dispose of same. At any time should the General Contractor be dissatisfied with the performance of clean-up responsibilities, he may elect, after proper notification, to undertake this operation and backcharge this Subcontractor accordingly.

I. All equipment shall be thoroughly cleaned and left in a satisfactory condition for proper operation at project completion.

3.14 DISINFECTION OF WATER SYSTEMS - INTERIOR AND EXTERIOR

A. Water piping systems shall be thoroughly disinfected with a solution containing no less than 50 parts per million of available chlorine. Chlorinating materials shall be either liquid chlorine or sodium hypochlorite solution, and shall be introduced into the system and drawn to all points in the system. Disinfection solution shall be allowed to remain in system for 24 hours. During this time, valves and faucets shall be opened and closed several times. After disinfection, solution shall be flushed from the system with clear water until residual chlorine content is no greater than 0.2 parts per million.

1. Notify all parties 48 hours prior to cleaning system.

2. Bypass all building filters.

3. Perform chlorination prior to heating the domestic hot water system. Run circulation pumps on the domestic HW system.

4. Provide advance notice to all trades prior to procedure. Post warning signs throughout the job site.

5. Collect samples randomly and at end user points.

B. Work shall be supervised by Owner and performed by approved chemical testing laboratory and results sent to the Architect or Architect's representative for verification.

C. Testing laboratory shall submit a summary of test procedure for approval prior to any work performed. Subcontractor shall provide valves required to disinfect water supply system in part as required by phasing of construction and to provide isolating valves and draw-off valves for proper containment, phasing and flushing.

3.15 TESTING AND ADJUSTING – GENERAL

A. Scope:

1. Test and adjust plumbing systems as specified and as required by Code.

2. Testing, balancing and adjusting shall in no way relieve guarantee requirements.

3. Provide services of qualified personnel, equipment and apparatus required to perform tests.

4. All systems shall be thoroughly adjusted for perfect intended operation. All mechanical equipment shall be adjusted for flow, temperature, etc. of fluid. Submit in writing to the Engineer upon completion of this work that it is complete and ready for use.

B. Before date of acceptance, furnish Architect with certificates of testing and inspection indicating approval of Authorities Having Jurisdiction and conformance with requirements of Contract Documents.

C. General:

1. Submit proposed test procedures, recording forms and test equipment for review before testing.

2. Notify Architect and Authorities involved at least 48 hours before testing and inspection.

3. Do not paint, cover or conceal work before testing, inspecting and obtaining approval; this includes backfilling and application of insulation.

4. Costs of repairs and restoration of work of other trades and of existing building surfaces or material damaged during cleaning or testing shall be borne by trade performing cleaning or testing.

D. 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.

1. Repair or replace leaks, damage and defects that result from tests to like-new condition. Remove and replace defective materials with acceptable materials.

2. Piping and joints shall be made tight without caulking. Continue tests until systems operate without adjustments and repair to equipment or piping.

3. Provide testing instruments, force pumps, gauges, equipment and labor necessary to conduct tests. Instruments used for testing and balancing shall have been calibrated within six months before balancing. Instrument calibration shall be certified.’

4. Submit six (6) copies of complete testing and balancing report to Architect for review.

E. Final test shall be made after vertical and horizontal pipes and roughing-in have been run and before sewer or fixture connection is made.

1. After soil, waste and storm lines, etc. have been installed outlets shall be temporarily plugged up.

2. Fill pipes with water to top of vertical lines and allow them to remain so filled for 24 hours.

3. Retesting after leaks are repaired shall be at no additional cost.

F. Pressurized Piping Systems:

1. Leak tests shall be conducted in accordance with ANSI applicable codes and as specified herein.

2. Before piping of various systems has been covered or furred-in, piping systems shall be tested tight for 1 hour under hydrostatic pressure, 1-1/2 times systems working pressures, but not greater than test pressure of 150 psig.

3. Tests shall be witnessed by Architect and pronounced satisfactory before pressure is removed or any water drained off.

4. Equipment shall be valved off or removed during test if equipment pressure rating is less than test pressure.

5. Retest systems after leaks are repaired within Contract Price.

G. Gravity Systems: Test under water pressure at heads specified in Plumbing Codes. Fill pipe lines with water to top of 5 foot vertical section of pipe or to level of top of vent pipe; maintain head pressure for 30 minutes.

H. Potable Water System Test:

1. Certification of the potable water system integrity shall be required where separate systems of potable and non-potable water are provided to supply plumbing fixtures.

2. Fill potable water system to capacity with clean clear water. Introduce water at top of piping system. During filling, introduce green food coloring dye into piping system. A floor-by-floor survey shall be conducted. Operate each outlet connected to water system until coloring has been observed. A method of maintaining the level of water and coloring shall be employed in order to make up the drawn off amounts. A survey sheet shall indicate each floor and the room number sequentially.

3. This survey is required to be performed after all pressure testing and flushing of the piping system, but before sterilization. Further, it is required that all fixtures connected to the potable water system be installed prior to the test.

3.16 TESTING: PIPING SYSTEMS

A. General:

1. Piping systems shall be subjected to testing water or air as noted and shall hold tight at the pressure head stated for the time interval required without adding air or water. While any system is being tested, required head or pressure shall be maintained until joints are inspected.

2. Tests shall be witnessed by inspector having jurisdiction, and the Architect within 48 hour notice, given these Authorities.

3. Equipment, material, and labor required for testing of various systems, or part thereof, shall be provided by Plumbing Contractor.

B. Sanitary, Waste and Roof Water Conductor System:

1. Water test shall be applied to drainage system either in their entirety or in sections as required, after rough piping has been installed.

2. If applied to entire system, openings in piping system shall be tightly closed, except the highest opening and system filled with water to point of overflow.

3. If system is tested in sections, each opening shall be tightly closed except highest opening in the section under test and each section shall be filled with water but no section shall be tested with less than a 10' head of water.

4. In testing successive sections, at least upper 10' of next preceding section shall be tested so that no joint of piping in building, except the uppermost 10' of the system shall be submitted to a test of less than a 10' head of water.

5. Water shall be kept in system for at least 15 minutes before inspection starts; the system shall then be made tight at all points.

C. Points of drainage systems tested with air instead of water shall be tested by attaching an air compressor testing apparatus to suitable opening and, after closing all other inlets or outlets, forcing air into systems until a uniform gauge pressure of 5 psi or sufficient pressure to balance a column of mercury 10" high. Pressure shall be held without introduction of additional air for a period of at least 15 minutes.

D. Interior Water Piping System: Upon completion of water supply systems or section thereof, as required, system shall be tested and proved tight under a water pressure of 150 psi. Gauge shall be located on lowest new floor and pressure shall hold for a period of one (1) hours without introducing additional water. Water used for testing shall be from a potable source of supply.

E. Testing Summary:

1. W&V – with water to a 10 foot head for 30 minutes.

2. Water – with potable water to 150 psi for one hour.

F. Defective Work: If inspection or tests show defects, such defective work or material shall be replaced and inspection and tests shall be repeated. Repairs to piping shall be made with new material. No caulking or screwed joints or holes shall be acceptable.

G. Additional Tests:

1. Provide additional tests such as smoke pressure tests as required by regulations or as directed by Authorities making the inspection.

2. Provide for any repeated test as directed by the Architect, to make all systems tight as required.

3. Visual inspections of joints and valves shall be made as directed by the Architect.

END OF SECTION

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SECTION 230000

HVAC

PART 1 – GENERAL

1.1 FILING OF SUB-BIDS

A. Sub-bids shall be submitted in accordance with the provisions of the General Laws, Chapter 149, Sections 44A to 44L, inclusive, as amended. The time and place for submission of Sub-bids shall be as set forth under “Instructions to Bidders”.

B. Each Sub-bid filed with the Awarding Authority shall be accompanied by a Bid Bond, Cash, Certified Check, Treasurer’s Check or Cashier’s Check issued by a responsible bank or trust company, payable to the City of Quincy, in the amount stipulated on the “Instructions to Bidders”. A sub-bid accompanied by any other form of bid deposit than those specified will be rejected.

C. Each Sub-bid submitted for the work under this section shall be on a form furnished by the Awarding Authority, as required by Section 44G of Chapter 149 of the General Laws, as amended.

1.2 GENERAL REQUIREMENTS AND REFERENCES

A. Include “General Requirements” and applicable parts of Division 1 as part of this section.

B. Examine all other sections of the Specifications for requirements which affect work under this Section whether or not such work is specifically mentioned in this section. Where paragraphs of this section conflict with similar paragraphs of Division 1, requirements of this section shall prevail.

C. Coordinate work with that of all other trades affecting, or affected by work of this section. Cooperate with such trades to assure the steady progress of all work under the Contract.

D. The HVAC Subcontractor shall be responsible for filing all documents, payment of all fees, and securing of all inspections and approvals necessary for the work of this section.

1.3 DEFINITIONS

A. As used in this section, “provide” means “furnish and install”, “POS” means “Provided Under Other Sections” and “HVAC” means “Heating, Ventilating and Air Conditioning”.

B. As used in the Drawings and Specifications for Mechanical Work, certain non-technical words shall be understood to have specific meanings as follows, regardless of indications to the contrary in the General Conditions of other documents governing the HVAC work.

1. “Furnish” means: Purchase and deliver to the project site complete with every necessary appurtenance and support, all as part of the HVAC work. Purchasing shall include payment of all sales taxes and other surcharges as may be required to assure that purchased item(s) are free of all liens, claims, or encumbrances.

2. “Install” means: 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, all as part of the HVAC work.

3. “Provide” means: “Furnish” and “Install”.

4. “New” means: Manufactured within the past two (2) years and never before used.

C. Except where modified by a specific notation to the contrary, it shall be understood that the indication and/or description of any HVAC item in the Drawings or Specifications for HVAC work carries with it the instruction to furnish, install and connect the item as part of the HVAC work, regardless of whether or not this instruction is explicitly stated.

D. It shall be understood that the Specifications and Drawings for HVAC work are complimentary and are to be taken together for a complete interpretation of the HVAC work except that indications on the Drawings, which refer to an individual element of work, take precedence over the Specifications where they conflict.

1.4 SCOPE

A. 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.

B. 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.

C. Give notices, file plans, obtain permits and licenses, pay fees and backcharges, 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.

D. Work shall include, but shall not be limited to, the following:

1. Tie-ins to existing hot water system.

2. Hoisting and rigging required to complete the work of this Section.

3. Sleeves, inserts and hangers.

4. Vibration isolation.

5. Motors.

6. Exhaust and ventilating air fans.

7. Rooftop supply and exhaust fans.

8. Hot water unit heaters.

9. Pipe, duct, valve and equipment identification.

10. Instruction manuals and startup instructions.

11. Testing and balancing.

12. Cleaning.

13. Carbon Monoxide monitoring and control system.

14. All interlock wiring and control wiring and devices.

E. Work to be done under this section is shown on the following Drawings: M Drawings

F. The following Drawings are included for reference and coordination and additional requirements for work in this Section – Plumbing, Electrical, Architectural and Structural Drawings.

G. 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. Site visit is particularly important because this is renovation work.

H. 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 Owner. Report conditions that might affect work adversely in writing through Contractor to Architect. 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 and preparatory work.

1.5 RELATED WORK UNDER OTHER SECTIONS

A. The following items are not included in this section and will be performed under the designated sections.

1. Cutting and patching of masonry, concrete, tile and other parts of structure, with the exception of drilling for hangers and providing holes and openings in metal decks.

2. Flashing of roof fans, or rooftop HVAC units, and of ductwork and all roof penetrations.

3. Painting, except as specified herein.

4. Electric power wiring for all equipment.

5. Structural supports necessary to distribute loading from equipment to roof or floor except as specified herein.

6. Plumbing.

7. Electrical.

1.6 REGULATORY REQUIREMENTS

A. Perform work strictly as required by rules, regulations, standards, codes, ordinances and laws of Local, State and Federal governments, and all other Authorities that have legal jurisdiction over the site. Materials and equipment shall be manufacturer 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. National Fire Protection Association (NFPA).
3. American Insurance Association (A.I.A.) (formerly National Board of Fire Underwriters).
4. Occupational Safety and Health Act (OSHA).
5. Underwriters' Laboratories (UL).

B. Material and equipment shall be listed by Underwriters' Laboratories (UL).

C. When requirements cited in this Specification conflict with each other or with Contract Documents the most stringent shall govern work. The Architect may relax this requirement when such relaxation does not violate the rulings 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 shall form part of the 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. Sheetmetal and Air Conditioning Contractors National Association (SMACNA).

1.7 SUBMITTALS

A. This section shall supplement Division 1.

B. Definitions:

1. Shop Drawings: Information prepared by the Contractor to illustrate portions of the work in more detail than shown in the Contract Documents.

2. Coordination Drawings: Detailed, large-scale layout Shop Drawings showing HVAC, Electrical, Plumbing and Fire Protection work superimposed to identify conflicts and ensure inter-coordination of Mechanical, Electrical, Architectural, Structural and other work.

3. Manufacturer's Product Data: Information prepared by the manufacturer which depicts standard equipment.

C. Submittals Procedures and Format:

1. Review submittal packages for compliance with Contract Documents and then submit to Architect for review. Submit transparency and two (2) blue or black-line reproductions of each Shop Drawing larger than 8-1/2" x 11". Submit eight (8) sets of each smaller shop drawing. After review, transparency original of each large Shop Drawing and six (6) sets of each small shop drawing will be returned with reviewer's marks. Electronically submitted shop drawings are acceptable.

2. Each Shop Drawing shall indicate in title block, and each Product Data package shall indicate on cover sheet, the following information:
   a. Title.
   b. Name and location of project.
   c. Names of Architect, Engineer, Contractor and Subcontractor(s).
   d. Names of Manufacturer, Supplier, Vendor, etc.
   e. Date of submittal.
   f. Whether original submittal or resubmitted.

3. Shop Drawings showing layouts of systems shall contain sufficient plans, elevations, sections, details and schematics to describe work clearly. They shall be ¼" = 1'-0" and shall indicate work of other Sections where physical clearances are critical and where interferences are possible. Provide larger scale details as necessary. Sheetmetal Drawings shall show elements of Architect's reflected ceiling plan, exposed ductwork, walls, partitions, diffusers, registers, grilles, fire dampers, sleeves and other aspects of construction as necessary for coordination.

D. Acceptable Manufacturers:

1. The Architect's Mechanical/Electrical design for each project is based on the single manufacturer listed in the schedule or shown on the Drawings. In Division 15 of these Specifications certain "Alternate Manufacturers" are listed as being acceptable. These are acceptable only if, as a minimum, they:
   a. Meet all performance criteria listed in the schedules and outlined in the Specifications.
   b. Have identical operating characteristics to those called for in the Specifications.
   c. Fit within the available space it was designed for, including space for maintenance and component removal, with no modifications to either the space or the product. Clearances to walls, ceilings and other equipment will be at least equal to those shown on the Contract Documents. The fact that a manufacturer's name appears as acceptable shall not be taken to mean the Architect has determined that the manufacturer's products will fit within the available space. This determination is solely the responsibility of the Contractor.
   d. For equipment mounted in areas where structural matters are a consideration, the products must have a weight no greater than the product listed in the schedules or Specifications.
   e. Products must adhere to all architectural considerations including, but not limited to, being the same size and of the same physical appearance as scheduled or specified products.

E. Deviations:

1. Concerning deviations other than substitutions, proposed deviations from Contract Documents shall be requested individually in writing whether deviations result from field

conditions, standard shop practice, or other cause. Submit letter with transmittal of Shop Drawings which flags the deviation to the attention of the Architect.

2. Without letters flagging the deviation to the Architect, it is possible that the Architect may not notice such deviation or may not realize its ramifications. Therefore, if such letters are not submitted to the Architect, the Contractor shall hold the Architect's and his consultants harmless for any and all adverse consequences resulting from the deviations being implemented. This shall apply regardless of whether the Architect has reviewed or approved Shop Drawings containing the deviation, and will be strictly enforced.

3. Approval of proposed deviations, if any, will be made at discretion of the Architect.

F. Submittal Notations: will be returned from the Architect marked as illustrated below:

NO EXCEPTION TAKEN	ACCEPTED AS NOTED
NOT ACCEPTED	REVISE AND RESUBMIT

Checking is only for general conformance with the design concept of the project and general compliance with the information given in the Contract Documents. Any action shown is subject to the requirements of the Drawings and Specifications. Contractor is responsible for dimensions which shall be confirmed and correlated at the job site; fabrication process and techniques of construction; coordination of his work with that of all other trades; and the satisfactory performance of his work.

G. Schedule: Incorporate the Shop Drawing review period into the construction schedule so that work is not delayed. Contractor shall assume full responsibility for delays caused by not incorporating the following Shop Drawing review time requirements into his project schedule. Allow at least ten (10) working days, exclusive of transmittal time, for review each time a Shop Drawing is submitted or resubmitted.

H. Responsibility:

1. The intent of submittal review is to check for capacity, rating, and certain construction features. Contractor shall ensure that work meets requirements of the Contract Documents regarding information that pertains to fabrication processes or means, methods, techniques, sequences and procedures of construction; and for coordination of work of this and other Sections. Work shall comply with submittals marked "REVIEWED" to extent that they agree with the Contract Documents. Submittal review shall not diminish responsibility under this Contract for dimensional coordination, quantities, installation, wiring, supports and access for service, nor the Shop Drawing errors or deviations from requirements of the Contract Documents. The Architect's noting of some errors while overlooking others will not excuse the Contractor for proceeding in error. Contract Document requirements are not limited, waived, nor superseded in any way by review.

2. Inform Subcontractors, Manufacturers, Suppliers, etc. of scope and limited nature of review process and enforce compliance with the Contract Documents.

I. Material and equipment requiring Shop Drawing and/or Manufacturer's Data Submittals shall include but not be limited to:

1. Ventilating and exhaust fans.
2. Automatic controls.
3. Insulation.
4. Vibration isolation.
5. Pipes, pipe hangers, sleeves and inserts.
6. Unit heaters.
7. Identification for pipe, duct, valves and equipment.
8. Louvers.
9. Intake hoods.
10. Fan roof curbs.
11. CO Monitoring System.

1.8 SURVEYS AND MEASUREMENTS

A. Base all required measurements, both horizontal and vertical, on reference points established by the General Contractor and be responsible for the correct laying out of the Mechanical work. In the event of a discrepancy between actual measurements and those indicated, notify the General Contractor in writing. Do not proceed with the work required until written instructions have been issued by the General Contractor.

1.9 COORDINATION

A. HVAC, Plumbing, Fire Protection, and Electrical Drawings are diagrammatic. They indicate general arrangements of Mechanical 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 Structural 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. Furnish information and Shop Drawings necessary to allow trades affected by the work to install their work 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 Architect. Where the HVAC work shall interfere with the work of other trades, assist in coordinating the space conditions to make satisfactory adjustments before installation. Without extra cost to the Owner, make reasonable modifications to the work as required by normal Structural interferences. The Mechanical Contractor shall be liable for any additional openings, or relocating and/or enlarging existing openings through concrete floors, walls, beams and roof required for any work which was not properly coordinated. 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 HVAC 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 trades involved without extra cost to the Owner.

F. Where conflicts or potential conflicts exist and engineering guidance is desired, submit sketch of proposed resolution to Architect for review and approval.

G. Protect all materials and work of other trades from damage which may be caused by the Mechanical work, and repair all damages without extra cost to the Owners.

1.10 MECHANICAL AND ELECTRICAL COORDINATION

A. The HVAC Subcontractor shall furnish and install various electrical items relating to the heating and ventilating equipment and control apparatus. The Electrical Subcontractor shall be required to connect power wiring to this equipment unless noted otherwise.

B. The HVAC and Electrical Subcontractors shall coordinate their respective portions of the work, as well as the electrical characteristics of the heating, ventilating and air conditioning equipment.

C. All power wiring and local disconnect switches will be provided by the Electrical Subcontractor for the line voltage power. All control and interlocking wiring shall be the responsibility of the HVAC Subcontractor.

D. 120V and above power wiring sources extended and connected to HVAC control panels, transformers and switches shall be the responsibility of the Electrical Subcontractor. All low voltage thermostats and any switch wiring shall be the responsibility of the HVAC Subcontractor.

E. Temperature control and equipment wiring shall be installed by the HVAC Subcontractor.

F. The Electrical Subcontractor will provide all magnetic starters except those furnished as an integral part of packaged equipment.

1.11 INSTALLATION REQUIREMENTS

A. The arrangement of all HVAC 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. Review the Architectural Drawings and Specifications before ordering any material and equipment. Any discrepancies shall be brought to the attention of the Architect for his determination prior to proceeding with the work.

1.12 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 Architect.

1.13 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 work. Internal diameter of sleeve ball shall be 1/2" larger than the outside diameter of the pipe or insulation covered line passing through it.

1.14 CORING, DRILLING

A. Core, cut and/or drill all small holes 4.5” diameter or less in walls and floors required for the installation of sleeves and supports for the Mechanical Electrical work.

1.15 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.

1.16 SUPPLEMENTARY SUPPORTING STEEL

A. Provide all supplementary (non-structural) steelwork required for mounting or supporting equipment and materials.

B. Steelwork shall be firmly connected to building construction as required. Locations and methods of attachment shall be approved by the Architect.

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.

1.17 TOOLS AND EQUIPMENT

A. Provide all tools and equipment required for the fabrication and installation of the mechanical equipment at the site.

1.18 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 the Owners.

1.19 RECORD DRAWINGS, PROJECT CLOSEOUT

A. As work progresses and for the duration of Contract, maintain a complete and separate set of prints of Contract Drawings at job site at all times. Record work completed and all changes from original Contract Drawings clearly and accurately including work installed as a modification or addition to the original design. Work shall be updated on a weekly basis and shall be made available for review by Architect. Failure to perform this work shall be reason for withholding requisition payments. In addition, take photographs of all concealed equipment in gypsum board ceilings, shafts, and other concealed, inaccessible work. At completion of work, make copies of photographs with written explanation on back. These shall become part of Record Documents.

B. At the completion of work, prepare a complete set of Record Drawings showing all systems as actually installed. The copies will be made available for the HVAC Contractor's copying, at his expense, to serve as backgrounds for the Record Drawings. The quantity of copies which are made available shall in no way be interpreted as setting a limit to the number of

Drawings necessary to show the required information. The HVAC Contractor's professional Draft Person shall transfer changes to electronic CAD files. Submit three (3) sets of electronic copies to Architect for comments as to compliance with this section.

C. The Architect will not certify the accuracy of the Record Drawings. This is the sole responsibility of the Mechanical Contractor.

D. This trade shall submit the Record Drawings for approval by the Fire and Building Departments in a form acceptable to the departments, when required by the jurisdiction.

E. Record Drawings shall show record condition of details, sections, riser diagrams, control changes and corrections to schedules. Schedules shall show actual manufacturer, make and model numbers of final equipment installation.

1.20 GUARANTEE/WARRANTY

A. Guarantee and 24 hour service.

1. Guarantee Work of this Section in writing for not less than one (1) year following the date of acceptance by the Owner. If the equipment is used for temporary heat, cooling, etc, prior to acceptance by the Owner, the bid price shall include an extended period of warranty covering the one (1) year of occupancy, starting from the date of acceptance by the Owner. The guarantee shall repair or replace defective materials, equipment, workmanship and installation that develop within this period, promptly and to the Architect's satisfaction and correct damage caused in making necessary repairs and replacements under guarantee within Contract Price.

2. In addition to guarantee requirements of Division 1 and of Subparagraph A above, obtain written equipment and material warranties offered in manufacturer's published data without exclusion or limitation, in Owner's name.

3. Upon receipt of notice from the Owner 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.

4. Replace material and equipment that require excessive service during guarantee period as defined and as directed by Architect.

5. Provide 24 hour service beginning on the date the project is accepted by the Owner, whether or not fully occupied, and lasting until the termination of the guarantee period. Service shall be at no cost to the Owner. Service can be provided by this Contractor or a separate service organization. Choice of service organization shall be subject to Architect and Owner 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.

6. Submit copies of equipment and material warranties to Architect before final payment.

7. At end of guarantee period, transfer manufacturer's equipment and material warranties still in force to Owner.

8. This paragraph shall not be interpreted to limit Owner's rights under applicable codes and laws and under this Contract.

9. Part 2 paragraphs of this Specification may specify warranty requirements that exceed those of this paragraph. Those paragraphs shall govern.

10. Use of systems provided under this Section for temporary services and facilities shall not constitute Final Acceptance of Work by Owner, and shall not initiate the guarantee period.

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 Owner's satisfaction, advise the Architect in writing, describe efforts to rectify situation, and provide analysis of cause of problem. The Architect and/or Engineer will direct course of action.

1.21 OPERATING, INSTRUCTION AND MAINTENANCE MANUALS

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. The manual shall contain the 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. 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. 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. Furnish three copies of manuals to the Architect for approval and distribution to the Owner. Deliver manuals no less than 30 days prior to acceptance of equipment to permit the Owner's personnel to become familiar with equipment and operation prior to acceptance.

C. Operating Instructions: Upon completion of installation or when the Owner accepts portions of building and equipment for operational use, instruct the Owner's operating personnel in any or all parts of the various systems. Instructions shall be performed by factory authorized personnel. The Owner shall determine which systems require additional instructions. The 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.

1.22 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 the Owner.

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 and labeled.

2. Be without blemish or defect.

3. Not be used for temporary purposes.

4. Be in accordance with the latest applicable ASHRAE standards.

G. Purchase 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.

H. Except for plans, all items of equipment or material of one generic type shall be the product of one manufacturer throughout.

I. For items which are to be installed but not purchased as part of the HVAC work, the Mechanical Contractor 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 until 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 the Contractor who originally purchased the item.

5. Field erection and internal wiring as necessary for their proper operation.

6. Mounting in place, including the purchase and installation of all dunnage, supporting members, and fastenings, necessary to adapt them to architectural and structural conditions.

1.23 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.

PART 2 – PRODUCTS

2.1 DUCTWORK AND AIR DISTRIBUTION EQUIPMENT

A. Reference Standards:

1. 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 the Drawings:

Standard	As Applicable To
SMACNA HVAC Duct Construction Standards Metal and Flexible	Sheetmetal 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
SMACNA Thermoplastic Duct (PVC) Construction Manual	PVC Ductwork
ADC and TIMA Flexible Duct Performance Standards	Flexible Ductwork
NFPA 90A	Fire Dampers; Fire Resistance Standards for Ducts and Liners
NFPA 96	Kitchen Hood Exhaust Ductwork
NFPA 45	Laboratories using chemicals
SMACNA Guidelines for Welding Sheetmetal	Welded Galvanized, Black Iron and Stainless Ductwork

B. General:

1. Provide supporting and hanging devices necessary to install the entire HVAC system including ductwork and equipment, and to prevent vibration.

2. Provide vertical and horizontal supports as required by code to meet minimum applicable earthquake resistance standards.

3. Ductwork shall be free from vibration under all conditions of operation. Dimensions shown on the Drawings for lined ductwork are net inside dimensions. Increase ductwork dimensions to accommodate lining requirements.

4. Pipe or conduit crossing duct: No pipe, conduit, hanger, Architectural element nor structural member shall pass through ductwork.

5. Connections to roof fans:
   a. Shall be at least 22 gauge galvanized steel soldered watertight.
   b. Solder side seams at least 12” up from bottom.

6. 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-corrodible 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.

7. Materials:
   a. Sheetmetal ducts shall be constructed of hot-dipped galvanized sheetmetal with G90 Commercial coating according to ASTM 527 unless specified otherwise.

2.2 DUCT INSULATION:

A. General:

1. Insulation shall be Certain-Teed, 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 Architect. 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. Insulate plenum connections to louvers.

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 Description	Pipe Size	Pipe Material	Joints	Fitting Material	Fitting Rating PSI/Class/ Weight
Hot Water	HWS/R	2” and under	Copper, B88, Type L or	Soldered 95/5 Tin/Antimony or Press	Wrought copper, B16.22	Class 150
Condensate Drain	CD	All	PVC. Schedule 40 Note 2	Solvent Welded	PVC, Schedule 40	Class 150

C. Connections:

1. Provide dielectric fittings at connections of dissimilar materials.

2. Nipples shall be same material, make and thickness as pipe with which they are used. Close nipples shall not be used.

3. Make piping connections 2” diameter and smaller to valves and equipment with steel body, 300 psi brass seat unions on steel piping and with heavy semi-finished brass unions on copper tubing.

4. 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.

5. Make screw joints tight with Teflon (polytetrafluoroethylene) tape or litharge-glycerin mixture applied to male threads. Use tapered threads.

2.4 VALVES AND STRAINERS

A. Valves on hot water shall be 125 psi unless noted otherwise. Pressure ratings of valves for steam and condensate services shall be as specified. Provide balancing valves where shown on Drawings.

B. Valves shall have name of manufacturer and guaranteed working pressure cast or stamped on bodies. Valves of similar type shall be by single manufacturer. Provide chain operators for valves 7 feet and higher above floor.

C. Provide bronze-body ball valves with reinforced Teflon seats, seals, bearings and packing. Ball valves shall be used for hot water services in sizes 2” and smaller. Do not use ball valves for balancing service. Valves on insulated piping shall have 2” extended stems. Valves shall be as manufactured by Apollo, Cannon, Nibco, Milwaukee or Watts. Valves shall be rated 600 psi W.O.G.

D. Strainers:

1. Strainers 2” and smaller shall be 250 lb. bronze body, stainless steel, screen with 20 mesh screen opening, Y-pattern, screwed ends, as manufactured by Sarco Type BT, Mueller, Watts or Armstrong.

2. Provide blow-off valve on each strainer.

E. Provide unions for threaded end valves to facilitate removal from pipe.

2.5 PIPE INSULATION

A. Insulation shall be fibrous glass insulation with factory-applied fire retardant vapor barrier jacket by Owens Corning, Certain-Teed, 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 the Architect. Remove dirt, scale, oil, rust and foreign matter prior to installation of insulation.

C. Provide fibrous dual temperature insulation with factory applied vapor barrier jacket on condensate drain piping, unless noted otherwise.

D. Provide longitudinal lap and 6” wide vapor barrier joint seal strips secured with approved adhesive.

E. 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.

2.6 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” diameter and smaller and 10’ for tubing 1-1/2” and larger.

E. Reduce spacing to a maximum of 10’-0” apart, regardless of pipe size, as necessary for fittings, valves and other concentrated loads.

F. Support piping 3” diameter and under from structure with Carpenter and Patterson Fig. 100 clevis hangers or approved equal.

G. Hangers shall be as manufactured 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.

2.7 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-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. 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 Director. 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 material 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.

2.8 ESCUTCHEONS

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.

2.9 HOT WATER UNIT HEATERS

A. Provide hot water unit heaters of horizontal discharge as shown on Drawings and on Schedules.

1. Casing shall be heavy gauge steel with welded seams and shall have threaded connections for vertical hanger rods.

2. Horizontal heaters shall have adjustable steel discharge louvers.

3. Electric motor shall have integral overload protection and shall be mounted away from coil and heated air stream.

4. Fan blades shall be aluminum or steel, statically and dynamically balanced at factory.

5. Coil shall have seamless copper serpentine tubes and aluminum or soldered copper fins bonded to tubes. Coils shall be tested at 300 psig air pressure without leaks.

B. Hangers and supports shall incorporate vibration and noise isolators. Motor and fan shall be separated from heater by resilient vibration isolators. OSHA-approved fan guards shall be provided on heaters.

C. Unit heaters shall be factory assembled for field installation, as manufactured by Sterling, Trane, Airtherm or Rittling.

2.10 LOUVERS

A. General: Provide stationary drainable blade style architectural louvers as shown on the drawings and based on the drawing schedules as manufactured by Greenheck, Ruskin, or an approved equal. All louvers shall be designed to protect air intake and exhaust openings in building exterior walls. Design shall incorporate a drainable head member and stationary horizontal blades to channel water to the jambs and guide water through vertical downspouts to escape at the sill. All louver finishes shall be coordinated with the Project Architect or Building Owner prior to final submittal to the Engineer.

B. Construction:

1. Frame: Heavy gauge extruded 6063-T5 aluminum, 4 inch by 0.081 inch nominal wall thickness.

2. Blades: Drainable design, heavy gauge extruded 6063-T5 aluminum, 0.081 inch nominal wall thickness, positioned at 37 degree and 45 degree angles on approximately 4 inch centers.

3. All components mechanically fastened.

4. Birdscreen: 3/4 inch by 0.051 inch flattened expanded aluminum in removable frame, inside mount.

C. Performance: Based on testing in standard air conditions – 0.075 lb./cubic foot, beginning point of water penetration shall be no less than 1007 feet/minute free air velocity. Individual louver panels shall be capable of withstanding a 25 pound/square foot wind load.

D. Certifications: All louvers shall be AMCA certified and may bear the AMCA Seal for air performance and water penetration ratings in accordance with AMCA publication 511.

2.11 CENTRIFUGAL FANS

A. Provide centrifugal fans by Cook, Trane, Greenheck, New York Blower with welded steel housing and wheel, balanced dynamically and statically. Fans shall be AMCA-certified and sealed.

B. Backdraft dampers shall not be provided when fans are specified or scheduled to be equipped with automatic control dampers in or immediately below curb.

C. Provide V-belt, variable-pitch drives for + 10% speed variation and with spring loaded belt tensioner.

D. Fans shall have centrifugal with backward-curved blades fan connected to electric motor so selected that in no instance can fan motor be overloaded at capacities shown on schedule on Drawings. Provide open drip-proof motor on adjustable base. Motors shall be high or premium efficiency type. See “Motors and Starters” paragraph of this specification for required efficiencies and other requirements.

E. Provide V-belt drives sized as recommended by manufacturer. Belt construction shall be rubber and cord. Belt sets shall be matched for length. Belt capacity shall be 150% of motor horsepower rating. Sheaves shall be cast and machined iron or steel larger than minimum diameters recommended for particular belt. Sheaves shall be balanced dynamically and statically.

F. Provide belt guards of 18 gauge steel mesh or perforated or expended steel sheets with angle frames and galvanized steel or iron trim, rigidly-braced. Provide ports for tachometer speed measurements at fan shafts.

G. Provide roof curb over existing skylight (48x48 field verify), 12-inch, with cap. Fan shall sit on top of the new curb cap with 12-inch curb for the fan. Entire system shall be flashed into the roof.

2.12 ROOF MOUNTED FRESH AIR HOOD

A. Hood shall be low silhouette, mushroom style with all aluminum reinforced construction. Hood shall be lined on interior with 1”, 3 lb. density fiberglass board for sound absorption. Insulation shall be held in place with full coverage of adhesive and welded stick-on fasteners positioned minimum of 1’ on center.

B. Provide bird screen and deflection baffles to keep out rain and snow.

C. Seams shall be welded and/or caulked for weather tightness.

D. Provide roof curb over existing skylight (48x48 field verify), 12-inch, with cap. Fan shall sit on top of the new curb cap with 12-inch curb for the fan. Entire system shall be flashed into the roof.

E. Unit shall be Penn, Cook, Greenheck or Jenn-Air.

2.13 CARBON MONOXIDE (CO) DETECTION AND CONTROL

A. Supply and install a CO Monitoring System similar to ACME CEL4 Series Multipoint & Multigas Centralized Detection and Control System consisting of the following:

1. A quantity of 1 Control Panel, a quantity of 2 CO sensors

B. The system shall use an addressable RS-485 communication protocol. Each sensor shall be sequentially pulled by the Control Panel. Sensor data shall be acquired and stored in the Control Panel memory.

C. The Control Panel shall have an LED display with an indicating light for each sensor location. This light shall blink slowly for low-level indication, blink quickly for high-level indication and

be solid ON for alarm level indication. A liquid-crystal alphanumeric 4-line display shall provide PPM levels for each sensor station, shall indicate the gas being sampled at that location and its alarm status.

D. The system shall have all of its components, including the controller, RS-485 communication module and relay outputs boards in a single enclosure.

E. The equipment shall be CSA and/or ETL certified.

F. The Control Panel shall incorporate the necessary logic circuits to operate the exhaust/supply fans and the motorized dampers for fresh air and/or exhaust according to the specified logic of ventilation.

G. The CEL Control Panel shall be of solid ventilated 16 gauge steel construction. All electronic components shall be behind a locked door. There shall be no accessible switches or knobs on front of panel. All electrical connections should be made to clearly identified terminals.

H. The system shall be self-checking.

I. The Control Panel shall include a time delay of approximately 30 minutes scheduled between the time a High Level is detected and the time visual display on unit cover or panel, audible alarm and closure of alarm contacts.

J. The wall or column mounted PVC gasketed enclosure with vandal-proof cover screws or a lockable clasp and shall not have any parts accessible from outside.

K. The sensor's response to ambient conditions shall be interpreted by the detection circuitry according to selected levels.

L. CO Sensor/Transmitter stations shall have LED's for visual indication of "Power-On" and a LED bar graph indicating concentration levels.

M. Removing or disconnecting a local sensor from the system shall not affect its operation as long as the "daisy-chain" connection to the other sensor stations is maintained.

N. There shall be no maintenance required except for periodic simple calibration checks performed by introducing a known gas mixture into the sensor and verifying or adjusting the electronic response at the sensor location.

O. All equipment shall be interconnected at the factor calibrated after a 7-day operational test. The logic of the system shall be factory tested by simulated field conditions as specified. A report shall be furnished with the equipment.

P. Provide on Control Panel selector switches with pilot lights to manually override all of the fans controlled by the system.

Q. Provide in CEL Control Panel a battery back-up to maintain the system in operation during a power failure. A compact rechargeable battery shall be used because of the reduced power requirements of the CEL system.

R. Provide a Remote Alarm Station furnished with Audible/Visual alarm with silencing button.

S. Provide all Audible/Visual alarms indicated, sensors indicated, programming as necessary for the sequence indicated, relays, and control for the two areas indicated to be monitored.

2.14 SEQUENCE OF OPERATIONS

A. Provide all motorized valves and remote thermostats for the two hot water unit heaters.

B. Provide all motorized dampers for the louvers and fans to operate as indicated on the Plans.

PART 3 – EXECUTION

3.1 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 Owner.

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 Architect.

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 Architect of location and extent of existing piping, ductwork and equipment that interferes with new construction. In coordination with and with approval of Architect, 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 Architect. Dispose of or store items as requested by Architect.

B. 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 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.

C. Use of Premises: Use of premises shall be restricted as directed by Architect 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 Architect and as specified under CLEANING paragraph.

2. It shall be this trade's responsibility to store his material 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 functions of existing sewers and gas mains. Extreme care shall be observed to prevent debris from entering ductwork. Confer with Architect 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 Architect to provide minimum interference with normal operation. Obtain Architect's approval of the method proposed for minimizing service interruption.

D. 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 Architect in writing and do not proceed with work until written instructions have been issued by Architect.

E. 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 Owner.

F. Airbound Coils: If, after plant is in operation, any coils or other apparatus are stratified or air bound (by vacuum or pressure), they shall be repiped with new approved and necessary fittings, air vents or vacuum breakers at no extra cost. If connections are concealed in furring, floors or ceilings this trade shall bear all expenses of tearing up and refinishing construction and finish, leaving same in as good condition as before it was disturbed.

3.2 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 and duct openings shall be temporarily closed to prevent obstruction and damage before completion.

1. 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.

2. 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.

3. Finish of materials, components and equipment shall be as approved by Architect and shall be resistant to corrosion and weather as necessary.

4. Owner will not be responsible for material and equipment before testing and acceptance.

3.3 CONTINUITY OF SERVICES

A. Do not interrupt existing service without Owner's approval.

B. Schedule interruptions in advance, according to Owner'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 Owner's operations.

3.4 ACCESS

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 Architect as to best method of approach for minimizing effect of reduced access which may result.

3.5 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 (1) 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 hangers.

3.6 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 Architect 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, weight 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 5 of Code of Practice of American Institute of Steel Construction.

3.7 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 (3) 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 to move freely from anchor points toward expansion joints, offsets, etc.

3.8 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: After completion of project, clean the exterior surface of equipment included in this section, including concrete residue.

3.9 STARTUP, TESTING AND BALANCING

A. General:

1. Provide qualified personnel, equipment, apparatus and services for startup, 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, Owners and Architect.

2. Startup, testing and balancing shall not diminish guarantee requirements.

3. Notify Architect and Authorities involved at least two (2) weeks before startup testing and balancing begins.

4. Do not cover or conceal work before testing and inspection and obtaining approval.

5. Instruments for testing and balancing shall have been calibrated within six (6) months prior to testing and balancing. Calibration shall be traceable to NBS Standards.

6. 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

7. Report on reporting forms, submitted to Architect for approval in advance, and on forms provided by Architect.

8. For each piece of equipment, copy nameplate data and include in report.

9. Submit six (6) copies of testing and balancing reports to Architect for approval.

10. 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 Owner.

11. Qualified representative of equipment manufacturer shall be present at test.

12. 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: Startup the following pieces of equipment in strict accordance with manufacturers instructions and with manufacturers representative present:

1. Fans.
2. CO Monitoring System.

END OF SECTION

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SECTION 260000

ELECTRICAL

PART 1 – GENERAL

1.1 FILING OF SUB-BIDS

A. Sub-bids shall be submitted in accordance with the provisions of the General Laws, Chapter 149, Sections 44A to 44L, inclusive, as amended. The time and place for submission of Sub-bids shall be as set forth under “Instructions to Bidders”.

B. Each Sub-bid filed with the Awarding Authority shall be accompanied by a Bid Bond, Cash, Certified Check, Treasurer’s Check or Cashier’s Check issued by a responsible bank or trust company, payable to the City of Quincy, in the amount stipulated on the “Instructions to Bidders”. A sub-bid accompanied by any other form of bid deposit than those specified will be rejected.

C. Each Sub-bid submitted for the work under this section shall be on a form furnished by the Awarding Authority, as required by Section 44G of Chapter 149 of the General Laws, as amended.

1.2 GENERAL REQUIREMENTS AND REFERENCES

A. Include “General Requirements” and applicable parts of Division 1 as part of this section.

B. Examine all other sections of the Specifications for requirements which affect work under this Section whether or not such work is specifically mentioned in this section. Where paragraphs of this section conflict with similar paragraphs of Division 1, requirements of this section shall prevail.

C. Coordinate work with that of all other trades affecting, or affected by work of this section. Cooperate with such trades to assure the steady progress of all work under the Contract.

D. The Subcontractor shall be responsible for filing all documents, payment of all fees, and securing of all inspections and approvals necessary for the work of this section.

E. The Electrical Subcontractor 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 Subcontractor 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 DEFINITIONS

A. As used in this section, “provide” means “furnish and install”, and “POS” means “Provided Under Other Sections”.

B. As used in the Drawings and Specifications for Electrical work, certain non-technical words shall be understood to have specific meanings as follows, regardless of indications to the contrary in the General Conditions of other documents governing the Electrical work.

1. “Furnish” means: Purchase and deliver to the project site complete with every necessary appurtenance and support, all as part of the Electrical work. Purchasing shall include payment of all sales taxes and other surcharges as may be required to assure that purchased item(s) are free of all liens, claims, or encumbrances.

2. “Install” means: 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, all as part of the Electrical work.

3. “Provide” means: “Furnish” and “Install”.

4. “New” means: Manufactured within the past two (2) years and never before used.

C. 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.

D. 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.

1.4 SCOPE

A. 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.

1. Interior secondary distribution systems including motor controls, magnetic starters, overcurrent and switching devices, panelboards, raceways, cables, wiring, junction and pull boxes, wireways, and all other components required for complete electrical distribution system.

2. 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.

3. Grounding and bonding of all electrical systems and equipment.

4. Wiring devices (switches and receptacles) complete with associated weatherproof in-use NEMA 3R covers.

5. Power wiring to HVAC and plumbing equipment.

6. Testing of all electrical systems.

7. Coordination between electrical and other trades.

8. All other systems hereinafter specified or indicated on the Contract Drawings, complete, leaving ready an electrical system in perfect operating condition.

9. All required staging and scaffolding of any height.

B. 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.

C. 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 an experienced observer. Site visit is particularly important because this is renovation work.

D. 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 Owner. Report conditions that might affect work adversely in writing through Contractor to Architect. 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 and preparatory work.

1.5 RELATED WORK UNDER OTHER SECTIONS

A. The following items are not included in this section and will be performed under the designated sections.

1. Temporary Facilities.

2. Earthwork: Excavation and backfill.

3. Masonry: All openings in masonry walls.

4. Waterproofing, Dampproofing and Caulking.

5. Roofing and Flashing.

6. Painting: All painting except as specified herein.

7. Finish Carpentry and Millwork.

8. Steel Doors and Frames.

9. Finish Hardware.

10. Plumbing.

11. HVAC.

1.6 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 Architect 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 Owners 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.

1.7 SUBMITTALS

A. This paragraph shall supplement Division 1.

B. Definitions:

1. Shop Drawings: Information prepared by the Contractor to illustrate portions of the work in more detail than shown in the Contract Documents.

2. Coordination Drawings: Detailed, large-scale layout Shop Drawings showing HVAC, Electrical, Plumbing and Fire Protection work superimposed to identify conflicts and ensure inter-coordination of Mechanical, Electrical, Architectural, Structural and other work.

3. Manufacturer's Product Data: Information prepared by the manufacturer which depicts standard equipment.

C. Submittals, Procedures and Format:

1. Review submittal packages for compliance with Contract Documents and then submit to Architect for review. Submit transparency and two (2) blue or black-line reproductions of each Shop Drawing larger than 8-1/2" x 11". Submit eight (8) sets of each smaller shop drawing. After review, transparency original of each large Shop Drawing and six (6) sets of each small shop drawing will be returned with reviewer's marks. Electronically submitted shop drawings are acceptable.

2. Each Shop Drawing shall indicate in title block, and each Product Data package shall indicate on cover sheet, the following information:
   a. Title.
   b. Name and location of project.
   c. Names of Architect, Engineer, Contractor and Subcontractor(s).
   d. Names of Manufacturer, Supplier, Vendor, etc.
   e. Date of submittal.
   f. Whether original submittal or resubmitted.

3. Shop Drawings and/or Manufacturer's Product Data shall contain detailed dimensional Drawings, accurate and complete description of materials of construction, manufacturer's published performance characteristics and capacity ratings (performance data alone is not acceptable), electrical requirements and wiring diagrams. Drawings shall clearly indicate location (terminal block or wire number), voltage and function for all field terminations, and other information necessary to demonstrate compliance with all requirements of Contract Documents.

D. Acceptable Manufacturers:

1. The Architect's Mechanical/Electrical design for each project is based on the single manufacturer listed in the schedule or shown on the Drawings. In Division 26 of these Specifications certain "Alternate Manufacturers" are listed as being acceptable. These are acceptable only if, as a minimum, they:
   a. Meet all performance criteria listed in the schedules and outlined in the Specifications.
   b. Have identical operating characteristics to those called for in the Specifications.
   c. Fit within the available space it was designed for, including space for maintenance and component removal, with no modifications to either the space or the product. Clearances to walls, ceilings and other equipment will be at least equal to those shown on the Contract Documents. The fact that a manufacturer's name appears as acceptable shall not be taken to mean the Architect has determined that the manufacturer's products will fit within the available space. This determination is solely the responsibility of the Contractor.
   d. For equipment mounted in areas where structural matters are a consideration, the products must have a weight no greater than the product listed in the schedules or Specifications.
   e. Products must adhere to all architectural considerations including, but not limited to, being the same size and of the same physical appearance as scheduled or specified products.

E. Substitutions:

1. Substitution of products by manufacturers other than those listed shall only be done in accordance with subparagraph "H" "Substitutions and Deviations".

F. Substitutions and Deviations:

1. Deviations from the Contract Documents and the substitution of materials or equipment relative to the "Acceptable Manufacturers" referred to above, shall be requested individually in writing whether deviations result from field conditions, standard shop practice, or other cause. Submit letter with transmittal of Shop Drawings which flags the substitution or deviation to the attention of the Architect. The letter shall describe changes in the system shown and physical characteristics (connections to adjacent materials, electrical services, service access requirements, and other characteristics), and differences in operating characteristics or cycles.

2. Without letters flagging the substitution or deviation to the Architect, it is possible that the Architect may not notice such substitution or deviation or may not realize its ramifications. Therefore, if such letters are not submitted to the Architect, the Contractor shall hold the Architect and his consultants harmless for any and all adverse consequences resulting from the deviations being implemented. Adverse consequences shall include, but not be limited to, excessive noise, excessive maintenance, shortened longevity, spatial

coordination problems, and inadequate performance versus scheduled design. This shall apply regardless of whether the Architect has reviewed or approved Shop Drawings containing the deviation, and will be strictly enforced.

3. Do not request substitute materials or equipment unless identical material or equipment has been operated successfully for at least three (3) consecutive years. Such materials and equipment shall be a regular cataloged item shown in the current catalog of the manufacturer. When deviation or substitution is permitted, coordinate fully with related changes to Architectural, Structural, Plumbing, Fire Protection, Mechanical, and other work. Ensure that related changes necessary for coordination of substituted items are made within the Contract Price. Assume full responsibility for safety, operation and performance of the altered system. Any extra costs incurred to the project based on the use of alternate manufacturers shall be borne by the Contractor who has requested the substitution.

4. Substitutions of equipment, systems, etc. requiring approval of local Authorities must comply with such regulations and be filed by the Contractor (should filing be necessary).

5. 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.

6. Approval of proposed deviations or substitutions, if any, will be made at discretion of Architect.

7. If equipment is proposed for substitution that is not tested and rated according to industry-wide standards, the Architect shall have the right to have performance tests completed, at the Contractor's expense, to confirm the manufacturer's performance claims.

G. Submittal Notations: Submittals will be returned from the Architect marked as illustrated below:

NO EXCEPTION TAKEN	ACCEPTED AS NOTED
NOT ACCEPTED	REVISE AND RESUBMIT

Checking is only for general conformance with the design concept of the project and general compliance with the information given in the Contract Documents. Any action shown is subject to the requirements of the Drawings and Specifications. Contractor is responsible for dimensions which shall be confirmed and correlated at the job site; fabrication process and techniques of construction; coordination of his work with that of all other trades; and the satisfactory performance of his work.

H. Schedule: Incorporate the Shop Drawing review period into the construction schedule so that work is not delayed. Contractor shall assume full responsibility for delays caused by not incorporating the following Shop Drawing review time requirements into his project schedule. Allow at least ten (10) working days, exclusive of transmittal time, for review each time Shop Drawing is submitted or resubmitted with the exception that fifteen (15) working days, exclusive of transmittal time, are required for the following:

1. Motor control wiring diagram submittals.

2. Short circuit and coordination studies.
3. Coordination Drawings, if required by this Specification.
4. If more than five (5) Shop Drawings of this trade are received in one (1) calendar week.

I. List of Proposed Equipment and Materials:

1. Within four (4) weeks after Award of Contract and before ordering materials or equipment, submit a complete list of proposed materials and equipment and indicate manufacturer's names and addresses. No consideration will be given to partial lists submitted out of sequence.

J. Responsibility:

1. The intent of submittal review is to check for capacity, rating, and certain construction features. Contractor shall ensure that work meets requirements of the Contract Documents regarding information that pertains to fabrication processes or means, methods, techniques, sequences and procedures of construction; and for coordination of work of this and other Sections. Work shall comply with submittals marked "REVIEWED" to extent that they agree with the Contract Documents. Submittal review shall not diminish responsibility under this Contract for dimensional coordination, quantities, installation, wiring, supports and access for service, nor the shop drawing errors or deviations from requirements of the Contract Documents. The Architect's noting of some errors while overlooking others will not excuse the Contractor for proceeding in error. Contract Document requirements are not limited, waived, nor superseded in any way by review.

2. Inform Subcontractors, Manufacturers, Suppliers, etc. of scope and limited nature of review process and enforce compliance with the Contract Documents.

K. Material and equipment requiring Shop Drawing and/or Manufacturer's Data Submittals shall include but not be limited to:

1. Light fixtures, including exterior pole base foundations.
2. Panelboards.
3. Overcurrent and switching devices.
4. Wiring devices and wallplates.
5. Weatherproof in-use NEMA 3R device covers.
6. Wiring and cables.
7. Conduit.
8. Boxes and fittings.
9. Safety switches.

1.8 COORDINATION

A. HVAC, Plumbing 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 Structural 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. Furnish information and Shop Drawings necessary to allow trades affected by the work to install their work 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 Architect. Where the Electrical work shall interfere with the work of other trades, assist in coordinating the space conditions to make satisfactory adjustments before installation. Without extra cost to the Owners, make reasonable modifications to the work as required by normal Structural interferences. Pay the General Contractor for additional openings, or relocating and/or enlarging existing openings through concrete floors, walls, beams and roof required for any work which was not properly coordinated. 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 trades involved without extra cost to the Owners.

F. Where conflicts or potential conflicts exist and engineering guidance is desired, submit sketch of proposed resolution to Architect 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 the Owners.

1.9 MECHANICAL AND ELECTRICAL COORDINATION

A. The HVAC Subcontractor shall furnish and install various electrical items relating to the heating and ventilating equipment and control apparatus. The Electrical Subcontractor shall be required to connect power wiring to this equipment unless noted otherwise.

B. The HVAC and Electrical Subcontractors shall coordinate their respective portions of the work, as well as the electrical characteristics of the heating, ventilating and air conditioning equipment.

C. All power wiring and local disconnect switches will be provided by the Electrical Subcontractor for the line voltage power. All control and interlocking wiring shall be the responsibility of the HVAC Subcontractor.

D. 120V and above power wiring sources extended and connected to HVAC control panels, transformers and switches shall be the responsibility of the Electrical Subcontractor. All low voltage thermostat, and any switch wiring shall be the responsibility of the HVAC Subcontractor.

E. Temperature control and equipment wiring shall be installed by the Heating and Ventilating Subcontractor.

F. The Electrical Subcontractor will provide all magnetic starters except those furnished as an integral part of packaged equipment.

1.10 MECHANICAL AND ELECTRICAL COORDINATION DRAWINGS

A. Coordination Drawings:

1. The Sheetmetal Subcontractor shall prepare a complete set of electronic type background Drawings at a scale not less than 1/8" equals 1'-0", showing structure and other information as needed for coordination. He shall show sheetmetal layout thereon. These will be the Coordination Drawings.

2. The main paths of egress and for equipment removal, from main Mechanical and Electrical rooms must be clearly shown on the Coordination Drawings.

3. Each of the below specialty trades shall add its work to these background Drawings with appropriate elevations and grid dimensions. Specialty trade information is required for fan rooms and mechanical rooms, horizontal exits from duct shafts, crossovers, and for spaces in and above ceilings where congestion of work may occur such as corridors, and even entire floors. Drawings shall indicate horizontal and vertical dimensions, to avoid interference with structural framing, ceilings, partitions, and other services.
   a. Specialty Trades:
      1) Plumbing System.
      2) HVAC Piping and Associated Control System.
      3) Electrical.
      4) Sheet Metal Work.

4. Each specialty trade shall sign and date each Coordination Drawing. Return Drawings to the Sheetmetal Subcontractor, who shall route them sequentially to all specialty trades.

5. Where conflicts occur with placement of materials of various trades, the Sheetmetal Subcontractor will be responsible to coordinate the available space to accommodate all trades. Any resulting adjustments shall be initialed and dated by the specialty trade. The Sheetmetal Subcontractor shall then final date and sign each Coordination Drawing. If he cannot resolve conflicts, the decision of the General Contractor shall be final, subject to the approval of the Architect.

6. A Subcontractor who fails to promptly review and incorporate his work on the Drawings shall assume full responsibility of any installation conflicts affecting his work and of any schedule ramifications.

7. The Sheetmetal Subcontractor shall make copies of all coordination Drawings. Fabrication shall not start until such copies of completed Drawings are received by the Architect/Engineer and have been reviewed.

8. Review of Coordination Drawings shall not diminish responsibility under this Contract for final coordination of installation and maintenance clearances of all systems and equipment with Architectural, Structural, Mechanical, and Electrical Contractors.

1.11 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. Review the Architectural Drawings and Specifications before ordering any material and equipment. Any discrepancies shall be brought to the attention of the Architect for his determination prior to proceeding with the work.

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 ball shall be 1/2" larger than the outside diameter of the pipe or insulation covered line passing through it.

1.13 CORING, DRILLING

A. Core, cut and/or drill all small holes 4.5” diameter or less in walls, floors and ceiling required for the installation of sleeves, supports, and conduit for the Electrical work.

1.14 FIRESTOPPING, SMOKEPROOFING AND WATERPROOFING

A. Provide firestop or smokestop between sleeves and conduit as manufactured by STI, Nelson, or Dow Corning Corp. Provide at all locations where conduits or electrical equipment penetrate fire/smoke walls or partitions.

B. Provide waterproofing of all materials which penetrate a floor, exterior wall, slab or roof. All sleeves shall extend a minimum of 3 inches above floor or roof.

1.15 COMMISSIONING OF SYSTEMS

A. Provide the services of an authorized representative to instruct the Owner. The Electrical Contractor shall be available during the commissioning phase to demonstrate the operation of all systems.

1.16 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.

1.17 SUPPLEMENTARY SUPPORTING STEEL

A. Provide all supplementary (non-structural) steelwork required for mounting or supporting equipment and materials.

B. Steelwork shall be firmly connected to building construction as required. Locations and methods of attachment shall be approved by the Architect.

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.

1.18 TOOLS AND EQUIPMENT

A. Provide all tools and equipment required for the fabrication and installation of the Mechanical and Electrical equipment at the site.

1.19 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 the Owners.

1.20 RECORD DRAWINGS, PROJECT CLOSEOUT

A. As work progresses and for the duration of Contract, maintain a complete and separate set of prints of Contract Drawings at job site at all times. Record work completed and all changes from original Contract Drawings clearly and accurately including work installed as a modification or addition to the original design. Work shall be updated on a weekly basis and shall be made available for review by Architect. Failure to perform this work shall be reason for withholding requisition payments. In addition, take photographs of all concealed equipment in gypsum board ceilings, shafts, and other concealed, inaccessible work. At completion of work, make copies of photographs with written explanation on back. These shall become part of Record Documents.

B. At completion of work the Electrical Contractor shall prepare a complete set of Record Drawings utilizing AutoCAD produced drawings showing all systems as actually installed, including electrical circuitry. Submit three (3) sets of prints to Architect for comments as to compliance with this section.

C. The Architect will not certify the accuracy of the Record Drawings. This is the sole responsibility of the Electrical Contractor.

D. This trade shall submit the Record Drawings for approval by the Fire and Building Departments in a form acceptable to the departments, when required by the jurisdiction.

E. Record Drawings shall show record condition of details, sections, riser diagrams, control changes and corrections to schedules. Schedules shall show actual manufacturer, make and model numbers of final equipment installation.

1.21 GUARANTEE/WARRANTY

A. Guarantee and 24 hour service:

1. Guarantee Work of this Section in writing for not less than one (1) year following the date of acceptance by the Owner. If the equipment is used for temporary power etc, prior to acceptance by the Owner, the bid price shall include an extended period of warranty covering the one (1) year of occupancy, starting from the date of acceptance by the Owner. The guarantee shall repair or replace defective materials, equipment, workmanship and installation that develop within this period, promptly and to the Architect's satisfaction and correct damage caused in making necessary repairs and replacements under guarantee within Contract Price.

2. In addition to guarantee requirements of Division 1 and of Subparagraph A above, obtain written equipment and material warranties offered in manufacturer's published data without exclusion or limitation, in Owner's name.

3. Upon receipt of notice from the Owner 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.

4. Replace material and equipment that require excessive service during guarantee period as defined and as directed by Architect.

5. Provide 24 hour service beginning on the date the project is accepted by the Owner, whether or not fully occupied, and lasting until the termination of the guarantee period. Service shall be at no cost to the Owner. Service can be provided by this Contractor or a separate service organization. Choice of service organization shall be subject to Architect and Owner 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.

6. Submit copies of equipment and material warranties to Architect before final payment.

7. At end of guarantee period, transfer manufacturer's equipment and material warranties still in force to Owner.

8. This paragraph shall not be interpreted to limit Owner's rights under applicable codes and laws and under this Contract.

9. Part 2 paragraphs of this Specification may specify warranty requirements that exceed those of this paragraph. Those paragraphs shall govern.

10. Use of systems provided under this Section for temporary services and facilities shall not constitute Final Acceptance of Work by Owner, and shall not initiate the guarantee period.

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 Owner's satisfaction, advise the Architect in writing, describe efforts to rectify situation, and provide analysis of cause of problem. The Architect and/or Engineer will direct course of action.

1.22 OPERATING, INSTRUCTION AND MAINTENANCE MANUALS

A. Refer to Section 01700 – CONTRACT CLOSEOUT for submittal procedures pertaining to operating and maintenance manuals.

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 (2) 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.

1.23 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 the Owner.

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 and 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. Buy 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 until 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 the Contractor who originally purchased the item.

5. Field erection and internal wiring as necessary for their proper operation.

6. Mounting in place, including the purchase and installation of all dunnage, supporting members, and fastenings, necessary to adapt them to architectural and structural conditions.

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 (1) 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.

1.24 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.

1.25 TEMPORARY POWER AND LIGHTING

A. The Electrical Subcontractor shall install and maintain the wiring and accessories for the offices of the General Contractor and the Clerk of the Works as specified in the contract form.

B. All temporary Electrical work shall meet the requirements of the National Electrical Code Article 590 Temporary Wiring, the Local Utility Company, and all Federal Standards and Laws.

C. All temporary wiring and accessories installed by the Electrical Subcontractor shall be removed after their purposes have been served.

D. The General Contractor will pay for the cost of electric energy consumed by himself and by all of his Subcontractors, unless otherwise indicated.

E. All lamps installed in permanent lighting fixtures and used for lighting during construction shall be replaced by the Electrical Subcontractor just prior to date of Use and Occupancy or Final Acceptance.

F. 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 1/2 hour before and 1/2 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. The Electrical Subcontractor will be compensated by the General Contractor for any additional standby time, materials or equipment required by the General Contractor or other Subcontractors beyond the normal working hours, as defined above.

1.26 STAGING AND SCAFFOLDING

A. Provide staging and scaffolding for all the work of this section complying with Division 1 requirements.

1.27 EXTRA MATERIALS

A. Furnish extra materials as indicated below that match products installed, are packaged with protective covering for storage, and are identified with labels clearly describing contents.

1. 10% of each total lamps installed.
2. 10% of each total circuits breaker installed.

1.28 SEISMIC REQUIREMENTS

A. Equipment and work shall meet the restraint requirements for the designated Seismic Design category. This shall include all installation and connections of material and equipment to the building structure. Refer to Structural Drawings for Seismic Design category and ASCE7 for electrical requirements.

1.29 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 Subcontractor, as required by job conditions and as determined by the Architect 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 period of time, in coordination with the Owner'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 Owner's working schedule, as many times as required until all work is completed. Any outages of service shall be approved by the Owner, prior to commencing the work. No outages or shutdowns of service shall occur without the written authorization of the Owner prior to commencing the work. Give notice of any scheduled shutdowns, a minimum of two (2) weeks in advance. Owner 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 Architect and Owner's representative 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 Subcontractor. All demolition and removal of electrical systems and equipment designed to be demolished shall be provided by the Electrical Subcontractor. Place all demolished electrical materials except hazardous materials (PCB lighting ballasts, fluorescent lamps, etc.) as determined by the Authority Having Jurisdiction in General Contractor's dumpster. All hazardous electrical materials shall be legally disposed of by the Electrical Subcontractor.

D. The Owner 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 Subcontractor shall construct the subject project in phases as directed by the Architect 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 GENERAL

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 purposes of limiting completion, 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 manufacturers names and/or "as approved" or "equal approved 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 the Architect.

E. All materials shall be new and shall be UL listed.

2.2 RACEWAYS AND FITTINGS

A. Raceways – General:

1. No raceway shall be used smaller than 3/4" diameter. No conduit shall have more than three (3) 90° bends in any one run, and where necessary, pull boxes shall be provided. Intermediate metal conduit is not allowed.

2. Rigid metal conduit conforming to, and installed in accordance with, Article 344 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 subjected to mechanical damage, i.e., loading docks, work shops, etc. or where indicated on the Contract Drawings.

3. Thin wall conduit (EMT), conforming to, and installed in accordance with, Article 358 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.

4. 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.

5. Acceptable Manufacturers:
   a. Wheatland Tube Company
   b. Allied Tube
   c. Western Tube & Conduit
   d. Carlon
   e. Perma-Cote Supreme

6. 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. Threadless fittings for EMT shall be watertight compression type. Set-screw type fittings are not acceptable. All fittings shall be concrete tight. No die-cast fittings allowed.
   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) Hubbell
      5) Thomas & Betts

2.3 WIRING MATERIALS

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. 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.

H. 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 type MC cable 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.

I. Wiring materials shall be manufactured by Southwire, Pirelli, 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 are 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 Architect. 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

4. All boxes installed within the new Wash Bay shall be NEMA 3R Rated with in-use type covers equal to Taymal #MX5208S.

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 areas, color as directed by the Architect. Provide galvanized steel for all Utility, Electric and Mechanical Rooms. All wiring devices in the new Wash Bay shall be installed in NEMA 3R enclosures listed in Section 2.4 Section A Item 4 above.

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 Architect for all areas. 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. quiet design, 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. 1221.
2. Double pole switch shall be equal to Hubbell No. 1222.
3. Three-way switch shall be equal to Hubbell No. 1223.
4. Single pole pilot light switch shall be equal to Hubbell No. HBL 1221PL.

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. Receptacles shall be mounted 18” to center line above finished floor unless noted otherwise.

1. Equal to Hubbell No. 5362.

2. Where indicated on plans provide receptacles with ground fault current interrupters, UL Class A; 20A, 125V to be equal to Hubbell No. GF5362.

E. Non-standard convenience receptacles and special purpose power supply receptacles shall be as listed on plans.

F. Devices and device plates for flush wall devices which are not integrally equipped with same, shall be as directed by the Architect.

G. 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.

H. Where more than one wiring device is indicated in the same location, the devices shall be mounted in gang under a common wall plate.

I. 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.

J. Wiring devices and associated hardware shall be manufactured by Leviton, Hubbell or Pass and Seymour.

2.6 GROUNDING REQUIREMENTS

A. Ground all systems and equipment in accordance with best industry practice, the requirements of NFPA 70, Article 250 and the following:

1. 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.

2. 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.

3. 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.

4. 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.

5. Bonding conductors on the load side 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.

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	Phase Circuits
Black	A
Red	B
Blue	C
White	Neutral
Green	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 PANELBOARDS

A. Panelboards shall consist of factory completed dead front assemblies of back pans, main busses, overcurrent and switching units, sheet metal cabinets and trims. They shall be so designed that switching and overcurrent devices can be replaced without disturbing adjacent units and without removing the main bus connectors, so that circuits may be changed without machine drilling or tapping.

B. Where indicated as power or distribution panels, they shall be as manufactured by Square D, Siemens, or Eaton.

C. Bus bars for their mains shall be of copper having current capacities as indicated and sized for such capacities in accordance with Underwriter Laboratory standards. Provide double size neutral bus bars and lugs for all 120/208 volt panelboards where fed from “K” rated transformers. Bus bar taps for panels with single pole branches shall be arranged for sequence phasing of the branch circuit devices. Bussing shall be braced throughout to conform to industry standard practice governing short circuit stresses in panelboards. Phase bussing shall be full height without reduction.

D. A ground bus shall be provided for each panel. Each ground bus shall be of the same material as the phase and neutral buses.

E. Cabinets shall be fabricated from industry standard gauge galvanized sheet steel with corners lapped and riveted, or fastened by approved methods.

F. The inside and outside of the trims shall be factory painted with one (1) rust proofing primer coat and one (1) finish coat. The finish paint shall be of a type to which field applied paint will bond. All trims shall be hinged.

G. Cabinets and trims shall be suitable for the required mounting. Trims shall be fastened to cabinets and shall be of a type that is self-supporting on cabinets. Trims for flush panels shall overlap cabinets by at least 3/4" all around. Where two section panels are required, cabinets shall be of equal height including those cases where there is one main for both sections.

H. Cabinets and trims for lighting and appliance panels shall accommodate and conform to the following limited dimensions:

1. Minimum wiring gutter width on each side: 5-3/4".
2. Maximum overall width: 24".
3. Maximum overall depth: 6".

I. Where wires or cables are used within panelboards to make up internal connections (factory installed or otherwise) such wire or cable shall have copper conductors only.

J. Any cabinet for a power or distribution panel shall (regardless of the actual devices required to be in it) have a width, depth and bussing adequate for a 3-pole branch device equal in rating to the panel mains. In no case shall the cabinet be wider than 42" or deeper than 18".

K. Hinged doors covering all switching device handles shall be included in all panel trims.

L. Doors in panelboard trims shall conform to the following:

1. In making switching device handles accessible, doors shall not uncover any live parts.

2. Doors shall have flush type paracentric cylinder locks and catches. Two (2) keys shall be supplied for each lock and each key shall open all panelboards. Locks and keys shall conform to a "standard keying policy" as directed.

M. Where "spaces only" for overcurrent protection and switching devices are called for in a panel, its main bus, and back pan, as well as its cabinet and trim, shall be extended to accommodate these spaces and shall include all necessary hardware including bus connectors to add future devices.

N. Panelboards shall comply with the following industry standards:

1. UL Standards:
   a. Panelboards – UL67.
   b. Cabinet & Boxes – UL50.
2. NEMA Standard – PB1.

O. Panelboards shall be labeled with UL short-circuit rating adequate for the available short-circuit and based on the lowest panel mounted circuit breaker available UL listed interrupting current rating, but in no case less than 65 ka for 480 volt and 22 ka for 240 volt panelboards.

P. Panelboards shall be manufactured by Eaton, Siemens, or Square D.

2.9 MOTOR CONTROLS

A. Motor Controls – Manual and Magnetic:

1. Individually-mounted magnetic starters shall be across-the-line type with thermal overload on each phase, single-speed, two-speed, or reduced voltage start as indicated.

Check exact type of two-speed or part-winding motors to be furnished by other contractors, and provide proper starter.

2. Starters shall be of the replaceable contact double break type, of size and type required for particular motor horsepower and voltage. Minimum size starter to be size 1.
   a. Starters shall have OL reset button, green pilot light to indicate “ON”, and “HAND-OFF-AUTO” switch in cover. Pilot lights shall be push-to-test type.
   b. Starters to have 120 volt control transformers with fused output being provided for those units operating on 277/480 volt system.
   c. Provide proper rating of thermal overloads. Replace any overloads found to be of an incorrect rating. Provide a spare set of three (3) thermal overloads for each starter.
   d. Provide four (4) sets of auxiliary contacts of convertible type N.O. to N.C. for each starter.
   e. Motor starters installed in dry locations shall have NEMA I enclosures. Those in wet locations shall have NEMA IV enclosures.
   f. Acceptable Manufacturers:
      1) Siemens
      2) Eaton
      3) Square D

3. Manual motor starters shall have pilot lights and shall be furnished with thermal overloads on each phase.

B. Motors: Each motor shall have disconnect switch and starter provided under this section. Starters which are a part of “factory assembled” control panel will be provided under section supplying equipment to be controlled but connected under this section.

C. Disconnect Switches:

1. Disconnect (safety) switches shall conform to industrial standards of NEMA, be UL listed and shall be heavy-duty type, quick-make, quick-break type with interlocking cover mechanism and provisions for padlocking switch handle in “OFF” position. Three (3) pole toggle switches are not acceptable as substitute for disconnect switches.

2. Disconnect switches shall be of fused or un-fused type as indicated with number of disconnecting poles indicated. The grounded conductor shall not be switched. Switches shall be for use with current limiting fuses with rejection type fuse clips and those shall be horsepower rated.

3. Enclosures shall be of proper NEMA type for the intended location and shall be phosphate coated or equivalent code gauge galvanized sheet steel with gray baked enamel finish.

4. Acceptable Manufacturers:
   a. Eaton
   b. Siemens
   c. Square D

D. Combination Starter: Provide combination starters where indicated on the plans.

E. Motor Control Circuitry:

1. Except as noted below, select materials exactly as specified for feeders. Utilize No. 12 A.W.G. THWN conductors throughout minimum.

2. Motor control circuit wires may be run in the same conduit as the wires of motor power circuits; however, exclude motor control wires from enclosures (other than motor starter enclosures) which contain power circuit overcurrent protection and switching devices; also from pull boxes and junction boxes containing the wires of main and sub-main feeders. Utilize auxiliary pull boxes to separate motor control wires from motor power circuit wires before the power circuit wires enter the items from which motor control wires are excluded.

3. Prior to installing any motor control circuitry for a particular motor, notify the Architect of any deviations between the control circuitry requirements of the trade supplying the motor and the indicated electric work.

2.10 LIGHTING FIXTURES

A. Lighting fixtures shall be in accordance with identifications on the Drawings and the following:

1. Finishes shall be as selected by the Architect or as indicated on the plans.

2. Any additional appurtenances required for installation and operation, where same are not covered by the identification used on the Drawings, shall be included.

3. Exact location of all fixtures shall be confirmed with Architect prior to rough-in.

4. Fixtures for use outdoors or in areas designated as damp locations, shall be suitably gasketed and UL listed for such applications.

5. All ballasts or transformers for discharge type lamps shall be for 60 cycles operation.

6. All ballasts or transformers for discharge or fluorescent type lamps shall be high power factor type.

7. In-line fuses shall be provided for all ballast and transformers.

8. Ballasts for T5 and T8 fluorescent lamps shall be electronic high frequency electronic type (20 KHZ or greater) type “P”, class “A” sound-rated, instant start and parallel wired such that if one lamp burns out the remaining lamps stay lit. Electronic ballasts shall comply with UL 935, ANSI C82.1, CBM certified and meet FCC standards for EMI/RFI (FCC 47 CFR Part 18 non-consumer) with a total harmonic distribution of less than 20%. Ballasts shall carry a manufacturer’s warranty of five (5) years and be manufactured by Osram Sylvania, Magnetek, Advance, or approved equal.

9. All ballasts or transformers for discharge type lamps intended for use outdoors shall be of the low temperature type having the lowest temperature rating available in standard manufacture.

10. Ballasts and transformers shall be of the “low energy full light output” type where available. Each shall not exceed industry minimum rated input wattage by more than 8%.

11. All fixtures shall be UL approved with labels attesting thereto.

12. All lamps shall be included. Except where specifically noted otherwise all fluorescent lamps shall be as follows:

a. Fluorescent lamps of the proper wattage and voltage rating shall be provided in each fixture as indicated on the fixture schedule. All fluorescent lamps shall be manufactured to appropriate Specifications given in ANSI C78. Unless noted otherwise, fluorescent lamps shall be T8 3500K and have a minimum CRI of 82.
b. Unless otherwise noted, all compact fluorescent lamps shall be 3500K and have a minimum CRI of 82. The Contractor shall verify that the proper lamp type for the specified ballast type is furnished with the compact fluorescent fixture.
   1) Compact fluorescent ballasts shall be UL listed, Class P, Type 1 and CBM Certified.
   2) Where 4-pin electronic ballast compatible compact fluorescent lamps are specified, electronic ballasts shall include circuitry capable of sensing when lamp is approaching end of life and shut show the lamp circuit. This end of life sensing must be impervious to low/high line voltage conditions and result in no false tripping or overheating of lamp bases.
c. 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.
d. Include the aiming and/or adjustments of all lighting fixtures requiring same in accordance with instructions issued by the Architect in the field.
e. All lamp sockets in lighting fixtures shall be suitable for the indicated lamps and shall be set so that the lamps are positioned in optically correct relation to all lighting fixture components.
f. Lighting fixtures shall be supported from building structure only, not from hung or suspended ceiling, by means of chains, threaded rods or #14 gauge tie wire.
g. All fixtures shall include seismic clips and shall be supported to comply with seismic regulations.
h. Lamps shall be manufactured by Eaton, Phillips. OSRAM, or Sylvania.

PART 3 – EXECUTION

3.1 BASIC REQUIREMENTS

A. Adhere to best industry practice and the following:

1. All work shall be concealed.

2. Route circuitry runs embedded in concrete to coordinate with structural requirements.

3. Equip each raceway intended for the future installation of wire or cable with a nylon pulling cord 3/16” in diameter and clearly identify both ends of the raceway.

4. 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.

5. Utilize lugs of the limited type to make connections at both ends of cables installed on the line side of main service overcurrent and switching devices. Provide cable limiters for each end of each service entrance cable.

6. Beyond the termination of raceways, fireproof the following:

a. All service feeder cables ahead of main service overcurrent protection devices, and elsewhere where not in raceways.
b. Fireproofing of wires and cables shall be by means of a half-lapped layer of arcproof or by means of sleeving of a type specifically manufactured for the purpose. Ends of tape or sleeving shall be severed with twine. Fireproofing shall be extended up into raceways. After conductors have been finally shaped into their permanent configuration, fireproofing tape or sleeving shall be coated with silicate of soda (water glass). Fireproofing shall be applied in an overall manner to raceway groupings of conductors.

7. Provide all sleeves through fireproof and waterproof slabs, walls, etc., required for electric work.
   a. Provide waterproof sealing for the sleeves through waterproof slabs, walls, etc.
   b. Provide fireproof sealing for the sleeves through fireproof walls, slabs, etc.
   c. Provide fireproof sealing for the openings in fireproof walls, slabs, etc., resulting from removal of existing electrical sleeves, conduits, poke-thru's etc.

8. Bundle wiring passing through pull boxes and panelboards in a neat and orderly manner.

9. Turn branch circuits and auxiliary system wiring out of wiring gutters at 90 degrees to circuit breakers and terminal lugs.

3.2 TESTING REQUIREMENTS & 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 Division 16 work.

B. The Electrical Subcontractor shall pay for all tests specified in Division 16, including expenses incident to retests occasioned by defects and failures of equipment to meet Specifications, at no additional cost to the Owner. Any defects or deficiencies discovered in any of the Electrical work shall be corrected.

1. The Electrical Subcontractor shall:
   a. Replace wiring and equipment found defective (defined as failing to meet specified requirements) at no additional cost to the Owner.
   b. Submit three (3) copies of test results to the Engineer.

2. Do not void equipment warranties or guarantees by testing and checkout work. Checks and tests shall be supplemental to and compatible with the Manufacturer's installation instructions. Where deviations are apparent, obtain the Manufacturer's approved review of procedures prior to testing. Where any repairs, modifications, adjustments, tests or checks are to be made, the Contractor shall contact the Engineer to determine if the work should be performed by or with the Manufacturer's Representative.

3. Tests are to:
   a. Provide initial equipment/system acceptance.
   b. Provide recorded data for future routine maintenance and trouble-shooting.
   c. Provide assurance that each system component is installed satisfactorily and can be expected to perform, and continue to perform its specified function with reasonable reliability throughout the life of the facility.
      1) 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.

2) Prior to testing and start-up, equipment and wiring shall be properly and permanently identified with nameplates, and other identification as specified in Section 3.7. 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.
3) 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 (5) years of experience with tests of same type and size as specified.
4) Inspections and tests shall be in accordance with the following applicable codes and standards as amended to date, unless otherwise specified.
   a) National Electrical Manufacturer's Association – NEMA.
   b) American Society for Testing and Materials _ ASTM.
   c) Institute of Electrical and Electronic Engineers – IEEE.
   d) National Electrical Testing Association – NETA.
   e) American National Standards Institute – ANSI.
   f) C2: National Electrical Safety Code.
   g) Z244-1: American National Standard for Personnel Protection.
   h) Insulated Cable Engineers Association – ICEA.
   i) Association of Edison Illuminating Companies – AEIC.
   j) Occupational Safety and Health Administration – OSHA.
   k) OSHA Part 1910; Subpart S, 1910.308.
   l) OSHA Part 1926; Subpart V, 1926.950 through 1926.960.
   m) National Fire Protection Association – NFPA.
   n) 70B: Electrical Equipment Maintenance.
   o) 70E: Electrical Safety Requirements for Employer Workplaces.
   p) 70: National Electrical Code.
   q) 78: Lightning Protection Code.
   r) 101: Life Safety Code.
   s) Inspections and tests shall utilize the following references:
   t) Contract Drawings and Specifications.
   u) Contractor's Short Circuit and Construction Study, in accordance with Section 16100.
   v) Manufacturer's printed test procedures for respective equipment.

4. Test Equipment:
   a. Test equipment used by the Contractor is to be inspected and calibrated.
   b. Perform calibration and setting checks with calibrated test instruments of at least twice that of the accuracy of the equipment, device, relay or meter under test. Dated calibration labels shall be visible on test equipment. Calibrations over six (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.

5. Test Procedures:
   a. 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.

b. Submit proposed testing and checkout 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.
c. 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.
d. Perform insulation tests on electrical equipment, apparatus, cables, motors, circuit breakers and switches and similar electrical equipment, at the following items and conditions:
e. Prior to energization and/or placing into service.
f. When damage to the insulation is suspected or known to exist.
g. After repairs or modifications to the equipment affecting the insulation.
h. Where lightning or other surge conditions are known to have existed on the circuit.
i. 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.
j. 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.
k. 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.
l. When the electrical tests and inspections specified or required within Division 16 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 notify the Engineer in writing when exceptions have been corrected. The Contractor will prepare a "Notification or Substantial Electrical Completion" for approval by the Engineer following Engineer's acceptance of electrical completion. If later in-service operation or further testing identified problems attributable to the Contractor, these will be corrected by the Contractor, at no additional cost to the Authority.

C. Specific Tests:

1. Perform the following specified tests. De-energize and isolate equipment and cable prior to performing the tests.

D. Motors:

1. Before energizing any machine, visually inspect for serviceability. Check Manufacturer's instruction manual for correct lubrication and ventilation. Align motor with driven equipment. Check nameplate for electrical power requirements.

2. Test run motors uncoupled or unloaded, before placing into operation. Check the motor for rotation, speed, current and temperature rise under normal load and record the

results. Maintain the proper color codes for phase identifications. This may require swaps at the motor for proper rotation. Use motor phase rotation meter prior to lead connection at motor in order to minimize later swaps.

E. Grounding Systems:

1. Test main building loops and major equipment grounds to remote earth, directly referenced to an extremely low resistance (approximately 1 ohm) reference ground benchmark. Perform a visual inspection of the systems, raceway and equipment grounds to determine the adequacy and integrity of the grounding. Ground testing results shall be recorded, witnesses, and submitted to the Engineer.

2. Perform ground tests using a low resistance, null-balance type ground testing ohmmeter, with test lead resistance compensated for. Use the type of test instrument which compensates for potential and current rod resistances.

3. Test each ground rod and measure ground resistance. If resistance is not 25 ohms or less, drive additional rods to obtain a resistance of 25 ohms or less. Submit tabulation of results to Engineer. Include identification of electrode, date of reading and ground resistance valve in the test reports.

4. Test each building and major equipment grounding system for continuity of connections and for resistance. Ground resistance of conduits, equipment cases, and supporting frames, shall not exceed 5 ohms to ground. Submit all readings to the Engineer.

5. Where ground test results identify the need for additional grounding conductors or rods that are not indicated or specified, design changes will be initiated to obtain the acceptable values. The Contractor is responsible for the proper installation of the grounding indicated and specified.

6. Wire and Cable: (All conductors originating from main switchboard and distribution panels).

7. Before energizing any cable or wire, megger the insulation resistance of every external circuit wire to each other and to ground. Tests shall be conducted at voltages of 500 volts or lower. Continuity test each wire and cable to verify the field-applied tag per conductor. Continuity test each wire and cable to verify the field-applied tag per conductor. Minimum insulation resistance valves shall not be less than two (2) megohms.

8. Take insulation resistance measurements for motor feeders. With motors disconnected, measure insulation resistance from load side of contactors or circuit breakers.

9. Check cables and wires for the proper identification numbering and/or color coding.

10. Inspect cables for physical damage and proper connection in accordance with single line diagram.

F. Power Distribution System:

1. Motor Control:
   a. Inspect for physical damage, proper anchorage and grounding.
   b. Compare equipment nameplate data with design plans or starter schedule.
   c. Motor Running Protection:

d. Compare overload heater rating with motor full-load current rating to verify proper sizing
e. If motor running protection is provided by fuses, verify proper rating considering motor characteristics.
f. Check tightness of bolted connections.
g. Measure insulation resistance of each bus section phase-to-phase and phase-to-ground for one (1) minute.
h. Measure insulation resistance of each starter section phase-to-phase and phase-to-ground with the starter contacts closed and the protective device open.
i. Measure insulation resistance of each control circuit with respect to ground.
j. Test motor overload units by injecting primary current through overload unit and monitoring trip time at 300% of motor full-load current.
k. Perform operational tests by initiating control devices to affect proper operation.
l. Bolt torque levels shall be in accordance with Manufacturer's recommendations.
m. Perform insulation resistance test, 1000 VDC minimum test voltage and 100 megohms minimum insulation resistance.
n. Control wiring insulation test voltage shall be 1000 VDC. Manufacturer shall be consulted for test voltage where solid-state control devices are utilized.
o. Perform overload tests at 300% of motor full-load current. Trip times shall be in accordance with Manufacturer's tolerances. Investigate values in excess of 120 seconds.

2. Panelboards:
   a. Inspect for physical damage and proper grounding.
   b. Compare nameplate information with schedules and report any discrepancies.
   c. Inspect all panelboards for cleanliness, workmanship, etc.

3. Operating Instructions: Furnish operating instructions to Owner'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.

4. Electrical Tests:
   a. Perform a shield-continuity test on each power cable by ohmmeter method.
   b. Perform an insulation-resistance test utilizing a megohmmeter with a voltage output of at least 2,500 volts. Individually test each conductor with all other conductors and shields grounded. Test duration shall be one minute.
   c. Perform a dc high-potential test on all cables. Adhere to all precautions and limits as specified in the applicable NEMA/ICEA Standard for the specific cable. Perform tests in accordance with ANSI/IEEE Standard 400. Test procedure shall be as follows, and the results for each cable test shall be recorded as specified herein. Test voltages shall not exceed 80 percent of cable manufacturer's factory test value or the maximum test voltage in Table 10.6.
      1) Insure that the input voltage to the test set is regulated.
      2) Current-sensing circuits in test equipment shall measure only the leakage current associated with the cable under test and shall not include internal leakage of the test equipment.
      3) Record wet- and dry-bulb temperatures or relative humidity and temperature
      4) Test each section of cable individually.
      5) Individually test each conductor with all other conductors grounded. Ground all shields.
      6) Terminations shall be adequately corona-suppressed by guard ring, field reduction sphere, or other suitable methods as necessary.

7) Insure that the maximum test voltage does not exceed the limits for terminators specified in IEEE Standard 48 or manufacturer's specifications.
8) Apply a dc high-potential test in at least five (5) equal increments until maximum test voltage is reached. No increment shall exceed the voltage rating of the cable. Record dc leakage current at each step after a constant stabilization time consistent with system charging current.
9) Raise the conductor to the specified maximum test voltage and hold for 15 minutes on shielded cable and five minutes on non-shielded cable. Record readings of leakage current at 30 seconds and one minute and at one minute intervals thereafter.
10) Reduce the conductor test potential to zero and measure residual voltage at discrete intervals.
11) Apply grounds for a time period adequate to drain all insulation stored charge.
12) When new cables are spliced into existing cables, the dc high-potential test shall be performed on the new cable prior to splicing in accordance with Section 7.3.2. After test results are approved for new cable and the splice is completed, an insulation-resistance test and a shield-continuity test shall be performed on the length of new and existing cable including the splice. After a satisfactory insulation-resistance test, a dc high-potential test shall be performed on the cable utilizing a test voltage acceptable to Owner and not exceeding 60 percent of factory test value.

5. Test Values:
   a. Shielding must exhibit continuity. Investigate resistance values in excess of ten ohms per 1,000 feet of cable.
   b. Graphic plots may be made of leakage current versus step voltage at each increment and leakage current versus time at final test voltages.
      1) The step voltage slope should be reasonably linear.
      2) Capacitive and absorption current should decrease continually until steady state leakage is approached.

6. Electrical Tests:
   a. Perform insulation-resistance tests on each pole, phase-to-phase and phase-to-ground with switch closed and across each open pole for one minute. Test voltage shall be in accordance with manufacturer's published data or Table 10.13.
   b. Perform an over potential test on each pole with switch closed. Test each pole-to-ground with all other poles grounded. Test voltage shall be in accordance with manufacturer's published data or Table 10.2.
   c. Measure contact resistance across each switchblade and fuse holder.
   d. Measure fuse resistance.
   e. Verify heater operation.

7. Test Values:
   a. Bolt-torque levels shall be in accordance with Table 10.12 unless otherwise specified by manufacturer.
   b. The insulation shall withstand the over potential test voltage applied.
   c. Minimum insulation resistance shall be in accordance with manufacturer's published data or Table 10.13.
   d. Investigate any contact resistance values which deviate from adjacent poles or similar switches by more than 25 percent.
   e. Investigate fuse resistance values that deviate from each other by more than 15 percent.

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 (1) cable for each leg and one (1) neutral cable, if any.

F. For circuitry indicated as being protected at 20 Amps or less, abide by the following:

1. All 20 amp, 120/208 volt, 3-phase, 4-wire combined branch circuit homeruns shall be provided with a #8 AWG neutral conductor.

2. Minimum conductor size shall be No. 12 AWG copper.

3. 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 AWG copper throughout.

4. Lighting fixtures and receptacles shall not be connected to the same circuit.

5. 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 type 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 a 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 or as indicated on drawing.

F. Final connections of flexible conduit shall be neoprene sheathed.

G. Apply one (1) 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 vapor proof 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 panelboard.
2. Each switch and circuit breaker.
3. Each feeder, wire or cable or all systems.
4. Each switchboard.
5. Each end of nylon pull-wire in empty conduit.
6. Each timer switch.

B. Each wire or cable in a feeder shall be identified at its terminal points of connection and in each pull box, 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 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 (1) “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 sheetmetal “red on white” signs reading “DANGER-HIGH VOLTAGE.”

L. Provide a sign at the service entrance equipment room indicating the type and location of all on-site emergency or standby power sources.

M. 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.

N. Prior to installing identifying tags and nameplates, submit their nomenclature for approval. Conform to all revisions issued by the Architect.

3.6 LIMITING NOISE PRODUCED BY ELECTRICAL INSTALLATION

A. Perform the following work in accordance with field instructions issued by the Architect 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, Local Electric Code and the following:

1. Include supporting frames or racks for equipment, intended for vertical surface mounting, which is required in a freestanding position.

2. 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 braces to form a substantial structure. Racks shall be of ample size to assure a workmanlike arrangement of all equipment mounted on them.

3. No work intended for exposed installation shall be mounted directly on any building surface. In such locations, flat bar members or spaces shall be used to create a minimum of ¼” air space between the building surfaces and the work. Provide ¾” thick exterior grade plywood painted with two (2) coats of fire-retardant gray paint for mounting of panelboards.

4. Nothing (including outlet, pull and junction boxes and fittings) shall depend on electric conduits, raceways or cables for support.

5. Nothing shall rest on, or depend for support on, suspended ceiling media.

6. Support less than 2” trade size, vertically run, conduits at intervals no greater than 8’. Support such conduits, 2-1/2” trade size or larger, at intervals no greater than they story height, or 15’, whichever is smaller.

7. Where they are not embedded in concrete, support less than 1” trade size, horizontally run, conduits at intervals no greater than 7’. Support such conduits, 1” trade size or larger, at intervals no greater than 10’.

8. Support all lighting fixtures directly from structural slab, intermediate decking or framing member as directed by the Architect. No light fixtures shall be supported directly from the roof deck.

9. 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.

10. Support all runs of conduit and/or circuitry directly from structural slabs, intermediate decking or framing members.

11. Fasten electric work to building structure in accordance with the best industry practice.

12. For items which are shown as being ceiling mounted at locations where fastenings to the building construction element above is not possible, provide suitably auxiliary channel or angle iron bridging tying to building structural elements.

13. 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.

14. As a minimum procedure, where weight applied to building attachment points exceed 100 lbs., but is 300 lbs. or less, conform to the following:
    a. 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 standard 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 a 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. 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 a 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 non-deteriorating 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” 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 1' away from the building construction opening occupied by the demountable items.

D. Apply junction and pull boxes in accordance with the following:

1. Include all 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. Multiple local switches indicated at a single location shall be gang-mounted in a single outlet box.

3. 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 conjunction with concealed circuitry.

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. Indicate 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 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 Architect 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 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 Architect 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 or as indicated on drawings.

F. 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”.

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 (4) 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 laced 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 suit the water condition encountered in the field.

END OF SECTION

HONORABLE THOMAS P. KOCH, MAYOR

CITY OF QUINCY PUBLIC WORKS DEPARTMENT
TRUCK WASHING FACILITY

55 SEA STREET

BID DOCUMENTS 07/29/2013

OWNER:

CITY OF QUINCY
1305 HANCOCK ST.
QUINCY, MA 02169
Phone: (617) 376-1131

ARCHITECT:

HOLMES & EDWARDS, INC.
26 CHESTNUT STREET
QUINCY, MA 02169
Phone: (617) 471-7377

STRUCTURAL ENGINEER:

ODEH ENGINEERS, INC.
1223 MINERAL SPRING AVE.
NORTH PROVIDENCE, RI 02904
Phone (401) 724-1771

MECHANICAL/PLUMBING & ELECTRICAL ENGINEERS:

B.E.R.
BUILDING ENGINEERING RESOURCES, INC.
66 MAIN ST.,
NORTH EASTON, MA 02356
Phone: (508) 230-0260

LIST OF DRAWINGS:

ARCHITECTURAL

A-001	TITLE SHEET AND DRAWINGS LIST
A-101	FIRST FLOOR & ROOF PLANS
A-201	EXTERIOR ELEVATIONS
A-401	WALL SECTIONS
A-402	EXTERIOR DETAILS

STRUCTURAL

S-001	GENERAL NOTES
S-111	FOUNDATION & SLAB ON GRADE PLAN
S-121	ROOF FRAMING PLAN
S-201	BUILDING SECTIONS
S-301	TYPICAL FOUNDATION & CMU DETAILS
S-302	TYPICAL STEEL DETAILS
S-303	FOUNDATION & ROOF DETAILS

PLUMBING

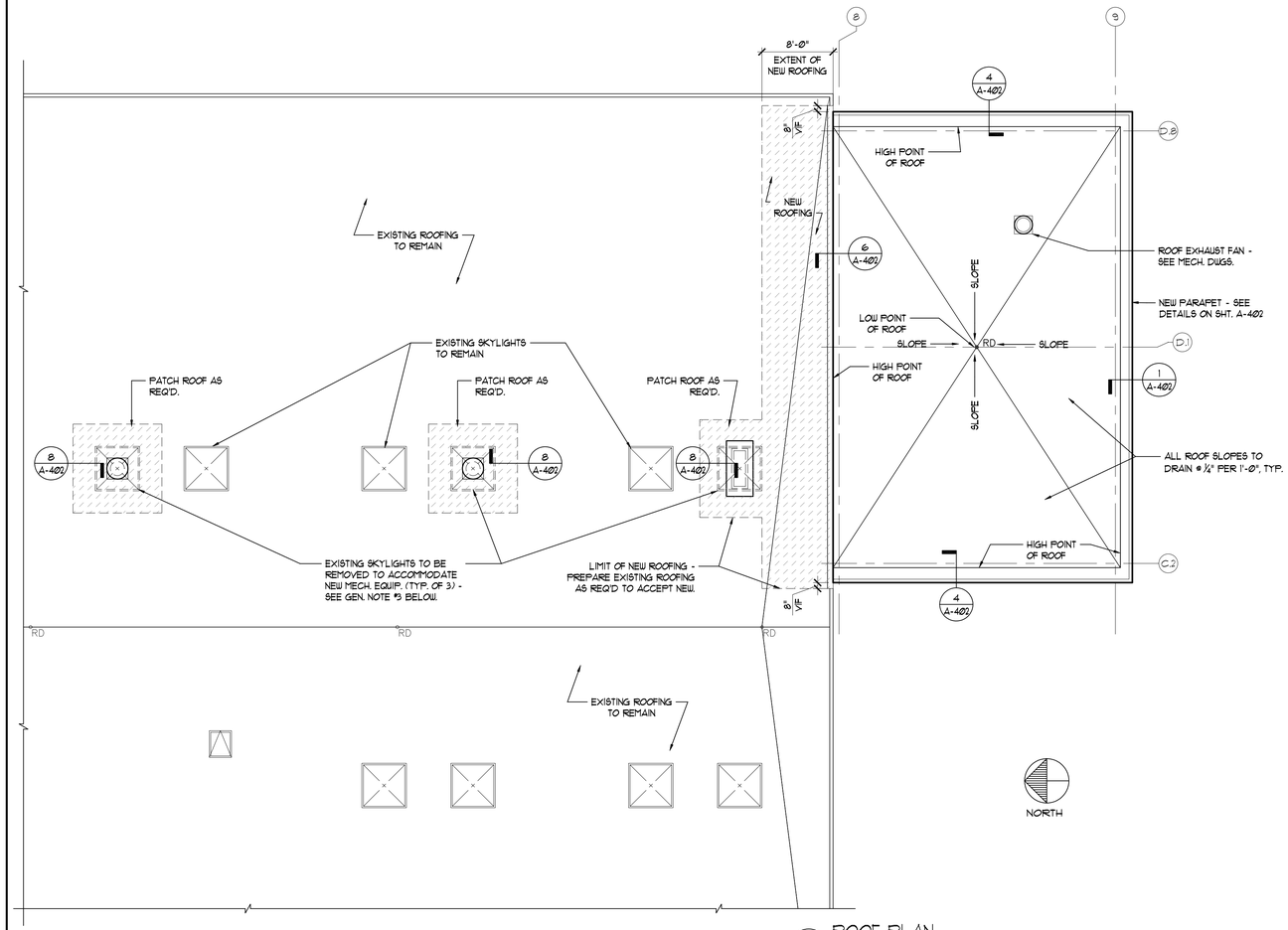
P-101	PLUMBING FIRST FLOOR PLAN

MECHANICAL

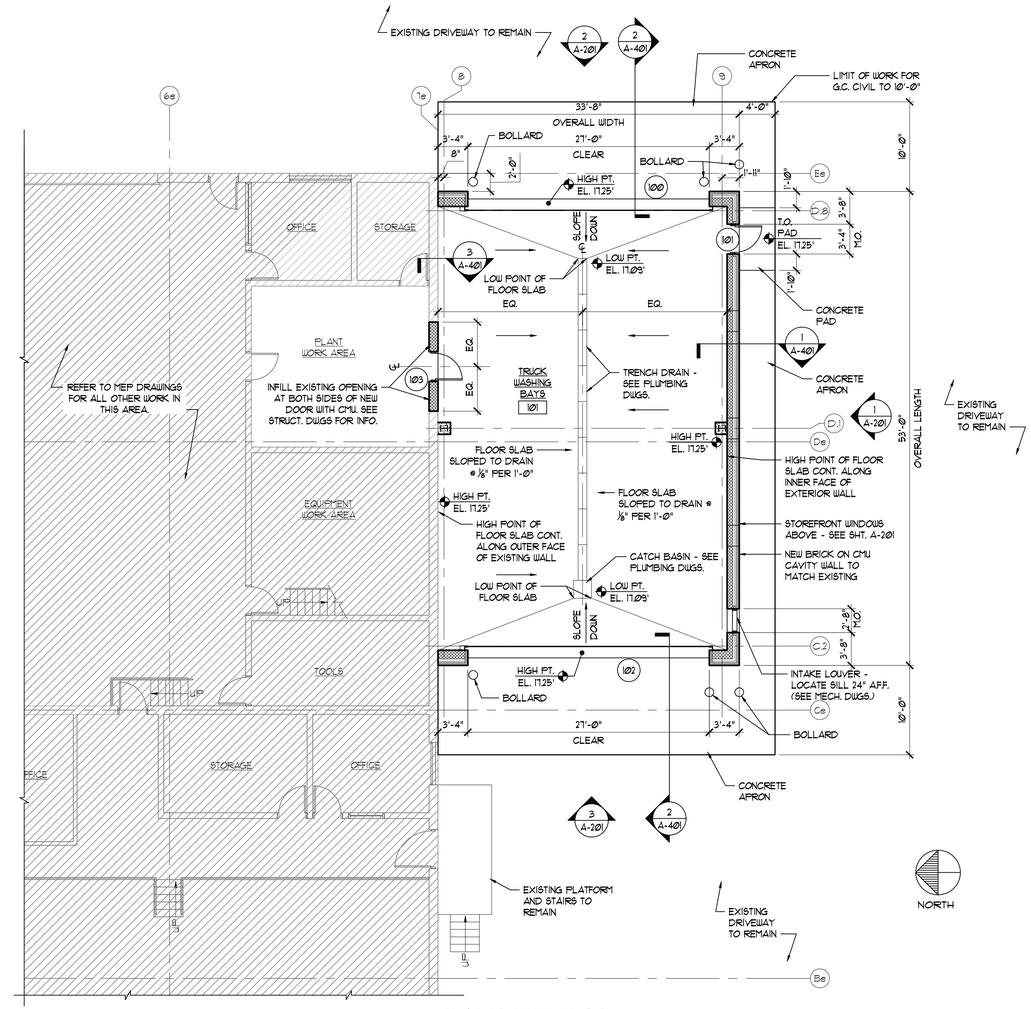
M-101	MECHANICAL LEGEND, DETAILS AND SCHEDULES
M-102	MECHANICAL FIRST FLOOR PLAN

ELECTRICAL

E-001	ELECTRICAL LEGEND, NOTES & SCHEDULES
E-101	ELECTRICAL FLOOR PLANS



2 ROOF PLAN
1/8" = 1'-0"



1 FIRST FLOOR PLAN
1/8" = 1'-0"

DOOR SCHEDULE			DOOR			FRAME			REMARKS
NUMBER	FROM	TO	SIZE	TYPE	MATERIAL & FINISH	TYPE	MATERIAL & FINISH	HARDWARE SET	
100	TRUCK WASHING BAY	EXTERIOR	27'-0"W x 14'-0"H x ¾"TH.	OVHD	GALV. STL. - PTD.	-	-	-	SEE SPECIFICATIONS FOR MANUFACTURER AND MODEL
101	TRUCK WASHING BAY	EXTERIOR	3'-0"W x 7'-0"H x 1¾"TH.	FLM	INSUL. MTL.	A	HM/PAINTED	A	SEE DOOR & HARDWARE NOTE 1.
102	TRUCK WASHING BAY	EXTERIOR	27'-0"W x 14'-0"H x ¾"TH.	OVHD	GALV. STL. - PTD.	-	-	-	SEE SPECIFICATIONS FOR MANUFACTURER AND MODEL
103	PLANT WORK AREA	TRUCK WASHING BAY	3'-0"W x 7'-0"H x 1¾"TH.	FLM	INSUL. MTL.	A	HM/PAINTED	A	SEE DOOR & HARDWARE NOTE 2.

DOOR HARDWARE SCHEDULE:

HDWR SET	ITEM	MANUFACTURER	MODEL	FINISH
A	CONTINUOUS HINGE	MCKINNEY	MCK-114HD	CL - CLEAR ANODIZED ALUMINUM
	MORTISE LOCKSET	SARGENT	8204 J LE1	US32D - SATIN STAINLESS STEEL
	DOOR CLOSER	SARGENT	351 SRI	US26D - SATIN CHROME PLATED
	INTERLOCKING GASKETING	PEMKO	335A & 336B	-
	AUTOMATIC DOOR BOTTOM	PEMKO	411ARL	-
	THRESHOLD	PEMKO	171BA	-

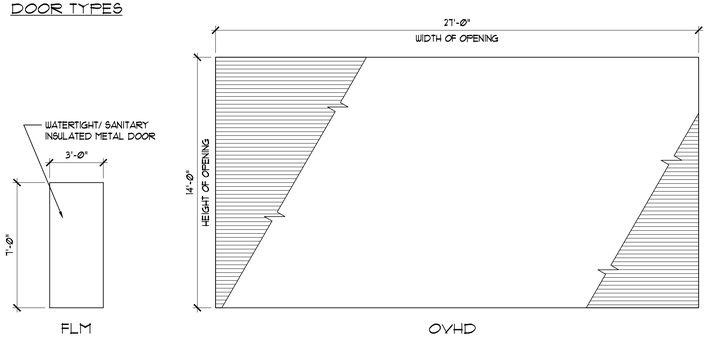
DOOR & HARDWARE NOTES:

1. PROVIDE ASSA ABLOY SANITARY/WATERTIGHT DOOR AND FRAME. DOOR CLOSER TO BE MOUNTED ON PULL SIDE OF DOOR 101. INTERLOCKING GASKETING MOUNTED ON LATCH SIDE OF DOOR 101.
2. PROVIDE ASSA ABLOY SANITARY/WATERTIGHT DOOR AND FRAME. DOOR CLOSER TO BE MOUNTED ON PUSH SIDE OF DOOR 103. INTERLOCKING GASKETING TO BE MOUNTED ON HINGE SIDE OF DOOR 103.
3. PROVIDE CYLINDER TO MATCH EXISTING KEYING SYSTEM.
4. COORDINATE THRESHOLD IN FIELD WITH EXISTING CONDITIONS.

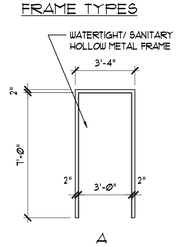
GENERAL NOTES:

1. PATCH/SEAL ALL LOCATIONS WHERE MECHANICAL, ELECTRICAL AND PLUMBING FIXTURES/OUTLETS HAVE BEEN REMOVED.
2. FINAL LOCATIONS OF BOLLARDS TO BE DETERMINED.
3. EXISTING SKYLIGHTS TO BE REMOVED IN DESIGNATED LOCATIONS ONLY. INFILL EXISTING METAL ROOF DECK AND INSTALL NEW PRE-FABRICATED ROOF CURBS AND MECHANICAL EQUIPMENT AS REQUIRED. PATCH ROOF AS REQUIRED AROUND NEW ROOF CURBS. SEE DETAILS ON SHT. A-402 AND MECHANICAL AND STRUCTURAL DRAWINGS FOR FURTHER INFORMATION.

DOOR TYPES



FRAME TYPES



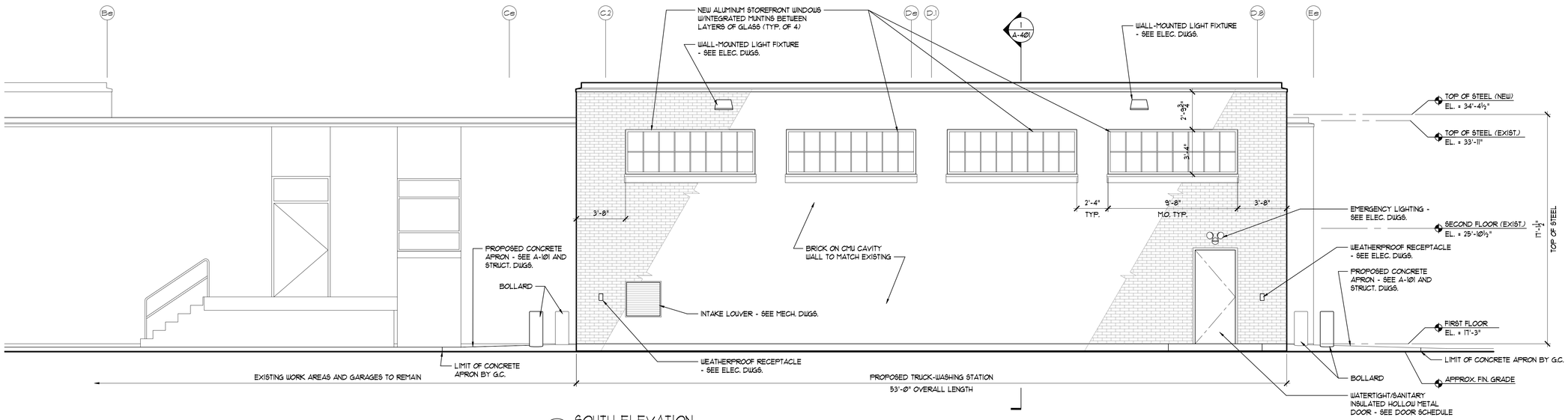
LEGEND

- BRICK (ELEVATION)
- BRICK (SECTION)
- CMU
- CLOSED CELL SPRAY INSULATION
- CONCRETE
- EARTH
- GRAVEL/ CRUSHED STONE
- GYPSUM WALL BOARD
- PLYWOOD
- RIGID INSULATION
- NEW/PATCHED ROOFING
- STEEL
- STUCCO

BID DOCUMENTS

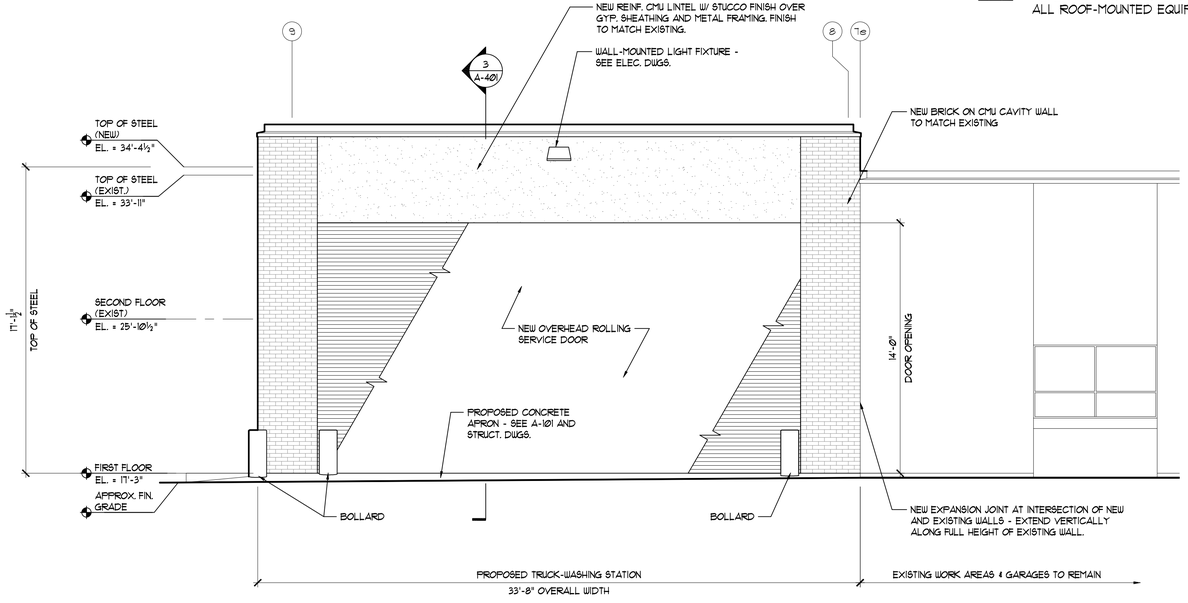
CITY OF QUINCY PUBLIC WORKS DEPARTMENT
TRUCK WASHING FACILITY, 55 SEA ST.

Scale: AS NOTED	Approved By: JE	Drawn By: TNB
Date: 07-29-13	Project Number: 1309	Revised:
HOLMES & EDWARDS, INC., ARCHITECTS 26 Chestnut Street, Quincy, Mass. 02169		Sheet Number:
Sheet Name: FIRST FLOOR & ROOF PLANS AND DOOR SCHEDULE		A-101

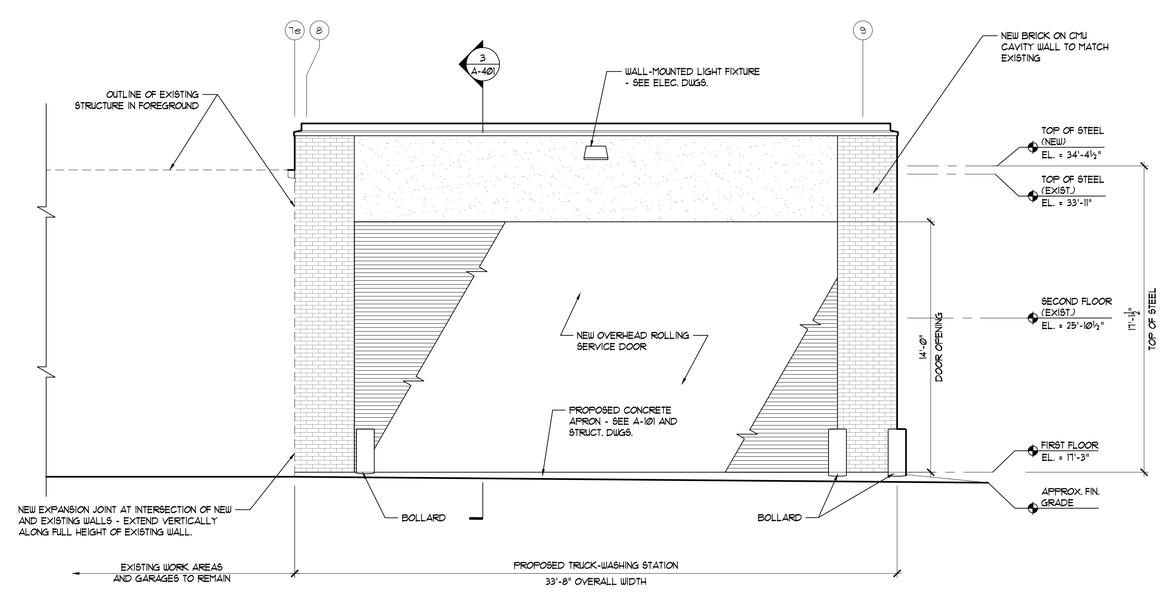


1 SOUTH ELEVATION
1/4" = 1'-0"

NOTE: REFER TO MECHANICAL DRAWINGS FOR ALL ROOF-MOUNTED EQUIPMENT



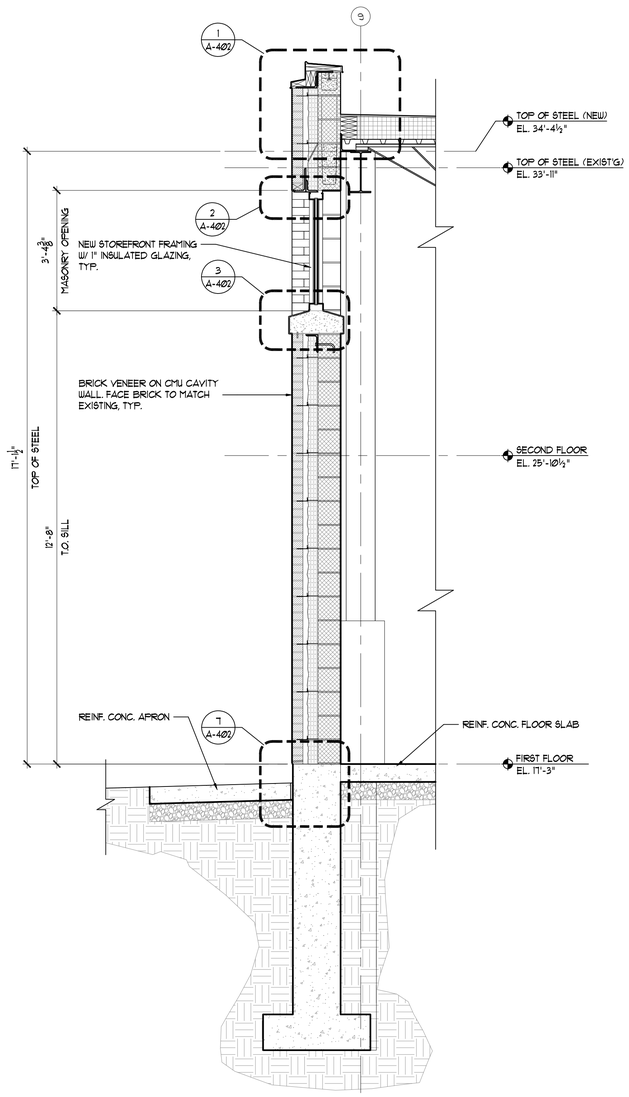
2 EAST ELEVATION
1/4" = 1'-0"



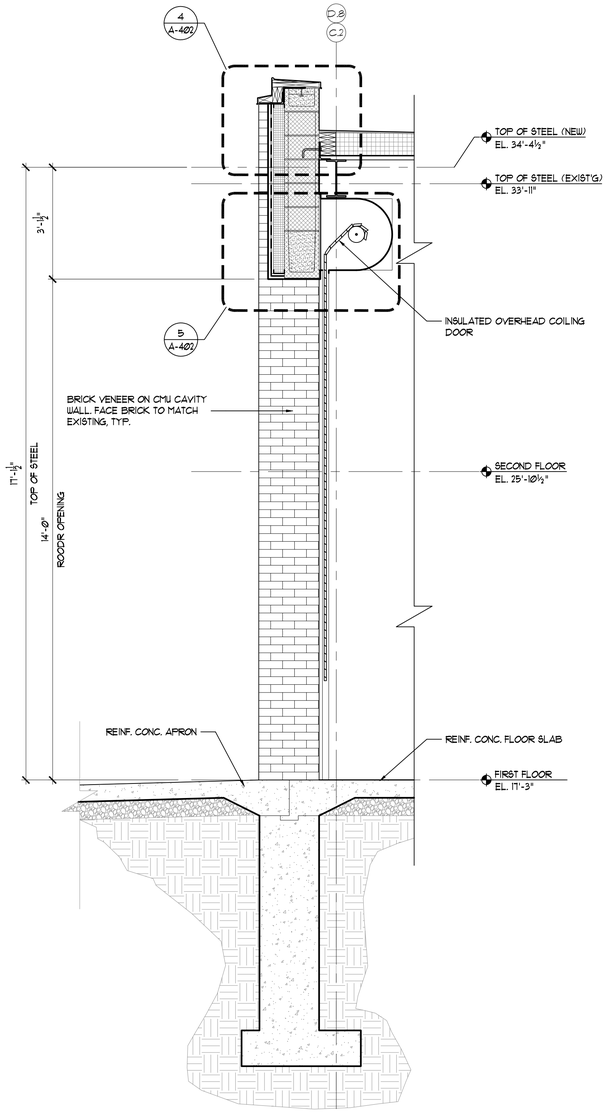
3 WEST ELEVATION
1/4" = 1'-0"

BID DOCUMENTS

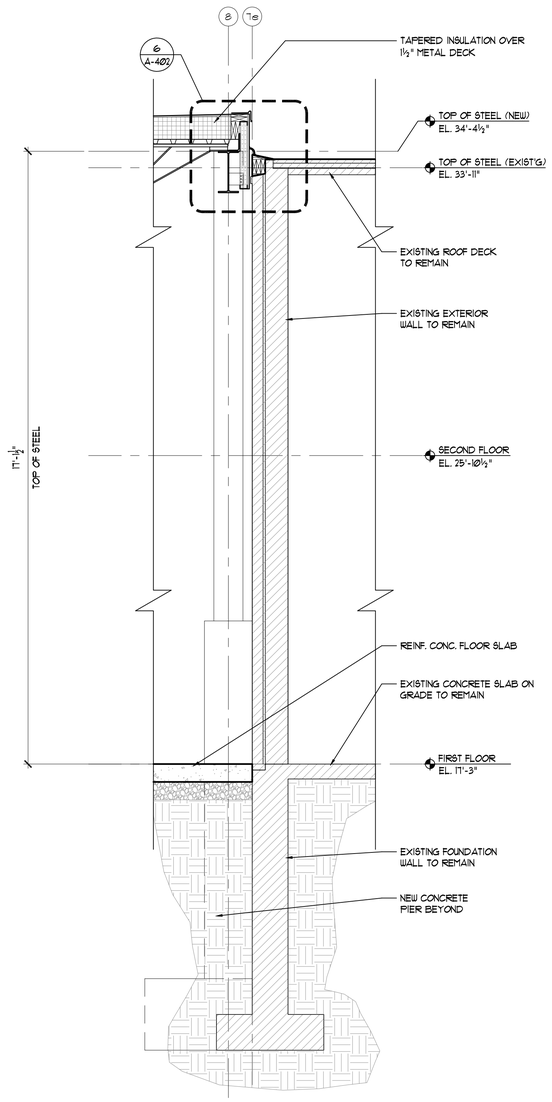
CITY OF QUINCY PUBLIC WORKS DEPARTMENT TRUCK WASHING FACILITY, 55 SEA ST.		
Scale: 1/4" = 1'-0"	Approved By: JE	Drawn By: TNB
Date: 07-29-13	Project Number: 1309	Revised:
HOLMES & EDWARDS, INC., ARCHITECTS 26 Chestnut Street, Quincy, Mass. 02169		Sheet Number:
Sheet Name: EXTERIOR ELEVATIONS		A-201



TYPICAL WALL SECTION THROUGH
CAVITY WALL AT WINDOWS
1
½" = 1'-0"



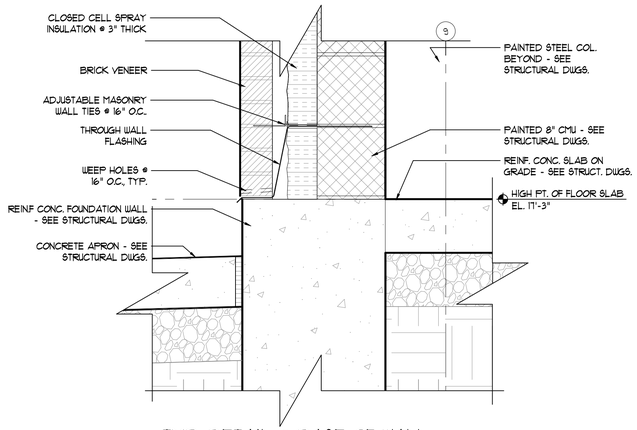
TYPICAL WALL SECTION THROUGH
CAVITY WALL AT OVERHEAD DOOR
2
½" = 1'-0"



TYPICAL WALL SECTION THROUGH NEW
ROOF EDGE ABOVE EXISTING WALL
3
½" = 1'-0"

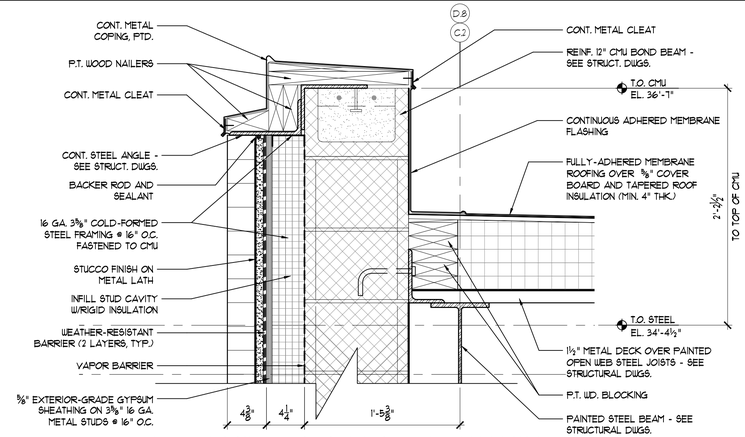
BID DOCUMENTS

CITY OF QUINCY PUBLIC WORKS DEPARTMENT TRUCK WASHING FACILITY, 55 SEA ST.		
Scale: AS NOTED	Approved By: JE	Drawn By: TNB
Date: 07-29-13	Project Number: 1309	Revised:
HOLMES & EDWARDS, INC., ARCHITECTS 26 Chestnut Street, Quincy, Mass. 02169		Sheet Number: A-401
Sheet Name: WALL SECTIONS		



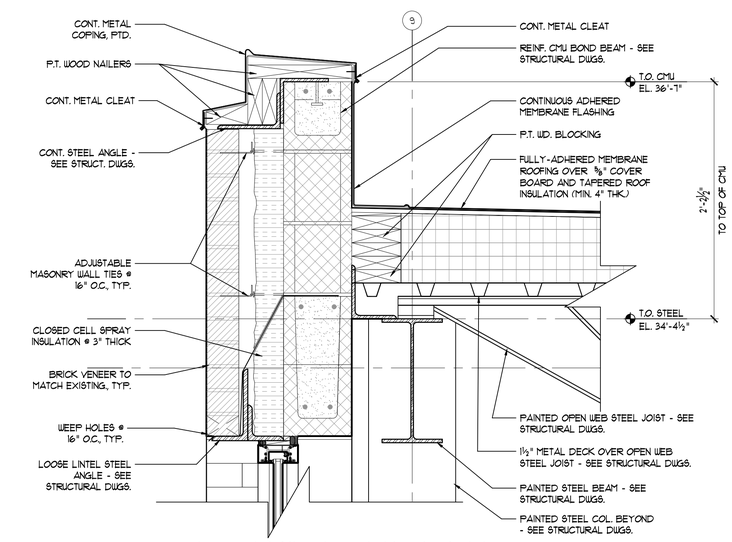
7 TYP. DETAIL @ BASE OF WALL

1½" = 1'-0"



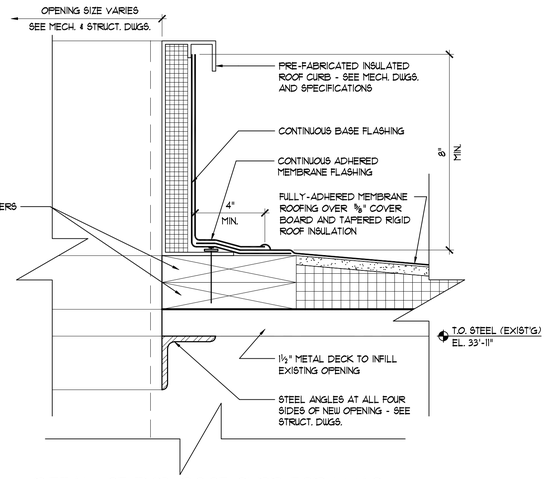
4 TYP. DETAIL @ PARAPET ABOVE CMU LINTEL

1½" = 1'-0"



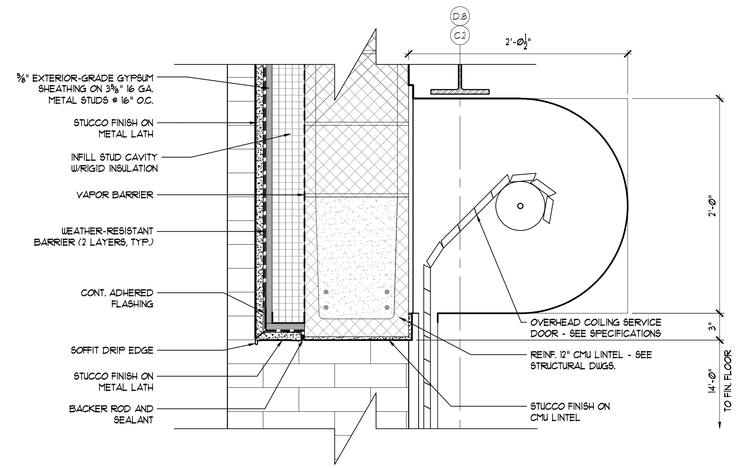
1 TYP. DETAIL OF BRICK PARAPET

1½" = 1'-0"



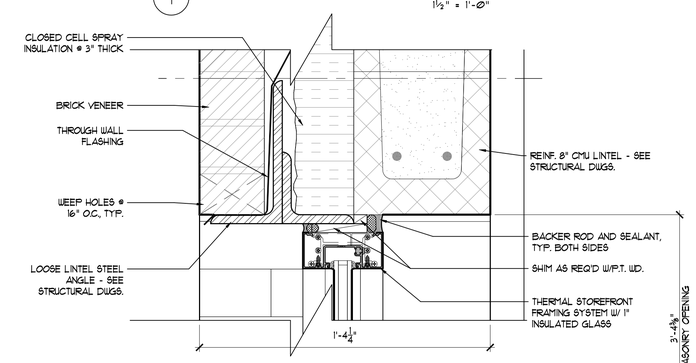
8 DETAIL OF TYP. ROOF CURB FOR HVAC EQUIP. @ RESIZED EXISTING ROOF OPENING

3" = 1'-0"



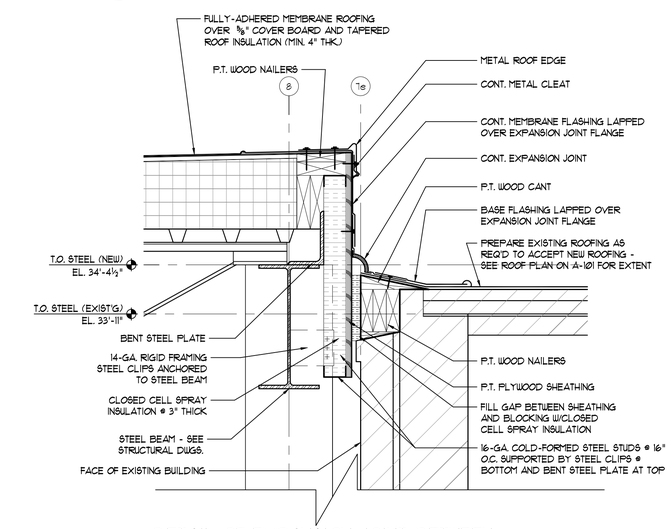
5 TYP. DETAIL THROUGH OVERHEAD DOOR @ CMU LINTEL

1½" = 1'-0"



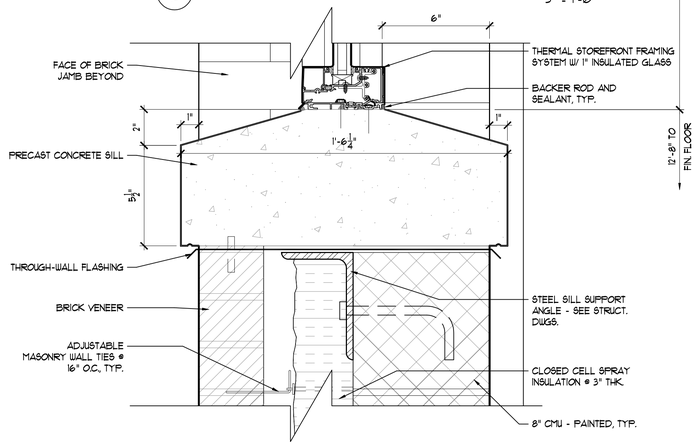
2 TYP. DETAIL OF STOREFRONT WINDOW HEAD

3" = 1'-0"



6 DETAIL OF EXPANSION JOINT BETWEEN NEW ROOF AND EXISTING ROOF

1½" = 1'-0"



3 TYP. DETAIL OF STOREFRONT WINDOW SILL

3" = 1'-0"

GENERAL NOTES:

1. ALL INTERIOR EXPOSED SURFACES AND STRUCTURE TO RECEIVE FINISH/PAINT. SEE SPECIFICATIONS FOR INTERIOR PAINT SCHEDULE.

BID DOCUMENTS

CITY OF QUINCY PUBLIC WORKS DEPARTMENT TRUCK WASHING FACILITY, 55 SEA ST.		
Scale: AS NOTED	Approved By: JE	Drawn By: TNB
Date: 07-29-13	Project Number: 1309	Revised:
HOLMES & EDWARDS, INC., ARCHITECTS 26 Chestnut Street, Quincy, Mass. 02169		Sheet Number:
Sheet Name: EXTERIOR DETAILS		A-402

GENERAL NOTES

I. GENERAL

1. ALL WORK SHALL CONFORM TO THE MASSACHUSETTS STATE BUILDING CODE (IBC 2009 WITH 780 CMR, 8th EDITION AMENDMENTS) AND ITS APPLICABLE REFERENCED STANDARDS.
2. IT IS THE RESPONSIBILITY OF THE GENERAL CONTRACTOR TO VERIFY ALL EXISTING CONDITIONS AND DIMENSIONS AS THEY RELATE TO NEW CONSTRUCTION. REPORT TO THE ARCHITECT/ENGINEER ALL OBSERVATIONS AND ANY DISCREPANCIES BEFORE PROCEEDING WITH WORK.
3. WHERE DETAILS FOR SPECIFIC CONDITIONS ARE NOT SHOWN ON THESE PLANS, USE DETAILS FOR THE MOST NEARLY SIMILAR CONDITIONS SHOWN ON THE STRUCTURAL DRAWINGS AS DETERMINED BY THE ARCHITECT AND STRUCTURAL ENGINEER OF RECORD. REPORT ANY COORDINATION ISSUES IMMEDIATELY TO THE ARCHITECT FOR REVIEW.
4. COORDINATE WITH ARCHITECTURAL, MECHANICAL, ELECTRICAL, PLUMBING, AND FIRE PROTECTION DRAWINGS FOR LOCATIONS AND DIMENSIONS OF CHASES, OPENINGS, BEAM PENETRATIONS, AND OTHER INFORMATION NOT SHOWN ON THESE PLANS THAT IMPACT STRUCTURE AND FOUNDATIONS. INCLUDE ADDITIONAL FRAMING AND REINFORCEMENT FOR SUCH WORK (PER TYPICAL STRUCTURAL DETAILS IN THIS SET) IN BASE CONTRACT.
5. ALL WORK SHALL BE CONTINUOUSLY MONITORED AND INSPECTED BY AN INDEPENDENT TESTING AGENCY. SUBMIT ALL TEST AND INSPECTION REPORTS TO A/E FOR REVIEW.
6. STRUCTURAL MEMBERS SHALL NOT BE MODIFIED IN THE FIELD WITHOUT WRITTEN APPROVAL FROM THE STRUCTURAL ENGINEER. IN THE EVENT OF A CONSTRUCTION OR FABRICATION ERROR, THE CONTRACTOR SHALL PREPARE A SKETCH WITH A PROPOSED REPAIR, AND SUBMIT IT TO THE A/E FOR APPROVAL PRIOR TO PERFORMING ANY CORRECTIVE WORK.
7. ANY ANTICIPATED MODIFICATIONS TO THE CONSTRUCTION DOCUMENTS MUST BE SUBMITTED TO THE ARCHITECT/ENGINEER FOR REVIEW AND COMMENTS. THIS OFFICE CANNOT CERTIFY ANY UNAUTHORIZED DEVIATIONS TO THE CONSTRUCTION DOCUMENTS. THIS OFFICE RESERVES THE RIGHT TO REQUEST THE CONTRACTOR TO OBTAIN THE SERVICES OF AN INDEPENDENT STRUCTURAL ENGINEER REGISTERED IN THE COMMONWEALTH OF MASSACHUSETTS TO VISIT THE PROJECT SITE AND TO DESIGN ANY REQUIRED REPAIRS OR TO JUSTIFY THE INSTALLED MODIFICATION. ALL ENGINEERING CALCULATIONS AND SKETCHES MUST BE SUBMITTED TO THE DESIGN TEAM FOR REVIEW AND APPROVAL.
8. PRIOR TO A GENERAL CONTRACTOR/CONSTRUCTION MANAGER REQUEST FOR AN INSPECTION BY ODEH ENGINEERS FOR A COMPLETED STAGE OF CONSTRUCTION, THE GENERAL CONTRACTOR/CONSTRUCTION MANAGER SHALL SUBMIT A STATEMENT STATING THAT “ALL WORK HAS BEEN COMPLETED IN CONFORMANCE WITH THE STRUCTURAL CONTRACT DRAWINGS AND SHOP DRAWINGS WITHOUT EXCEPTION OR HAS BEEN PERFORMED WITH FORMAL WRITTEN EXCEPTIONS ORIGINATING FROM OR AUTHORIZED BY ODEH ENGINEERS, INC.”. PRIOR TO RELEASE OF THE FINAL PROJECT CERTIFICATION TO THE BUILDING OFFICIAL, ODEH ENGINEERS REQUIRES A LETTER FROM THE PRINCIPAL OF THE GENERAL CONTRACTOR/CONSTRUCTION MANAGER STATING THAT “ALL WORK INDICATED ON THE STRUCTURAL DRAWINGS HAS BEEN PERFORMED WITHOUT EXCEPTION OR WAS PERFORMED WITH FORMAL WRITTEN EXCEPTIONS ORIGINATING FROM OR AUTHORIZED BY ODEH ENGINEERS, INC.”.
9. THE TRADE CONTRACTORS SHALL SUBMIT SHOP AND ERECTION DRAWINGS (COLLECTIVELY KNOWN HEREIN AS "SHOP DRAWINGS") FOR REVIEW PRIOR TO PROCEEDING WITH FABRICATION AND/OR CONSTRUCTION.
   a. THE SHOP DRAWINGS SHALL BE PREPARED IN ACCORDANCE WITH THE LATEST EDITION OF THE RESPECTIVE TRADES' CODES OF STANDARD PRACTICE. ALL SHOP DRAWINGS SHALL BE FULLY DEVELOPED BY THE TRADE CONTRACTORS OR BY AGENTS OF THE CONTRACTORS. CAD FILES, PHOTOCOPIES, OR OTHER REPRODUCTIONS OF THE CONTRACT DRAWINGS IN WHOLE OR IN PART SHALL NOT BE USED BY THE TRADE CONTRACTORS OR THEIR AGENTS FOR THE PREPARATION AND DEVELOPMENT OF SHOP DRAWINGS WITHOUT THE EXPRESSED WRITTEN CONSENT OF ODEH ENGINEERS, INC.
   b. ELECTRONIC SUBMISSIONS OF SHOP DRAWINGS WILL NOT BE ALLOWED. PRINTED (HARD) COPIES OF SHOP DRAWINGS SHALL BE SUBMITTED FOR REVIEW.
10. THIS STRUCTURAL DRAWING SET IS BASED ON ARCHITECTURAL AUTOCAD FILES DATED 05/08/2013. THIS STRUCTURAL DRAWING SET HAS BEEN PREPARED USING ONLY THESE ARCHITECTURAL DRAWINGS AND ANY INFORMATION REGARDING OTHER TRADES THAT HAS BEEN REFLECTED ON THESE ARCHITECTURAL DRAWINGS.

II. DESIGN LOADS

1. GENERAL DESIGN REQUIREMENTS (PER IBC 2009 SECTION 1604)
   a. OCCUPANCY CATEGORY IV
2. ROOF LIVE LOAD (PER IBC 2009 SECTION 1608 & 780 CMR TABLE 1604.11)
   a. GROUND SNOW LOAD*, Pg .... 45 PSF
   b. SNOW EXPOSURE FACTOR, Ce 0.9
   c. THERMAL FACTOR, Ct 1.0
   d. SNOW LOAD IMPORTANCE FACTOR, Is 1.2
   *-MODIFIED FOR SNOW DRIFT PER IBC - SEE ROOF LOADING PLAN
3. WIND LOADS (PER IBC 2009 SECTION 1609 & 780 CMR TABLE 1604.11)
   a. BASIC WIND SPEED, V .... 105 MPH
   b. WIND LOAD IMPORTANCE FACTOR, Iw 1.15
   c. WIND EXPOSURE CATEGORY C
   d. MAIN WIND FORCE RESISTING SYSTEM DESIGN METHOD .... METHOD 1 (PER ASCE 7-05 CHAPTER 6)
   e. COMPONENTS AND CLADDING LOADS .... PER ASCE 7-05 CHAPTER 6
4. EARTHQUAKE LOADS (PER IBC 2009 SECTIONS 1613 & 780 CMR TABLE 1604.11)
   a. SITE CLASS .... D
   b. SPECTRAL RESPONSE ACCELERATIONS
      i. Ss 0.27
      ii. S1 .... 0.067
   c. SPECTRAL RESPONSE COEFFICIENTS
      i. Sds 0.252
      ii. Sd1 .... 0.107
   d. SEISMIC DESIGN CATEGORY C
   e. SEISMIC IMPORTANCE FACTOR, Ie 1.5
   f. SEISMIC FORCE RESISTING SYSTEM:
      INTERMEDIATE REINFORCED MASONRY SHEAR WALLS FOR SEISMIC RESISTANCE:
      R=3 1/2, Ω_o=2 1/2, Cd=2 1/4
      (ALL CONNECTIONS SHALL BE DESIGNED FOR 2x FORCES AND MOMENTS FROM SEISMIC LOADS)
   g. DESIGN BASE SHEAR, V .... SEE CALCS.
   h. SEISMIC RESPONSE COEFFICIENT, Cs 0.108
   i. ANALYSIS PROCEDURE .... EQUIVALENT LATERAL FORCE PROCEDURE PER ASCE 7-05 SECTION 12.8

III. FOUNDATIONS

1. THE GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR CONTACTING "DIG SAFE" AS WELL AS ALL APPROPRIATE AGENCIES AND MUNICIPALITIES TO AVOID DAMAGE TO UNDERGROUND UTILITIES PRIOR TO THE START OF ANY SITE WORK.
2. BOTTOMS OF ALL EXTERIOR FOOTINGS SHALL BE A MINIMUM OF 4'-0" BELOW FINISH GRADE.
3. FOOTINGS SHALL BE STEPPED AT A MAXIMUM SLOPE OF 2 HORIZONTAL TO 1 VERTICAL, UNLESS NOTED OTHERWISE (SEE TYPICAL DETAILS).
4. REMOVE ALL TOPSOIL, EXISTING FILLS, ORGANIC MATERIALS, AND FROST DISTURBED SOILS PRIOR TO PLACING NEW FOOTINGS.
5. ALL BOTTOMS OF FOOTINGS SHALL BEAR ON VIRGIN SOIL WITH A MINIMUM BEARING CAPACITY OF 3000 PSF (TO BE VERIFIED BY A P.E. DURING CONSTRUCTION), OR SHALL BEAR ON ENGINEERED FILL. THE ENGINEERED FILL SHALL BE COMPACTED IN 8" LOOSE LAYERS TO 95% OF THE SPECIFIED MAXIMUM DRY DENSITY AS ESTABLISHED BY ASTM D-1557-78, METHOD D. THE COMPACTION SHALL BE DETERMINED BY ASTM DESIGNATION D1556-82, D2167-66, D2922-81, OR OTHER APPROVED NUCLEAR DENSITY TESTING DEVICE.
6. ENGINEERED FILL UNDER SLABS AND FOOTINGS SHALL CONSIST OF GRANULAR SOIL FREE TO ORGANIC MATTER AND CONFORMING TO THE FOLLOWING LIMITATIONS ON GRADATION:
   a. MAXIMUM SIZE OF PARTICLES .... 3 INCHES
   b. RETAINED ON 3/4" SIEVE .... 30% MAXIMUM
   c. PASSING NO. 100 SIEVE .... 45% MAXIMUM
   d. PASSING NO. 200 SIEVE .... 8% MAXIMUM
7. DURING BACKFILL OPERATIONS OF ALL FOUNDATION WALLS, THE FILL ON EITHER SIDE OF THE WALL SHALL NOT EXCEED A 2'-0" DIFFERENTIAL, UNLESS THE WALL IS DESIGNED FOR RETAINING ACTION.
8. FOR PENETRATIONS THROUGH CONCRETE FOUNDATION WALLS EXCEEDING 8"ø, REINFORCE WALL AROUND PERIMETER WITH (4)-#5 BARS, EACH FACE IN A DIAGONAL PATTERN EXTENDING 2'-6" BEYOND OPENING. COORDINATE ALL OPENING LOCATIONS WITH ARCHITECT.
9. SUBMIT REINFORCING STEEL SHOP DRAWINGS FOR REVIEW (SEE SECTION "I. GENERAL").

IV. CONCRETE

1. ALL CONCRETE WORK SHALL CONFORM TO ACI 318 AND 301 REQUIREMENTS. THIS SHALL INCLUDE PROPORTIONING OF CONCRETE MIX, CONCRETE TESTING, PLACEMENT OF CONCRETE, AND CURING PROCEDURES.
2. CONCRETE SHALL HAVE THE FOLLOWING 28 DAY COMPRESSIVE STRENGTH:
   a. ALL CONCRETE........ 4000 PSI
3. PROVIDE TOTAL AIR ENTRAINMENT OF 6% (±) FOR ALL CONCRETE EXPOSED TO WEATHER.
4. MAXIMUM WATER/CEMENT RATIO FOR 4000 PSI CONCRETE - W/C = 0.45. PROVIDE A HIGH-RANGE WATER REDUCING ADMIXTURE IF REQUIRED TO INCREASE WORKABILITY OF THE CONCRETE.
5. ALL REINFORCING STEEL SHALL BE IN CONFORMANCE WITH ASTM A615 AND SHALL HAVE A MINIMUM TENSILE YIELD STRENGTH OF 60 KSI, U.N.O.
6. WELDED WIRE FABRIC SHALL BE IN ACCORDANCE WITH ASTM A185.
7. ADDITIONAL REFERENCED STANDARDS FOR REINFORCEMENT:
   a. WELDABLE REINFORCING STEEL: ALL REINFORCING STEEL TO BE WELDED OR DESIGNATED AS "WELDABLE" SHALL CONFORM TO BOTH ASTM A615 (BILLET-STEEL) AND ASTM A706 (LOW-ALLOY STEEL) WITH A MINIMUM YIELD STRENGTH OF 60 KSI. THE WELDING OF REINFORCING BARS SHALL CONFORM TO THE ANSI/AWS D1.4 WELDING CODE.
   b. EPOXY-COATED REINFORCING STEEL: ALL REINFORCING STEEL DESIGNATED AS "EPOXY-COATED" SHALL CONFORM TO ASTM A775 "SPECIFICATION FOR EPOXY-COATED STEEL REINFORCING BARS" OR ASTM A934 "STANDARD SPECIFICATION FOR EPOXY-COATED PREFABRICATED STEEL REINFORCING BARS".
   c. EPOXY-COATED WELDED WIRE REINFORCEMENT: ALL WELDED WIRE REINFORCEMENT DESIGNATED AS "EPOXY-COATED" SHALL CONFORM TO ASTM A884 "EPOXY-COATED STEEL WIRE AND WELDED WIRE REINFORCEMENT".
8. ALL TIES SHALL BE CLOSED TYPE UNLESS OTHERWISE NOTED.
9. CONCRETE SHALL MEET THE FOLLOWING MINIMUM PERCENTAGES OF ITS 28 DAY COMPRESSIVE STRENGTH (F'c) PRIOR TO REMOVING FORMS AND/OR SHORES:
   a. WALLS 40%
10. UNLESS NOTED OTHERWISE, PROVIDE THE FOLLOWING MINIMUM REINFORCING COVER:
    a. CONCRETE CAST AGAINST EARTH........ 3 INCHES
    b. FORMED CONCRETE EXPOSED TO WEATHER OR EARTH .... 2 INCHES
    c. SLABS ON GRADE (STEEL BARS) .... 2 INCHES
    d. SLABS ON GRADE (W.W.F.) .... (SEE SLAB DETAILS)
11. ALL CONCRETE SHALL BE PLACED WITHOUT HORIZONTAL CONSTRUCTION JOINTS, EXCEPT WHERE SPECIFICALLY INDICATED. VERTICAL CONSTRUCTION JOINTS AND STOPS IN THE CONCRETE WORK SHALL BE MADE AT MIDSPAN. HORIZONTAL WALL REINFORCEMENT SHALL BE CONTINUOUS THROUGH VERTICAL CONSTRUCTION JOINTS.
12. REINFORCEMENT SHALL BE CONTINUOUS THROUGH ALL CONSTRUCTION JOINTS, TYP.
13. MAXIMUM CONCRETE WALL LENGTHS BETWEEN CONSTRUCTION JOINTS SHALL BE 60 FEET.
14. PROVIDE VERTICAL CONTROL JOINTS AT A MAXIMUM SPACING OF 20 FEET O.C. FOR ALL CONTINUOUS WALLS WITH MORE THAN 12" PROJECTION ABOVE FINISH GRADE.
15. REINFORCING LAP SPLICES SHALL BE IN ACCORDANCE WITH ACI-318-05 FOR TENSION LAP SPLICES, CLASS B, UNLESS NOTED OTHERWISE. SEE DRAWINGS FOR SPECIAL LAP SPLICE INSTRUCTIONS AT FOUNDATION WALLS AND GRADE BEAM/PILE CAP INTERSECTIONS.
16. PROVIDE CORNER BARS AT ALL WALL CORNERS & INTERSECTIONS MATCHING HORIZONTAL REINFORCEMENT WITH 2'-6" MINIMUM LAPS.
17. PLACE ALL SLABS PER ACI 301 AND ACI 302.1r04 SPECIFICATIONS. UNLESS NOTED OTHERWISE, PROVIDE A MINIMUM FLOOR FLATNESS Ff=25, AND, AT SLABS ON GRADE, A MINIMUM FLOOR LEVELNESS Fl=25.
18. PROVIDE SAWCUT JOINTS IN ALL SLABS ON GRADE USING AN EARLY-ENTRY SAW WITHIN 4 HOURS OF PLACEMENT. PROVIDE SAWCUTS @ 10'-0" O.C. MAX., UNLESS NOTED OTHERWISE.
19. SET AND TIE ALL REINFORCEMENT PRIOR TO PLACING CONCRETE. SETTING OF DOWELS AND REINFORCEMENT INTO WET CONCRETE SHALL NOT BE PERMITTED.
20. WHERE NO REINFORCEMENT IS INDICATED FOR CONCRETE SLABS AND WALLS, PROVIDE A MINIMUM #4 @ 12" O.C. CONTINUOUS EACH WAY, TOP AND BOTTOM (OR EACH FACE OF WALL).
21. NOT ALL OPENINGS AND PENETRATIONS THROUGH CONCRETE WALLS AND SLABS ARE SHOWN ON STRUCTURAL DRAWINGS. COORDINATE ALL PENETRATIONS WITH ARCHITECT, MEP, AND OTHER TRADES PRIOR TO CONSTRUCTION.
22. PROVIDE MATCHING DOWELS FOR ALL VERTICAL REINFORCING BARS AT CMU WALLS. DOWEL DIAMETER SHALL MATCH VERTICAL REINFORCING BAR DIAMETER. DOWEL LENGTH SHALL BE 96 BAR DIAMETERS MINIMUM WITH 48 BAR DIAMETER MIN. EMBEDMENT AND 48 BAR DIAMETER MIN. LAP (U.N.O.).
23. WHERE NECESSARY DUE TO CONGESTION OF REINFORCEMENT, CONTRACTOR SHALL PROVIDE MECHANICAL BAR COUPLERS AND BAR TERMINATORS IN LIEU OF LAP SPLICES AND HOOKED ENDS. THE CONTRACTOR SHALL INCLUDE THE COST OF SUCH MECHANICAL ACCESSORIES IN BASE CONTRACT.
24. ALL CONCRETE TEST CYLINDERS FOR CONCRETE COMPRESSIVE TESTING SHALL BE STANDARD 6"x12" CYLINDERS.
25. ALL CONCRETE MIX DURATION TIMES SHALL BE LESS THAN 90 MINUTES. NO EXCEPTIONS WILL BE ALLOWED, EVEN WITH THE INTRODUCTION OF SUPERPLASTICIZER ADMIXTURES. THIS OFFICE WILL NOT TAKE RESPONSIBILITY FOR ANY CONCRETE THAT IS POURED AFTER THE ACI ALLOWED DURATION TIME.
26. ALL CONCRETE MUST BE POURED FROM A HEIGHT NO GREATER THAN 4'-0" ABOVE ITS FINAL POSITION. ANY CONCRETE PLACEMENT ABOVE 4'-0" WILL NOT BE ALLOWED AND ODEH ENGINEERS, INC. WILL NOT TAKE RESPONSIBILITY.
27. PROVIDE BAR SUPPORTS, SPACERS, AND ACCESSORIES RECOMMENDED IN THE LATEST EDITION OF THE ACI DETAILING MANUAL, PUBLICATION SP-66. ALL ACCESSORIES IN CONTACT WITH EXPOSED SURFACES SHALL BE PLASTIC-COATED. PROVIDE SCHEDULE OF ALL ACCESSORIES WITH SHOP DRAWINGS FOR REVIEW.
28. DETAILING OF REINFORCEMENT SHALL BE ACCORDING TO THE LATEST EDITION OF THE ACI 315 "MANUAL OF STANDARD PRACTICE FOR DETAILING REINFORCED CONCRETE STRUCTURES".
29. SUBMIT PROPOSED MIX DESIGN OF EACH CONCRETE TYPE AND REINFORCING SHOP DRAWINGS FOR REVIEW (SEE SECTION "I. GENERAL").

V. STRUCTURAL STEEL

1. ALL WORK SHALL CONFORM TO THE AMERICAN INSTITUTE OF STEEL CONSTRUCTION SPECIFICATIONS AND ITS CODE OF STANDARD PRACTICE.
2. MATERIAL SPECIFICATIONS:
   W, WT SHAPES .... ASTM A992 (50 KSI)
   S, M, HP, C, MC SHAPES .... ASTM A572, GRADE 50
   SQUARE & RECTANGULAR HSS .... ASTM A500, GRADE C (50 KSI)
   ROUND HSS .... ASTM A500, GRADE C (46 KSI)
   L SHAPES, MISC. PLATES & BARS........ ASTM A36
   THREADED RODS, THREADED FASTENERS .... ASTM A36
   BOLTS .... ASTM A325 OR A490
   ANCHOR RODS .... ASTM F1554, GRADE 36
   SHEAR STUD CONNECTORS .... ASTM A108
3. ALL WELDING OPERATIONS SHALL BE PERFORMED BY AWS CERTIFIED WELDERS IN CONFORMANCE WITH ALL APPLICABLE REQUIREMENTS. USE E-70XX WELDING ELECTRODES.
4. STRUCTURAL STEEL CONNECTIONS SHALL DEVELOP (1/2) OF MEMBERS' TOTAL UNIFORM LOAD CAPACITY AS DETERMINED FROM THE AISC STEEL CONSTRUCTION MANUAL, 13TH ED (LRFD). SEE NOTES ON THESE PLANS FOR COMPOSITE BEAM REQUIREMENTS.
5. ALL BOLTED CONNECTIONS SHALL USE ASTM A325 BOLTS OR A490 BOLTS (3/4"ø MINIMUM), UNLESS NOTED OTHERWISE. BOLTED CONNECTIONS SHALL BE DESIGNED PER THE AISC STEEL CONSTRUCTION MANUAL, 13TH EDITION (LRFD) AND THE RCSC SPECIFICATION FOR STRUCTURAL JOINTS USING ASTM A325 OR A490 BOLTS (LRFD).
6. ALL NEW STRUCTURAL STEEL SHALL BE GIVEN ONE COAT OF AN APPROVED SHOP PRIMER APPLIED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS, UNLESS NOTED OTHERWISE. SURFACE PREPARATION OF STEEL PRIOR TO SHOP PAINTING SHALL CONFORM TO SSPC SP6.
7. AFTER ERECTION IS COMPLETE, TOUCH-UP ALL SHOP PRIMED COATS DAMAGED DURING TRANSPORTATION AND ERECTION, AND PRIME ALL FIELD WELDS USING THE SAME PAINT USED FOR SHOP PRIMING.
8. ALL STRUCTURAL STEEL TO RECEIVE SPRAY-ON FIREPROOFING SHALL BE FABRICATED WITHOUT ANY PRIMER COATINGS (COORDINATE WITH ARCHITECT).
9. ALL EXPOSED STRUCTURAL STEEL AND CONNECTIONS SHALL BE HOT-DIP GALVANIZED, OR MAY BE PRIMED AND PAINTED WITH AN APPROVED EPOXY PAINT SYSTEM. TOUCH UP ALL CONNECTIONS AND DAMAGED SURFACES WITH THE SAME PAINT SYSTEM.

VI. STEEL JOISTS AND JOIST GIRDERS

1. THE DESIGN, FABRICATION, PAINTING, AND ERECTION OF ALL STEEL JOISTS AND JOIST GIRDERS SHALL CONFORM TO THE APPLICABLE REQUIREMENTS OF THE STEEL JOIST INSTITUTE (SJI) STANDARD SPECIFICATIONS.
2. HORIZONTAL BRIDGING SHALL BE PROVIDED WITH DESIGN AND CONNECTION DETAILS CONFORMING TO SJI SPECIFICATIONS. ALL BRIDGING SHALL BE INSTALLED BEFORE ANY CONSTRUCTION LOADS ARE PLACED ON THE JOISTS. THE ENDS OF ALL BRIDGING LINES TERMINATING AT WALLS OR BEAMS SHALL BE ANCHORED THERETO.
3. UNLESS SPECIFIED OTHERWISE BY THE MANUFACTURER, THE ENDS OF ALL JOISTS BEARING ON STEEL BEAMS OR BEARING PLATES SHALL EXTEND THE FOLLOWING MINIMUM DISTANCES OVER THE SUPPORT:
   K-SERIES JOISTS........ 2 1/2" MINIMUM
4. UNLESS SPECIFIED OTHERWISE BY THE MANUFACTURER, THE MINIMUM TYPICAL ANCHORAGE OF JOIST ENDS TO THE STEEL SUPPORTS SHALL BE AS FOLLOWS:
   K-SERIES JOISTS........ (2)-1/8" FILLET WELDS x 3" LONG
5. DURING THE CONSTRUCTION PERIOD, THE CONTRACTOR SHALL EXERCISE CARE AT ALL TIMES TO AVOID DAMAGE THROUGH CARELESS HANDLING DURING UNLOADING, STORING, AND ERECTION OF THE JOISTS. UNDER NO CIRCUMSTANCE SHALL THE JOIST BE MODIFIED IN THE FIELD OR OTHERWISE FROM THE ORIGINAL DESIGN.
6. ALL ROOF JOISTS AND JOIST BRIDGING SHALL BE DESIGNED FOR WIND UPLIFT LOADS PER SJI SPECIFICATIONS AND PER "DESIGN LOADS" INDICATED ABOVE.
7. PROVIDE ADDITIONAL LINE OF CONTINUOUS BOTTOM CHORD BRIDGING NEAR FIRST BOTTOM CHORD PANEL POINTS FOR ALL STEEL JOISTS IN WIND UPLIFT AREAS AND WITHIN 10'-0" OF ALL ROOF EDGES, TYPICAL.
8. COORDINATE BRIDGING LOCATION WITH MEP DUCTWORK AND LIGHTING, TYPICAL.
9. JOIST GIRDERS AND "SP" JOISTS SHALL BE DESIGNED BY A P.E. REGISTERED IN THE COMMONWEALTH OF MASSACHUSETTS.
10. SUBMIT SHOP DRAWINGS FOR REVIEW (SEE SECTION "I. GENERAL").

VII. STEEL DECKS

1. ALL STEEL DECKING SHALL CONFORM TO THE STEEL DECK INSTITUTE (SDI) APPLICABLE REQUIREMENTS. INSTALLATION SHALL BE PER THE MANUFACTURER'S RECOMMENDATIONS IN ACCORDANCE WITH SDI SPECIFICATIONS.
2. STEEL DECK SHALL TYPICALLY BE STORED OFF THE GROUND AT THE JOBSITE, AND BE PROTECTED FROM THE ELEMENTS WITH A WATERPROOF COVERING WHERE REQUIRED.
3. DECK SHEETS SHALL BE PLACED IN ACCORDANCE WITH APPROVED ERECTION LAYOUT DRAWINGS (INCLUDING FASTENING SCHEDULE) SUPPLIED BY THE DECK MANUFACTURER, AND IN CONFORMANCE WITH THE MANUFACTURER'S STANDARDS. UNLESS NOTED OTHERWISE, END LAPS SHALL OCCUR OVER SUPPORTS, AND SHALL NOT BE LESS THAN 2 INCHES.
4. ALL STEEL TO BE USED FOR DECKING SHALL BE GALVANIZED, SEE SPECIFIC NOTES AT EACH FRAMING PLAN FOR INFORMATION.
5. UNLESS NOTED OTHERWISE ON PLANS, THE FOLLOWING DECKING SHALL BE USED:
   ROOF DECK .... 1 1/2" - 20 GA. (TYPE B) (SEE FRAMING PLANS)
6. PROVIDE 1/4" THICK (BOTTOM) & 20 GA. (TOP) GALVANIZED STEEL PLATES AT ALL RIDGES, VALLEYS AND LOCATIONS WHERE DECK CHANGES DIRECTION FOR CONTINUOUS EVEN SURFACE.
7. UNLESS NOTED OTHERWISE, PROVIDE THE FOLLOWING MINIMUM FASTENING FOR ROOF DECK:
   a. EACH SHEET SHALL BE FASTENED USING 5/8" PUDDLE WELDS WITH 36/7 WELD PATTERN AND (4)-#10 (36" O.C. MAX.) TEK SCREW SIDELAP FASTENERS PER SPAN MINIMUM.
   b. ROOF DECK FASTENING SHALL CONFORM TO FM APPROVAL GUIDE, CLASS I-90.
   c. ALL ROOF DECK MATERIALS & CONSTRUCTION SHALL CONFORM TO FM GLOBAL APPROVAL GUIDE, CLASS I-90.
   d. ROOF DECK FASTENING SHALL CONFORM TO FM GLOBAL PROPERTY LOSS DATA SHEET 1-29, SECTION 2.2.13.
   e. MINIMUM ROOF DECK FASTENER REQUIREMENTS SHALL BE AS FOLLOWS:
      FIELD & PERIMETER: SEE NOTE 7a (ABOVE).
      CORNERS: 2 WELDS IN EACH RIB (SEE "ii" BELOW)
      i. "PERIMETER" IS DEFINED AS A 10'-0" STRIP AROUND THE ENTIRE ROOF PERIMETER AS WELL AS AT ALL CANOPIES.
      ii. "CORNERS" ARE DEFINED AS THE COMMON AREAS SHARED BY TWO OR MORE INTERSECTING ROOF PERIMETER AREAS (10'-0"x10'-0")
8. ROOF DECK SHALL BE DESIGNED FOR INDICATED WIND UPLIFT LOADS PER THE MASSACHUSETTS STATE BUILDING CODE, FM APPROVAL GUIDE, AND "DESIGN LOAD" NOTES ABOVE.
9. NO PERMANENT SUSPENDED LOADS ARE TO BE SUPPORTED BY STEEL ROOF DECK. THIS INCLUDES PIPING, DUCTWORK, MECHANICAL UNITS, CEILINGS, ETC. ALL COMPONENTS ARE TO SUSPENDED FROM STRUCTURAL FRAMING MEMBERS, USING APPROVED ATTACHMENT DEVICES (SEE SPECIFICATIONS).
10. THE CONTRACTOR SHALL PROVIDE A SECONDARY FRAMING SYSTEM (i.e. UNISTRUT OR APPROVED EQUAL) ATTACHED TO STRUCTURAL FRAMING TO SUPPORT ALL PERMANENT SUSPENDED LOADS AT THE UNDERSIDE OF ALL METAL ROOF DECKS. THE SECONDARY FRAMING SYSTEM SHALL SPAN BETWEEN STRUCTURAL STEEL BEAMS AND SHALL NOT BE CONNECTED IN ANY WAY TO THE METAL DECK.
11. SUBMIT SHOP DRAWINGS FOR REVIEW (SEE SECTION "I. GENERAL").

VIII. MASONRY

1. ALL MASONRY UNITS SHALL CONFORM TO ASTM C-90, TYPE N-1, WITH THE STRENGTH OF UNITS AND MORTAR BEING SUCH THAT THE (f'm) VALUES INDICATED ARE SATISFIED.
2. MINIMUM COMPRESSIVE STRENGTH OF CONCRETE MASONRY SHALL BE (f'm=1500 PSI), UNLESS NOTED OTHERWISE.
3. ALL MORTAR SHALL CONFORM TO ASTM C-270, TYPE (M) OR (S). ALL GROUT SHALL CONFORM TO ASTM C-476. MINIMUM COMPRESSIVE STRENGTH OF GROUT SHALL BE f'c = 3000 PSI, U.N.O.
4. ALL REINFORCING STEEL SHALL CONFORM TO ASTM A615 WITH A MINIMUM YIELD STRENGTH OF 60 KSI, UNLESS NOTED OTHERWISE.
5. ALL REINFORCING STEEL TO BE WELDED OR DESIGNATED AS "WELDABLE" SHALL CONFORM TO BOTH ASTM A615 (BILLET-STEEL) AND ASTM A706 (LOW-ALLOY STEEL) WITH A MINIMUM YIELD STRENGTH OF 60 KSI. THE WELDING OF REINFORCING BARS SHALL CONFORM TO THE ANSI/AWS D1.4 WELDING CODE.
6. ALL MASONRY WORK, INCLUDING CURING, ERECTION, AND WEATHER PROTECTION, SHALL CONFORM TO THE REQUIREMENTS OF ACI 530-05 AND 530.1-05 AS WELL AS WITH THE STANDARDS OF THE NATIONAL CONCRETE MASONRY ASSOCIATION (NCMA).
7. PROVIDE GALVANIZED HORIZONTAL JOINT REINFORCEMENT AT 16" O.C. VERTICALLY, UNLESS NOTED OTHERWISE.
8. UNLESS NOTED OTHERWISE, PROVIDE A MINIMUM OF #5 CONTINUOUS BARS AT 32" O.C. VERTICAL REINFORCEMENT IN ALL CMU WALLS, TYPICAL.
9. PROVIDE MATCHING DOWELS INTO FOUNDATION WALLS AT ALL VERTICAL REINFORCEMENT LOCATIONS - SEE TYPICAL DETAILS.
10. PROVIDE ADDITIONAL VERTICAL REINFORCEMENT AT JAMBS OF ALL WALL OPENINGS, ENDS OF WALL, AND STEEL BEAM OR ANGLE BEARING LOCATIONS. MINIMUM REINFORCEMENT SHALL BE (2)-#6 VERTICAL BARS, UNLESS NOTED OTHERWISE.
11. LAP VERTICAL AND HORIZONTAL REINFORCEMENT (48) DIAMETERS MINIMUM.
12. PROVIDE CONTINUOUS BOND BEAMS AT ALL FLOOR LEVELS AND AT TOPS OF ALL CMU WALLS, U.N.O.
13. PROVIDE ADDITIONAL BOND BEAMS MIDWAY BETWEEN EACH FLOOR LEVEL, OR AT 8'-0" O.C. MAXIMUM VERTICAL SPACING, U.N.O.
14. REINFORCE 6" & 8" CMU BOND BEAMS WITH (2)-#5 CONTINUOUS BARS AND 12" CMU BOND BEAMS WITH (2)-#6 CONTINUOUS BARS, UNLESS NOTED OTHERWISE. SEE TYPICAL CMU WALL PLAN DETAILS FOR ADDITIONAL REQUIREMENTS AT CORNERS, INTERSECTIONS, AND ENDS OF WALLS.
15. PROVIDE VERTICAL CONTROL JOINTS IN ALL CMU WALLS AT STEEL COLUMN LOCATIONS TYPICALLY, OR AT 40'-0" O.C. MAXIMUM, WHICHEVER IS LESS. COORDINATE ALL CONTROL JOINT LOCATIONS WITH THE ARCHITECT.
16. SEE STRUCTURAL DRAWINGS FOR MASONRY LINTEL SCHEDULE AND NOTES.
17. HIGH LIFT GROUTING SHALL BE PERMITTED ONLY IF THE PROCEDURES OF ACI 530.1-05 (PART 3) ARE FOLLOWED, INCLUDING BUT NOT LIMITED TO CLEANOUTS AND POUR HEIGHT LIMITS.
18. ALL MASONRY WORK SHALL BE CONTINUOUSLY MONITORED AND INSPECTED BY AN INDEPENDENT TESTING AGENCY. SUBMIT FIELD REPORTS FOR REVIEW. PROVIDE "LEVEL C" QUALITY ASSURANCE, INCLUDING ALL REQUIRED PRISM TESTS, PER ACI 530.1-05 SECTION 1.6.
19. SUBMIT REINFORCING STEEL SHOP DRAWINGS FOR REVIEW (SEE SECTION "I. GENERAL").

IX. COLD-FORMED METAL FRAMING

1. ALL METAL STUD WALLS SHALL BE DESIGNED BY THE METAL STUD SUPPLIER IN ACCORDANCE WITH THE REQUIREMENTS OF THE RHODE ISLAND STATE BUILDING CODE AND ITS APPLICABLE REFERENCED STANDARDS.
2. THE COLD-FORMED METAL STUD SUPPLIER SHALL DESIGN AND FABRICATE THE METAL STUD WALLS AS A SYSTEM. THIS SHALL INCLUDE ALL STICK FRAMED AND PANELIZED SECTIONS, ALL PERMANENT AND TEMPORARY LATERAL BRACING, AND WALL REQUIRED CONNECTIONS. COORDINATE WITH ARCHITECTURAL DRAWINGS FOR ALL DETAILS, DIMENSIONS, AND OTHER INFORMATION NOT INCLUDED IN THE STRUCTURAL DRAWINGS.
3. ALL EXTERIOR METAL STUD WALLS SHALL BE DESIGNED USING THE LOADING INFORMATION INCLUDED IN THESE DOCUMENTS.
4. ALL COLD-FORMED METAL STUDS SHALL BE 6"-16 GAUGE MINIMUM UNLESS NOTED OTHERWISE.
5. INSTALLATION, BRIDGING, AND CONNECTIONS SHALL BE DESIGNED IN STRICT ACCORDANCE WITH THE METAL STUD MANUFACTURER'S SPECIFICATIONS AND RECOMMENDATIONS.
6. ALL METAL STUD CURTAIN (NON-BEARING) WALLS SHALL BE BRACED AGAINST ROTATION BY DIAPHRAGM RATED SHEATHING BOARD APPLIED FULL HEIGHT TO EACH SIDE OF THE WALL. WHERE THE WALL IS NOT SHEATHED FULL HEIGHT EACH SIDE OR SHEATHED ON ONE SIDE ONLY, CONTINUOUS BRIDGING SPACED AT 5'-0" O.C. (OR AS RECOMMENDED BY COLD-FORMED MANUFACTURER) SHALL PROVIDE ROTATIONAL SUPPORT. THE CONTRACTOR IS RESPONSIBLE FOR BRACING THE WALLS DURING CONSTRUCTION.
7. SIZES OF COLD-FORMED MEMBERS INDICATED IN CONTRACT DRAWINGS REPRESENT THE MINIMUM FRAMING/SIZE REQUIREMENTS. THE FINAL DESIGN OF ALL COLD-FORMED MEMBERS AND SECTIONS SHALL BE DETERMINED/VERIFIED BY THE COLD-FORMED DESIGNER.
8. CONTRACTOR SHALL SUBMIT SHOP DRAWINGS AND DESIGN CALCULATIONS (STAMPED BY A P.E. REGISTERED IN THE STATE OF RHODE ISLAND) FOR REVIEW (SEE SECTION "I. GENERAL").

ABBREVIATIONS & SYMBOLS LEGEND

SYMBOLS

- SECTION DESIGNATION, SECTION APPEARS ON SAME SHEET (##) - INDICATES SECTION OR DETAIL
- SECTION DESIGNATION (##) - INDICATES SECTION OR DETAIL; SHEET NUMBER WHERE SECTION APPEARS (S#.##)
- 0'-0" (boxed) - INDICATES T.O. NEW CONCRETE FOUNDATION WALL/PIER OR CMU WALL ELEVATION.
- [0'-0"] - INDICATES BOTTOM OF NEW CONCRETE FOOTING ELEVATION.
- INDICATES STEP IN CONCRETE FOOTING - SEE FOUNDATION DETAILS.
- 0'-0" - INDICATES FINISH CONCRETE SLAB ELEVATION.
- INDICATES SQUARE HSS STEEL COLUMN.
- INDICATES RECTANGULAR HSS STEEL COLUMN.
- INDICATES COLUMN GRID.
- INDICATES STRUCTURAL STEEL MOMENT CONNECTION.
- INDICATES CONCRETE MASONRY UNIT (CMU). SECTION VIEW
- INDICATES BRICK VENEER SECTION VIEW
- F1 - INDICATES CONCRETE FOOTING. SEE SCHEDULE.
- P1 - INDICATES CONCRETE PIER. SEE SCHEDULE.
- (SJ) - INDICATES SAWCUT CONTROL JOINT.

STRUCTURAL WALL TYPES: (COORD. ALL LOCATIONS w/ARCH.)

- C# - INDICATES CONCRETE WALL TYPE C#. (PLAN VIEW)
- M# - INDICATES CMU WALL TYPE W#. SEE CMU WALL REINFORCEMENT SCHEDULE. (PLAN VIEW)
- INDICATES CMU LINTEL BEAM. SEE CMU LINTEL SCHEDULE. (PLAN VIEW)

ABBREVIATIONS:

A/E	ARCHITECT/ENGINEER
ADDN'L	ADDITIONAL
A.F.F.	ABOVE FINISH FLOOR
ARCH.	ARCHITECT, ARCHITECTURAL
B	BOTTOM
B.O.	BOTTOM OF
BLDG	BUILDING
C.L.	CENTER LINE
C.J.	CONSTRUCTION JOINT
CMU	CONCRETE MASONRY UNIT
CONC.	CONCRETE
CONT.	CONTINUOUS
CONT'D	CONTINUED
COORD.	COORDINATE
DIM.	DIMENSION
DN	DOWN
DWG	DRAWING
E.F.	EACH FACE
E.W.	EACH WAY
EBC	EXTENDED (JOIST) BOTTOM CHORD
EXP.	EXPANSION
EL.	ELEVATION
E.O.D.	EDGE OF DECK
E.O.S.	EDGE OF SLAB
EXT.	EXTERIOR
FDN	FOUNDATION
FIN.	FINISH
FTG	FOOTING
GA.	GAUGE
GALV.	GALVANIZED
H.P.	HIGH POINT
HORIZ.	HORIZONTAL
HSS	HOLLOW STRUCTURAL SECTION
I.F.	INSIDE FACE (REINFORCING)
LB, LBS	POUND, POUNDS
LFH	LONG FACE HORIZONTAL (TUBES)
LFV	LONG FACE VERTICAL (TUBES)
LLH	LONG LEG HORIZONTAL (L-ANGLES)
LLV	LONG LEG VERTICAL (L-ANGLES)
L.P.	LOW POINT
L.W.	LIGHT-WEIGHT
MAX.	MAXIMUM
MECH.	MECHANICAL
MIN.	MINIMUM
N.T.S.	NOT TO SCALE
O.C.	ON CENTER
O.F.	OUTSIDE FACE (REINFORCING)
O.H.	OPPOSITE HAND
OEI	ODEH ENGINEERS, INC.
OPN'G	OPENING
P.E.	PROFESSIONAL ENGINEER
PL.	PLATE
PSF	POUNDS PER SQUARE FOOT
PSI	POUNDS PER SQUARE INCH
REINF.	REINFORCED, REINFORCEMENT, ETC.
REQ'D	REQUIRED
RTU	ROOF TOP UNIT
SIM.	SIMILAR
SJ	SAWCUT (CONTROL) JOINT
SJI	STEEL JOIST INSTITUTE
SOG	SLAB-ON-GRADE
SPECS	SPECIFICATIONS
SS	STAINLESS STEEL
STL	STEEL
T	TOP (FRAMING OR REINFORCING)
T&B	TOP AND BOTTOM
TCX	(JOIST) TOP CHORD EXTENSION
T.O.	TOP OF
T.O.W.	TOP OF WALL
T.O.S.	TOP OF STEEL
TYP.	TYPICAL
U.N.O.	UNLESS NOTED OTHERWISE
VERT.	VERTICAL
V.I.F.	VERIFY IN FIELD
w/	WITH
WT	WEIGHT
W.W.F.	WELDED WIRE FABRIC
@	AT

STRUCTURAL DRAWING LIST

S-001 GENERAL NOTES
S-111 FOUNDATION & SLAB ON GRADE PLAN
S-121 ROOF FRAMING PLAN
S-201 BUILDING SECTIONS
S-301 TYPICAL FOUNDATION & CMU DETAILS
S-302 TYPICAL STEEL DETAILS
S-303 FOUNDATION & ROOF DETAILS

BID SET

CITY OF QUINCY PUBLIC WORKS DEPARTMENT
TRUCK WASHING FACILITY, 55 SEA STREET

Scale: AS NOTED	Revision:	Drawn: GPB
Date: 07-29-13	Revision On:	Checked:
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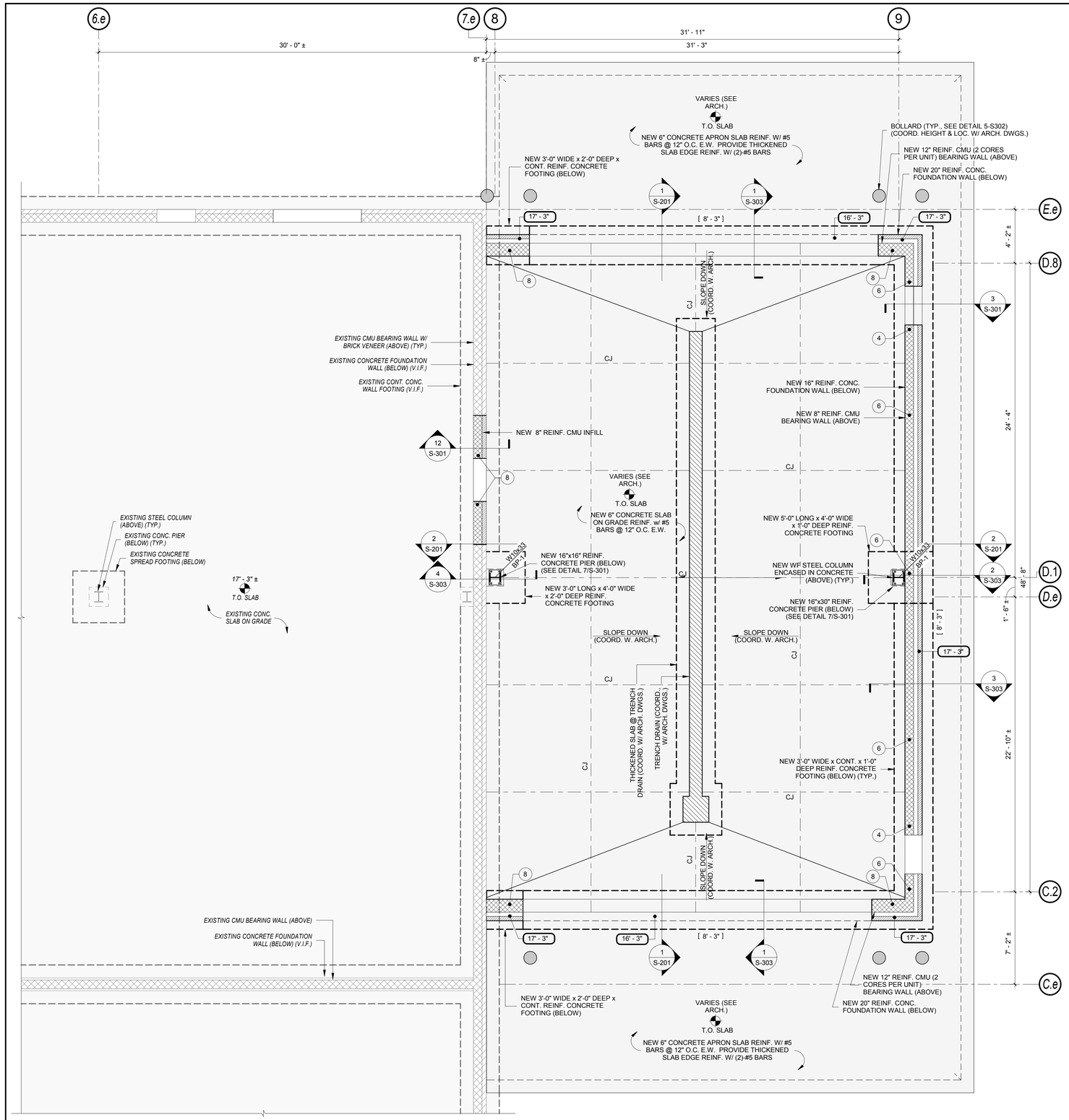
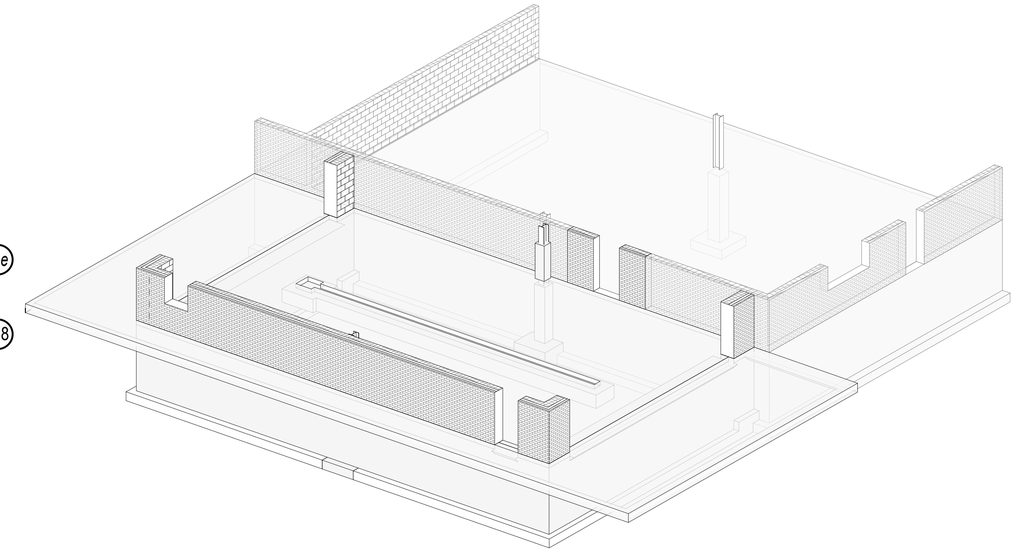


1 FOUNDATION & SLAB ON GRADE PLAN

SCALE: 1/4" = 1'-0"

NOTES:

1. COORDINATE ALL WORK (INCLUDING FLOOR ELEVATIONS, DIMENSIONS, FINISH DETAILS, PENETRATIONS, ETC.) WITH THE ARCHITECTURAL DRAWINGS.
2. (##'-##") - INDICATES TOP OF NEW CONCRETE FOUNDATION WALL.
3. [##'-##"] - INDICATES BOTTOM OF NEW CONCRETE FOOTING ELEVATION
4. BOTTOM OF ALL NEW EXTERIOR FOOTINGS SHALL BE LOCATED A MINIMUM OF 4'-0" BELOW FINISH GRADE.
5. ##'-##" - INDICATES FLOOR ELEVATION (TYP., U.N.O.).
6. (#) - INDICATES NUMBER OF ADDITIONAL #6 (8" BLOCK) #8 (12" BLOCK) VERT. CMU REINFORCEMENT IN GROUT FILLED CORES (2 PER CORE). PROVIDE MATCHING MASONRY DOWELS IN FOUNDATION WALLS (TYP., U.N.O.).
7. TOP OF PIER ELEVATION IS 8" BELOW TOP OF SLAB, UNLESS NOTED OTHERWISE.
8. I - INDICATES NEW STEEL COLUMN LOCATION. SEE TYPICAL STEEL DETAILS.
9. SJ - INDICATES SLAB SAWCUT CONTROL JOINT; SEE TYPICAL DETAILS.
10. BP-1 - INDICATES BASE PLATE TYPE; SEE TYPICAL DETAILS.



2 3D VIEW

N.T.S.

NOTES REGARDING 3D VIEWS

ALL 3D VIEWS ARE FOR REFERENCE ONLY. THE 3D VIEWS ONLY SHOW BASIC STRUCTURAL ELEMENTS; THEY DO NOT INCLUDE DETAILS SUCH AS EXTERIOR RAMPS AND STAIRS, SLAB AND ROOF PITCHES, OR SPECIFIC STRUCTURAL DETAILS. REFER TO ALL PLANS, DETAIL SHEETS, AND ARCHITECTURAL DRAWINGS FOR ADDITIONAL INFORMATION. DO NOT SCALE OFF OF THIS DRAWING.

EPOXY COATED REINFORCEMENT NOTE

ALL REINFORCEMENT IN CONCRETE SLABS ON GRADE, COLUMNS, AND WALLS (UNLESS SPECIFICALLY NOTED OTHERWISE) SHALL BE EPOXY COATED (TYP.). ALL HOOKED BARS & DOWELS CONNECTING STRUCTURAL ELEMENTS SHALL BE EPOXY COATED REINFORCEMENT.

CMU REINFORCING SCHEDULE

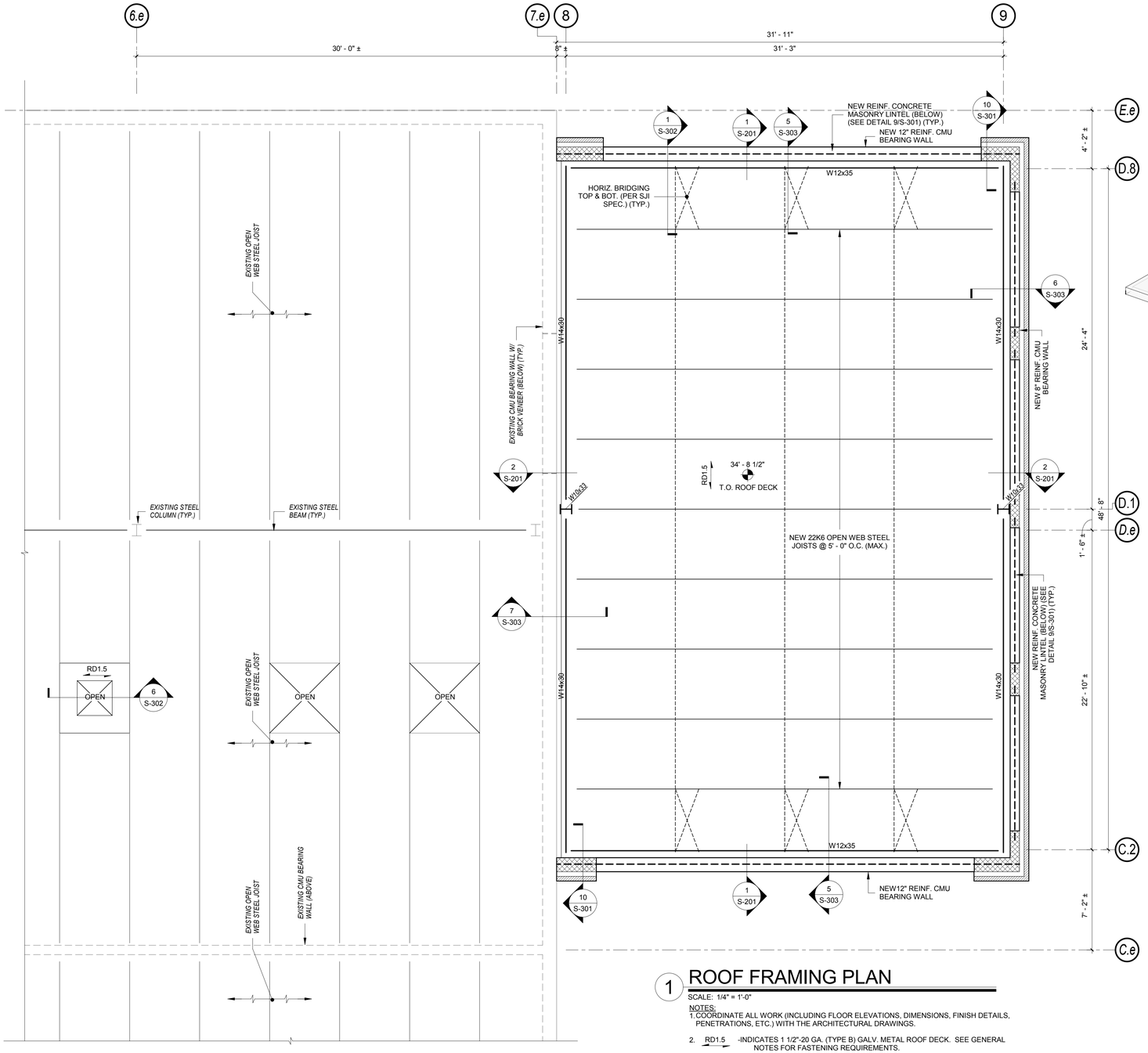
SPAN CONDITION	VERT. REINF.	HORIZ. REINF. (BOND BEAMS)
8" CMU WALLS	#5 AT 48" O.C.	(2) - #5 CONT. AT MAX. 4'-0" O.C.

NOTES:

1. NOT ALL CMU WALLS ARE INDICATED ON STRUCTURAL PLANS. COORDINATE WALL LOCATIONS WITH ARCH. DWGS.
2. PROVIDE BOND BEAMS AT TOPS OF ALL CMU WALLS. PROVIDE ADDITIONAL BOND BEAMS AT MAXIMUM SPACING AS LISTED IN TABLE ABOVE AS WELL AS WINDOW SILLS, COURSES RECEIVING WALL ANCHORS, SHEAR CLIP CONNECTIONS, ETC.

BID SET

CITY OF QUINCY PUBLIC WORKS DEPARTMENT TRUCK WASHING FACILITY, 55 SEA STREET		
Scale: AS NOTED	Revision:	Drawn: GPB
Date: 07-29-13	Revision On:	Checked:
HOLMES & EDWARDS, INC., ARCHITECTS 26 Chestnut Street, Quincy, Massachusetts 02169		Project Number:
Sheet Name: FOUNDATION & SLAB ON GRADE PLAN		Sheet Number: S-111

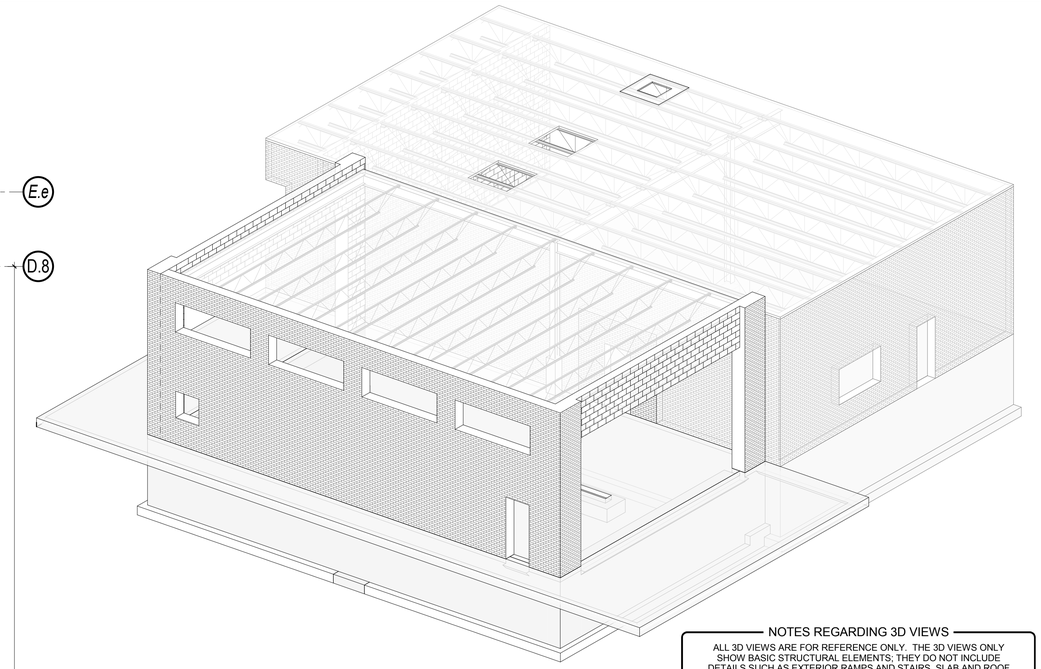


1 ROOF FRAMING PLAN

SCALE: 1/4" = 1'-0"

NOTES:

1. COORDINATE ALL WORK (INCLUDING FLOOR ELEVATIONS, DIMENSIONS, FINISH DETAILS, PENETRATIONS, ETC.) WITH THE ARCHITECTURAL DRAWINGS.
2. RD1.5 -INDICATES 1 1/2"-20 GA. (TYPE B) GALV. METAL ROOF DECK. SEE GENERAL NOTES FOR FASTENING REQUIREMENTS.
3. ##'-##" - INDICATES FLOOR ELEVATION (TYP., U.N.O.).
4. - INDICATES NEW STEEL COLUMN LOCATION. SEE TYPICAL STEEL DETAILS.
5. - INDICATES CMU LINTEL LOCATION, SEE LINTEL SCHEDULE.
6. TOP OF STEEL ELEVATION = 34' 4-1/2" U.N.O. WITH (+#'-#" OR -#'-#")

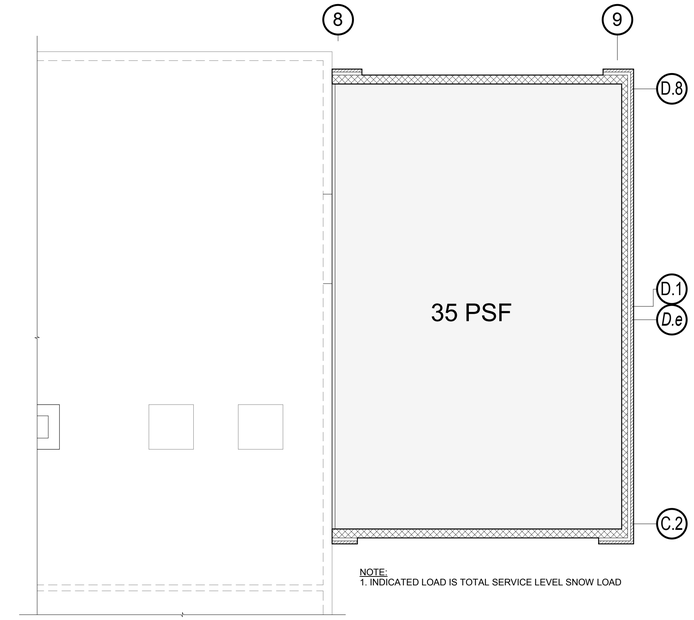


2 3D VIEW

N.T.S.

NOTES REGARDING 3D VIEWS

ALL 3D VIEWS ARE FOR REFERENCE ONLY. THE 3D VIEWS ONLY SHOW BASIC STRUCTURAL ELEMENTS; THEY DO NOT INCLUDE DETAILS SUCH AS EXTERIOR RAMPS AND STAIRS, SLAB AND ROOF PITCHES, OR SPECIFIC STRUCTURAL DETAILS. REFER TO ALL PLANS, DETAIL SHEETS, AND ARCHITECTURAL DRAWINGS FOR ADDITIONAL INFORMATION. DO NOT SCALE OFF OF THIS DRAWING.



NOTE:

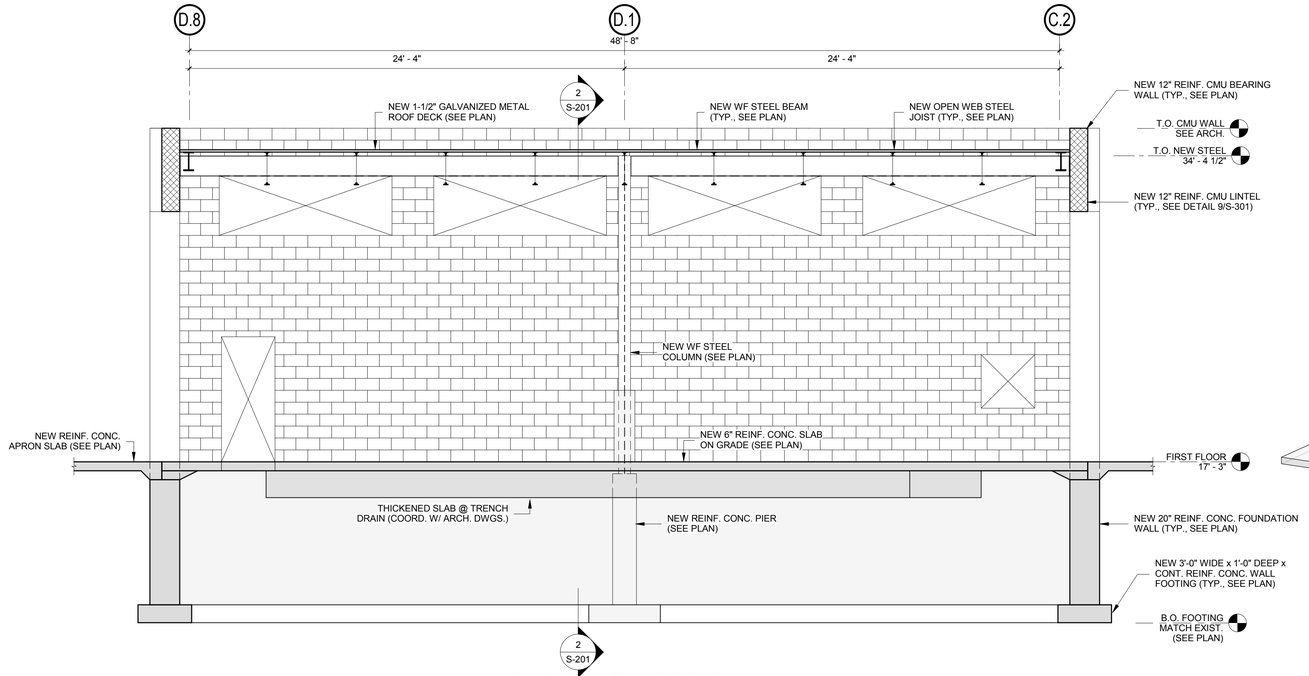
1. INDICATED LOAD IS TOTAL SERVICE LEVEL SNOW LOAD

3 ROOF LOAD PLAN

N.T.S.

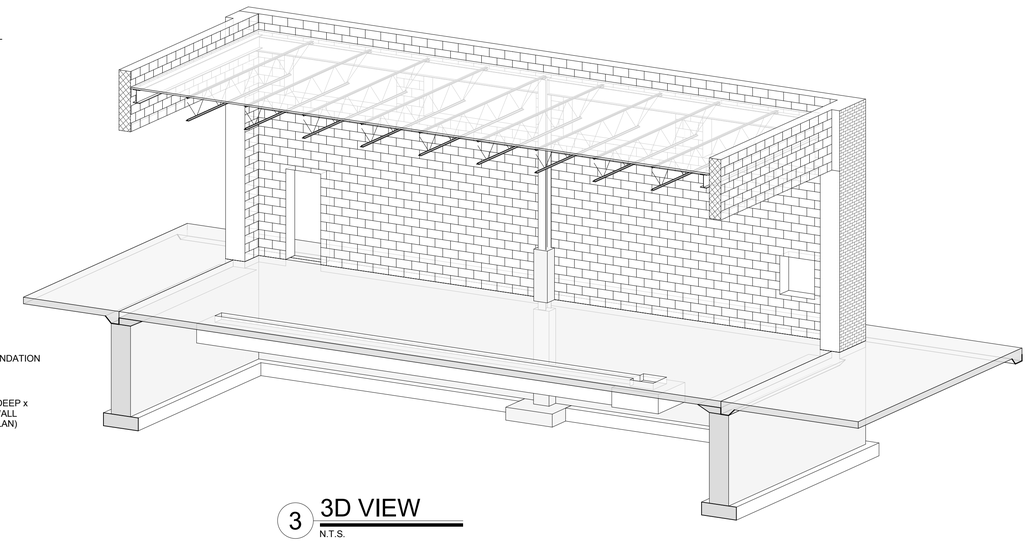
BID SET

CITY OF QUINCY PUBLIC WORKS DEPARTMENT TRUCK WASHING FACILITY, 55 SEA STREET		
Scale: AS NOTED	Revision:	Drawn: GPB
Date: 07-29-13	Revision On:	Checked:
HOLMES & EDWARDS, INC., ARCHITECTS 26 Chestnut Street, Quincy, Massachusetts 02169		Project Number:
Sheet Name: ROOF FRAMING PLAN		Sheet Number: S-121



1 BUILDING SECTION

SCALE: 1/4" = 1'-0"

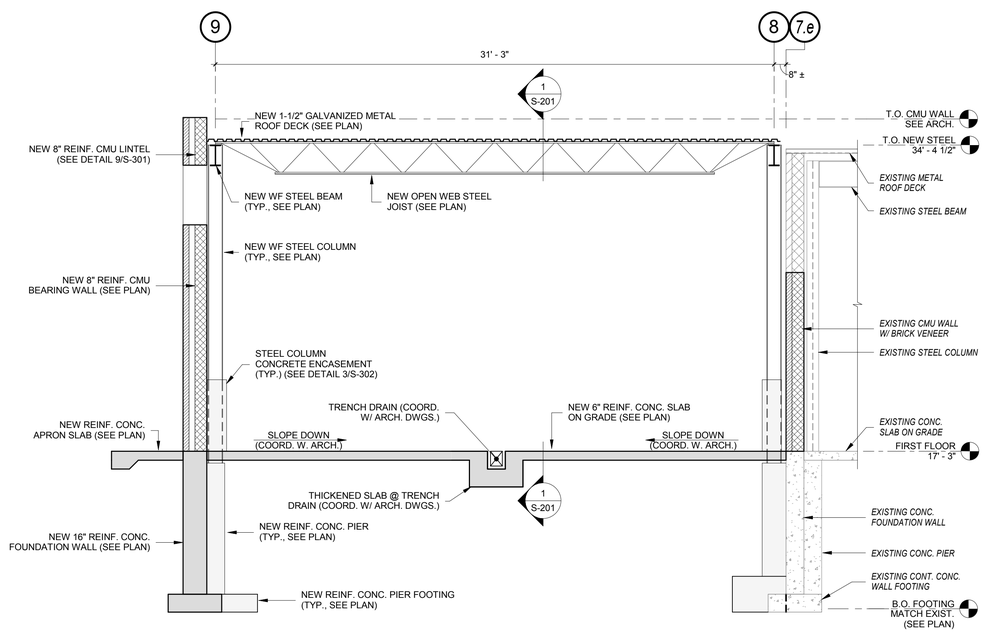


3 3D VIEW

N.T.S.

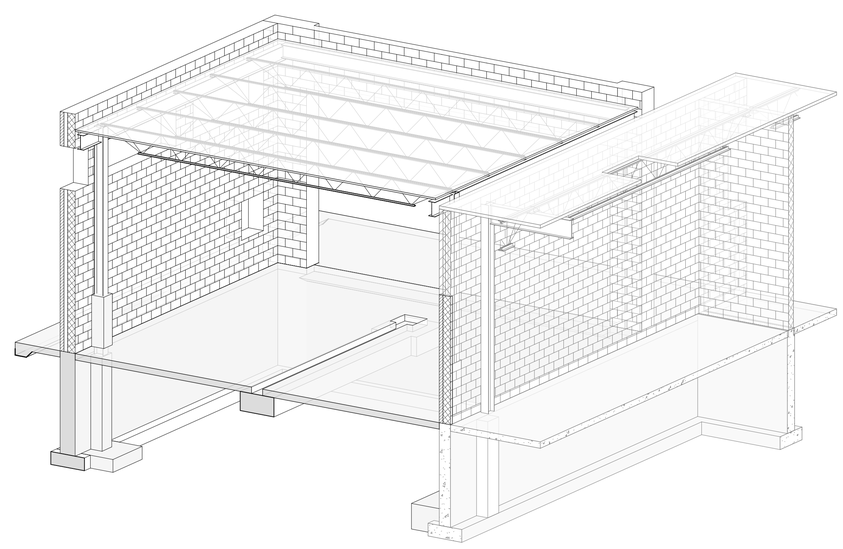
NOTES REGARDING 3D VIEWS

ALL 3D VIEWS ARE FOR REFERENCE ONLY. THE 3D VIEWS ONLY SHOW BASIC STRUCTURAL ELEMENTS; THEY DO NOT INCLUDE DETAILS SUCH AS EXTERIOR RAMPS AND STAIRS, SLAB AND ROOF PITCHES, OR SPECIFIC STRUCTURAL DETAILS. REFER TO ALL PLANS, DETAIL SHEETS, AND ARCHITECTURAL DRAWINGS FOR ADDITIONAL INFORMATION. DO NOT SCALE OFF OF THIS DRAWING.



2 BUILDING SECTION

SCALE: 1/4" = 1'-0"

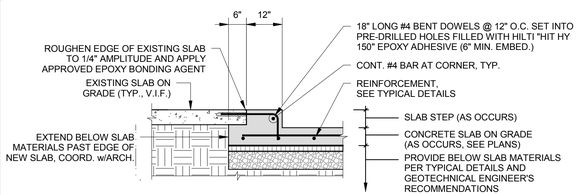


4 3D VIEW

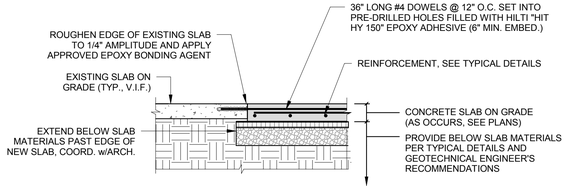
N.T.S.

BID SET

CITY OF QUINCY PUBLIC WORKS DEPARTMENT TRUCK WASHING FACILITY, 55 SEA STREET		
Scale: AS NOTED	Revision:	Drawn: GPB
Date: 07-29-13	Revision On:	Checked:
HOLMES & EDWARDS, INC., ARCHITECTS 26 Chestnut Street, Quincy, Massachusetts 02169		Project Number:
Sheet Name: BUILDING SECTIONS		Sheet Number: S-201



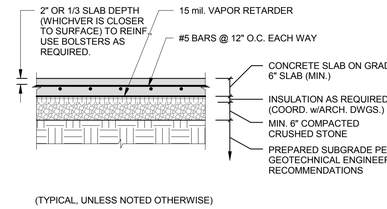
EXISTING-NEW SLAB JOINTS AT DIFFERENT ELEVATIONS



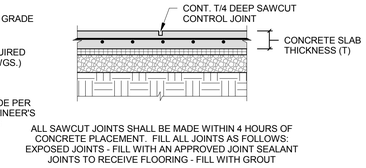
EXISTING-NEW SLAB JOINTS AT EQUAL ELEVATIONS

1 TYPICAL EXISTING-NEW CONCRETE SLAB ON GRADE JOINT DETAIL

NO SCALE



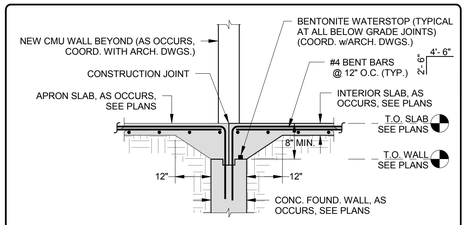
TYPICAL CONCRETE SLAB ON GRADE



TYPICAL SLAB CONTROL JOINT DETAIL

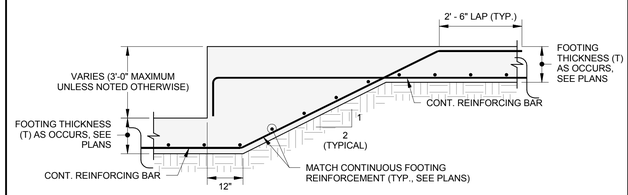
2 TYPICAL CONCRETE SLAB DETAILS

NO SCALE



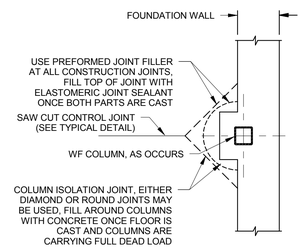
3 TYPICAL SLAB HAUNCH AT EXTERIOR DOORS

NO SCALE



4 TYPICAL STEPPED FOOTING DETAIL

NO SCALE

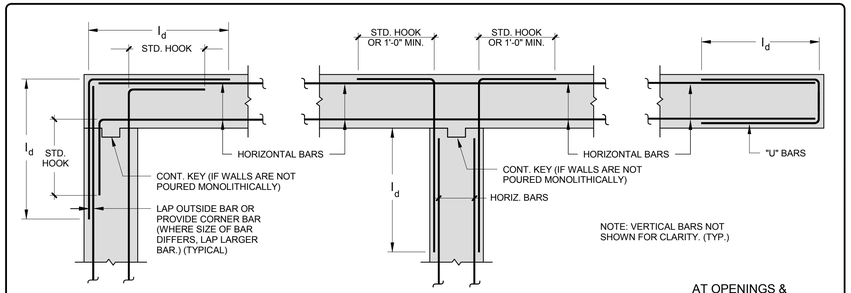


PIER OR COLUMN AT PERIMETER WALL

5 TYPICAL SLAB ISOLATION JOINT DETAILS

NO SCALE

NOTES:
1. THESE DETAILS SHALL BE USED AT ALL COLUMN LOCATIONS.



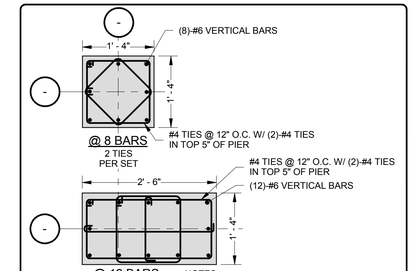
AT CORNERS

AT INTERSECTION

AT OPENINGS & DISCONTINUOUS ENDS

6 TYPICAL PLAN DETAILS AT WALL HORIZ. REINFORCING

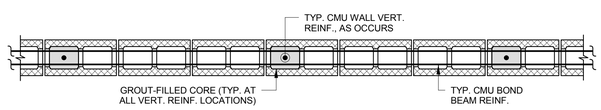
NO SCALE



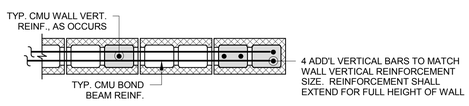
NOTES:
1. REFER TO ACI 315 FOR DETAILS AND DETAILING OF CONCRETE REINFORCEMENT.

7 TYPICAL PIER REINFORCEMENT

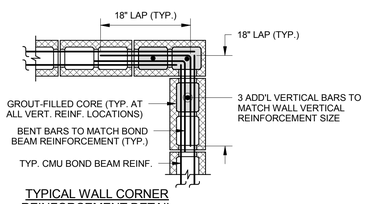
NO SCALE



TYPICAL CONTINUOUS WALL REINFORCEMENT DETAIL



TYPICAL OPEN END WALL REINFORCEMENT DETAIL



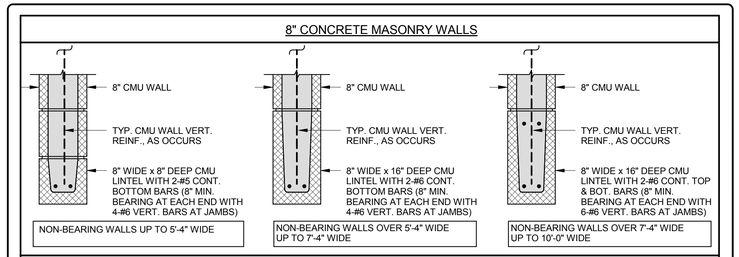
TYPICAL WALL CORNER REINFORCEMENT DETAIL

8 TYPICAL CMU WALL PLAN DETAILS

NO SCALE

NOTES:
1. ALL CMU VERTICAL REINFORCED CORES AND HORIZONTAL REINFORCED COURSES (BOND BEAMS) SHALL BE GROUTED SOLID. GROUTING OF HORIZONTAL REINFORCEMENT NOT SHOWN ON THIS DETAIL FOR CLARITY.

8" CONCRETE MASONRY WALLS

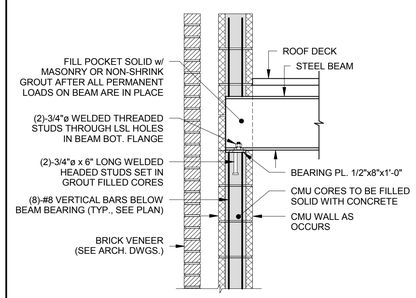


SEE ROOF DETAIL 5/S-303 FOR 12" CONCRETE MASONRY LINTEL

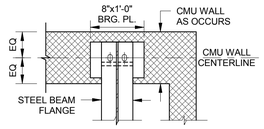
NOTES:
1. TYPICAL CMU LINTEL DETAILS SHALL BE USED AT ALL CONCRETE MASONRY WALL OPENINGS, EXCEPT WHERE SPECIALLY CONSTRUCTED LINTELS ARE INDICATED. SEE STRUCTURAL PLANS & SECTIONS FOR ALTERNATE CMU LINTEL REQUIREMENTS.
2. ALL REQUIRED CMU LINTELS ARE NOT INDICATED ON STRUCTURAL PLANS. SEE ARCHITECTURAL AND MECHANICAL DRAWINGS FOR COORDINATION OF CMU LINTEL REQUIREMENTS AT ALL WALL OPENINGS AND PENETRATIONS THROUGH BOTH BEARING/EXTERIOR AND NON-BEARING CONCRETE MASONRY WALLS.
3. FOR OPENING WIDTHS GREATER THAN SHOWN, CONSULT STRUCTURAL ENGINEER.

9 CONCRETE MASONRY LINTEL SCHEDULE

N.T.S.



TYPICAL SECTION VIEW

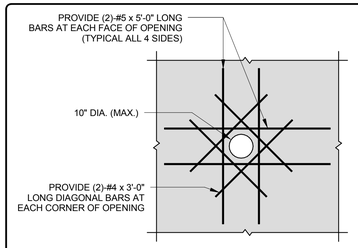


TYPICAL PLAN VIEW

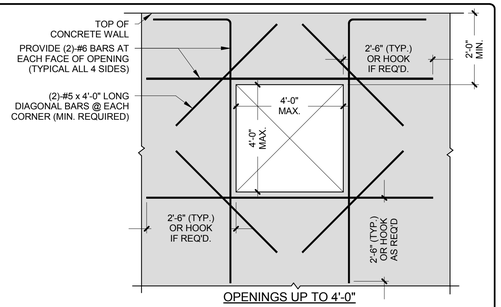
10 TYPICAL DETAILS FOR STEEL BEAMS BEARING ON NEW CMU WALLS

NO SCALE

NOTES:
1. STEEL BEAM BEARING DETAILS SHOWN HEREIN SHALL BE USED AT ALL BEAM LOCATIONS, UNLESS NOTED OTHERWISE ON STRUCTURAL DRAWINGS.



OPENINGS UP TO 0'-10"

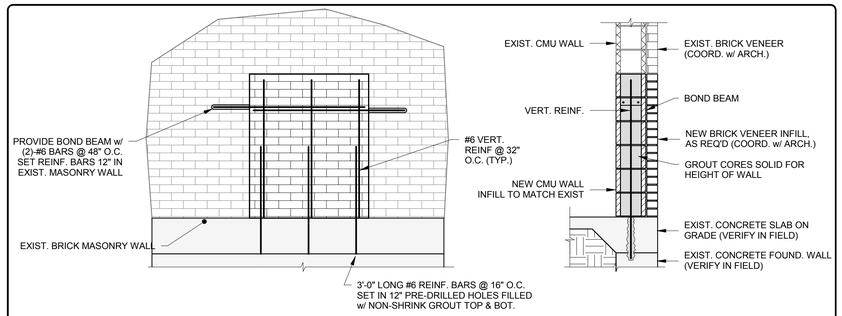


OPENINGS UP TO 4'-0"

11 TYPICAL OPENING REINFORCEMENT IN CONCRETE WALLS

NO SCALE

NOTES:
1. THESE DETAILS ARE TO BE USED AT ALL CIRCULAR OR RECTANGULAR OPENINGS IN CONCRETE WALLS. THESE DETAILS MAY NOT BE REQUIRED AND ARE BEING PROVIDED IN CASE OPENINGS ARE REQUIRED TO BE PLACED IN CONCRETE WALLS.



12 TYPICAL WALL INFILL DETAIL

1/2" = 1'-0"

SPAN CONDITION	STEEL LINTEL
UP TO 6'-4" WIDE	L6x4x3/8 (LLV) GALV. - 8" MIN. END BEARING
OVER 6'-4" UP TO 10'-0" WIDE	L8x4x1/2 (LLV) GALV. - 8" MIN. END BEARING

NOTES:
1. SEE DRAWINGS FOR STRUCTURAL LINTELS CONNECTED TO STRUCTURAL ELEMENTS.
2. FOR OPENING WIDTHS GREATER THAN SHOWN, CONSULT STRUCTURAL ENGINEER.
3. SEE ARCHITECTURAL DRAWINGS FOR FLASHING DETAILS AT WINDOW & DOOR OPENINGS.
4. GALV. - INDICATES HOT-DIP GALVANIZED.

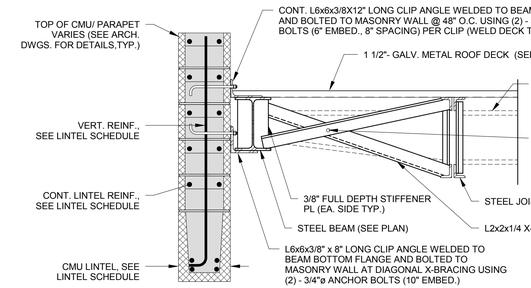
13 MASONRY VENEER LOOSE LINTEL SCHEDULE

N.T.S.

BID SET

CITY OF QUINCY PUBLIC WORKS DEPARTMENT
TRUCK WASHING FACILITY, 55 SEA STREET

Scale: AS NOTED	Revision:	Drawn: GPB
Date: 07-29-13	Revision On:	Checked:
HOLMES & EDWARDS, INC., ARCHITECTS 26 Chestnut Street, Quincy, Massachusetts 02169		Project Number:
Sheet Name: TYPICAL FOUNDATION & CMU DETAILS		Sheet Number: S-301



NOTE: MAKE CLIP ANGLE CONNECTIONS AT TOP AND BOT. ONLY AFTER ALL ROOF AND DEAD LOADING HAS BEEN APPLIED, TYP.

CONTRACTORS OPTION: EXPANSION ANCHORS MAY BE USED IN LIEU OF CAST-IN-PLACE ANCHOR BOLTS PROVIDED THAT THE EXPANSION BOLTS ARE OF EQUAL OR GREATER CAPACITY THAN THE ANCHOR BOLTS, TYPICAL. SUBMIT EXPANSION BOLT SUBSTITUTION FOR REVIEW AND APPROVAL PRIOR TO THE START OF WORK.

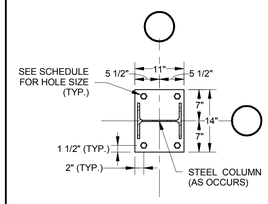
TYPICAL BRACING AT JOIST PARALLEL TO CMU WALL

1 TYPICAL BRACING AT ENDS OF LINES OF BRIDGING FOR OPEN WEB STEEL JOISTS

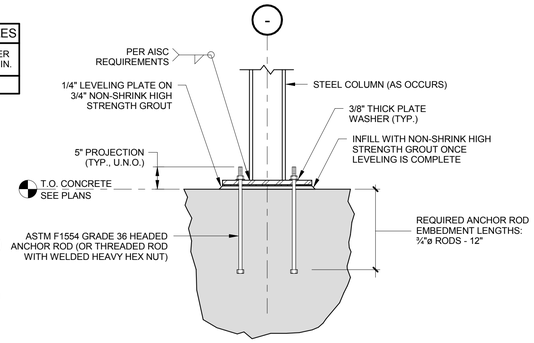
NO SCALE

BASE PLATE ANCHOR ROD HOLE SIZES		
ANCHOR ROD DIAMETER, IN.	HOLE DIAMETER, IN.	MIN. WASHER DIAMETER*, IN.
¾	1 5/16	1⅞

*OR WIDTH FOR RECTANGULAR PLATE.

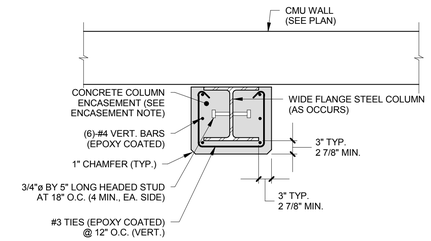


BASE PLATE 1 (BP-1)
1"x12"x1'-2" PLATE
(WITH 4 ANCHOR RODS)



TYPICAL HEADED ANCHOR ROD DETAIL

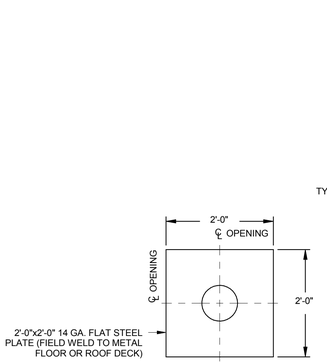
2 TYPICAL BASE PLATE AND ANCHOR ROD DETAILS



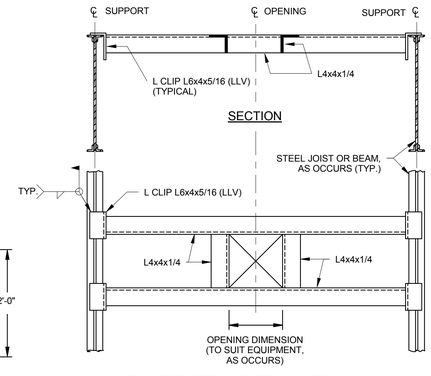
3 TYPICAL STEEL COLUMN CONC. ENCASEMENT DETAIL

NO SCALE

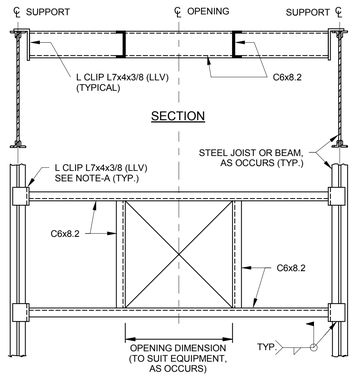
NOTES:
1. ENCASE COLUMN 4'-0" MIN. ABOVE FLOOR ELEVATION. COORDINATE HEIGHT OF ENCASEMENT WITH ARCHITECTURAL DRAWINGS.
2. ALL REINF. STEEL IN COLUMN ENCASEMENT SHALL BE EPOXY COATED.
3. PROVIDE 1" CHAMFER AROUND TOP OF ENCASEMENT.



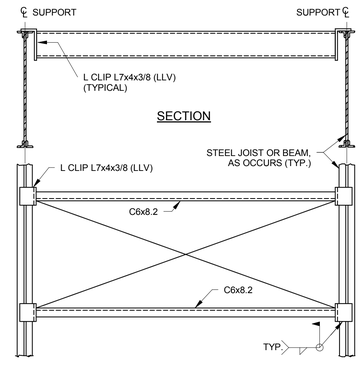
PLAN FOR OPENINGS LESS THAN 8"



PLAN FOR OPENINGS FROM 8" TO 1'-6" AND AT ROOF DRAINS



PLAN FOR OPENINGS OVER 1'-6"

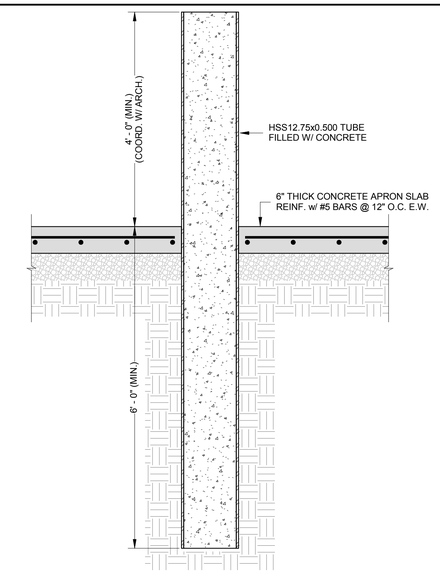


PLAN FOR OPENINGS FULL BAY

NOTES:
1. THESE DETAILS ARE REQUIRED AT ALL ROOF DECK & NON-COMPOSITE FLOOR DECK OPENINGS AND/OR EQUIPMENT. THE LOCATIONS OF THESE OPENINGS ARE NOT SHOWN ON THE STRUCTURAL DRAWINGS. THE GENERAL CONTRACTOR IS RESPONSIBLE FOR COORDINATING THE EXACT LOCATIONS OF THESE OPENINGS - COORDINATE SIZES AND LOCATIONS OF ALL OPENINGS WITH ARCHITECTURAL, MECHANICAL AND OTHER TRADES DRAWINGS.
2. WHERE MECHANICAL UNITS ARE PRESENT, COORD. LOCATION OF FRAMING MEMBERS WITH SUPPORT/CURB REQUIREMENT DETAILS. ADDITIONAL PLATES MAY BE REQUIRED FOR CURB SUPPORT. COORDINATE DETAILS w/ ARCHITECTURAL & MEP DRAWINGS

4 TYPICAL ROOF/NON-COMPOSITE DECK OPENING & CURB SUPPORT FRAMING DETAILS

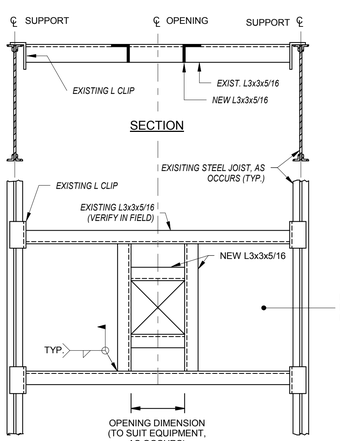
NO SCALE



5 TYPICAL BOLLARD DETAIL

NO SCALE

NOTES:
1. COORDINATE BOLLARD HEIGHT AND LOCATION WITH ARCHITECTURAL DRAWINGS.



INFILL EXISTING OPENING WITH 1-1/2" 20GA. (TYPE B) GALV. METAL ROOF DECK (SEE GENERAL NOTES FOR FASTENING REQUIREMENTS.)

PLAN FOR NEW FRAMING WITHIN EXISTING SKYLIGHT OPENING

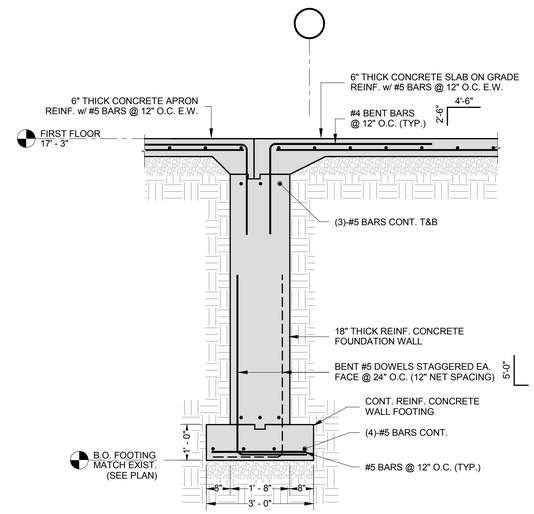
NOTES:
1. THESE DETAILS ARE REQUIRED AT ALL ROOF DECK & NON-COMPOSITE FLOOR DECK OPENINGS AND/OR EQUIPMENT. THE GENERAL CONTRACTOR IS RESPONSIBLE FOR COORDINATING THE EXACT LOCATIONS OF THESE OPENINGS - COORDINATE SIZES AND LOCATIONS OF ALL OPENINGS WITH ARCHITECTURAL, MECHANICAL AND OTHER TRADES DRAWINGS.
2. WHERE MECHANICAL UNITS ARE PRESENT, COORD. LOCATION OF FRAMING MEMBERS WITH SUPPORT/CURB REQUIREMENT DETAILS. ADDITIONAL PLATES MAY BE REQUIRED FOR CURB SUPPORT. COORDINATE DETAILS w/ ARCHITECTURAL & MEP DRAWINGS

6 SUPPORT FRAMING DETAIL FOR NEW OPENING WITHIN EXISTING OPENING

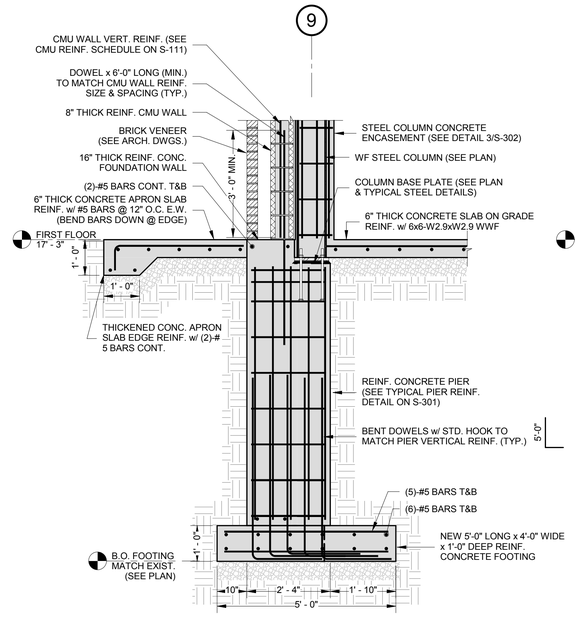
NO SCALE

BID SET

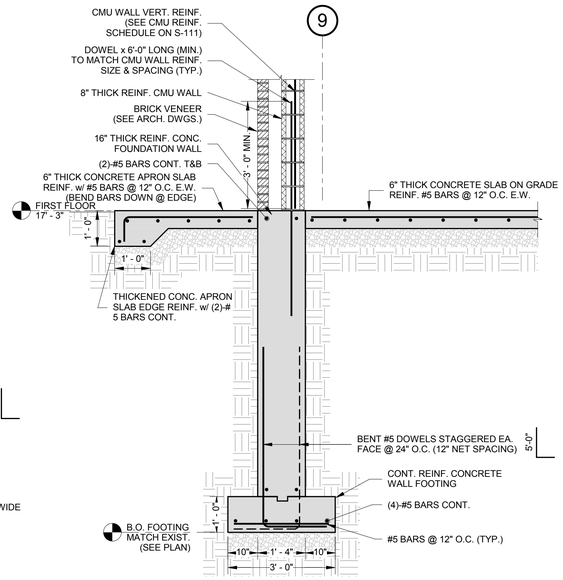
CITY OF QUINCY PUBLIC WORKS DEPARTMENT TRUCK WASHING FACILITY, 55 SEA STREET		
Scale: AS NOTED	Revision:	Drawn: GPB
Date: 07-29-13	Revision On:	Checked:
HOLMES & EDWARDS, INC., ARCHITECTS 26 Chestnut Street, Quincy, Massachusetts 02169		Project Number:
Sheet Name: TYPICAL STEEL DETAILS		Sheet Number: S-302



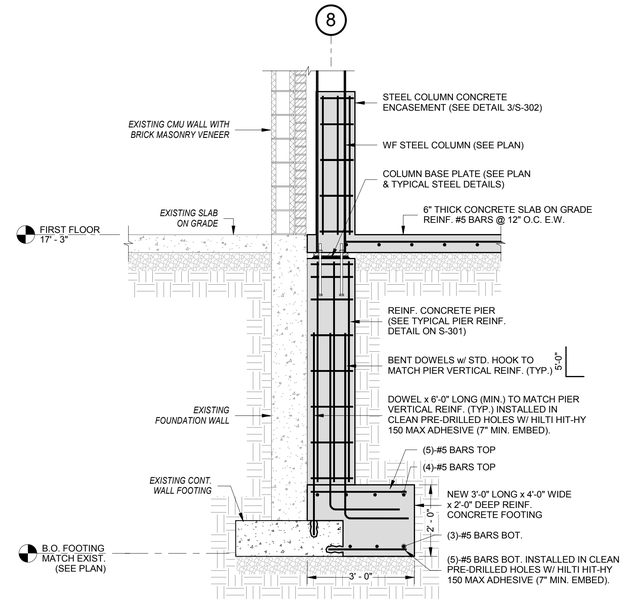
1 SECTION
SCALE: 1/2" = 1'-0"



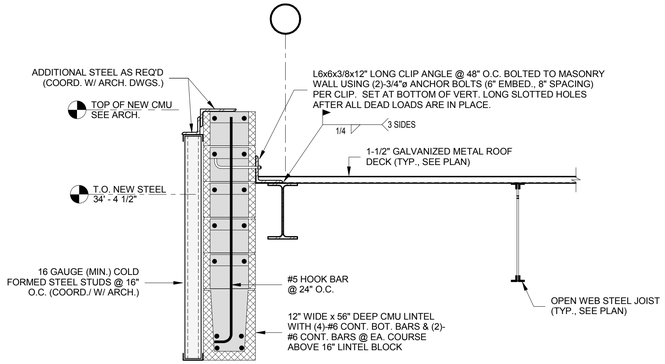
2 SECTION
SCALE: 1/2" = 1'-0"



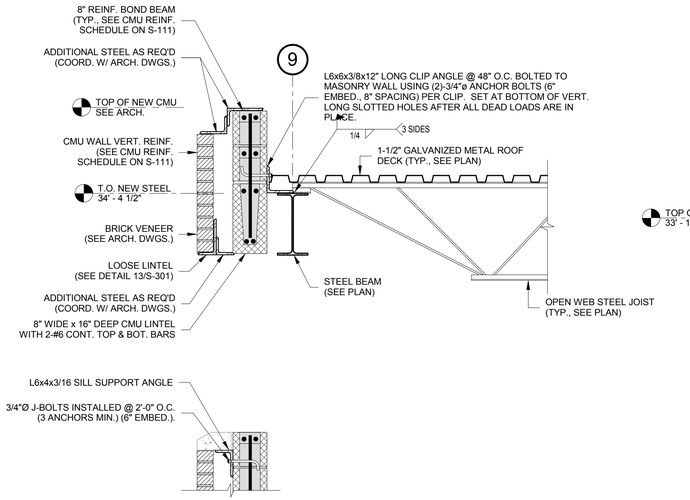
3 SECTION
SCALE: 1/2" = 1'-0"



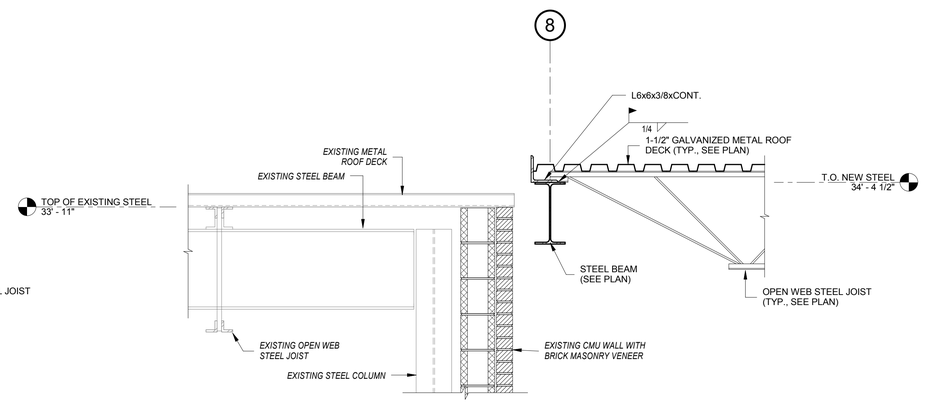
4 SECTION
SCALE: 1/2" = 1'-0"



5 SECTION
SCALE: 3/4" = 1'-0"



6 SECTION
SCALE: 3/4" = 1'-0"



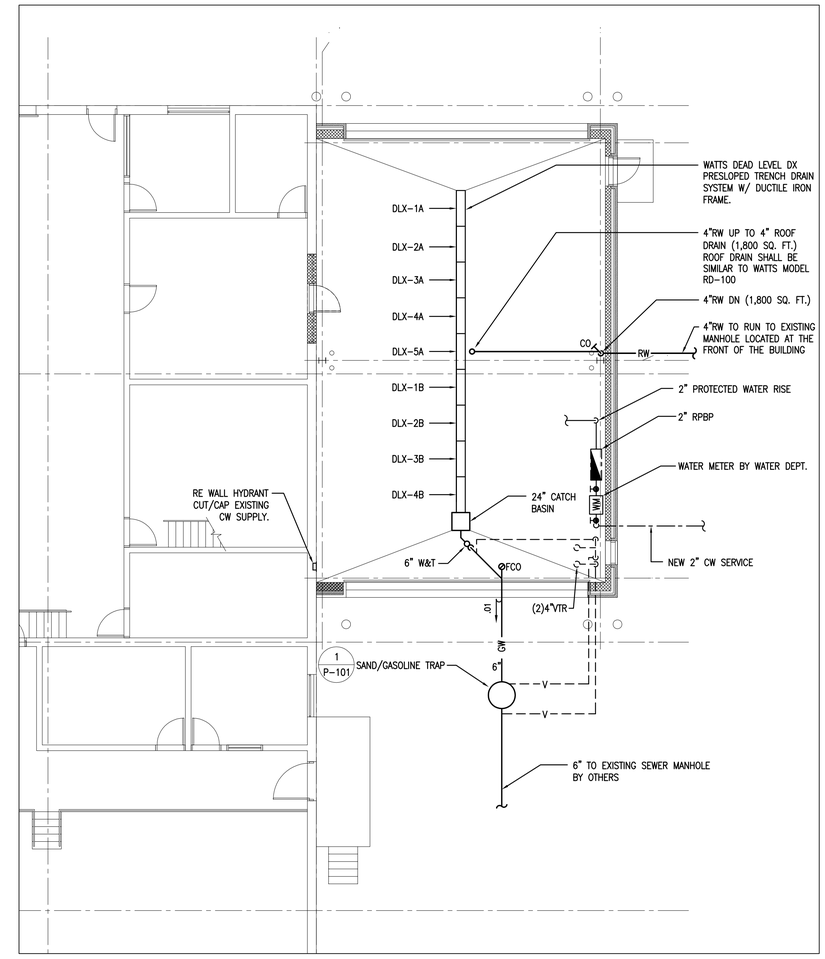
7 SECTION
SCALE: 3/4" = 1'-0"

BID SET

CITY OF QUINCY PUBLIC WORKS DEPARTMENT TRUCK WASHING FACILITY, 55 SEA STREET		
Scale: AS NOTED	Revision:	Drawn: GPB
Date: 07-29-13	Revision On:	Checked:
HOLMES & EDWARDS, INC., ARCHITECTS 26 Chestnut Street, Quincy, Massachusetts 02169		Project Number:
Sheet Name: FOUNDATION & ROOF DETAILS		Sheet Number: S-303

PLUMBING LEGEND

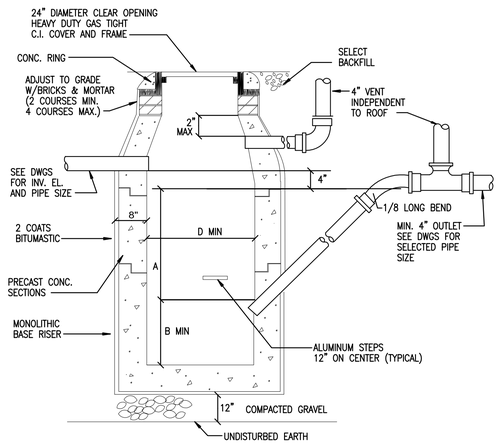
	ETR	LIGHT LINE INDICATES EXISTING PIPING TO REMAIN.
	RE	REMOVE EXISTING PIPING
	CTE	CONNECT TO EXISTING
	C&C	CUT & CAP
	CW	COLD WATER
CW	CW	COLD WATER BELOW FLOOR OR BURIED
GW	GW	GARAGE WASTE BELOW FLOOR OR BURIED
	V	VENT
V	V	VENT BELOW FLOOR OR BURIED
	RW	RAINWATER
RW	RW	RAINWATER/CONDUCTOR BELOW FLOOR OR BURIED
G	G	NATURAL GAS
	CONT	CONTINUATION
	UP	PIPE RISE OR UP
	DN	PIPE DROP OR DOWN
	TEE	PIPE TEE
	SOV	SHUT-OFF VALVE
	W & T	WASTE & TRAP
	CO	CLEANOUT PLUG
	FCO	FLUSH FLOOR CLEANOUT
	DCO	DANDY CLEANOUT
		ARROW INDICATES DIRECTION OF FLOW
.01		ARROW INDICATES DIRECTION OF SLOPE
	WH	WALL HYDRANT
1 / P-1		DIAGRAM NO. & DWG. NO. REFERENCE
	RD "A"	ROOF DRAIN & TYPE
	RPBP	REDUCED PRESSURE BACKFLOW PREVENTER
WM	WM	WATER METER
GM	GM	GAS METER
	VTR	VENT THRU ROOF
	S=.01	SLOPE = 1/8" PER FOOT



FIRST FLOOR PLAN

1/8" = 1'-0"

NORTH



INLET	D	A	B
4"	3'-6" DIA	3'-0"	2'-6"
6"	4'-0" DIA	5'-0"	4'-6"
	4'-6" DIA	4'-0"	3'-6"
	5'-0" DIA	3'-6"	3'-0"

NOTE:
REINFORCE FRAME AND COVER FOR H-20 LOADING WHERE SUBJECT TO VEHICULAR TRAFFIC

NOTE:
CONTRACTOR SHALL VERIFY THAT ANY PRE-CAST STRUCTURES USED ARE MASS APPROVED OR STRUCTURES SHALL BE BUILT IN PLACE TO MEET MASS WATER & SEWER COMMISSION GUIDELINES.

1 SAND/GASOLINE INTERCEPTOR

NTS

BID DOCUMENTS

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CITY OF QUINCY PUBLIC WORKS DEPARTMENT

TRUCK WASHING FACILITY, 55 SEA ST.

Scale: AS NOTED	Approved By:	Drawn By: CTU
Date: 07-29-13	Project Number: 1309	Revised: ---
HOLMES & EDWARDS, INC., ARCHITECTS 26 Chestnut Street, Quincy, Mass. 02169		Sheet Number:
Sheet Name: PLUMBING FIRST FLOOR PLAN		P-101

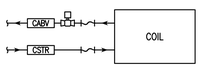
MECHANICAL PLAN LEGEND

SYMBOL	DESCRIPTION
	CONTROL DAMPER
HWS	HOT WATER SUPPLY PIPING
HWR	HOT WATER RETURN PIPING
	ELBOW UP
	ELBOW DOWN
–	DIFFUSER & GRILLE TAG
– –	EQUIPMENT TAG
C	CO2 SENSOR
SD	SMOKE DETECTOR – DUCT MOUNTED
S	SWITCH
T	THERMOSTAT OR TEMPERATURE SENSOR
	CONTROL CONNECTION

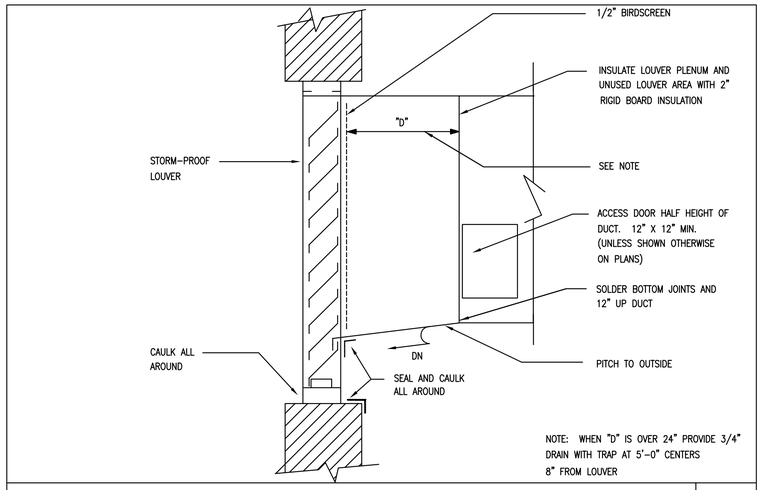
PIPING PLAN GENERAL NOTES

1. UOI, BRANCH PIPES TO TERMINAL UNITS SHALL BE AS FOLLOWS:

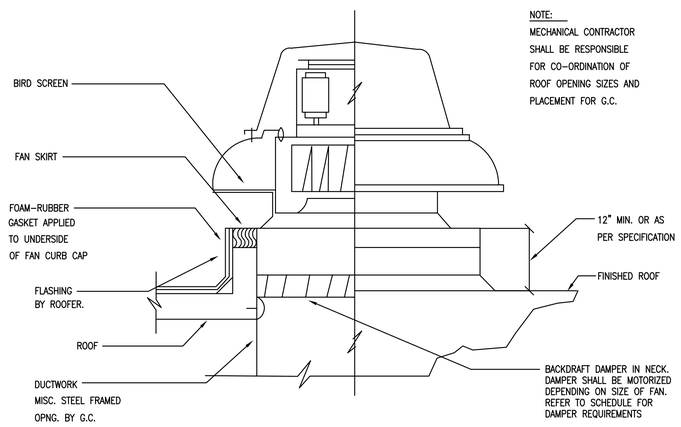
GPM	BRANCH PIPES	GPM	BRANCH PIPES
0.0 TO 3.0	3/4"	19.1 TO 40.0	2"
3.1 TO 7.0	1"	40.1 TO 70.0	2–1/2"
7.1 TO 12.0	1–1/4"	70.1 TO 120.0	3"
12.1 TO 19.0	1–1/2"	120.1 TO 250.0	4"



UNIT HEATER HYDRONIC PIPING DIAGRAM — NTS



LOUVER CONNECTION DETAIL — NTS



NOTE:
MECHANICAL CONTRACTOR SHALL BE RESPONSIBLE FOR CO–ORDINATION OF ROOF OPENING SIZES AND PLACEMENT FOR G.C.

ROOF–MOUNTED EXHAUST FAN — NTS

FAN SCHEDULE

GENERAL			PERFORMANCE					ELECTRICAL			PHYSICAL		REMARKS			
TAG	LOCATION	SERVICE	CFM	ESP (IN WG)	RPM	BHP	SONES	HP	VOLTAGE	PHASE	WEIGHT (LBS)	MANUFACTURER MODEL	TYPE	RATINGS	FEATURES	INSTALL
EF–1	ROOF	TRUCK WASH	1150	.25	1674	.22	12.8	1/4	115	1	46	GREENHECK G–099–VG	1	1 2	1 2 3 4 5 6 7	1
EF–2	ROOF	FORESTRY DIVISION	2000	.25	1725	.53	16.7	1/2	115	1	58	GREENHECK G–133–A	1	1 2	1 2 3 4 5 6 7	1
EF–3	ROOF	FORESTRY DIVISION	2000	.25	1725	.53	16.7	1/2	115	1	58	GREENHECK G–133–A	1	1 2	1 2 3 4 5 6 7	1

1. CENTRIFUGAL ROOF EXHAUSTER, DOWNBLAST, DIRECT DRIVE

1. AIR PERFORMANCE CERTIFIED IN ACCORDANCE TO AMCA 211
2. SOUND PERFORMANCE CERTIFIED IN ACCORDANCE TO AMCA 311

1. ROOF CURB WITH RUBBER SEAL
2. ROOF CURB HINGE KIT
3. ROOF CURB EXTENSION
4. NON–FUSED DISCONNECT SWITCH
5. CONTROL DAMPER, TWO POSITION [, FAIL OPEN CLOSED]
6. BIRDSCREEN
7. UNIT MOUNTED SPEED CONTROLLER

1. SEE DETAIL M–101

LOUVER SCHEDULE

GENERAL			PERFORMANCE			PHYSICAL				REMARKS			
TAG	LOCATION	SERVICE	CFM	FPM	SPD (IN.WG.)	WIDTH (IN)	HEIGHT (IN)	FREE AREA (SQ.FT.)	MANUFACTURER MODEL	TYPE	RATINGS	FEATURES	INSTALL
L–1	SEE PLANS	TRUCK WASH	1150	400	.03	30	30	2.875	GREENHECK EDJ–401	1	1	1 2 3	1

1. STATIONARY BLADE, DRAINABLE, [0.081" 0.125"] THICK EXTRUDED ALUMINUM FRAME & BLADES, 4" DEEP

1. AMCA 511 CERTIFIED FOR WATER AND AIR PERFORMANCE

1. [BIRD INSECT] SCREEN
2. MINIMUM 0.7 MIL INTEGRAL COLOR ANODIZE FINISH, COLOR SELECTABLE BY ARCHITECT
3. MINIMUM [0.4 0.7] MIL CLEAR ANODIZE FINISH

1. INSTALL BOTTOM OF LOUVER 24" ABOVE FINISHED FLOOR

UNIT HEATER SCHEDULE

GENERAL		PERFORMANCE						ELECTRICAL			PHYSICAL	REMARKS			
TAG	LOCATION	MBH	GPM	WPD (FT WG)	LAT (°F)	CFM	FAN SPEED	HP	VOLTAGE	PHASE	MANUFACTURER MODEL	TYPE	RATINGS	FEATURES	INSTALL
UH–1	TRUCK WASH	43,710	4.7	.47	–	1120	1550	1/10	115	1	RITTLING RH–63–H01AA	1	1	1 2 3 4	–
UH–2	TRUCK WASH	43,710	4.7	.47	–	1120	1550	1/10	115	1	RITTLING RH–63–H01AA	1	1	1 2 3 4	–

1. HORIZONTAL

1. 200°F EWT, 180°F LWT, 60°F EAT [, 30% PROPYLENE GLYCOL]

1. VERTICAL LOUVERS
2. [OSHA STANDARD] FAN GUARD
3. NON–FUSED DISCONNECT SWITCH
4. LINE VOLTAGE THERMOSTAT [,WALL UNIT MOUNTED]

1. SEE DETAIL ON M–101
2. SELECT AUTOMATIC BALANCING VALVE FOR GPM INDICATED

HOOD SCHEDULE

GENERAL		PERFORMANCE		PHYSICAL				REMARKS	
TAG	LOCATION	CFM	TPD (IN WG)	THROAT WIDTH (IN)	THROAT LENGTH (IN)	WEIGHT (LBS)	MANUFACTURER MODEL	TYPE	FEATURES
IH–1	EQUIPMENT WORK AREA	4000	0.158	16	48	95	GREENHECK FGI	1	1 2 3

1. GRAVITY INTAKE, LOUVERED

1. ROOF CURB WITH RUBBER SEAL
2. MOTORIZED DAMPER
3. 3/4" ALUMINUM BIRDSCREEN

BID DOCUMENTS

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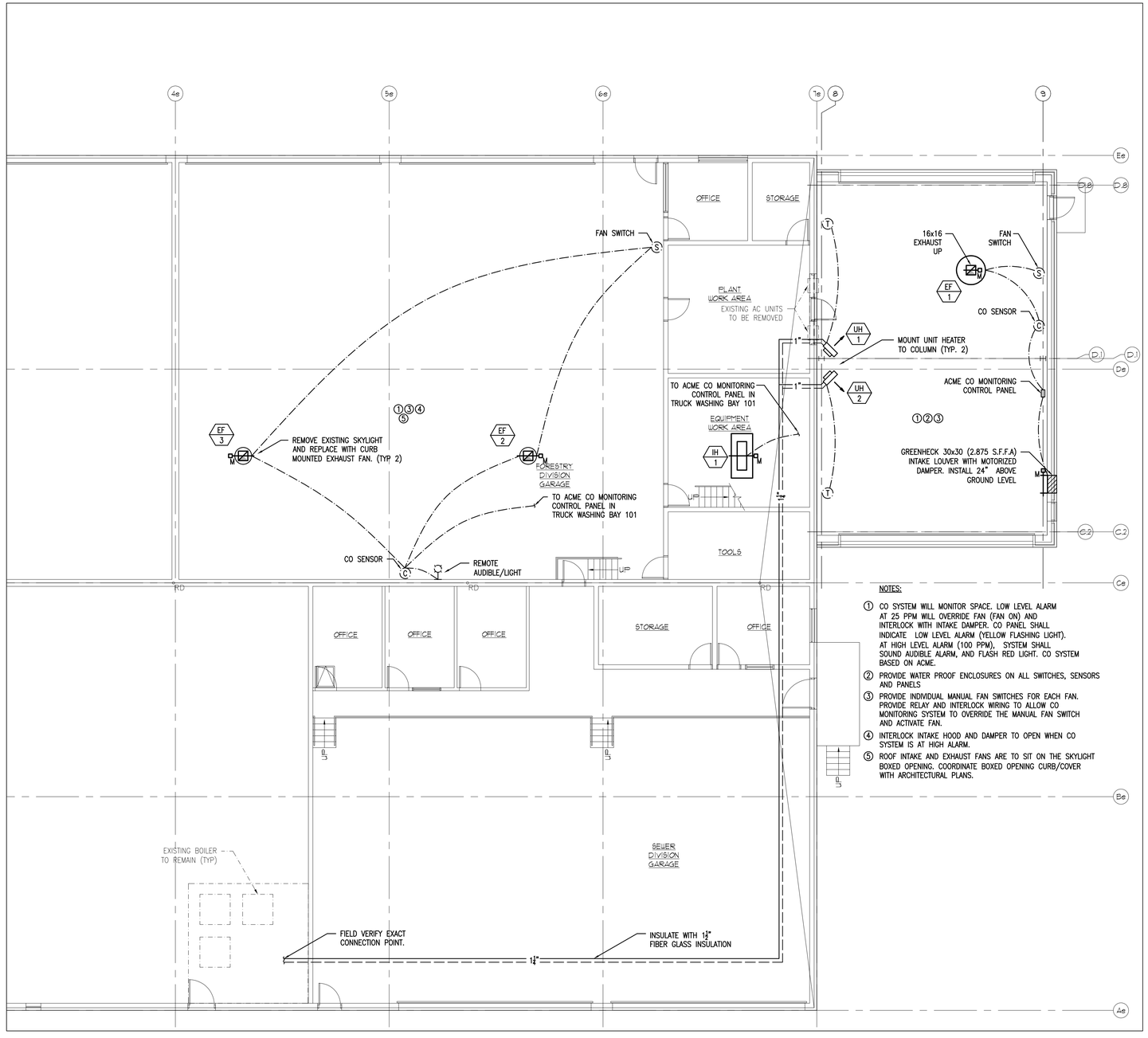
CITY OF QUINCY PUBLIC WORKS DEPARTMENT
TRUCK WASHING FACILITY, 55 SEA ST.

Scale: AS NOTED	Approved By: ---	Drawn By: AMR
Date: 07-29-13	Project Number: 1309	Revised: ---
HOLMES & EDWARDS, INC., ARCHITECTS 26 Chestnut Street, Quincy, Mass. 02169		Sheet Number:
Sheet Name: MECHANICAL LEGEND, DETAILS, AND SCHEDULES		M-101



NOTES:

1. CO SYSTEM WILL MONITOR SPACE. LOW LEVEL ALARM AT 25 PPM WILL OVERRIDE FAN (FAN ON) AND INTERLOCK WITH INTAKE DAMPER. CO PANEL SHALL INDICATE LOW LEVEL ALARM (YELLOW FLASHING LIGHT). AT HIGH LEVEL ALARM (100 PPM), SYSTEM SHALL SOUND AUDIBLE ALARM, AND FLASH RED LIGHT. CO SYSTEM BASED ON ACME.
2. PROVIDE WATER PROOF ENCLOSURES ON ALL SWITCHES, SENSORS AND PANELS
3. PROVIDE INDIVIDUAL MANUAL FAN SWITCHES FOR EACH FAN. PROVIDE RELAY AND INTERLOCK WIRING TO ALLOW CO MONITORING SYSTEM TO OVERRIDE THE MANUAL FAN SWITCH AND ACTIVATE FAN.
4. INTERLOCK INTAKE HOOD AND DAMPER TO OPEN WHEN CO SYSTEM IS AT HIGH ALARM.
5. ROOF INTAKE AND EXHAUST FANS ARE TO SIT ON THE SKYLIGHT BOXED OPENING. COORDINATE BOXED OPENING CURB/COVER WITH ARCHITECTURAL PLANS.

FIRST FLOOR PLAN

1/8" = 1'-0"

NORTH

BID DOCUMENTS

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CITY OF QUINCY PUBLIC WORKS DEPARTMENT
TRUCK WASHING FACILITY, 55 SEA ST.

Scale: AS NOTED	Approved By: —	Drawn By: AMR
Date: 07-29-13	Project Number: 1309	Revised: —
HOLMES & EDWARDS, INC., ARCHITECTS 26 Chestnut Street, Quincy, Mass. 02169		Sheet Number:
Sheet Name: MECHANICAL FIRST FLOOR PLAN		M-102

LEGEND

* MOUNTING HEIGHTS SHALL BE AS INDICATED UNLESS SHOWN OTHERWISE ON ELECTRICAL DRAWINGS OR ARCHITECTURAL ELEVATIONS

* ALL SYMBOLS MAY NOT BE SHOWN ON PLANS

RACEWAYS AND WIRING

P4–1,3,5 — SINGLE PHASE HOMERUNS TO PANELBOARD. "P4" DENOTES PANEL, "1,3,5" DENOTES CIRCUIT NUMBERS, [(3) 20A, 1P CIRCUITS] NUMBER OF SLASH MARKS DENOTES NUMBER OF #12AWG CONDUCTORS IN MINIMUM 3/4"C. NO SLASH MARKS INDICATE 2#12 & 1#12G–3/4"C UNLESS INDICATED OTHERWISE.

P4–2 / 20/3 — MULTI–POLE HOMERUN TO PANELBOARD. "P4" DENOTES PANEL, "2" DENOTES CIRCUIT NUMBER, 20 AMP 3 POLE C/B. NUMBER OF SLASH MARKS DENOTES NUMBER OF #12AWG CONDUCTORS IN MINIMUM 3/4"C.

NOTES:
1. GREEN GROUND CONDUCTOR NOT INDICATED BUT SHALL BE INCLUDED IN EACH RACEWAY. SIZE SHALL BE #12AWG UNLESS INDICATED OTHERWISE.

LIGHTING FIXTURES

A / 2a — PENDANT MOUNTED FLUORESCENT LIGHTING FIXTURE. "A" DENOTES FIXTURE TYPE, "2" DENOTES CIRCUIT NUMBER, "a" DENOTES SWITCH CONTROL,

B — WALL MOUNTED EXTERIOR LIGHTING FIXTURE, 'B' DENOTES FIXTURE TYPE

WALL MOUNTED ILLUMINATED EXIT SIGN WITH TWIN HEADS AND REMOTE CAPABILITY– SHADING INDICATES FACE PLATE(S)

EB — EMERGENCY BATTERY UNIT – SEE LIGHTING FIXTURE SCHEDULE

WP — WEATHERPROOF EMERGENCY ONLY LIGHT FIXTURE WITH TWIN HEADS. CONNECT TO EXIT LIGHT BATTERY UNIT WITH 2/C#10 TYPE MC CABLE

TOGGLE SWITCHES (MOUNTED 48" AFF)

S3b — THREE WAY TOGGLE SWITCH "b" DENOTES FIXTURE CONTROL

T a,c — TIMER SWITCH IN WEATHERPROOF HOUSING. "a" DENOTES FIXTURE CONTROL. EQUAL TO TORK C–SERIES #C460M, DPDT TYPE.

RECEPTACLES (MOUNTED 18" AFF OR AS INDICATED ON ARCHITECTURAL PLANS)

IG 2 / GFI WP — DUPLEX RECEPTACLE, "2" DENOTES CIRCUIT NUMBER, "GFI" DENOTES GROUND FAULT CIRCUIT INTERRUPTER TYPE DEVICE, "IG" DENOTES ISOLATED GROUND TYPE DEVICE, "WP" DENOTES WEATHER PROOF COVER

DUPLEX RECEPTACLE MOUNTED 6" ABOVE COUNTER TOP OR AS INDICATED ON ARCHITECTURAL PLANS

L6–30 — SPECIAL PURPOSE RECEPTACLE, "L6–30" DENOTES TYPE, SEE POWER PLANS FOR EXACT TYPES USED

POWER DISTRIBUTION EQUIPMENT

DISTRIBUTION PANEL

PANELBOARD, SURFACE MOUNTED

PANELBOARD, FLUSH MOUNTED

J — JUNCTION BOX, SIZED PER NEC

2 — MOTOR, "2" DENOTES HORSEPOWER

MAGNETIC MOTOR STARTER WITH ENCLOSURE, MINIMUM SIZE NEMA 1

P — MANUAL MOTOR STARTER WITH THERMAL OVERLOAD. "P" DENOTES PILOT LIGHT

30/3 — NON–FUSED DISCONNECT SWITCH: "30/3" DENOTES 30 AMP/3 POLE SWITCH

30/20/3 — FUSED DISCONNECT SWITCH: "30/20/3" DENOTES 30 AMP/3 POLE SWITCH, 20 AMP FUSES

COMBINATION MAGNETIC STARTER AND FUSED DISCONNECT SWITCH. SIZE OF STARTER, SWITCH AND FUSE AS REQUIRED

MISCELLANEOUS

J — JUNCTION BOX WITH FLEXIBLE CONNECTION TO EQUIPMENT

EF — EXHAUST FAN

CP — CONTROL PANEL

PB — PULL BOX – SIZED PER NEC FOR CONDUITS ENTERING AND LEAVING

FIRE RATED POKE–THRU WITH FLUSH MOUNTED DEVICES AS INDICATED

T/D J — FIRE RATED POKE–THRU WITH FLEXIBLE CONNECTION TO FURNITURE SYSTEM "T/D" DENOTES TEL/DATA SYSTEM DEVICE

TV — CABLE TELEVISION OUTLET, WALL MOUNTED. E.C. SHALL PROVIDE 3/4" EMPTY CONDUIT WITH PULL STRING TO NEAREST ACCESSIBLE CEILING. PROVIDE FACEPLATE WITH TYPE "F" CONNECTOR AT BOX.

P WP — PUSHBUTTON AND PLATE, "WP" DENOTES WEATHERPROOF

C — 120 VOLT CLOCK HANGER OUTLET

C — CENTRAL SYSTEM CLOCK WIRED TO CORRECTIVE CLOCK WIRING SYSTEM 12" DIAMETER UNLESS OTHERWISE NOTED "SP" DENOTES SHATTER GUARD

C S — CLOCK/SPEAKER COMBINATION

B — BUZZER/BELL, LOW VOLTAGE

TL — LOW VOLTAGE TRANSFORMER

MUSHROOM TYPE PUSHBUTTON STATION FOR ACTIVATION OF SHUNT–TRIP DEVICE ON INDICATED CIRCUIT BREAKER

PC — PHOTO–CELL

TC — TIME CLOCK

KP — KEY PAD

MECHANICAL EQUIPMENT TAG ABBREVIATIONS

AH — DENOTES EQUIPMENT TYPE
2 — DENOTES UNIT NUMBER

ACC	AIR–COOLED CONDENSER
AHU	AIR HANDLING UNIT
B	BOILER
CH	CHILLER
CUH	CABINET UNIT HEATER
EF	EXHAUST FAN
EH	EXHAUST HOOD
EWH	ELECTRIC WALL HEATER
FC	FAN COIL
HP	HEAT PUMP
P	PUMP
RTU	ROOF TOP UNIT
UH	UNIT HEATER
WH	ELECTRIC WATER HEATER

ABBREVIATIONS

3R	NEMA 3R RATING	G	GROUND
4X	NEMA 4X RATING	GC	GENERAL CONTRACTOR
A	AMPERES	GFI	GROUND FAULT INTERRUPTER
AFF	ABOVE FINISHED FLOOR	HVAC	HEATING, VENTILATION, AIR CONDITIONING CONTRACTOR
AFG	ABOVE FINISHED GRADE	IG	ISOLATED GROUND
AIC	AMPERE INTERRUPTING CAPACITY	KVA	KILOVOLT–AMPERES
ARCH	ARCHITECT	KW	KILOWATTS
ATS	AUTOMATIC TRANSFER SWITCH	MCB	MAIN CIRCUIT BREAKER
AWG	AMERICAN WIRE GAUGE	MLO	MAIN LUGS ONLY
C	CONDUIT	NEC	NATIONAL ELECTRICAL CODE
C/B	CIRCUIT BREAKER	NTS	NOT TO SCALE
C.T.	CURRENT TRANSFORMER	ø	PHASE
CAT	CATALOG	P	POLE
CKT	CIRCUIT	PVC	POLYVINYL CHLORIDE
CU	COPPER	RL	NEW LOCATION OF RELOCATED DEVICE
DWG	DRAWING	TEL	TELEPHONE
EC	ELECTRICAL CONTRACTOR	UNO	UNLESS NOTED OTHERWISE
ETD	EXISTING TO BE DEMOLISHED	V	VOLT
ETR	EXISTING TO REMAIN	VIF	VERIFY IN FIELD
ETRL	EXISTING TO BE RELOCATED	W	WATT
ETRP	EXISTING TO BE REPLACED	WP	WEATHERPROOF

BRANCH CIRCUIT WIRING NOTES:

1. WIRING IS SHOWN ON DRAWINGS ONLY FOR SPECIFIC ROUTES OR SPECIAL CONDITIONS.
2. WIRING AND CONDUIT SHALL BE REQUIRED BETWEEN ALL OUTLETS INDICATED WITH CIRCUIT NUMBERS AND PANEL DESIGNATIONS.
3. ALL SWITCH CONTROLS SHALL BE PROVIDED WITH WIRING AND CONDUIT AS REQUIRED.
4. ALTHOUGH ALL BRANCH CIRCUIT WIRING AND CONDUIT IS NOT SHOWN, IT IS THE INTENT OF THESE DOCUMENTS THAT A COMPLETE BRANCH CIRCUIT WIRING SYSTEM BE INSTALLED.
5. A GREEN GROUNDING CONDUCTOR SHALL BE RUN WITH ALL CIRCUITS. VERIFY CONDUIT SIZE TO ENSURE IT CAN ACCOMMODATE ALL PHASE, NEUTRAL AND GROUND CONDUCTORS.
6. PROVIDE A NEUTRAL CONDUCTOR TO ALL LIGHTING SWITCH BOXES PER NEC ARTICLE 404.2.
7. WHERE EXISTING SWITCHES AND RECEPTACLES ARE INDICATED TO REMAIN, THIS CONTRACTOR SHALL REPLACE SAID DEVICE(S) AND DEVICE PLATE(S) WITH NEW TO MATCH THE NEW CONSTRUCTION. WHERE THEY ARE INDICATED AS RELOCATED, EXTEND BRANCH CIRCUIT WIRING TO NEW LOCATION AND PROVIDE NEW DEVICE AND DEVICE PLATE TO MATCH NEW CONSTRUCTION.

LIGHTING FIXTURE SCHEDULE

TYPE	DESCRIPTION	MANUFACTURER & CATALOG NUMBER	LAMPS NUMBER	LAMPS TYPE	LAMPS VOLTS	LAMPS WATTS	REMARKS
A	SPLASH ZONE LINEAR FLUORESCENT WITH UPLIGHT COMPONENT	DAYBRITE #SZW354HOP–UNV–1/3EB10I–LPT835–SZB	3	F54HO/T5	120	155	UL LISTED FOR WET LOCATION. SEE MOUNTING DETAIL ON DWG. E101
B	LED MEDIUM WALLPACK	DAYBRITE WTM60WLU–MC3–BK–PE	1	LED	120	62	FULL CUT OFF WITH PE CONTROL. WALL MOUNT AT 18" BELOW ROOF
	UL WET LOCATION LED EXIT SIGN WITH INTEGRAL BATTERY BACK–UP	CHLORIDE #VNLCL–R–DEH	2	PAR36	120	4.8	PROVIDE WITH TWO EMERGENCY LIGHTS
EB	UL WET LOCATION EMERGENCY BATTERY UNIT	CHLORIDE #SV16LBWL	2	MR16	120	11	MOUNT AT 8'–6" AFF TO TOP OF UNIT
WP	EXTERIOR REMOTE EMERGENCY UNIT WITH TWIN HEADS	CHLORIDE #PDRB	2	HALOGEN	120	12	REMOTE UNIT ONLY – MOUNT AT 6" ABOVE DOOR

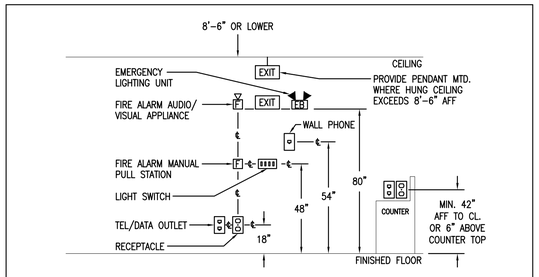
LIGHTING FIXTURE NOTES:

1. PROVIDE ACCESSORIES AND MOUNTING HARDWARE FOR ALL FIXTURES.
2. COLORS SHALL BE AS SELECTED BY ARCHITECT.
3. COORDINATE EXACT LOCATION WITH ARCHITECT PRIOR TO ROUGH–IN.
4. ALL COMPACT FLUORESCENT BALLASTS SHALL BE ELECTRONIC TYPE.
5. ALL FLUORESCENT LAMPS SHALL BE 3500°K.

PANELBOARD SCHEDULE

PANEL DESIGNATION	VOLTS	PHASE	WIRES	MAINS MLO: MAIN LUGS ONLY MCB: MAIN CKT. BKR. BUS SIZE	OVERCURRENT DEVICE FRAME AMPS	OVERCURRENT DEVICE TRIP AMPS	BKR. POLES	BRANCH DEVICES BREAKER AMPS 15	20	25	30	40	50	60	70	* TOTAL POLES	MOUNTING: S: SURFACE F: FLUSH	GROUND BUS	ADDITIONAL BRANCH C.B.'S	REMARKS
WB	120/208	3	4	225	100	100	1	24		2						42	S	✓	–	–
							2	–												
							3	2												
–	–	–	–	–	–	–	1	–								–	–	✓	–	–
							2	–												
							3	–												

* INCLUDES SPACES



NOTES:
1. INSTALL DEVICES ON ONE COMMON VERTICAL CENTERLINE.
2. INSTALL DEVICES AT THIS HEIGHT WHEREVER APPLICABLE.

DETAIL OF TYPICAL DEVICE MOUNTING HEIGHTS — NTS

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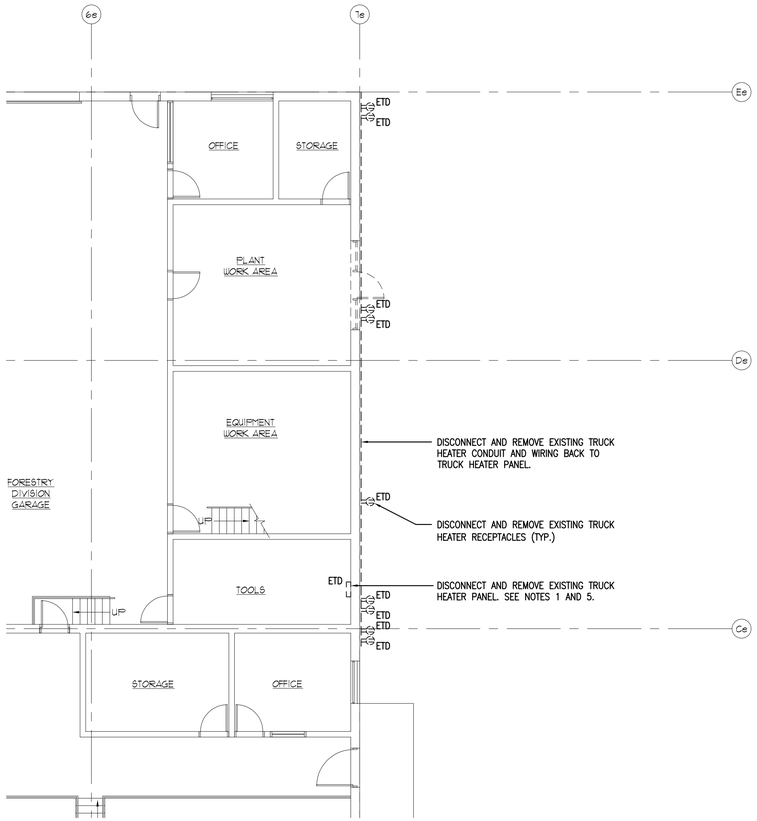
BID DOCUMENTS

CITY OF QUINCY PUBLIC WORKS DEPARTMENT
TRUCK WASHING FACILITY, 55 SEA ST.

Scale: NONE	Approved By: RF	Drawn By: RAB
Date: 07-29-13	Project Number: 1309	Revised:
HOLMES & EDWARDS, INC., ARCHITECTS 26 Chestnut Street, Quincy, Mass. 02169		Sheet Number: E001
Sheet Name: ELEC. LEGEND, NOTES & SCHEDULES		



ELECTRICAL DEMOLITION PLAN

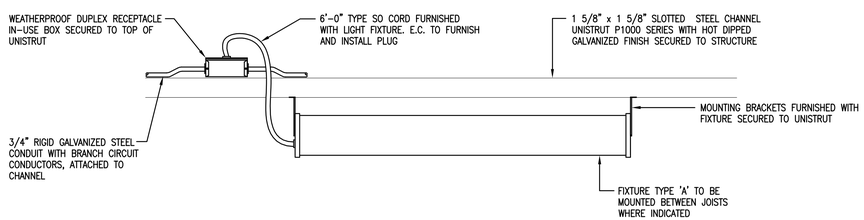
1/8" = 1'-0"

NORTH

ELECTRICAL NEW WORK PLAN

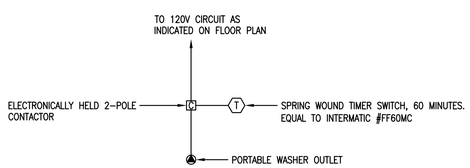
1/8" = 1'-0"

NORTH



FIXTURE TYPE 'A' MOUNTING DETAIL

NOT TO SCALE



NOTE:
1. MANUAL TIMER SHALL ENERGIZE CONTACTOR COIL.

POWER WASHER OUTLET WIRING DIAGRAM

NOT TO SCALE

NOTES:

1. DISCONNECT AND REMOVE EXISTING TRUCK HEATER PANEL, INCLUDING CONDUIT AND WIRING BACK TO EXISTING PANEL "MDP". THE E.C. SHALL VERIFY THAT THIS PANEL ONLY FEEDS TRUCK HEATER RECEPTACLES WHICH ARE TO BE REMOVED. ANY ACTIVE CIRCUITS REMAINING SHALL BE TEMPORARILY DISCONNECTED AND EXTENDED TO NEW PANEL "WB" AS REQUIRED.
2. FINAL LOCATION OF NEW PANEL "WB" SHALL BE FIELD VERIFIED WITH EXISTING CONDITIONS AND SHALL BE COORDINATED WITH THE OWNER PRIOR TO INSTALLATION.
3. ALL DUPLEX RECEPTACLES, PORTABLE WASHER OUTLETS, LIGHT SWITCHES, TIMERS, CONTACTOR AND THERMAL TOGGLE SWITCHES IN THE WASH BAY SHALL BE SURFACE MOUNTED ON WALLS OR ON MECHANICAL UNITS THEY PROTECT AND SHALL BE PROVIDED WITH WEATHERPROOF DEVICE COVERS AS MANUFACTURED BY TAYMAC OR APPROVED EQUAL. RECEPTACLE COVERS SHALL BE OF THE IN-USE TYPE, TAYMAC #MX5280S OR APPROVED EQUAL.
4. PORTABLE WASHER OUTLET. E.C. SHALL VERIFY RECEPTACLE TYPE REQUIRED WITH EXISTING POWER WASHER ON SITE PRIOR TO INSTALLATION. COORDINATE FINAL LOCATION WITH OWNER. SEE WIRING DIAGRAM, THIS SHEET.
5. THE EXISTING PANEL "MDP" IS MANUFACTURED BY SQUARE D, TYPE NQOD, 120/208V, 3ø, 4W, 225A MAIN BUS WITH A 200A MCB. REMOVE THE EXISTING 2P-90A CIRCUIT BREAKER WHICH FEEDS THE EXISTING TRUCK HEATER PANEL AND PROVIDE SPACE FILLERS. REMOVE (3) SPARE 1P-20A CIRCUIT BREAKERS AND REPLACE WITH NEW 3P-100A C.B. FOR NEW PANEL "WB". TURN ALL REMOVED BREAKERS OVER TO THE OWNER.
6. ALL EMERGENCY BATTERY UNITS SHALL BE CIRCUITED AHEAD OF ALL LOCAL SWITCHING.
7. ALL CONDUITS RUN WITHIN WASH BAY SHALL BE RIGID GALVANIZED STEEL, 3/4" MINIMUM OR SIZED AS INDICATED.
8. OVERHEAD DOOR MOTOR, PUSHBUTTON, PHOTOELECTRIC SENSORS, CONTROLLER, LOW VOLTAGE WIRING AND REQUIRED APPURTENANCES SHALL BE FURNISHED AND INSTALLED BY THE OVERHEAD DOOR CONTRACTOR. THE ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR BRING 208V, 3ø POWER TO THE STARTER AND CONTROLLER.

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CITY OF QUINCY PUBLIC WORKS DEPARTMENT

TRUCK WASHING FACILITY, 55 SEA ST.

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Sheet Name: ELECTRICAL FLOOR PLANS		