

set no.: _____

for: _____

P R O J E C T M A N U A L & TECHNICAL SPECIFICATIONS

H. U. D. PROJECT NUMBER 023-EE241

STEVENS MEMORIAL SENIOR HOUSING HUD 202 SENIOR HOUSING

12 CHESTNUT STREET, LUDLOW, MA. 01056

FOR

STEVENS MEMORIAL SENIOR HOUSING OF LUDLOW, INC.

322 MAIN STREET, SUITE 1
SPRINGFIELD, MA 01105

28 UNITS TOTAL
20 PARKING SPACES

FEBRUARY 18, 2011

FOR SPONSOR:

HAP, INC.
322 MAIN STREET, SUITE 1
SPRINGFIELD, MA. 01105

CONTRACTOR:

OWNER:

STEVENS MEMORIAL SENIOR HOUSING
OF LUDLOW, INC.
322 MAIN STREET, SUITE 1
SPRINGFIELD, MA. 01105

BONDING COMPANY:

ARCHITECT:

STUDIO ONE INC.
979 MAIN STREET
SPRINGFIELD, MA. 01103

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PROJECT MANUAL
 & TECHNICAL SPECIFICATIONS
STEVENS MEMORIAL SENIOR HOUSING

OWNER:	ARCHITECTS:
Stevens Memorial Senior Housing of Ludlow, Inc. 322 Main Street, Suite 1 Springfield, MA 01105 Attention:	studio one inc. south commons 979 main street springfield, MA 01103 Contact Person: Bill Gagnon
telephone: 1-413-233-1500 fax: 1-413-731-8723 email:	telephone: 1-413-733-7332 fax: 1-413-737-1464 email: wgagnon@studiooneinc.net

STRUCTURAL ENGINEERS:	MECHANICAL ENGINEER: HVAC-Plumbing
Steiger Engineering Inc. 9 Moody Rd. Enfield, CT. 06082 Contact Person: Phil Steiger, P.E.	Walter McIlveen Associates, Inc. 195 West Main Street Avon, CT 06001
telephone: 1-860-698-9626 fax: 1-860-000-0000 email:	telephone: 1-860-678-0230 fax: 1-860-676-9955 email:

SITE ENGINEER:	ELECTRICAL ENGINEER:
EcoTec Environmental Associates P.O. Box 188 East Longmeadow, MA 01028 Contact Person: Gary Weiner, P.E.	Walter McIlveen Associates, Inc. 195 West Main Street Avon, CT 06001
telephone: 1-413-525-6703 fax: 1-413-525-4720 email: gwecotec@verizon.net	telephone: 1-860-678-0230 fax: 1-860-676-9955 email:

FIRE PROTECTION ENGINEER:	ENVIRONMENTAL CONSULTANTS:
Walter McIlveen Associates, Inc. 195 West Main Street Avon, CT 06001	Environmental Compliance Services, Inc. 588 Silver Street Agawam, Ma. 01101 Contact Person: Chris Godfrey
telephone: 1-860-678-0230 fax: 1-860-676-9955 email:	telephone: 1-413-789-3530 fax: 1-413-789-2776 email: cgodfrey@ecsconsult.com

February 18, 2011

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SECTION 00010 - NOTICE OF CALL FOR BIDS

OWNER REQUESTS SEALED PROPOSALS ON CONSTRUCTION WORK AS FOLLOWS:

- A. PROJECT: **STEVENS MEMORIAL SENIOR HOUSING**
12 CHESTNUT STREET, LUDLOW, MA.
- B. OWNER: **STEVENS MEMORIAL SENIOR HOUSING OF LUDLOW, INC.**
322 MAIN STREET, SUITE 1, SPRINGFIELD, MA. 01105
- C. BIDS DUE: _____ October 5, 2012 @ 1pm _____
- D. PLACE DUE: **OFFICE OF STUDIO ONE INC. ARCHITECTS**
115 STATE ST., STE 201 SPRINGFIELD, MA 01103
- E. TYPE OF BIDDING & CLASS OF WORK:

INVITED BIDDING - GENERAL CONTRACTORS - PRIVATE BID OPENING

The Owner will make monthly progress payments on all classes of work direct to the General Contractor upon acceptance of Architect/Engineer. Proposals for the General Construction work, shall be submitted in accordance with Information For Bidders Section 00100.

AVAILABILITY OF DOCUMENTS

Construction Documents

Copies of Construction Documents will be available September 17, 2012 at the office of the Architects, Studio One, Inc., 115 State Street, Suite 201, Springfield, MA 01103

AVAILABILITY OF DOCUMENTS

Construction Contract Documents

Pdf's of the Construction Contract Documents will be available September 17, 2012 on line from the office of the Architect, Studio One Inc. The link address will be forwarded to the Invited General Contractors by Studio One Inc.

Sets may be **purchased** from New England Blue Call 413-737-3556.

SHIPPING

Construction sets can be shipped via FedEx billed to recipients account. Include completed FedEx USA AirBill with deposit

PRE BID CONFERENCE

A pre bid conference shall be held at the job sites on September 20, 2012.
Pre bid conference shall begin at 10:00 a.m..

REJECTION

Owner reserves the right to reject any or all proposals and to re-advertise and rebid the project.

PRIOR APPROVAL

This contract has a ten day prior approval clause.

BID SECURITY

Not required for this project.

BONDS

Contractor shall furnish a Performance, Labor and Materials Bond for 100% of the Contract Amount upon signing of a contract.

WAGE RATES:

WAGES PAID TO EMPLOYEES FOR WORK PERFORMED ON THIS PROJECT SHALL CONFORM WITH CURRENT DAVIS-BACON, COMMONWEALTH OF MASS., HAMPDEN COUNTY PREVAILING WAGE RATES FOR WORK PERFORMED IN CLASSIFICATIONS LISTED IN THE PREVAILING WAGE RATE SCHEDULE.

STATE EXCISE, SALES TAX:

In submitting this bid the bidder is understood to **have not included** in the bid price the **State Sales Tax** of building materials, supplies and equipment to contractors, subcontractors or builders for the erection of buildings or improvement of real property. **Tax exempt I.D. number will be provided to the awarded low bidder.**

END OF SECTION 00010

SECTION 00110 - INFORMATION FOR BIDDERS

PART 1 - GENERAL

INFORMATION INCLUDED

- A. Requirements for bidders regarding bid submission.
- B. Requirements for other pre-bid and post-bid submissions.

RELATED WORK SPECIFIED ELSEWHERE

- | | | |
|----|---|-------------------------|
| A. | Notice for Call for Bids | 00010 |
| B. | Proposal Form | 00300 |
| C. | Other Forms | Section 0 |
| D. | General, Supplemental
& Special Requirements | Section 0 and Section 1 |

EXECUTION

GENERAL (SEE BIDDING FORMAT AT THE END OF THIS SECTION)

Contract Documents include Notice of Call for Bids, Instruction to Bidders, Proposals, Specifications and Drawings, and any Addenda issued prior to bidding.

Bid Proposal, herein, is furnished for the convenience of bidders and is not to be detached, filled out or executed.

Use separate copies of Bid Proposal forms furnished for submission of bids.

Comply with these instructions in submission of bids.

BIDDERS REPRESENTATION

By making a bid, bidder represents that he has read and understands the Contract Documents.

The contractor shall examine the contract documents for demolition and removal requirements and provisions for new work. Verify all existing conditions and dimensions before commencing work and/or ordering materials.

All bidders are expected and required to examine and to be thoroughly familiar with all contract documents and with the conditions under which the work is to be carried out.

The Contractor shall be required to become familiar with all conditions and requirements, in all areas of work and the result which is to be produced, that the contract documents are adequate and will be required to produce the required results.

The Owner will not be responsible for errors, omissions, and/or charges for extra work arising from the General Contractors, or Sub-Contractors failure to familiarize themselves with the contract documents, existing conditions, site constraints, etc.

In the case of an inconsistency between drawings and the project manual, or within either document which is not clarified by addendum, the product or scope of work of greater quality or quantity of work shall be provided by the Contractor at no additional cost to the owner, in accordance with the Architect's interpretation, which will be final.

He further represents that he has inspected the site of the proposed work to ascertain any obstacles that might be encountered and other matters and conditions relevant to the work.

The contractor shall visit the site and examine the existing conditions as they finds them, prior to submitting bid and shall inform herself/himself of the character, extent and type of work required to be performed.

Submit any questions, to the Architect, regarding the extent and character of the work required to be performed, in the manner and within the time period established for receipt of such questions during the bidding period.

No oral interpretation will be made to any bidder as to meaning of Contract Documents.

Make written requests for interpretation to Architect.

Any inquiry received 10 or more calendar days (240 hours) prior to time for opening of bids will be considered.

**Make written requests for interpretation and questions to Architect.
All questions must be submitted in writing via Fax or 'E' Mail to Bill Gagnon
Fax: 1-413-737-1464. 'E' Mail: wgagnon@studiooneinc.net**

Interpretations by the Architect will only be in form of an Addendum to Contract Documents.

Addendum will be filed in Architect's and Owner's offices.

In addition, such addenda will be mailed to all those procuring a complete set of drawings and specifications.

Bidder is responsible for inquiry as to number of addenda issued.

He further represents that he has inspected the site of the proposed work to ascertain any obstacles

No representations as to subsurface conditions are made.

When soil borings are included, they are for informational purposes only and not as a representation of actual subsurface conditions.

BIDDING PROCEDURES

COMPLETION OF BID PROPOSAL

1. Complete in duplicate.
2. Fill in all blank spaces in ink or by typewriter.

3. Initial any alteration, correction or deletion as approved by Bidder, or in case of a Corporate Bidder, by duly authorized officer prior to submission of bid.
4. Furnish signed certification explaining alterations.
5. It is mandatory for each bidder to bid any and all alternates and to carry allowance as specified herein.
6. Include all labor, material, and equipment for incorporating of alternate or unit price into base bid construction according to drawings, schedules and specifications.
7. Should alternate construction not result in a change in contract sum, enter "no change" in appropriate space on Proposal Form.
8. State all prices in writing and in figures in Proposal Form.
9. In case of difference in written words and figures, amount stated in writing governs.
10. Do not stipulate in bid any condition not contained in Contract Documents unless specifications indicate that alternative materials, equipment and methods will be considered.
11. In this case a space will be provided for such alternate.
12. Owner will not consider any bid not prepared and submitted in accordance with the provisions hereof and reserves the right to reject any and all bids.
13. Any bid may be withdrawn prior to scheduled time for opening of bids or authorize postponement thereof.
14. Date Bid Proposal.
15. Indicate addenda received on Proposal Form.
16. General contractors are required to include all subcontractors for all categories listed in the Schedule of Values portion of the Bid Form. Failure to list all subcontractors may result in the rejection of the bid.
17. General Contractors are required to submit with their Bid the qualifications of all the subcontractors listed in Schedule of Values portion of the Bid Form.
18. Submit proposal in duplicate on forms furnished.

SUBSTITUTIONS

1. Base bid only on materials, equipment and procedures specified only.
2. Certain types of equipment and kinds of material are described in specifications by means of trade names and catalog numbers and/or manufacturer's names.
3. Other types of equipment and kinds of material may be acceptable to Owner and Architect, contact during the bidding stage the Architect to receive addendum's which may be issued regarding.

4. See section 01631, Product Substitutions, for information on procedure for requesting substitutions.
5. Types of equipment and kinds of material to be used if not specifically indicated in specifications, must be approved in writing by Architect and be agreed upon by Owner prior to letting of contract.
6. No substitution allowed after letting of contract.
7. Conditional bids will not be accepted.

SIGNING OF PROPOSALS

Sign proposals according to following conditions as they may apply:

1. Attached a power of attorney to proposals, which are not signed by individuals making them, evidencing authority to sign proposals in name of person for whom it is signed.
2. Sign proposals for a co-partnership by all of co-partners or by an Attorney-In-Fact.
3. If signed by an Attorney-In-Fact, attach Power of Attorney evidencing authority to sign.
4. Append correct corporate name to proposals which are signed for a corporation.
5. Append written signature of president or other authorized officer of corporation below, written or typewritten corporate name following the work "BY _____"
6. If such a proposal is manually signed by an official other than the president of corporation, attach a certified copy of resolution of Board of Directors evidencing authority of such official to sign.

SUBMISSION OF BID PROPOSALS

1. Submit in duplicate.
2. Submit to location stated in Notice of Call for Bids.
3. Submit not later than time indicated.
4. Seal bids in an 9" x 12" manila submission envelope addressed to

STEVENS MEMORIAL SENIOR HOUSING
STEVENS MEMORIAL SENIOR HOUSING OF LUDLOW, INC.
LUDLOW, MA.
5. Oral, telephone, fax or telegraphic bids not accepted.
6. On outside of submission envelope, also type or print:
 - a. Name and Address & Telephone No. of Bidder

QUALIFICATION OF BIDDERS

1. Owner may make such investigation as he deems necessary to determine ability of bidder to perform the work. This will include a financial statement.
2. Furnish to Owner all such information and data for this purpose as Owner may request. Bidder may submit such information in letter form with their proposal, but not as part of same.
3. Owner reserves the right to reject any bid if evidence submitted by, or investigation of, such bidder fails to satisfy Owner that such bidder is properly qualified to carry out the obligations of Contract and to complete work contemplated therein.

CONSIDERATION OF BIDS

1. Owner reserves the right, in the determination of the lowest responsible bidder, to consider ultimate economy as affected by cost of operation, maintenance, and repairs the best interest of the Owner and such other factors as may be reasonably determined to affect the ultimate economy of the award.
2. For purpose of determining lowest responsible bidder, Owner reserves the right to accept or reject any or all alternates.
3. Alternates may be accepted or rejected in any order.
4. Owner reserves the right to reject any bid if the Bid Form is not filled out as required.

SUBMISSION OF POST-BID INFORMATION

With contract, submit:

1. Insurance
2. Contract Security

Within 7 days after execution of contract, submit:

1. A statement of costs for each major item or specification section of form provided by Architect. (Schedule of values on AIA 703G)
2. A list of names of sub-contractors for Architect's approval.
3. A list of specific material proposed for use.
4. Other items as indicated in Section 00090.

RETAINAGE

Retainage shall be **ten (10%) per cent** of each approved requisition for payment.

TIME OF COMPLETION

Contractor shall indicate in his bid the number of consecutive calendar days within which all work required for completion of building will be completed and the building will be ready for occupancy, which statement will be considered in awarding the Contract. Length of the Construction period will be of prime consideration in the awarding of a contract.

PERMITS AND FEES

General Contractor is responsible for securing and paying for all permits. Contact Town Building Offices regarding requirements. Fill out required forms and cooperate with the Town in fulfillment of requirements.

All contractors are advised to carefully read the contract documents and determine for themselves all items to be carried as allowances.

BIDDING FORMAT

All contractors are advised to carefully read the contract documents and determine for themselves all items to be carried as allowances and unit prices.

END OF SECTION 00100

GENERAL CONTRACTOR BID FORM

A.PROJECT: **STEVENS MEMORIAL SENIOR HOUSING
12 CHESTNUT STREET
LUDLOW, MA.**

B. OWNER **STEVENS MEMORIAL SENIOR HOUSING OF LUDLOW, INC.
322 MAIN STREET, SUITE 1
SPRINGFIELD, MA. 01105**

C. ARCHITECT: **STUDIO ONE INC., ARCHITECTS
115 STATE ST., SUITE 201
SPRINGFIELD, MA. 01103**

BIDS DUE: October 05, 2012 @ 1pm
AT THE OFFICES OF -

**STUDIO ONE INC., ARCHITECTS
115 STATE ST., SUITE 201
SPRINGFIELD, MA. 01103**

NAME OF BIDDER: _____

ADDRESS _____

CITY, STATE _____

TELEPHONE NO. _____ FAX ___ - _____

PROPOSAL PRICE:

1. THE UNDERSIGNED BIDDER AGREES TO FURNISH ALL LABOR, INSTALL ALL MATERIALS AND PROVIDE ALL EQUIPMENT REQUIRED TO COMPLETE THE ABOVE PROJECT AS DESCRIBED IN THE CONTRACT DOCUMENTS PROVIDED BY THE ARCHITECT, STUDIO ONE INC. FOR THE TOTAL AMOUNT.

TOTAL BASE BID _____ **DOLLARS**

(\$ _____).

2. THIS BID INCLUDES ADDENDA # A1 , _____ , _____.

3. CONTRACTOR SHALL FILL OUT AND ATTACH HUD FORM HUD-2328 WITH THIS BID FORM.

Form must be filled out electronically. Form is available from the HUD.gov website

4. UNIT PRICES

A.) FULL HEIGHT 1 HR. RATED WOOD STUD PARTITIONS.

EXTRA \$ _____ /L.F. _____ DOLLARS PER LINEAR FOOT

CREDIT \$ _____ /L.F. _____ DOLLARS PER LINEAR FOOT

B.) SUSPENDED GYPSUM CEILINGS.

EXTRA \$ _____ /S.F. _____ DOLLARS PER SQUARE FOOT

CREDIT \$ _____ /S.F. _____ DOLLARS PER SQUARE FOOT

C.) SUSPENDED ACOUSTICAL PANEL CLGS.

EXTRA \$ _____ /S.F. _____ DOLLARS PER SQUARE FOOT

CREDIT \$ _____ /S.F. _____ DOLLARS PER SQUARE FOOT

D.) WOOD FLOOR REFINISHING

EXTRA \$ _____ /SQ. FT. _____ DOLLARS PER SQUARE FOOT

CREDIT \$ _____ /SQ. FT. _____ DOLLARS PER SQUARE FOOT

E.) MCT FLOORING.

EXTRA \$ _____ /S.F. _____ DOLLARS PER SQUARE FOOT

CREDIT \$ _____ /S.F. _____ DOLLARS PER SQUARE FOOT

F.) NON-SLIP SHEET FLOORING.

EXTRA \$ _____ /S.F. _____ DOLLARS PER SQUARE FOOT

CREDIT \$ _____ /S.F. _____ DOLLARS PER SQUARE FOOT

G.) PAINTING.

EXTRA \$ _____ /S.F. _____ DOLLARS PER SQUARE FOOT

CREDIT \$ _____ /S.F. _____ DOLLARS PER SQUARE FOOT

H.) STEEL DOOR AND FRAME.

EXTRA \$ _____ / DOOR. _____ DOLLARS PER DOOR

CREDIT \$ _____ / DOOR. _____ DOLLARS PER DOOR

J.) FLUSH WOOD DOOR AND STEEL FRAME.

EXTRA \$ _____ / DOOR. _____ DOLLARS PER DOOR

CREDIT \$ _____ / DOOR. _____ DOLLARS PER DOOR

K.) DUPLEX ELECTRICAL OUTLETS.

EXTRA \$ _____ /OUTLET _____ DOLLARS PER OUTLET

CREDIT \$ _____ /OUTLET _____ DOLLARS PER OUTLET

L.) CATV OUTLETS.

EXTRA \$ _____ /OUTLET _____ DOLLARS PER OUTLET

CREDIT \$ _____ /OUTLET _____ DOLLARS PER OUTLET

M.) TELEPHONE OUTLETS.

EXTRA \$ _____ /OUTLET _____ DOLLARS PER OUTLET

CREDIT \$ _____ /OUTLET _____ DOLLARS PER OUTLET

N.) FIRE ALARM SYSTEM DEVICES.

EXTRA \$ _____ /OUTLET _____ DOLLARS PER DEVICE

CREDIT \$ _____ /OUTLET _____ DOLLARS PER DEVICE

O.) MASONRY REPOINTING

EXTRA \$ _____ /SQ. FT. _____ DOLLARS PER SQUARE FOOT

CREDIT \$ _____ /SQ. FT. _____ DOLLARS PER SQUARE FOOT

P.) MASONRY REPAIRS

EXTRA \$ _____ /SQ. FT. _____ DOLLARS PER SQUARE FOOT

CREDIT \$ _____ /SQ. FT. _____ DOLLARS PER SQUARE FOOT

Q.) PLYWOOD ROOF SHEATHING

EXTRA \$ _____ /SQ. FT. _____ DOLLARS PER SQUARE FOOT

CREDIT \$ _____ /SQ. FT. _____ DOLLARS PER SQUARE FOOT

6. ASBESTOS ABATEMENT UNIT PRICES.

A.) ITEM UNIT PRICE #AA1. THE REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING FLOOR TILES WITH ASBESTOS CONTAINING MASTIC.

EXTRA \$ _____ /S.F. _____ DOLLARS PER SQUARE FOOT

B.) ITEM UNIT PRICE #AA2. THE REMOVAL AND DISPOSAL OF NON-ASBESTOS CONTAINING FLOOR TILES WITH ASBESTOS CONTAINING MASTIC.

EXTRA \$ _____ /S.F. _____ DOLLARS PER SQUARE FOOT

C.) ITEM UNIT PRICE #AA3. THE REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING CERAMIC TILE ADHESIVE.

EXTRA \$ _____ /S.F. _____ DOLLARS PER SQUARE FOOT

D.) ITEM UNIT PRICE #AA4. THE REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING DAMPROOFING AND BLIND FLASHING MATERIALS IN WALLS.

EXTRA \$ _____ /S.F. _____ DOLLARS PER SQUARE FOOT

E.) ITEM UNIT PRICE #AA5. THE REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING WATERPROOFING AND VAPOR BARRIER MATERIAL BELOW FLOORS.

EXTRA \$ _____ /S.F. _____ DOLLARS PER SQUARE FOOT

F.) ITEM UNIT PRICE #AA6. THE REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING WINDOW, DOOR OR BUILDING EXPANSION CAULKING AND SEALANT MATERIALS.

EXTRA \$ _____ /L.F. _____ DOLLARS PER LINEAR FOOT

G.) ITEM UNIT PRICE #AA7. THE REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING ELECTRICAL INSULATION.

EXTRA \$ _____ /L.F. _____ DOLLARS PER LINEAR FOOT

H.) ITEM UNIT PRICE #AA8. THE REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING FIRE DOOR CONSTRUCTION.

EXTRA \$ _____ /UNIT. _____ DOLLARS PER UNIT

I.) ITEM UNIT PRICE #AA9. THE REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING GLUE DAUB ASSOCIATED WITH BLACKBOARDS AND TACK BOARDS.

EXTRA \$ _____ /DAUB. _____ DOLLARS PER DAUB

J.) ITEM UNIT PRICE #AA10. THE REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING FLEX OR VIBRATION DAMPENERS.

EXTRA \$ _____ /UNIT. _____ DOLLARS PER UNIT

K.) ITEM UNIT PRICE #AA11. THE REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING ROOF FLASHING MATERIALS.

EXTRA \$ _____ /L.F. _____ DOLLARS PER LINEAR FOOT

L.) ITEM UNIT PRICE #AA12. THE REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING ROOF FIELD MATERIALS.

EXTRA \$ _____ /S.F. _____ DOLLARS PER SQUARE FOOT

M.) ITEM UNIT PRICE #AA13. THE REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING INTERIOR FIRE BRICK, MORTAR AND GASKET MATERIALS FROM BOILERS.

EXTRA \$ _____ /S.F. _____ DOLLARS PER SQUARE FOOT

N.) ITEM UNIT PRICE #AA14. THE REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING COVE BASE AND ASSOCIATED MASTIC/ADHESIVE.

EXTRA \$ _____ /L.F. _____ DOLLARS PER LINEAR FOOT

O.) ITEM UNIT PRICE #AA15. THE REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING TRANSITE PANELS OR THERMAL SYSTEM DUCT INSULATION.

EXTRA \$ _____ /S.F. _____ DOLLARS PER SQUARE FOOT

P.) ITEM UNIT PRICE #AA16. THE REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING ACCESSIBLE MUDDERED THERMAL PIPE FITTING INSULATION.

EXTRA \$ _____ /L.F. _____ DOLLARS PER LINEAR FOOT

Q.) ITEM UNIT PRICE #AA17. THE REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING THERMAL SYSTEM PIPE INSULATION.

EXTRA \$ _____ /L.F. _____ DOLLARS PER LINEAR FOOT

R.) ITEM UNIT PRICE #AA18. THE REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING FLOORING FELTS/PAPER UNDER HARDWOOD FLOORS.

EXTRA \$ _____ /S.F. _____ DOLLARS PER SQUARE FOOT

S.) ITEM UNIT PRICE #AA19. THE REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING TRANSITE TABLE TOPS.

EXTRA \$ _____ /UNIT. _____ DOLLARS PER UNIT

T.) ITEM UNIT PRICE #AA20. THE CONSTRUCTION OF A SMALL CONTAINMENT W/
DECON LESS THAN 500 SQ. FT. (INCLUDES MOBILIZATION)

EXTRA \$ _____ /UNIT. _____ DOLLARS PER UNIT

U.) ITEM UNIT PRICE #AA21. THE CONSTRUCTION OF A MID-SIZED CONTAINMENT
W/ DECON LESS THAN 2500 SQ. FT. (INCLUDES MOBILIZATION)

EXTRA \$ _____ /UNIT. _____ DOLLARS PER UNIT

V.) ITEM UNIT PRICE #AA22. THE CONSTRUCTION OF A LARGE CONTAINMENT W/
DECON GREATER THAN 2500 SQ. FT. (INCLUDES MOBILIZATION)

EXTRA \$ _____ /UNIT. _____ DOLLARS PER UNIT

WAGES PAID TO EMPLOYEES FOR WORK PERFORMED ON THIS PROJECT SHALL CONFORM WITH
CURRENT DAVIS-BACON COMMONWEALTH OF MASS. PREVAILING WAGE RATES FOR WORK
PERFORMED IN CLASSIFICATIONS LISTED IN THE PREVAILING WAGE RATE SCHEDULE.

THE ABOVE FIGURES INCLUDES ALL APPLICABLE SALES, USE AND/OR CONSUMER TAXES.
Sales Tax Exempt I.D. Number For This Project Will Be Supplied To The Awarded Low Bidder By
The Owners.

COMPLETION OF WORK:

1. SHOULD THIS PROPOSAL BE ACCEPTED BY THE OWNER, THE ABOVE BIDDER SHALL BE
PREPARED TO COMPLETE THE ABOVE MENTIONED PROJECT IN _____ CALENDAR
DAYS AFTER THE EXECUTION OF THE CONTRACT.

2. THE ABOVE MENTIONED TIME OF COMPLETION SHALL BE OF PRIME CONSIDERATION IN THIS
PROJECT, THEREFORE, CONTRACTORS NEGLECTING TO COMPLETE THIS FORM AS REQUIRED
MAY HAVE THEIR BIDS DISREGARDED.

BIDDER'S QUALIFICATION

THE UNDERSIGNED OFFERS THE FOLLOWING INFORMATION AS EVIDENCE OF HIS
QUALIFICATIONS TO PERFORM THE WORK REQUIRED.

1. NUMBER OF YEARS IN BUSINESS UNDER PRESENT NAME? _____

2. NAME OF COMPANY PRESIDENT? _____

3. NAME OF PERSON WHO WILL BE RESPONSIBLE FOR THIS PROJECT?

4. HAVE YOU EVER FAILED TO COMPLETE ANY AWARDED WORK? _____

5. LIST THREE PROJECTS IN THE LAST FIVE YEARS ON WHICH YOU SERVED AS THE GENERAL CONTRACTOR FOR WORK OF A SIMILAR NATURE.

BUILDING	ARCHITECT	OWNER	CONTRACT SUM
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

6. **BANK REFERENCE:**

7. **TRADE REFERENCES:**

THE UNDERSIGNED CERTIFIES THAT HE IS ABLE TO FURNISH LABOR AND SUPERVISION THAT CAN WORK IN HARMONY WITH ALL OTHER LABOR EMPLOYED OR TO BE EMPLOYED ON THE WORK.

IF THE UNDERSIGNED IS NOTIFIED OF THE ACCEPTANCE OF THE PROPOSAL 30 DAYS AFTER U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT APPROVAL, HE AGREES TO EXECUTE A CONTRACT IN TRIPLICATE, IN THE STANDARD FORM OF AGREEMENT ISSUED BY THE AMERICAN INSTITUTE OF ARCHITECTS OR OTHER FORM ACCEPTABLE TO THE OWNER.

BIDDER UNDERSTANDS THAT DUE TO THE LENGTH OF TIME IT TAKES U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT TO REVIEW AND APPROVE THE PROJECT **THE TOTAL BID PRICE MUST REMAIN VALID FROM THE TIME OF BIDDING, THROUGH THE CLOSING PROCESS, UNTIL PROJECT IS COMPLETED.**

BIDDER UNDERSTANDS THAT THE OWNER RESERVES THE RIGHT TO REJECT ANY OR ALL BIDS AND TO WAIVE ANY INFORMALITIES IN THE BIDDING.

THE 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 ELECTED AUTHORIZED OFFICER OR AGENT OF SUCH CORPORATION UNDER THE SEAL OF THE CORPORATION.

GUARANTEE:

1. AS A CONDITION OF THE CONTRACT, THE CONTRACTOR SHALL GUARANTEE ALL WORK AND MATERIALS FOR A PERIOD OF NOT LESS THAN ONE (1) YEAR FROM DATE OF SUBSTANTIAL COMPLETION.

SCHEDULE OF VALUES

GENERAL CONTRACTORS ARE REQUIRED TO INCLUDE ALL SUBCONTRACTORS FOR ALL CATEGORIES LISTED. FAILURE TO LIST ALL SUBCONTRACTORS MAY RESULT IN THE REJECTION OF THE BID.

GENERAL CONTRACTORS ARE REQUIRED TO SUBMIT WITH THEIR BID THE QUALIFICATIONS OF ALL THE SUBCONTRACTORS LISTED.

(please note at the following amounts will not add up to equal the proposal price)

CATEGORIES	SUBCONTRACTOR	COST
<u>GENERAL CONDITIONS</u>		\$ _____
<u>SITE WORK & IMPROVEMENTS</u>		\$ _____
<u>LANDSCAPING (include allowance)</u>		\$ _____
<u>ASBESTOS ABATEMENT</u>		\$ _____
<u>LEAD BASED PAINT ABATEMENT</u>		\$ _____
<u>DECONSTRUCTION</u>		\$ _____
<u>MASONRY REST. & CLEANING</u>		\$ _____
<u>UNIT MASONRY</u>		\$ _____
<u>METAL FABRICATIONS</u>		\$ _____
<u>STRUCTURAL STEEL</u>		\$ _____
<u>ROUGH CARPENTRY</u>		\$ _____
<u>FINISH CARPENTRY</u>		\$ _____
<u>SHINGLE ROOFING</u>		\$ _____
<u>INSULATION</u>		\$ _____
<u>STEEL DOORS AND FRAMES</u>		\$ _____
<u>WOOD DOORS</u>		\$ _____
<u>ACCESS DOORS</u>		\$ _____
<u>ALUM. WINDOWS</u>		\$ _____

<u>FINISH HARDWARE</u>	\$ _____
<u>GYP. BOARD SYSTEMS</u>	\$ _____
<u>CERAMIC TILE</u>	\$ _____
<u>ACOUSTICAL CLGS</u>	\$ _____
<u>VINYL FLOORING</u>	\$ _____
<u>CERAMIC TILE</u>	\$ _____
<u>PAINTING</u>	\$ _____
<u>SIGNAGE</u>	\$ _____
<u>BATHROOM ACCESS.</u>	\$ _____
<u>KITCHEN AND BATH CABINETS</u>	\$ _____
<u>APPLIANCES</u>	\$ _____
<u>WINDOW TREATMENT</u>	\$ _____
<u>ELEVATOR</u>	\$ _____
<u>PLUMBING (include allowance)</u>	\$ _____
<u>HVAC</u>	\$ _____
<u>FIRE SUPPRESSION (include allowance)</u>	\$ _____
<u>ELECTRICAL (include allowances)</u>	\$ _____

PERFORMANCE, LABOR AND MATERIALS BOND:

Contractor shall furnish a Performance, Labor and Materials Bond for 100% of the Contract Amount upon signing of a contract.

THE UNDERSIGNED HEREBY CERTIFIES UNDER THE PENALTIES OF PERJURY THAT THE ANSWERS TO THE QUESTIONS AND ALL STATEMENTS THEREIN CONTAINED IN THE PROPOSAL FORM ARE TRUE , CORRECT AND FAIR AND MADE WITHOUT COLLUSION OR FRAUD WITH ANY OTHER PERSON. THE WORD "PERSON" SHALL MEAN ANY NATURAL PERSON, JOINT VENTURE, PARTNERSHIP, CORPORATION OR OTHER BUSINESS OR LEGAL ENTITY.

DATE: _____

NAME OF ORGANIZATION

BY: _____

TITLE: _____

SECTION 00500 - AGREEMENT FORMS

CONTRACT FORMS (AIA DOCUMENTS)

The following forms are hereby made a part of this Contract and shall be executed as referred to in other sections of this Specification. The forms following are sample forms only, copies of same are available upon request from the Architect.

SEE ATTACHED SAMPLE CONTRACT:

- 1. U.S. DEPT. OF HOUSING AND URBAN DEVELOPMENT CONTRACT:
CONSTRUCTION CONTRACT, LUMP SUM - FORM, H.U.D. - 92442-CAA (11-00).
CONSISTING OF 3 PAGES.**
- 2. U.S. DEPT. OF HOUSING AND URBAN DEVELOPMENT FORM:
CONTRACTOR'S AND/OR MORTGAGOR'S COST BREAKDOWN.
FORM, H.U.D. - 2328 (5-95).
CONSISTING OF 3 PAGES.**
- 3. U.S. DEPT. OF HOUSING AND URBAN DEVELOPMENT FORM:
PERFORMANCE-PAYMENT BOND.
FORM, H.U.D. - 92452-CA (4-92).
CONSISTING OF 2 PAGES.**
- 4. U.S. DEPT. OF HOUSING AND URBAN DEVELOPMENT DAVIS-BACON WAGE RATES.
CONSISTING OF 12 PAGES.**

SAMPLE FORMS FOLLOW

SECTION 00700 - GENERAL CONDITIONS

STANDARD FORMS (AIA DOCUMENT A-201)

General Conditions of the Contract for Construction Standard AIA Document A201 1997 Edition, are hereby made a part of the contract Documents, except as they may be amended by Supplementary Conditions, Special Conditions, Special Requirements and the specific provisions of Documents.

Any article and/or portions of any article not amended by the Supplementary Conditions, Special Conditions, Special Requirements, and Specifications for Workmanship and Materials shall remain in full effect.

AIA DOCUMENT A - 201 FOLLOWS

SECTION 00800 - SUPPLEMENTARY CONDITIONS

AMENDMENTS

ARTICLE 1 - GENERAL PROVISIONS

DELETE 1.1.7 And Add the following subparagraph 1.1.7;

- 1.1.7 Project Manual
The Project Manual is the volume which includes the bidding requirements, sample forms and the General Conditions of the Contract as well as the Technical Requirements of the Contract and is also referred to as the 'Specifications' in the Contract Documents.

ARTICLE 2 - OWNER

- 2.2 Information & Services required of the Owner
Delete subparagraph in its entirety and substitute the following:
- 2.2.5 The Successful Bidder (Contractor) will be furnished free of charge TWO(2) copies of Drawings and Projects Manuals BY THE OWNER. Additional sets will be furnished at the cost of reproduction, postage and handling.

ARTICLE 3 - CONTRACTOR

ADD THE FOLLOWING

- 3.4.3. Procedures for product substitution are outlined additionally in **Section 01631, "Product Substitutions"**
- 3.12 Shop Drawings, Product Data and Samples
Add the following subparagraph 3.12.1.1 to 3.12
- 3.12.1.1 The procedure for submitting and obtaining acceptance for shop drawings is outlined additionally in **Section 01300 "Submittals"**.
- 3.15 'CLEANING UP:' Add the following subparagraph 3.15.3 to 3.15
- 3.15.3 Requirements for cleaning up are additionally outlined in **Section 01700 "Project Closeout"**.

ARTICLE 4 - ADMINISTRATION OF THE CONTRACT

- 4.2.7 Delete the word 'approve' and insert the word 'accept', in the first sentence of this section. Delete the words 'approval' and insert the word 'acceptance', in the last sentence of this section.

ARTICLE 5 - SUB-CONTRACTOR

No Amendments.

ARTICLE 6 - WORK BY OWNER OR BY SEPARATE CONTRACTORS

No Amendments.

ARTICLE 7 - CHANGES IN THE WORK

- 7.3.6 After ' in case of an increase in the contract sum a reasonable allowance for overhead and profit' add the following:
In no case shall the Contractor be entitled to more than what is allowed by HUD for overhead and profit based on the percentages indicated on the Contractors Form HUD 2328.

ARTICLE 8 - TIME

No Amendments

ARTICLE 9 - PAYMENTS & COMPLETION

- 9.3 Applications for payment
Add the following clause 9.3.1.3 to 9.3.1;
- 9.3.1.3 Until Substantial Completion, the Owner will pay **ninety (90%) percent of the amount due** to the Contractor on account of progress payments. Application for payment shall be made as outlined in Section 01027 "Application For Payments".
- Delete subparagraph 9.4.1 in its entirety and substitute the following:
- 9.4.1 The Architect will, within seven (7) days after the receipt of the Contractor's Application for payment, take appropriate action on the Contractor's Application for Payment.

ARTICLE 10 - PROTECTION OF PERSONS & PROPERTY

No Amendment

ARTICLE 11 - INSURANCE

Add the following: 11.4.2.A

- 11.4.2.A A Performance Bond and Labor & Materials Bond for 100% (one hundred percent) of the contract amount shall be required for this Project.

ARTICLE 12 - UNCOVERING & CORRECTION OF WORK

No Amendment

ARTICLE 13 - MISCELLANEOUS PROVISIONS

No Amendment

ARTICLE 14 - TERMINATION OR SUSPENSION OF THE CONTRACT

No Amendment

NOTE: THE FOLLOWING FOUR PAGES OF ADDITIONAL **SUPPLEMENTARY CONDITIONS OF THE CONTRACT AS MARKED AND PREPARED BY U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT, FORM HUD 2554 (2/2002)**. 4 PAGES TOTAL. SHALL FORM A PART OF THESE SUPPLEMENTAL CONDITIONS.

END OF SECTION 00800

SECTION 00850 - SCHEDULE OF DRAWINGS

<u>DRAWING TITLE</u>	<u>DRAWING No.</u>	<u>SHEET No.</u>
COVER SHEET	C0.0	01
DRAWING LIST & SYMBOLS	C1.0	02
CODE REVIEW SHEET	CR1.0	03
.....		
ALTA/ACSM LAND TITLE SURVEY	S0.1	04
ALTA/ACSM LAND TITLE SURVEY	S0.2	05
EXISTING CONDITIONS PLAN	S01	06
PROPOSED SITE LAYOUT PLAN	S02	07
PROPOSED GRADING AND UTILITIES PLAN	S03	08
CONSTRUCTION SPEC'S AND DETAILS	S04	09
.....		
LOWER LEVEL DECONSTRUCTION PLAN	A0.1	10
FIRST FLOOR DECONSTRUCTION PLAN	A0.2	11
SECOND FLOOR DECONSTRUCTION PLAN	A0.3	12
THIRD FLOOR DECONSTRUCTION PLAN	A0.4	13
ATTIC LEVEL DECONSTRUCTION PLAN	A0.5	14
.....		
LOWER LEVEL PLAN	A1.1	15
LOWER LEVEL RATED WALLS AND INSULATION PLANS	A1.1.1	16
FIRST FLOOR PLAN	A1.2	17
FIRST FLOOR RATED WALLS AND INSULATION PLANS	A1.2.1	18
SECOND FLOOR PLAN	A1.3	19
SECOND FLOOR RATED WALLS AND INSULATION PLANS	A1.3.1	20
THIRD FLOOR PLAN	A1.4	21

THIRD FLOOR RATED WALLS AND INSULATION PLANS	A1.4.1	22
ATTIC LEVEL PLAN	A1.5	23
ROOF PLAN	A1.6	24
ROOF DETAILS	A1.6.1	25
BUILDING ELEVATIONS	A2.1	26
BUILDING ELEVATIONS	A2.2	27
BUILDING ELEVATIONS	A2.3	28
BUILDING SECTIONS	A3.1	29
BUILDING SECTIONS	A3.2	30
DOOR SCHEDULE	A4.1	31
DOOR SCHEDULE	A4.2	32
DOOR SCHEDULE	A4.3	33
DOOR SCHEDULE	A4.4	34
DOOR SCHEDULE	A4.5	35
ROOM FINISH SCHEDULE	A5.1	36
ROOM FINISH SCHEDULE	A5.2	37
ROOM FINISH SCHEDULE	A5.3	38
ROOM FINISH SCHEDULE	A5.4	39
LOWER LEVEL REFLECTED CEILING PLAN	A6.0	40
FIRST FLOOR REFLECTED CEILING PLAN	A6.1	41
SECOND FLOOR REFLECTED CEILING PLAN	A6.2	42
THIRD FLOOR REFLECTED CEILING PLAN	A6.3	43
LOWER LEVEL FLOORING PLAN	A7.0	44
FIRST FLOOR FLOORING PLAN	A7.1	45
SECOND FLOOR FLOORING PLAN	A7.2	46

THIRD FLOOR FLOORING PLAN	A7.3	47
TYPICAL UNIT PLANS	A8.1	48
CANOPY DETAILS	A9.1	49
INTERIOR ELEVATIONS	A10.1	50
INTERIOR ELEVATIONS	A10.2	51
LOWER LEVEL CORRIDOR ELEVATIONS	A11.1	52
FIRST FLOOR CORRIDOR ELEVATIONS	A11.2	53
SECOND FLOOR CORRIDOR ELEVATIONS	A11.3	54
THIRD FLOOR INTERIOR CORRIDOR ELEVATIONS	A11.4	55
WALL TYPE DETAILS	A12.1	56
WALL TYPE DETAILS	A12.2	57
STAIR ONE DETAILS	A13.1	58
STAIR TWO DETAILS	A13.2	59
EXTERIOR STAIR DETAILS	A13.3	60
.....		
STRUCTURAL-LINTEL LOCATION (WEST)	ST1.1	61
STRUCTURAL- LINTEL LOCATION (EAST)	ST1.2	62
STRUCTURAL- LINTEL DETAILS	ST1.3	63
STRUCTURAL-THIRD FLOOR FRAMING PLAN	ST2.0	64
STRUCTURAL-THIRD FLOOR DETAILS	ST2.1	65
STRUCTURAL-SEISMIC FLOOR TO WALL ANCHORING	ST3.0	66
.....		
PLUMBING & FIRE PROTECTION SYM,SCHD,NOTES & DETL	PFP0.1	67
PLUMBING & FIRE PROTECTION RISERS AND DETAILS	PFP0.2	68

PLUMBING & FIRE PROTECTION LOWER LEVEL FLOOR PLAN	PFP1.01	69
PLUMBING & FIRE PROTECTION FIRST FLOOR PLAN	PFP1.02	70
PLUMBING & FIRE PROTECTION SECOND FLOOR PLAN	PFP1.03	71
PLUMBING & FIRE PROTECTION THIRD FLOOR PLAN	PFP1.04	72
PLUMBING & FIRE PROTECTION ATTIC PLAN	PFP1.05	73



MECHANICAL SYMB, SCHD, NOTES & DETAILS	M0.01	74
MECHANICAL DETAILS	M0.02	75
MECHANICAL RISERS AND DETAILS	M0.03	76
MECHANICAL LOWER LEVEL FLOOR PLAN	M1.01	77
MECHANICAL FIRST FLOOR PLAN	M1.02	78
MECHANICAL SECOND FLOOR PLAN	M1.03	79
MECHANICAL THIRD FLOOR PLAN	M1.04	80
HEATING LOWER LEVEL FLOOR PLAN	M2.01	81
HEATING FIRST FLOOR PLAN	M2.02	82
HEATING SECOND FLOOR PLAN	M2.03	83
HEATING THIRD FLOOR PLAN	M2.04	84
MECHANICAL ATTIC PLAN	M3.01	85
MECHANICAL SITE PLAN	M3.02	86



ELECTRICAL SYMB, SCHD, NOTES & DETAILS	E0.01	87
ELECTRICAL DISTIRB RISER DIAGRAM & PANEL SCHD.	E0.02	88

**STEVENS MEMORIAL SENIOR HOUSING, LUDLOW, MA.
HUD 023-EE241**

studio one inc. architects

ELECTRICAL PANEL SCHEDULES & DETAILS	E0.03	89
ELECTRICAL LIGHTING LOWER LEVEL FLOOR PLAN	E1.01	90
ELECTRICAL LIGHTING FIRST FLOOR PLAN	E1.02	91
ELECTRICAL LIGHTING SECOND FLOOR PLAN	E1.03	92
ELECTRICAL LIGHTING THIRD FLOOR PLAN	E1.04	93
ELECTRICAL POWER LOWER LEVEL FLOOR PLAN	E2.01	94
ELECTRICAL POWER FIRST FLOOR PLAN	E2.02	95
ELECTRICAL POWER SECOND FLOOR PLAN	E2.03	96
ELECTRICAL POWER THIRD FLOOR PLAN	E2.04	97
ELECTRICAL LOWER LEVEL UNIT FLOOR PLANS	E3.01	98
ELECTRICAL FIRST FLOOR UNIT FLOOR PLANS	E3.02	99
ELECTRICAL SECOND FLOOR UNIT FLOOR PLANS	E3.03	100
ELECTRICAL THIRD FLOOR UNIT FLOOR PLANS	E3.04	101
ELECTRICAL ATTIC PLAN	E4.01	102
ELECTRICAL SITE PLAN	E5.01	103

END OF SECTION 00850

SECTION 01010 - SUMMARY OF WORK

PART 1 - GENERAL

RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

PROJECT DESCRIPTION

The Project consists of the adaptive reuse and renovation of the Stevens Memorial Building into 28 units of senior housing as shown on the Contract Documents prepared by Studio One Inc. Architect-Planners, Dated, February 18, 2011.

The existing building was constructed in 1906 and is four stories plus attic, constructed of exterior and some interior masonry walls, wood framed floors, some wood framed interior walls, wood framed roof with slate shingles, wood window and doors, the basement contains a pool, locker rooms, showers and bathrooms. The first floor is broken up into rooms, the second floor contains the auditorium/gymnasium and the third floor contains the balcony. The existing boiler room is a separate structure off the back of the main building.

The Work

Deconstruction: Demolition work shall include but not limited to the removal and disposal of the boiler room out building, all existing interior non load bearing partitions, finishes, windows systems, doors and frames, pool and equipment, plumbing fixtures and piping, mechanical systems, ductwork, radiation, piping, and equipment, electrical fixtures, systems and wiring, telephone systems and wiring, catv, and equipment not schedule to remain. Removal of areas of existing interior and exterior masonry walls for new openings, removal of sections of existing concrete slabs, removal of existing exterior site improvements, removal of existing slate roofing are part of the work.

Contractor shall coordinate the removal of systems owned by outside vendors with those vendors. Contractor shall be required to identify and protect existing systems and utilities scheduled to remain. Contractor shall coordinate with the owner items to be salvaged for owners use.

All nonhazardous demolition waste must be separated, salvaged and recycled as indicated in Section 01740 Construction Waste Management and Disposal.

All hazardous materials must be abated and disposed of as indicated in Section 02070 Miscellaneous Hazardous Materials, Section 02080 Asbestos Abatement and Section 02090 Lead Containing Paint Handling.

New Construction:

The new work includes but not limited to reinf. concrete footings, testing, new brick and block masonry wall construction and patching, plaster patching, new steel framing, metal stud partitions, new alum. windows, new steel doors and frames, wood doors and steel frames, interior finishes including painted gyp. wallb'd walls and clg's, acoustical panel clg's, mct, non-slip sheet goods, carpet, ceramic tile, wood floor refinishing, kitchen cabinets and countertops and bathrooms, residential appliances, new asphalt/fiberglass shingle roofing, new fabric canopy, new elevator and shaft, plumbing, heating, fire suppression, and electrical work. Site improvements include new concrete sidewalks, asphalt parking lots, landscaping, site lighting, sitting areas, new utilities and storm drainage.

Nonhazardous construction waste must be separated, salvaged and recycled as indicated in Section 01740 Construction Waste Management and Disposal.

CONTRACTOR USE OF PREMISES

General: Limit use of the premises to construction activities within the property lines. Allow for public access to the R.O.W. on the south side of property. Parking allowed within property/contract limit line.

Keep driveways and entrances serving the premises clear and available at all times. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on site.

Use of the Existing Building: Maintain the existing buildings in a weathertight condition throughout the construction period. Repair damage caused by construction operations. Take all precautions necessary to protect the building and its occupants during the construction period. Maintain all existing utilities in working order during construction.

At some point during the project work will take place during the winter months and winter conditions will apply. G.C. is required to include winter conditions in their bid.

Winter Conditions: General Contractor shall be responsible for providing and maintaining all labor, materials, equipment and services necessary to continue construction activities which may otherwise be delayed due to cold temperatures and precipitation.

OWNER OCCUPANCY

Partial Owner Occupancy of Project Building: The Owner reserves the right to occupy and to place and install equipment in completed areas of the project building, prior to Substantial Completion provided that such occupancy does not interfere with completion of the Work. Such placing of equipment and partial occupancy shall not constitute acceptance of the total Work.

Obtain a Certificate of Occupancy from local building officials prior to full Owner occupancy.

Prior to partial Owner occupancy, mechanical and electrical systems shall be fully operational. Required inspections and tests shall have been successfully completed. Contractor shall conduct meetings with the owner's representatives on the proper operation and maintenance of all systems prior to final acceptance.

OWNER-FURNISHED ITEMS

The Owner will provide and or install all as indicated 'by Owner' or N.I.C. on the contract documents

The Owner will arrange and pay for delivery of Owner-furnished items in accordance with the Contractor's Construction Schedule, and will inspect deliveries for damage.

If Owner-furnished items are damaged, defective or missing, the Owner will arrange for replacement. The Owner will also arrange for manufacturer's field services, and the delivery of manufacturer's warranties and bonds to the Contractor.

The Contractor is responsible for designating the delivery dates of Owner-furnished items in the Contractor's Construction Schedule and for receiving, unloading and handling Owner-furnished items at the site. The Contractor is responsible for protecting Owner-furnished items from damage,

including damage from exposure to the elements, and to repair or replace items damaged as a result of his operations.

PART 2 - PRODUCTS (Not applicable).

PART 3 - EXECUTION

END OF SECTION 01010

SECTION 01026 - UNIT PRICES

This Section specifies administrative and procedural requirements for unit prices.

A unit price is an amount proposed by Bidders and stated on the Bid Form as a price per unit of measurement for materials or services that will be added to or deducted from the Contract Sum by Change Order if estimated quantities of Work required by Contract Documents are increased or decreased.

Unit prices include necessary material, overhead, profit and applicable taxes.

Refer to individual Sections for construction activities requiring establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.

Schedule: A "Unit Price Schedule" is included at the end of this Section. Sections referenced in the Schedule contain requirements for materials and methods described under each unit price.

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

UNIT PRICES:

SHOULD THE CONTRACTOR BE REQUIRED TO PERFORM ADDITIONAL WORK OR SHOULD HE BE DIRECTED TO OMIT WORK REQUIRED BY THE CONTRACT DOCUMENTS, HE WILL AGREE TO OFFER THE FOLLOWING CREDITS AND EXTRAS TO THE OWNER, AS THE CASE MAY BE, ON THE BASIS OF THE UNIT PRICES LISTED BELOW AND IN ACCORDANCE WITH REQUIREMENTS OF THE PROJECT MANUAL.

A.) FULL HEIGHT 1 HR. RATED WOOD STUD PARTITIONS.

THIS CONTRACTOR MAY BE REQUIRED TO PROVIDE AND INSTALL NEW FULL HEIGHT PARTITIONS CONSTRUCTED OF 3-1/2" WOOD STUDS AT 16" O.C., W/ TOP AND BOTTOM PLATES, LATERAL BRACING AND 3-1/2" MINERAL WOOL BATTS AND 5/8" GWB FIRECODE TYPE-X, BOTH SIDES, TAPED, SANDED AND PAINTED, COLOR AS SELECTED BY THE ARCHITECT FOR A PRICE OF:

EXTRA \$ _____ /L.F. _____ DOLLARS PER LINEAR FOOT

CREDIT \$ _____ /L.F. _____ DOLLARS PER LINEAR FOOT

B.) SUSPENDED GYPSUM CEILINGS.

THIS CONTRACTOR MAY BE REQUIRED TO PROVIDE AND INSTALL NEW SUSPENDED GYPSUM CEILINGS 5/8" GWB FIRECODE TYPE-X TAPED, SANDED AND PAINTED, COLOR AS SELECTED BY THE ARCHITECT OVER FULL SUSPENSION GRID 1-1/2" 16 GA. METAL CHANNELS AND 20 GA. METAL FURRING CHANNELS @ 24" O.C. AS INDICATED ON TYPICAL DETAILS FOR A PRICE OF:

EXTRA \$ _____ /S.F. _____ DOLLARS PER SQUARE FOOT

CREDIT \$ _____ /S.F. _____ DOLLARS PER SQUARE FOOT

C.) SUSPENDED ACOUSTICAL PANEL CLGS.

THIS CONTRACTOR MAY BE REQUIRED TO PROVIDE AND INSTALL NEW 2'X2' SUSPENDED ACOUSTICAL CEILING TILES AND GRID SYSTEM TO MEET THE STANDARDS SET FORTH WITHIN THE PROJECT MANUAL FOR A PRICE OF:

EXTRA \$ _____ /S.F. _____ DOLLARS PER SQUARE FOOT

CREDIT \$ _____ /S.F. _____ DOLLARS PER SQUARE FOOT

D.) WOOD FLOOR REFINISHING

THIS CONTRACTOR MAY BE REQUIRED TO PERFORM ADDITIONAL WOOD FLOOR REFINISHING OR MAY BE DIRECTED TO OMIT WOOD FLOOR REFINISHING REQUIRED BY THE CONTRACT DOCUMENTS. THIS CONTRACTOR SHALL PROVIDE ALL LABOR, MATERIALS & EQUIPMENT REQUIRED TO PREFORM THIS WORK FOLLOWING THE SAME PROCEDURES & USING THE SAME MATERIALS AS THE BASE BID WOOD FLOOR REFINISHING WORK FOR THE PRICE OF :

EXTRA \$ _____ /SQ. FT. _____ DOLLARS PER SQUARE FOOT

CREDIT \$ _____ /SQ. FT. _____ DOLLARS PER SQUARE FOOT

E.) MCT FLOORING.

THIS CONTRACTOR MAY BE REQUIRED TO PROVIDE AND INSTALL ADDITIONAL 13" X 13" MARMOLEUM COMPOSITION TILE AS DIRECTED BY THE ARCHITECT. NEW MCT SHALL MEET THE STANDARDS AS SET FORTH WITHIN THE PROJECT MANUAL. ALL COLORS, PATTERNS AND BORDERS SHALL BE SELECTED BY THE ARCHITECT. AND SHALL DO SO FOR A PRICE OF:

EXTRA \$ _____ /S.F. _____ DOLLARS PER SQUARE FOOT

CREDIT \$ _____ /S.F. _____ DOLLARS PER SQUARE FOOT

F.) NON-SLIP SHEET FLOORING.

THIS CONTRACTOR MAY BE REQUIRED TO PROVIDE AND INSTALL ADDITIONAL NON-SLIP SHEET FLOORING AS DIRECTED BY THE ARCHITECT. NEW NON-SLIP SHEET FLOORING SHALL MEET THE STANDARDS AS SET FORTH WITHIN THE PROJECT MANUAL. ALL COLORS, PATTERNS AND BORDERS SHALL BE SELECTED BY THE ARCHITECT. AND SHALL DO SO FOR A PRICE OF:

EXTRA \$ _____ /S.F. _____ DOLLARS PER SQUARE FOOT

CREDIT \$ _____ /S.F. _____ DOLLARS PER SQUARE FOOT

G.) PAINTING.

THIS CONTRACTOR MAY BE REQUIRED TO PERFORM ADDITIONAL PAINTING OR MAY BE DIRECTED TO OMIT PAINTING REQUIRED BY THE CONTRACT DOCUMENTS. THIS CONTRACTOR SHALL PROVIDE ALL LABOR, MATERIALS & EQUIPMENT REQUIRED TO PREFORM THIS WORK FOLLOWING THE SAME PROCEDURES & USING THE SAME MATERIALS AS THE BASE BID PAINTING WORK FOR THE PRICE OF :

EXTRA \$ _____ /S.F. _____ DOLLARS PER SQUARE FOOT

CREDIT \$ _____ /S.F. _____ DOLLARS PER SQUARE FOOT

H.) STEEL DOOR AND FRAME.

THIS CONTRACTOR MAY BE REQUIRED TO INSTALL ADDITIONAL STEEL DOORS AND FRAMES OR MAY BE DIRECTED TO OMIT STEEL DOORS AND FRAMES REQUIRED BY THE CONTRACT DOCUMENTS. THIS CONTRACTOR SHALL PROVIDE ALL LABOR, MATERIALS & EQUIPMENT REQUIRED TO PREFORM THIS WORK FOLLOWING THE SAME PROCEDURES & USING THE SAME MATERIALS AS THE BASE BID STEEL DOORS AND FRAMES WORK. INSTALLATION TO INCLUDE MASONRY OPENING, STEEL LINTELS, ANCHORS, DOOR, FRAME, BUTTS, LOCKSET, DOOR SILENCERS AND PAINTING FOR THE PRICE OF :

EXTRA \$ _____ / DOOR. _____ DOLLARS PER DOOR

CREDIT \$ _____ / DOOR. _____ DOLLARS PER DOOR

J.) FLUSH WOOD DOOR AND STEEL FRAME.

THIS CONTRACTOR MAY BE REQUIRED TO INSTALL ADDITIONAL WOOD DOORS AND STEEL FRAMES OR MAY BE DIRECTED TO OMIT WOOD DOORS AND STEEL FRAMES REQUIRED BY THE CONTRACT DOCUMENTS. THIS CONTRACTOR SHALL PROVIDE ALL LABOR, MATERIALS & EQUIPMENT REQUIRED TO PREFORM THIS WORK FOLLOWING THE SAME PROCEDURES & USING THE SAME MATERIALS AS THE BASE BID STEEL DOORS AND FRAMES WORK. INSTALLATION TO INCLUDE MASONRY OPENING, STEEL LINTELS, ANCHORS, DOOR, FRAME, BUTTS, LOCKSET, DOOR SILENCERS AND PAINTING FOR THE PRICE OF :

EXTRA \$ _____ / DOOR. _____ DOLLARS PER DOOR

CREDIT \$ _____ / DOOR. _____ DOLLARS PER DOOR

K.) DUPLEX ELECTRICAL OUTLETS.

THIS CONTRACTOR MAY BE REQUIRED TO PROVIDE AND INSTALL ADDITIONAL DUPLEX ELECTRICAL RECEPTACLES CONSISTING OF STANDARD WALL RECESSED METAL RECEPTACLE BOXES, FACEPLATES, ETC. THIS WORK REQUIRED MAY OCCUR PRIOR TO WALL CAVITY OR AFTER WALL FINISH APPLICATIONS AND CAVITY CONCEALMENT DURING THE CONSTRUCTION PERIOD PRIOR TO PROJECT 'SUBSTANTIAL COMPLETION'. THE CONTRACTOR SHALL BE REQUIRED TO PATCH AND REPAIR ANY WALL SURFACE DAMAGED DURING THIS WORK AND SHALL BE INCLUDED IN THIS UNIT PRICE. THIS WORK SHALL BE PROVIDE UNPON REQUEST OF THE OWNER FOR THE PRICE OF :

EXTRA \$ _____ /OUTLET _____ DOLLARS PER OUTLET

CREDIT \$ _____ /OUTLET _____ DOLLARS PER OUTLET

L.) CATV OUTLETS.

THIS CONTRACTOR MAY BE REQUIRED TO PROVIDE AND INSTALL ADDITIONAL CABLE T.V. OUTLETS CONSISTING OF STANDARD WALL RECESSED METAL RECEPTACLE BOXES, FACEPLATES, WIRING, ETC. THIS WORK REQUIRED MAY OCCUR PRIOR TO WALL CAVITY OR AFTER WALL FINISH APPLICATIONS AND CAVITY CONCEALMENT DURING THE CONSTRUCTION PERIOD PRIOR TO PROJECT 'SUBSTANTIAL COMPLETION'. THE CONTRACTOR SHALL BE REQUIRED TO PATCH AND REPAIR ANY WALL SURFACE DAMAGED DURING THIS WORK AND SHALL BE INCLUDED IN THIS UNIT PRICE. ALL NEW RECEPTACLES SHALL MEET THE STANDARDS SET FORTH WITHIN THE PROJECT MANUAL. THIS WORK SHALL BE PROVIDE UNPON REQUEST OF THE OWNER FOR THE PRICE OF :

EXTRA \$ _____ /OUTLET _____ DOLLARS PER OUTLET

CREDIT \$ _____ /OUTLET _____ DOLLARS PER OUTLET

M.) TELEPHONE OUTLETS.

THIS CONTRACTOR MAY BE REQUIRED TO PROVIDE AND INSTALL ADDITIONAL TELEPHONE OUTLETS CONSISTING OF STANDARD WALL RECESSED METAL RECEPTACLE BOXES, FACEPLATES, WIRING, ETC. THIS WORK REQUIRED MAY OCCUR PRIOR TO WALL CAVITY OR AFTER WALL FINISH APPLICATIONS AND CAVITY CONCEALMENT DURING THE CONSTRUCTION PERIOD PRIOR TO PROJECT 'SUBSTANTIAL COMPLETION'. THE CONTRACTOR SHALL BE REQUIRED TO PATCH AND REPAIR ANY WALL SURFACE DAMAGED DURING THIS WORK AND SHALL BE INCLUDED IN THIS UNIT PRICE. ALL NEW RECEPTACLES SHALL MEET THE STANDARDS SET FORTH WITHIN THE PROJECT MANUAL. THIS WORK SHALL BE PROVIDE UNPON REQUEST OF THE OWNER FOR THE PRICE OF :

EXTRA \$ _____ /OUTLET _____ DOLLARS PER OUTLET

CREDIT \$ _____ /OUTLET _____ DOLLARS PER OUTLET

N.) FIRE ALARM SYSTEM DEVICES.

THIS CONTRACTOR MAY BE REQUIRED TO PROVIDE AND INSTALL NEW FIRE ALARM SYSTEM DEVICES, WIRING, ETC AND ALL RELATED WORK. THIS WORK REQUIRED MAY OCCUR PRIOR TO WALL CAVITY OR AFTER WALL FINISH APPLICATIONS AND CAVITY CONCEALMENT DURING THE CONSTRUCTION PERIOD PRIOR TO PROJECT 'SUBSTANTIAL COMPLETION'. THE CONTRACTOR SHALL BE REQUIRED TO PATCH AND REPAIR ANY WALL SURFACE DAMAGED DURING THIS WORK AND SHALL BE INCLUDED IN THIS UNIT PRICE. ALL NEW DETECTORS SHALL MEET THE STANDARDS SET FORTH WITHIN THE PROJECT MANUAL. THIS WORK SHALL BE PROVIDE UNPON REQUEST OF THE OWNER FOR THE PRICE OF :

EXTRA \$ _____ /OUTLET _____ DOLLARS PER DEVICE

CREDIT \$ _____ /OUTLET _____ DOLLARS PER DEVICE

O.) MASONRY REPOINTING

THIS CONTRACTOR MAY BE REQUIRED TO PERFORM ADDITIONAL REPOINTING WORK OF EXISTING BRICK MASONRY WALL CONSTRUCTION NOT SPECIFIED OR MAY BE DIRECTED TO OMIT MASONRY WALL REPOINTING REQUIRED BY THE CONTRACT DOCUMENTS FOR REPOINTING IN THE BASE BID. THIS CONTRACTOR SHALL PROVIDE ALL LABOR, MATERIALS & EQUIPMENT REQUIRED TO PREFORM THIS WORK FOLLOWING THE SAME PROCEDURES & USING THE SAME MATERIALS AS THE BASE BID MASONRY REPOINTING WORK FOR THE PRICE OF :

EXTRA \$ _____ /SQ. FT. _____ DOLLARS PER SQUARE FOOT

CREDIT \$ _____ /SQ. FT. _____ DOLLARS PER SQUARE FOOT

P.) MASONRY REBUILDING

THIS CONTRACTOR MAY BE REQUIRED TO REBUILD EXISTING UNACCEPTABLE BRICK MASONRY WALL CONSTRUCTION ENCOUNTERED DURING THE RENOVATION WORK NOT SPECIFIED FOR REBUILDING IN THE BASE BID. OR MAY BE DIRECTED TO OMIT BRICK MASONRY WALL RECONSTRUCTION REQUIRED BY THE CONTRACT DOCUMENTS. UNACCEPTABLE SHALL BE DEFINED AS WHICH IS LOOSE, DETERIORATED, OUT OF PLUMB OR SHOWS ANY OTHER SIGNS OF MOVEMENT AS DETERMINED BY THE ARCHITECT AND STRUCTURAL ENGINEER. THIS CONTRACTOR SHALL PROVIDE ALL LABOR, MATERIALS & EQUIPMENT REQUIRED TO PREFORM THIS WORK FOLLOWING THE SAME PROCEDURES & USING THE SAME MATERIALS AS THE BASE BID MASONRY REBUILDING WORK FOR THE PRICE OF :

EXTRA \$ _____ /SQ. FT. _____ DOLLARS PER SQUARE FOOT

CREDIT \$ _____ /SQ. FT. _____ DOLLARS PER SQUARE FOOT

Q.) PLYWOOD ROOF SHEATHING

THIS CONTRACTOR MAY BE REQUIRED TO PROVIDE AND INSTALL ADDITIONAL 3/4" PLYWOOD ROOF SHEATHING OR MAY BE DIRECTED TO OMIT 3/4" PLYWOOD ROOF SHEATHING REQUIRED BY THE CONTRACT DOCUMENTS. THIS CONTRACTOR SHALL PROVIDE ALL LABOR, MATERIALS & EQUIPMENT REQUIRED TO PERFORM THIS WORK FOLLOWING THE SAME PROCEDURES & USING THE SAME MATERIALS AS THE BASE BID WORK FOR THE PRICE OF :

EXTRA \$ _____ /SQ. FT. _____ DOLLARS PER SQUARE FOOT

CREDIT \$ _____ /SQ. FT. _____ DOLLARS PER SQUARE FOOT

ASBESTOS ABATEMENT UNIT PRICES.

- A.) ITEM UNIT PRICE #AA1. THE REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING FLOOR TILES WITH ASBESTOS CONTAINING MASTIC.**

EXTRA \$ _____ /S.F. _____ DOLLARS PER SQUARE FOOT

- B.) ITEM UNIT PRICE #AA2. THE REMOVAL AND DISPOSAL OF NON-ASBESTOS CONTAINING FLOOR TILES WITH ASBESTOS CONTAINING MASTIC.**

EXTRA \$ _____ /S.F. _____ DOLLARS PER SQUARE FOOT

- C.) ITEM UNIT PRICE #AA3. THE REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING CERAMIC TILE ADHESIVE.**

EXTRA \$ _____ /S.F. _____ DOLLARS PER SQUARE FOOT

- D.) ITEM UNIT PRICE #AA4. THE REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING DAMPROOFING AND BLIND FLASHING MATERIALS IN WALLS.**

EXTRA \$ _____ /S.F. _____ DOLLARS PER SQUARE FOOT

- E.) ITEM UNIT PRICE #AA5. THE REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING WATERPROOFING AND VAPOR BARRIER MATERIAL BELOW FLOORS.**

EXTRA \$ _____ /S.F. _____ DOLLARS PER SQUARE FOOT

- F.) ITEM UNIT PRICE #AA6. THE REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING WINDOW, DOOR OR BUILDING EXPANSION CAULKING AND SEALANT MATERIALS.**

EXTRA \$ _____ /L.F. _____ DOLLARS PER LINEAR FOOT

- G.) ITEM UNIT PRICE #AA7. THE REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING ELECTRICAL INSULATION.**

EXTRA \$ _____ /L.F. _____ DOLLARS PER LINEAR FOOT

- H.) ITEM UNIT PRICE #AA8. THE REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING FIRE DOOR CONSTRUCTION.**

EXTRA \$ _____ /UNIT. _____ DOLLARS PER UNIT

- I.) ITEM UNIT PRICE #AA9. THE REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING GLUE DAUB ASSOCIATED WITH BLACKBOARDS AND TACK BOARDS.**

EXTRA \$ _____ /DAUB. _____ DOLLARS PER DAUB

J.) ITEM UNIT PRICE #AA10. THE REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING FLEX OR VIBRATION DAMPENERS.

EXTRA \$ _____ /UNIT. _____ DOLLARS PER UNIT

K.) ITEM UNIT PRICE #AA11. THE REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING ROOF FLASHING MATERIALS.

EXTRA \$ _____ /L.F. _____ DOLLARS PER LINEAR FOOT

L.) ITEM UNIT PRICE #AA12. THE REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING ROOF FIELD MATERIALS.

EXTRA \$ _____ /S.F. _____ DOLLARS PER SQUARE FOOT

M.) ITEM UNIT PRICE #AA13. THE REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING INTERIOR FIRE BRICK, MORTAR AND GASKET MATERIALS FROM BOILERS.

EXTRA \$ _____ /S.F. _____ DOLLARS PER SQUARE FOOT

N.) ITEM UNIT PRICE #AA14. THE REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING COVE BASE AND ASSOCIATED MASTIC/ADHESIVE.

EXTRA \$ _____ /L.F. _____ DOLLARS PER LINEAR FOOT

O.) ITEM UNIT PRICE #AA15. THE REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING TRANSITE PANELS OR THERMAL SYSTEM DUCT INSULATION.

EXTRA \$ _____ /S.F. _____ DOLLARS PER SQUARE FOOT

P.) ITEM UNIT PRICE #AA16. THE REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING ACCESSIBLE MUDDERED THERMAL PIPE FITTING INSULATION.

EXTRA \$ _____ /L.F. _____ DOLLARS PER LINEAR FOOT

Q.) ITEM UNIT PRICE #AA17. THE REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING THERMAL SYSTEM PIPE INSULATION.

EXTRA \$ _____ /L.F. _____ DOLLARS PER LINEAR FOOT

R.) ITEM UNIT PRICE #AA18. THE REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING FLOORING FELTS/PAPER UNDER HARDWOOD FLOORS.

EXTRA \$ _____ /S.F. _____ DOLLARS PER SQUARE FOOT

S.) ITEM UNIT PRICE #AA19. THE REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING TRANSITE TABLE TOPS.

EXTRA \$ _____ /UNIT. _____ DOLLARS PER UNIT

**T.) ITEM UNIT PRICE #AA20. THE CONSTRUCTION OF A SMALL CONTAINMENT W/
DECON LESS THAN 500 SQ. FT. (INCLUDES MOBILIZATION)**

EXTRA \$ _____ /UNIT. _____ DOLLARS PER UNIT

**U.) ITEM UNIT PRICE #AA21. THE CONSTRUCTION OF A MID-SIZED CONTAINMENT
W/ DECON LESS THAN 2500 SQ. FT. (INCLUDES MOBILIZATION)**

EXTRA \$ _____ /UNIT. _____ DOLLARS PER UNIT

**V.) ITEM UNIT PRICE #AA22. THE CONSTRUCTION OF A LARGE CONTAINMENT W/
DECON GREATER THAN 2500 SQ. FT. (INCLUDES MOBILIZATION)**

EXTRA \$ _____ /UNIT. _____ DOLLARS PER UNIT

END OF SECTION 01026

SECTION 01250 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Sections include the following:
 - 1. Division 1 Section "Unit Prices" for administrative requirements for using unit prices.
 - 2. Division 1 Section "Product Requirements" for administrative procedures for handling requests for substitutions made after Contract award.

1.3 MINOR CHANGES IN THE WORK

- A. Architect will issue supplemental instructions authorizing Minor Changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, "Architect's Supplemental Instructions."

1.4 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. Proposal Requests issued by Architect are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
 - 2. Within 10 days after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
 - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.

- c. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
 - B. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a request for a change the Architect.
 1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
 2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 4. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
 5. Comply with requirements in Division 1 Section "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.
 - C. Proposal Request Form: Use AIA Document G709 for Proposal Requests.
 - D. Proposal Request Form: For Change Order proposals, use forms provided by Owner. Sample copies are included at end of this Section.

1.5 CHANGE ORDER PROCEDURES

- A. Upon the Owner's approval of a Change Order Proposal Request, the Architect will issue a Change Order for signatures of the Owner and Contractor on form HUD-92437, as provided in the Conditions of the Contract.

1.6 CONSTRUCTION CHANGE DIRECTIVE

- A. Work Change Directive: Architect may issue a Work Change Directive on AIA Document G714. Work Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
 1. Work Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

- B. Documentation: Maintain detailed records on a time and material basis of work required by the Work Change Directive.
 - 1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01250

SECTION 01290 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. Related Sections include the following:
 - 1. Division 1 Section "Unit Prices" for administrative requirements governing use of unit prices.
 - 2. Division 1 Section "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
 - 3. Division 1 Section "Construction Progress Documentation" for administrative requirements governing preparation and submittal of Contractor's Construction Schedule and Submittals Schedule.

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 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.
 - 1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:
 - a. Application for Payment forms with Continuation Sheets.
 - b. Submittals Schedule.
 - 2. Submit the Schedule of Values to Architect at earliest possible date but no later than (fourteen) 14 days before the date scheduled for submittal of initial Applications for Payment.

3. Sub-schedules: Where the Work is separated into phases requiring separately phased payments, provide subs-schedules showing values correlated with each phase of payment.
- 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.
1. Identification: Include the following Project identification on the Schedule of Values:
 - a. Project name and location.
 - b. Name of Architect.
 - c. Architect's project number.
 - d. Contractor's name and address.
 - e. Date of submittal.
 2. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:
 - a. Related Specification Section or Division.
 - b. Description of the Work.
 - c. Name of subcontractor.
 - d. Name of manufacturer or fabricator.
 - e. Name of supplier.
 - f. Change Orders (numbers) that affect value.
 - g. Dollar value.
 - 1) Percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
 3. 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 Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate.
 4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
 5. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
 - a. Differentiate between items stored on-site and items stored off-site. Include evidence of insurance or bonded warehousing if required.
 6. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
 7. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
 - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.

8. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.5 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
 1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.
- C. Payment Application Times: The date for each progress payment is the 15th day of each month. The period covered by each Application for Payment starts on the day following the end of the preceding period and ends 15 days before the date for each progress payment.
- D. Payment Application Forms: Use HUD Document HUD-92448 as the form for Application for Payment.
- E. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
 1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
 2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
- F. Transmittal: Submit 6, (six) signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
 1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's liens from every entity who is lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment including but not limited to all subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.
 1. Submit partial waivers on each item for amount requested, before deduction for retainage, on each item.
 2. When an application shows completion of an item, submit final or full waivers.

3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
 4. Waiver Delays: Submit each Application for Payment with Contractor's waiver of mechanic's lien for construction period covered by the application.
 - a. Submit final Application for Payment with or preceded by final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
 5. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.
- H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
 2. Schedule of Values.
 3. Contractor's Construction Schedule (preliminary if not final).
 4. Products list.
 5. Schedule of unit prices.
 6. Submittals Schedule (preliminary if not final).
 7. List of Contractor's staff assignments.
 8. List of Contractor's principal consultants.
 9. Copies of building permits.
 10. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 11. Initial progress report.
 12. Report of pre-construction conference.
 13. Certificates of insurance and insurance policies.
 14. Performance and payment bonds.
 15. Data needed to acquire Owner's insurance.
 16. Initial settlement survey and damage report if required.
- I. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- J. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.

3. Updated final statement, accounting for final changes to the Contract Sum.
4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
6. AIA Document G707, "Consent of Surety to Final Payment."
7. Evidence that claims have been settled.
8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01290

SECTION 01310 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. General project coordination procedures.
 - 2. Conservation.
 - 3. Coordination Drawings.
 - 4. Administrative and supervisory personnel.
 - 5. Project meetings.
- B. Each contractor shall participate in coordination requirements. Certain areas of responsibility will be assigned to a specific contractor.
- C. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 1 Section "Summary of Multiple Contracts" for a description of the division of Work among separate contracts and responsibility for coordination activities not in this Section.
 - 2. Division 1 Section "Construction Progress Documentation" for preparing and submitting the Contractor's Construction Schedule.
 - 3. Division 1 Section "Execution Requirements" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
 - 4. Division 1 Section "Closeout Procedures" for coordinating Contract closeout.

1.3 COORDINATION

- A. Coordination: Coordinate construction operations included in various Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation. Each contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its operations with operations, included in different Sections, that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. If necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
1. Preparation of Contractor's Construction Schedule.
 2. Preparation of the Schedule of Values.
 3. Installation and removal of temporary facilities and controls.
 4. Delivery and processing of submittals.
 5. Progress meetings.
 6. Pre-installation conferences.
 7. Project closeout activities.
- D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.
1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work.

1.4 SUBMITTALS

- A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.
1. Indicate relationship of components shown on separate Shop Drawings.
 2. Indicate required installation sequences.
 3. Refer to Division 15 Section "Basic Mechanical Materials and Methods" and Division 16 Section "Basic Electrical Materials and Methods" for specific Coordination Drawing requirements for mechanical and electrical installations.
 4. Coordination and Background Drawings shall be prepared as follows:

First: Sheet metal trade shall draw ductwork layout in detail on drawings provided by architect. Plans shall show top and bottom of duct heights, location of ducts, duct sizes including insulation, structural steel and bottom of steel elevations.

Second: As part of work SECTION 13900, fire suppression trade shall draw fire protection piping, sprinkler heads, drain piping, etc. on coordination drawings prepared by sheet metal trade. Include pipe sizes, center line elevations of pipes and locations of pipe.

Third: As part of DIVISION 16 – ELECTRICAL, electrical trade shall draw electrical distribution conduits, cable trays, wires, panels, and other trades on coordination drawings which have been prepared by sheet metal and fire suppression trades.

Fourth: As part of SECTION 15400, plumbing trade shall draw waster piping, vent piping, water piping, risers and other plumbing work which must be coordinated with other trades on coordination drawings which have been prepared by sheet metal, fire suppression and electrical trades. Include elevations and locations of all plumbing equipment.

Fifth: As part of work of SECTION 15600, HVAC trades shall draw HVAC piping work which must be coordinated with other trades on coordination drawings that have been prepared by the sheet metal, fire suppression, electrical and plumbing trades.

Each trade shall use a different color code.

5. Coordination Meeting and Drawing Revisions

Sixth: General contractor shall hold coordination meetings with sheet metal, fire suppression, electrical, plumbing and HVAC trades and shall resolve conflicts between trades. Coordination drawings are to assist in identifying trade conflicts.

Seventh: Each trade shall revise their drawing to remedy conflicts identified during coordination meeting. The general contractor shall create and maintain a composite drawing showing all revisions.

Eighth: Sheet metal, fire suppression, electrical, plumbing and HVAC trades shall sign the final composite coordination drawings as indication of their acceptance of the construction layout shown thereon.

B. Staff Names: Within 15 days of starting construction operations, submit a list of principal staff assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.

1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone.

1.5 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

- A. General: In addition to Project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.
 - 1. Include special personnel required for coordination of operations with other contractors.

1.6 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
 - 1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
 - 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 - 3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within 3 days of the meeting.
- B. Pre-construction Conference: Schedule a pre-construction conference before starting construction, at a time convenient to Owner Clerk of the Works, Clerk of the Works, (if one is retained by Owner),, and Architect, but no later than 15 days after execution of the Agreement. Hold the conference at Project site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.
 - 1. Attendees: Authorized representatives of Owner, Clerk of the Works, Clerk of the Works, (if one is retained by Owner), and their consultants; Contractor and its superintendent; major subcontractors; manufacturers; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 2. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Tentative construction schedule.
 - b. Phasing.
 - c. Critical work sequencing.
 - d. Designation of responsible personnel.
 - e. Procedures for processing field decisions and Change Orders.
 - f. Procedures for processing Applications for Payment.
 - g. Distribution of the Contract Documents.
 - h. Submittal procedures.
 - i. Preparation of Record Documents.
 - j. Use of the premises.
 - k. Responsibility for temporary facilities and controls.
 - l. Parking availability.
 - m. Office, work, and storage areas.
 - n. Equipment deliveries and priorities.
 - o. First aid.
 - p. Security.

- q. Progress cleaning.
 - r. Working hours.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
- 1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect, Clerk of the Works, (if one is retained by Owner), Architect, of scheduled meeting dates.
 - 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. Contract Documents.
 - b. Options.
 - c. Related Change Orders.
 - d. Purchases.
 - e. Deliveries.
 - f. Submittals.
 - g. Review of mockups.
 - h. Possible conflicts.
 - i. Compatibility problems.
 - j. Time schedules.
 - k. Weather limitations.
 - l. Manufacturer's written recommendations.
 - m. Warranty requirements.
 - n. Compatibility of materials.
 - o. Acceptability of substrates.
 - p. Temporary facilities and controls.
 - q. Space and access limitations.
 - r. Regulations of authorities having jurisdiction.
 - s. Testing and inspecting requirements.
 - t. Required performance results.
 - u. Protection of construction and personnel.
 - 3. Record significant conference discussions, agreements, and disagreements.
 - 4. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Progress Meetings: Conduct progress meetings at monthly intervals. Coordinate dates of meetings with preparation of payment requests.
- 1. Attendees: In addition to representatives of Owner, Clerk of the Works, (if one is retained by Owner), and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - b. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.
 - 7) Site utilization.
 - 8) Temporary facilities and controls.
 - 9) Work hours.
 - 10) Hazards and risks.
 - 11) Progress cleaning.
 - 12) Quality and work standards.
 - 13) Change Orders.
 - 14) Documentation of information for payment requests.
 3. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.
 - a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.
- E. Coordination Meetings: Conduct Project coordination meetings at weekly intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
1. Attendees: In addition to representatives of Owner, Clerk of the Works, (if one is retained by Owner), and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work
 2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

- a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to Combined Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - b. Schedule Updating: Revise Combined Contractor's Construction Schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
 - c. Review present and future needs of each contractor present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.
 - 7) Site utilization.
 - 8) Temporary facilities and controls.
 - 9) Work hours.
 - 10) Hazards and risks.
 - 11) Progress cleaning.
 - 12) Quality and work standards.
 - 13) Change Orders.
3. Reporting: A 'Field Observation Report' will be prepared by the Architect's office and distributed to the Owner, Clerk of the Works, (if one is retained by Owner), and General Contractor. Distribution of the Architect's 'Field Observation Report' to any other party, including sub-contractors, suppliers etc. shall be the responsibility of the Contractor.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01310

SECTION 01320 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - 1. Preliminary Construction Schedule.
 - 2. Contractor's Construction Schedule.
 - 3. Submittals Schedule.
 - 4. Daily construction reports.
 - 5. Material location reports.
 - 6. Field condition reports.
 - 7. Special reports.
 - 8. Construction photographs.
- B. Related Sections include the following:
 - 1. Division 1 Section "Payment Procedures" for submitting the Schedule of Values.
 - 2. Division 1 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes.
 - 3. Division 1 Section "Submittal Procedures" for submitting schedules and reports.
 - 4. Division 1 Section "Quality Requirements" for submitting a schedule of tests and inspections.
 - 5. Division 1 Section "Closeout Procedures" for submitting photographic negatives as Project Record Documents at Project closeout.

1.3 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
 - 1. Critical activities are activities on the critical path. They must start and finish on the planned early start and finish times.
 - 2. Predecessor activity is an activity that must be completed before a given activity can be started.
- B. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

- C. Critical Path: The longest continuous chain of activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- D. Event: The starting or ending point of an activity.
- E. Float: The measure of leeway in starting and completing an activity.
 - 1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
 - 2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the following activity.
 - 3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.
- F. Fragnet: A partial or fragmentary network that breaks down activities into smaller activities for greater detail.
- G. Major Area: A story of construction, a separate building, or a similar significant construction element.
- H. Milestone: A key or critical point in time for reference or measurement.
- I. Network Diagram: A graphic diagram of a network schedule, showing activities and activity relationships.

1.4 SUBMITTALS

- A. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- B. Submittals Schedule: Submit 3 (Three) copies of schedule. Arrange the following information in a tabular format:
 - 1. Scheduled date for first submittal.
 - 2. Specification Section number and title.
 - 3. Submittal category (action or informational).
 - 4. Name of subcontractor.
 - 5. Description of the Work covered.
 - 6. Scheduled date for Architect's and Clerk of the Works, (if one is retained by Owner), final release or approval.
- C. Preliminary Construction Schedule: Submit 4 (four) printed copies; one a single sheet of reproducible media, and one a print.
- D. Preliminary Network Diagram: Submit 4 (four) printed copies; one a single sheet of reproducible media, and one a print; large enough to show entire network for entire construction period.

- E. Contractor's Construction Schedule: Submit 8 (eight) printed copies of initial schedule, one a reproducible print and one a blue- or black-line print, large enough to show entire schedule for entire construction period.
1. Submit an electronic copy of schedule, using software indicated, on 3-1/2-inch diskettes, formatted to hold 1.44 MB of data, and labeled to comply with requirements for submittals. Include type of schedule (Initial or Updated) and date on label.
- F. CPM Reports: Concurrent with CPM schedule, submit 4 (four) printed copies of each of the following computer-generated reports. Format for each activity in reports shall contain activity number, activity description, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float.
1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
 2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
 3. Total Float Report: List of all activities sorted in ascending order of total float.
 4. Earnings Report: Compilation of Contractor's total earnings from commencement of the Work until most recent Application for Payment.
- G. Construction Photographs: Submit two prints of each photographic view within seven days of taking photographs.
1. Format: 8-by-10-inch smooth-surface matte prints on single-weight commercial-grade stock, enclosed back to back in clear plastic sleeves that are punched for standard 3-ring binder.
 2. Identification: On back of each print, provide an applied label or rubber-stamped impression with the following information:
 - a. Name of Project.
 - b. Name and address of photographer.
 - c. Name of Architect & Clerk of the Works, (if one is retained by Owner),
 - d. Name of Contractor.
 - e. Date photograph was taken.
 - f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
 3. Negatives: Submit a complete set of photographic negatives in protective envelopes as a Project Record Document. Identify date photographs were taken.
- H. Daily Construction Reports: Submit 4 (four) copies at weekly job meeting intervals.
- I. Material Location Reports: Submit 4 (four) copies at weekly job meeting intervals.
- J. Field Condition Reports: Submit 4 (four) copies at discovery of differing conditions.
- K. Special Reports: Submit 4 (four) copies at time of unusual event.

1.5 QUALITY ASSURANCE

- A. Scheduling Consultant Qualifications: An experienced specialist in CPM scheduling and reporting.
- B. Photographer Qualifications: An individual of established reputation who has been regularly engaged as a professional photographer for not less than three years.
- C. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to the Preliminary Construction Schedule and Contractor's Construction Schedule, including, but not limited to, the following:
 - 1. Review software limitations and content and format for reports.
 - 2. Verify availability of qualified personnel needed to develop and update schedule.
 - 3. Discuss constraints, including interim milestones and partial Owner occupancy.
 - 4. Review delivery dates for Owner-furnished products.
 - 5. Review schedule for work of Owner's separate contracts.
 - 6. Review time required for review of submittals and resubmittals.
 - 7. Review requirements for tests and inspections by independent testing and inspecting agencies.
 - 8. Review time required for completion and startup procedures.
 - 9. Review and finalize list of construction activities to be included in schedule.
 - 10. Review submittal requirements and procedures.
 - 11. Review procedures for updating schedule.

1.6 COORDINATION

- A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.
- B. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.
 - 1. Secure time commitments for performing critical elements of the Work from parties involved.
 - 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.
- C. Auxiliary Services: Cooperate with photographer and provide auxiliary services requested, including access to Project site and use of temporary facilities including temporary lighting.

PART 2 - PRODUCTS

2.1 SUBMITTALS SCHEDULE

- A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.
1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.
 2. Initial Submittal: Submit concurrently with preliminary bar-chart schedule. Include submittals required during the first 60 days of construction. List those required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
 - a. At Contractor's option, show submittals on the Preliminary Construction Schedule, instead of tabulating them separately.
 3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's Construction Schedule.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Procedures: Comply with procedures contained in AGC's "Construction Planning & Scheduling."
- B. Time Frame: Extend schedule from date established for commencement of the Work to date of Final Completion.
1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- C. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:
1. Activity Duration: Define activities so no activity is longer than 30 (thirty) days, unless specifically allowed by Architect.
 2. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
 3. Submittal Review Time: Include review and resubmittal times indicated in Division 1 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.
 4. Startup and Testing Time: Include not less than 7 (seven) days for startup and testing.
 5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect & Clerk Of The Work's (if one is retained by the Owner) administrative procedures necessary for certification of Substantial Completion.

- D. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
1. Phasing: Arrange list of activities on schedule by phase.
 2. Work under More Than One Contract: Include a separate activity for each contract.
 3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
 4. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Division 1 Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
 5. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Division 1 Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
 6. Work Restrictions: Show the effect of the following items on the schedule:
 - a. Coordination with existing construction.
 - b. Limitations of continued occupancies.
 - c. Uninterruptible services.
 - d. Partial occupancy before Substantial Completion.
 - e. Use of premises restrictions.
 - f. Provisions for future construction.
 - g. Seasonal variations.
 - h. Environmental control.
 7. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
 - a. Subcontract awards.
 - b. Submittals.
 - c. Purchases.
 - d. Mockups.
 - e. Fabrication.
 - f. Sample testing.
 - g. Deliveries.
 - h. Installation.
 - i. Tests and inspections.
 - j. Adjusting.
 - k. Curing.
 - l. Startup and placement into final use and operation.
 8. Area Separations: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
 - a. Structural completion.
 - b. Permanent space enclosure.
 - c. Completion of mechanical installation.
 - d. Completion of electrical installation.
 - e. Substantial Completion.

- E. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion.
- F. Cost Correlation: At the head of schedule, provide a cost correlation line, indicating planned and actual costs. On the line, show dollar volume of the Work performed as of dates used for preparation of payment requests.
 - 1. Refer to Division 1 Section "Payment Procedures" for cost reporting and payment procedures.
- G. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using fragnets to demonstrate the effect of the proposed change on the overall project schedule.
- H. Computer Software: Prepare schedules using a program that has been developed specifically to manage construction schedules, compatible with 'Windows 98' and 'Macintosh OSX' operating systems.

2.3 PRELIMINARY CONSTRUCTION SCHEDULE

- A. Bar-Chart Schedule: Submit preliminary horizontal bar-chart-type construction schedule within 14 (fourteen) days of date established for the commencement of the Work.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 60 (sixty) days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

2.4 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

- A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal Gantt-chart-type, Contractor's Construction Schedule within 30 (thirty) days of date established for commencement of the Work. Base schedule on the Preliminary Construction Schedule and whatever updating and feedback was received since the start of Project.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.
 - 1. For construction activities that require 3 months or longer to complete, indicate an estimated completion percentage in 10% (ten percent) increments within time bar.

2.5 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE) 'Alternative Option' To Above.

- A. General: Prepare network diagrams using AON (activity-on-node) format.

- B. Preliminary Network Diagram: Submit diagram within 14 (fourteen) days of date established for commencement of the Work. Outline significant construction activities for the first 60 (sixty)days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.
- C. CPM Schedule: Prepare Contractor's Construction Schedule using a CPM network analysis diagram.
1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 30 (thirty)days after date established for commencement of the Work.
 2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
 3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
 4. Use "one workday" as the unit of time.
- D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the preliminary network diagram, prepare a skeleton network to identify probable critical paths.
1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
 - a. Preparation and processing of submittals.
 - b. Purchase of materials.
 - c. Delivery.
 - d. Fabrication.
 - e. Installation.
 2. Processing: Process data to produce output data or a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
 3. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
 - a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.
- E. Initial Issue of Schedule: Prepare initial network diagram from a list of straight "early start-total float" sort. Identify critical activities. Prepare tabulated reports showing the following:
1. Contractor or subcontractor and the Work or activity.
 2. Description of activity.
 3. Principal events of activity.
 4. Immediate preceding and succeeding activities.
 5. Early and late start dates.
 6. Early and late finish dates.
 7. Activity duration in workdays.

8. Total float or slack time.
 9. Average size of workforce.
 10. Dollar value of activity (coordinated with the Schedule of Values).
- F. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
1. Identification of activities that have changed.
 2. Changes in early and late start dates.
 3. Changes in early and late finish dates.
 4. Changes in activity durations in workdays.
 5. Changes in the critical path.
 6. Changes in total float or slack time.
 7. Changes in the Contract Time.
- G. Value Summaries: Prepare two cumulative value lists, sorted by finish dates.
1. In first list, tabulate activity number, early finish date, dollar value, and cumulative dollar value.
 2. In second list, tabulate activity number, late finish date, dollar value, and cumulative dollar value.
 3. In subsequent issues of both lists, substitute actual finish dates for activities completed as of list date.
 4. Prepare list for ease of comparison with payment requests; coordinate timing with progress meetings.
 - a. In both value summary lists, tabulate "actual percent complete" and "cumulative value completed" with total at bottom.
 - b. Submit value summary printouts one week before each regularly scheduled progress meeting.

2.6 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
1. List of subcontractors at Project site.
 2. List of separate contractors at Project site.
 3. Approximate count of personnel at Project site.
 4. High and low temperatures and general weather conditions.
 5. Accidents.
 6. Meetings and significant decisions.
 7. Unusual events (refer to special reports).
 8. Stoppages, delays, shortages, and losses.
 9. Meter readings and similar recordings.
 10. Emergency procedures.
 11. Orders and requests of authorities having jurisdiction.
 12. Change Orders received and implemented.
 13. Construction Change Directives received.
 14. Services connected and disconnected.

15. Equipment or system tests and startups.
16. Partial Completions and occupancies.
17. Substantial Completions authorized.

- B. **Material Location Reports:** At weekly intervals, prepare a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site.
- C. **Field Condition Reports:** Immediately on discovery of a difference between field conditions and the Contract Documents, prepare a detailed report. Submit with a request for information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.7 SPECIAL REPORTS

- A. **General:** Submit special reports directly to Owner within one day of an occurrence. Distribute copies of report to parties affected by the occurrence.
- B. **Reporting Unusual Events:** When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. **Scheduling Consultant:** Engage a consultant to provide planning, evaluation, and reporting using CPM scheduling.
 1. **In-House Option:** Owner may waive the requirement to retain a consultant if Contractor employs skilled personnel with experience in CPM scheduling and reporting techniques. Submit qualifications.
 2. **Meetings:** Scheduling consultant shall attend all meetings related to Project progress, alleged delays, and time impact.
- B. **Contractor's Construction Schedule Updating:** At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
 1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 3. As the Work progresses, indicate Actual Completion percentage for each activity.

- C. Distribution: Distribute copies of approved schedule to Architect & Clerk Of The Works, (if retained by the Owner), Owner separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
 - 1. Post copies in Project meeting rooms and temporary field offices.
 - 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

3.2 CONSTRUCTION PHOTOGRAPHS

- A. Photographer: Engage a qualified commercial photographer to take construction photographs.
- B. Photographic Film: Medium-format, 2-1/4 by 2-3/4 inches.
- C. Date Stamp: Unless otherwise indicated, date and time stamp each photograph as it is being taken so stamp is integral to photograph.
- D. Preconstruction Photographs: Before starting construction, take 18 (eighteen) color photographs of Project site and surrounding properties from different vantage points, as directed by Architect Show existing conditions adjacent to property.
- E. Periodic Construction Photographs: Take 12 (twelve) color photographs monthly, coinciding with cutoff date associated with each Application for Payment. Photographer shall select vantage points to best show status of construction and progress since last photographs were taken.
 - 1. Field Office Prints: Retain one set of prints of periodic photographs in field office at Project site, available at all times for reference. Identify photographs the same as for those submitted to Architect & Clerk of the Works, (if retained by the Owner),
- F. Final Completion Construction Photographs: Take 24 (twenty-four) color photographs after date of Substantial Completion for submission as Project Record Documents. The Architect will direct photographer for desired vantage points.

END OF SECTION 01320

SECTION 01330 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other miscellaneous submittals.
- B. Related Sections include the following:
 - 1. Division 1 Section "Payment Procedures" for submitting Applications for Payment.
 - 2. Division 1 Section "Project Management and Coordination" for submitting Coordination Drawings.
 - 3. Division 1 Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's Construction Schedule and the Submittals Schedule and construction photographs.
 - 4. Division 1 Section "Quality Requirements" for submitting test and inspection reports and Delegated-Design Submittals and for erecting mockups.
 - 5. Division 1 Section "Closeout Procedures" for submitting warranties Project Record Documents and operation and maintenance manuals.
 - 6. Division 1 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.

1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information that requires Architect's responsive action.
- B. Informational Submittals: Written information that does not require Architect's approval. Submittals may be rejected for not complying with requirements.

1.4 SUBMITTAL PROCEDURES

- A. General: Electronic copies of CAD Drawings of the Contract Drawings will not be provided by Architect for Contractor's, Sub-Contractor's or Material Suppliers use in preparing submittals.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
 - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.

2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Submittals Schedule: Comply with requirements in Division 1 Section "Construction Progress Documentation" for list of submittals and time requirements for scheduled performance of related construction activities.
- D. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal.
 1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
 2. Concurrent Review: Where concurrent review of submittals by Architect's consultants, Owner, or other parties is required, allow 21 days for initial review of each submittal.
 3. Direct Transmittal to Consultant: Where the Contract Documents indicate that submittals may be transmitted directly to Architect's consultants, provide duplicate copy of transmittal to Architect & Clerk of the Works (if retained by the Owner) Submittal will be returned to Architect before being returned to Contractor.
 4. If intermediate submittal is necessary, process it in same manner as initial submittal.
 5. Allow 15 (fifteen)days for processing each resubmittal.
 6. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing.
- E. Identification: Place a permanent label or title block on each submittal for identification.
 1. Indicate name of firm or entity that prepared each submittal on label or title block.
 2. Provide a space approximately 4 by 5 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
 3. Include the following information on label for processing and recording action taken:
 - a. Project name.
 - b. Date.
 - c. Name and address of Architect & Clerk of the Works (if retained by the Owner)
 - d. Name and address of Contractor.
 - e. Name and address of subcontractor.
 - f. Name and address of supplier.
 - g. Name of manufacturer.
 - h. Unique identifier, including revision number.
 - i. Number and title of appropriate Specification Section.
 - j. Drawing number and detail references, as appropriate.
 - k. Other necessary identification.
- F. Deviations: Highlight, encircle, or otherwise identify deviations from the Contract Documents on submittals.

- G. Additional Copies: Unless additional copies are required for final submittal, and unless Architect & Clerk of the Works (if retained by the Owner) observes noncompliance with provisions of the Contract Documents, initial submittal may serve as final submittal.
1. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect & Clerk of the Works (if retained by the Owner)
 2. Additional copies submitted for maintenance manuals will be marked with action taken and will be returned.
- H. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect or Clerk of the Works (if retained by the Owner) will return submittals, without review, received from sources other than Contractor.
1. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect & Clerk of the Works (if retained by the Owner) on previous submittals, and deviations from requirements of the Contract Documents, including minor variations and limitations. Include the same label information as the related submittal.
 2. Include Contractor's certification stating that information submitted complies with requirements of the Contract Documents.
 3. Transmittal Form: Provide locations on form for the following information:
 - a. Project name.
 - b. Date.
 - c. Destination (To:).
 - d. Source (From:).
 - e. Names of subcontractor, manufacturer, and supplier.
 - f. Category and type of submittal.
 - g. Submittal purpose and description.
 - h. Submittal and transmittal distribution record.
 - i. Remarks.
 - j. Signature of transmitter.
- I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- J. Use for Construction: Use only final submittals with mark indicating action taken by Architect in connection with construction.

PART 2 - PRODUCTS

2.1 ACTION SUBMITTALS

- A. General: Prepare and submit Action Submittals required by individual Specification Sections.

1. Number of Copies: Submit 6, (six) copies of each submittal, unless otherwise indicated. Architect will return two copies. Mark up and retain one returned copy as a Project Record Document.
 2. Number of Copies: Submit copies of each submittal, as follows, unless otherwise indicated:
 - a. Initial Submittal: Submit a preliminary single copy of each submittal where selection of options, color, pattern, texture, or similar characteristics is required. Architect & Clerk of the Works (if retained by the Owner), will return submittal with options selected.
 - b. Final Submittal: Submit 6, (six) copies, unless copies are required for operation and maintenance manuals. Submit 8, (eight) copies where copies are required for operation and maintenance manuals. Architect & Clerk of the Works will retain one copy each; remainder will be returned. Mark up and retain one returned copy as a Project Record Document.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
 2. Mark each copy of each submittal to show which products and options are applicable.
 3. Include the following information, as applicable:
 - a. Manufacturer's written recommendations.
 - b. Manufacturer's product specifications.
 - c. Manufacturer's installation instructions.
 - d. Standard color charts.
 - e. Manufacturer's catalog cuts.
 - f. Wiring diagrams showing factory-installed wiring.
 - g. Printed performance curves.
 - h. Operational range diagrams.
 - i. Mill reports.
 - j. Standard product operating and maintenance manuals.
 - k. Compliance with recognized trade association standards.
 - l. Compliance with recognized testing agency standards.
 - m. Application of testing agency labels and seals.
 - n. Notation of coordination requirements.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
1. Preparation: Include the following information, as applicable:
 - a. Dimensions.
 - b. Identification of products.
 - c. Fabrication and installation drawings.
 - d. Roughing-in and setting diagrams.
 - e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
 - f. Shopwork manufacturing instructions.

- g. Templates and patterns.
 - h. Schedules.
 - i. Design calculations.
 - j. Compliance with specified standards.
 - k. Notation of coordination requirements.
 - l. Notation of dimensions established by field measurement.
 2. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.
 3. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 30 by 40 inches .
 4. Number of Copies: Submit copies of each submittal, as follows:
 - a. Initial Submittal: Submit one correctable, translucent, reproducible print and one blue- or black-line print. Architect & Clerk of the Works (if retained by the Owner) will return the reproducible print.
 - b. Initial Submittal: Submit three blue- or black-line prints. Architect & Clerk of the Works (if retained by the Owner) will return one print.
 - c. Final Submittal: Submit five blue- or black-line prints, unless prints are required for operation and maintenance manuals. Submit seven prints where prints are required for operation and maintenance manuals. Architect & Clerk of the Works (if retained by the Owner) will retain two prints; remainder will be returned. Mark up and retain one returned print as a Project Record Drawing.
- D. Coordination Drawings: Comply with requirements in Division 1 Section "Project Management and Coordination."
- E. Samples: Prepare physical units of materials or products, including the following:
1. Comply with requirements in Division 1 Section "Quality Requirements" for mockups.
 2. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
 3. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from the same material to be used for the Work, cured and finished in manner specified, and physically identical with the product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
 4. Preparation: Mount, display, or package Samples in manner specified to facilitate review of qualities indicated. Prepare Samples to match Architect's sample where so indicated. Attach label on unexposed side that includes the following:
 - a. Generic description of Sample.
 - b. Product name or name of manufacturer.
 - c. Sample source.
 5. Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, provide the following:

- a. Size limitations.
 - b. Compliance with recognized standards.
 - c. Availability.
 - d. Delivery time.
6. Submit Samples for review of kind, color, pattern, and texture for a final check of these characteristics with other elements and for a comparison of these characteristics between final submittal and actual component as delivered and installed.
- a. If variation in color, pattern, texture, or other characteristic is inherent in the product represented by a Sample, submit at least three sets of paired units that show approximate limits of the variations.
 - b. Refer to individual Specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar construction characteristics.
7. Number of Samples for Initial Selection: Submit two full sets of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect or the Clerk of the Works (if retained by the Owner) will return submittal with options selected.
8. Number of Samples for Verification: Submit five sets of Samples. Architect & Clerk of the Works (if retained by the Owner) will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a Project Record Sample.
- a. Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
9. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
- a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
- F. Product Schedule or List: Prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
1. Type of product. Include unique identifier for each product.
 2. Number and name of room or space.
 3. Location within room or space.
- G. Delegated-Design Submittal: Comply with requirements in Division 1 Section "Quality Requirements."
- H. Contractor's Construction Schedule: Comply with requirements in Division 1 Section "Construction Progress Documentation" for Construction Manager's action.

- I. Submittals Schedule: Comply with requirements in Division 1 Section "Construction Progress Documentation."
- J. Application for Payment: Comply with requirements in Division 1 Section "Payment Procedures."
- K. Schedule of Values: Comply with requirements in Division 1 Section "Payment Procedures."
- L. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
 - 1. Name, address, and telephone number of entity performing subcontract or supplying products.
 - 2. Number and title of related Specification Section(s) covered by subcontract.
 - 3. Drawing number and detail references, as appropriate, covered by subcontract.

2.2 INFORMATIONAL SUBMITTALS

- A. General: Prepare and submit Informational Submittals required by other Specification Sections.
 - 1. Number of Copies: Submit three copies of each submittal, unless otherwise indicated. Architect & Clerk of the Works (if retained by the Owner) will not return copies.
 - 2. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
 - 3. Test and Inspection Reports: Comply with requirements in Division 1 Section "Quality Requirements."
- B. Contractor's Construction Schedule: Comply with requirements in Division 1 Section "Construction Progress Documentation."
- C. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- D. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements.
- E. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.
- F. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements and, where required, is authorized for this specific Project.

- G. **Manufacturer Certificates:** Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements. Include evidence of manufacturing experience where required.
- H. **Material Certificates:** Prepare written statements on manufacturer's letterhead certifying that material complies with requirements.
- I. **Material Test Reports:** Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements.
- J. **Preconstruction Test Reports:** Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements.
- K. **Compatibility Test Reports:** Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- L. **Field Test Reports:** Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements.
- M. **Product Test Reports:** Prepare written reports indicating current product produced by manufacturer complies with requirements. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- N. **Research/Evaluation Reports:** Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
 - 1. Name of evaluation organization.
 - 2. Date of evaluation.
 - 3. Time period when report is in effect.
 - 4. Product and manufacturers' names.
 - 5. Description of product.
 - 6. Test procedures and results.
 - 7. Limitations of use.
- O. **Maintenance Data:** Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements in Division 1 Section "Closeout Procedures".
- P. **Design Data:** Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

- Q. **Manufacturer's Instructions:** Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:
1. Preparation of substrates.
 2. Required substrate tolerances.
 3. Sequence of installation or erection.
 4. Required installation tolerances.
 5. Required adjustments.
 6. Recommendations for cleaning and protection.
- R. **Manufacturer's Field Reports:** Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:
1. Name, address, and telephone number of factory-authorized service representative making report.
 2. Statement on condition of substrates and their acceptability for installation of product.
 3. Statement that products at Project site comply with requirements.
 4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 6. Statement whether conditions, products, and installation will affect warranty.
 7. Other required items indicated in individual Specification Sections.
- S. **Insurance Certificates and Bonds:** Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.
- T. **Construction Photographs and Videotapes:** Comply with requirements in Division 1 Section "Photographic Documentation"
- U. **Material Safety Data Sheets:** Submit information directly to Owner. If submitted to Architect, Architect will not review this information but will return it with no action taken.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

- A. Review each submittal and check for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect & Clerk of the Works (if retained by the Owner).
- B. **Approval Stamp:** Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

- A. **General: Architect & Clerk of the Works (if retained by the Owner) will not review submittals that do not bear Contractor's approval stamp and will return them without action.**
- B. Action Submittals: Architect & Clerk of the Works (if retained by the Owner) will review each submittal, make marks to indicate corrections or modifications required, and return it. The Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:
- C. Informational Submittals: Architect & Clerk of the Works (if retained by the Owner) will review each submittal and will not return it, or will reject and return it if it does not comply with requirements. Architect & Clerk of the Works (if retained by the Owner) will forward each submittal to appropriate party.
- D. Submittals not required by the Contract Documents will not be reviewed and may be discarded.

END OF SECTION 01330

SECTION 01400 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for quality assurance and 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-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 quality-control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
- C. Related Sections include the following:
 - 1. Divisions 2 through 16 Sections for specific test and inspection requirements.

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 ensure that proposed construction complies with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that completed construction complies with requirements. Services do not include contract enforcement activities performed by Architect or Construction Manager.
- C. Mockups: Full-size, physical example assemblies to illustrate finishes and materials. 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. Mockups establish the standard by which the Work will be judged.

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

1.4 REGULATORY REQUIREMENTS

- A. Copies of Regulations: Obtain copies of the following regulations and retain at Project site to be available for reference by parties who have a reasonable need:

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. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit 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, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

- C. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.
2. Description of test and inspection.
3. Identification of applicable standards.
4. Identification of test and inspection methods.
5. Number of tests and inspections required.
6. Time schedule or time span for tests and inspections.
7. Entity responsible for performing tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

- D. 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. Ambient 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.

- E. 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. 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.
- B. 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.
- C. 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.
- D. 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.
- 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 similar regulations governing the Work, nor interfere with local trade-union jurisdictional settlements and similar conventions.
- G. Testing Agency Qualifications: An agency with the experience and capability to conduct testing and inspecting indicated, as documented by ASTM E 548, and that specializes in types of tests and inspections to be performed.
- H. Preconstruction Testing: Testing agency shall perform preconstruction testing for compliance with specified requirements for performance and test methods.
 - 1. Contractor responsibilities include the following:
 - a. Provide test specimens and assemblies representative of proposed materials and construction. Provide sizes and configurations of assemblies to adequately demonstrate capability of product to comply with performance requirements.

- b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
 - c. When testing is complete, remove assemblies; do not reuse materials 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.
- I. 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. Notify Architect and Construction Manager seven (7) days in advance of dates and times when mockups will be constructed.
 3. Demonstrate the proposed range of aesthetic effects and workmanship.
 4. Obtain Architect's and Construction Manager's approval of mockups before starting work, fabrication, or construction.
 5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 6. Demolish and remove mockups when directed, unless otherwise indicated.

1.7 QUALITY CONTROL

- A. The General Contractor will engage a qualified testing agency to perform quality-control services. The General Contractor shall include the cost of these services in their contract.
 1. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
 2. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 3. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 4. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
 5. 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.
- B. Special Tests and Inspections: Owner will engage a testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner.
 1. Testing agency will notify Architect, Construction Manager, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
 2. Testing agency will submit a certified written report of each test, inspection, and similar quality-control service to Architect, through Construction Manager, with copy to Contractor and to authorities having jurisdiction.
 3. Testing agency will submit a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.

4. Testing agency will interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
 5. Testing agency will retest and reinspect corrected work.
- C. 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.
- D. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that revised or replaced Work that failed to comply with requirements established by the Contract Documents.
- E. Testing Agency Responsibilities: Cooperate with Architect, Construction Manager, and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Architect, Construction Manager, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 2. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
 3. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 4. Do not release, revoke, alter, or increase requirements of the Contract Documents or approve or accept any portion of the Work.
 5. Do not perform any duties of Contractor.
- F. 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. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 6. Security and protection for samples and for testing and inspecting equipment at Project site.
- G. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- H. 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 by the Notice to Proceed.

1. Distribution: Distribute schedule to Owner, Architect, Construction Manager, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.8 ACCEPTABLE TESTING AGENCIES

- A. Provide the name of the agency engaged for testing and or inspections to the Architect and Construction manager seven (7) days prior to any testing or inspection work.

1.9 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 Sections of these Specifications. Restore patched areas and extend restoration into adjoining areas in a manner that eliminates evidence of patching.
 2. Comply with the Contract Document requirements for Division 1 Section "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 01400

SECTION 01500 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes requirements for temporary facilities and controls, including temporary utilities, support facilities, and security and protection facilities.

- B. Temporary utilities include, but are not limited to, the following:

1. Sewers and drainage.
2. Water service and distribution.
3. Sanitary facilities, including toilets, wash facilities, and drinking-water facilities.
4. Heating and cooling facilities.
5. Ventilation.
6. Electric power service.
7. Lighting.
8. Telephone service.

- C. Support facilities include, but are not limited to, the following:

1. Temporary roads and paving.
2. Dewatering facilities and drains.
3. Project identification and temporary signs.
4. Waste disposal facilities.
5. Field offices.
6. Storage and fabrication sheds.
7. Lifts and hoists.
8. Temporary elevator usage.
9. Temporary stairs.
10. Construction aids and miscellaneous services and facilities.
11. Temporary heat and power
12. Groundbreaking Items

- D. Security and protection facilities include, but are not limited to, the following:

1. Environmental protection.
2. Stormwater control.
3. Tree and plant protection.
4. Pest control.
5. Site enclosure fence.

6. Security enclosure and lockup.
7. Barricades, warning signs, and lights.
8. Covered walkways.
9. Temporary enclosures.
10. Temporary partitions.
11. Fire protection.

E. Related Sections include the following:

1. Division 2 Section "Hot-Mix Asphalt Paving" for construction and maintenance of asphalt paving for temporary roads and paved areas.
2. Division 2 Section "Cement Concrete Pavement" for construction and maintenance of cement concrete pavement for temporary roads and paved areas.
3. Divisions 2 through 16 for temporary heat, ventilation, and humidity requirements for products in those Sections.

1.3 DEFINITIONS

- A. Permanent Enclosure: As determined by Architect, permanent or temporary roofing is complete, insulated, and weathertight; exterior walls are insulated and weathertight; and all openings are closed with permanent construction or substantial temporary closures.

1.4 USE CHARGES

- A. General: Cost or use charges for temporary facilities are not chargeable to Owner or Architect and shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to, the following:
1. Owner's construction forces.
 2. Occupants of Project.
 3. Architect.
 4. Testing agencies.
 5. Personnel of authorities having jurisdiction.
- B. Sewer Service: Pay sewer service use charges for sewer usage, by all parties engaged in construction, at Project site.
- C. Water Service: Pay water service use charges, whether metered or otherwise, for water used by all entities engaged in construction activities at Project site.
- D. Electric Power Service: Pay electric power service use charges, whether metered or otherwise, for electricity used by all entities engaged in construction activities at Project site.
- E. Telephone Service: Pay telephone service use charges, whether metered or otherwise, for telephone services used by all entities engaged in construction activities at Project site.

1.5 SUBMITTALS

- A. Temporary Utility Reports: Submit reports of tests, inspections, meter readings, and similar procedures performed on temporary utilities.
- B. Implementation and Termination Schedule: Within 15 days of date established for submittal of Contractor's Construction Schedule, submit a schedule indicating implementation and termination of each temporary utility.

1.6 QUALITY ASSURANCE

- A. Standards: Comply with ANSI A10.6, NECA's "Temporary Electrical Facilities," and NFPA 241.
 - 1. Trade Jurisdictions: Assigned responsibilities for installation and operation of temporary utilities are not intended to interfere with trade regulations and union jurisdictions.
 - 2. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.7 PROJECT CONDITIONS

- A. Temporary Utilities: At earliest feasible time, when acceptable to Owner, change over from use of temporary service to use of permanent service.
 - 1. Temporary Use of Permanent Facilities: Installer of each permanent service shall assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.
- B. Conditions of Use: The following conditions apply to use of temporary services and facilities by all parties engaged in the Work:
 - 1. Keep temporary services and facilities clean and neat.
 - 2. Relocate temporary services and facilities as required by progress of the Work.
- C. Winter Conditions: General Contractor shall be responsible for providing and maintaining all labor, materials, equipment and services necessary to continue construction activities which may otherwise be delayed due to cold temperatures and precipitation.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Provide new materials. Undamaged, previously used materials in serviceable condition may be used if approved by Architect. Provide materials suitable for use intended.
- B. Pavement: Comply with Division 2
- C. Chain-Link Fencing: Minimum **2-inch**, **0.148-inch**- thick, galvanized steel, chain-link fabric fencing; minimum **6 feet** high with galvanized steel pipe posts; minimum **2-3/8-inch**- OD line posts and **2-7/8-inch**- OD corner and pull posts, with **1-5/8-inch** OD top rails.
- D. Portable Chain-Link Fencing: Minimum **2-inch** 9-gage, galvanized steel, chain-link fabric fencing; minimum **6 feet** high with galvanized steel pipe posts; minimum **2-3/8-inch**- OD line posts and **2-7/8-inch**- OD corner and pull posts, with **1-5/8-inch**- OD top and bottom rails. Provide concrete bases for supporting posts.
- E. Lumber and Plywood: Comply with requirements in Division 6 Section "Rough Carpentry".
- F. Roofing: Standard-weight, mineral-surfaced, asphalt shingles or asphalt-impregnated and -coated, mineral-surfaced, roll-roofing sheet.
- G. Gypsum Board: Minimum **1/2 inch** thick by **48 inches** wide by maximum available lengths; regular-type panels with tapered edges. Comply with ASTM C 36.
- H. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indices of 25 and 50, respectively.
- I. Paint: Comply with requirements in Division 9 Section "Painting."
- J. Tarpaulins: Fire-resistive labeled with flame-spread rating of 15 or less.
- K. Water: Potable.

2.2 EQUIPMENT

- A. General: Provide equipment suitable for use intended.
- B. Field Offices: Prefabricated with lockable entrances, operable windows, and serviceable finishes; heated and air conditioned; on foundations adequate for normal loading. Provide a complete Contractor's field office with separate facilities for Architect and the Clerk of the Works (if retained by the Owner) with furnishings to accommodate typical construction office daily activities and weekly project meetings.
- C. Fire Extinguishers: Hand carried, portable, UL rated. Provide class and extinguishing agent as indicated or a combination of extinguishers of NFPA-recommended classes for exposures.
 - 1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

- D. Self-Contained Toilet Units: Single-occupant units of chemical, aerated recirculation, or combustion type; vented; fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material.
- E. Drinking-Water Fixtures: Containerized, bottled-water drinking-water units, including paper cup supply.
 - 1. Where power is accessible, provide electric water coolers to maintain dispensed water temperature at 45 to 55 deg F.
- F. Heating Equipment: Unless Owner authorizes use of permanent heating system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
 - 1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
 - 2. Heating Units: Listed and labeled, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use for type of fuel being consumed.
- G. Electrical Outlets: Properly configured, NEMA-polarized outlets to prevent insertion of 110- to 120-V plugs into higher-voltage outlets; equipped with ground-fault circuit interrupters, reset button, and pilot light.
- H. Power Distribution System Circuits: Where permitted and overhead and exposed for surveillance, wiring circuits, not exceeding 125-V ac, 20-A rating, and lighting circuits may be nonmetallic sheathed cable.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.
- B. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

- A. General: Engage appropriate local utility company to install temporary service or connect to existing service. Where utility company provides only part of the service, provide the remainder with matching, compatible materials and equipment. Comply with utility company recommendations.
 - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
 - 2. Provide adequate capacity at each stage of construction. Before temporary utility is available, provide trucked-in services.

3. Obtain easements to bring temporary utilities to Project site where Owner's easements cannot be used for that purpose.
- B. Sewers and Drainage: If sewers are available, provide temporary connections to remove effluent that can be discharged lawfully. If sewers are not available or cannot be used, provide drainage ditches, dry wells, stabilization ponds, and similar facilities. If neither sewers nor drainage facilities can be lawfully used for discharge of effluent, provide containers to remove and dispose of effluent off-site in a lawful manner.
1. Filter out excessive soil, construction debris, chemicals, oils, and similar contaminants that might clog sewers or pollute waterways before discharge.
 2. Connect temporary sewers to municipal system as directed by sewer department officials.
 3. Maintain temporary sewers and drainage facilities in a clean, sanitary condition. After heavy use, restore normal conditions promptly.
 4. Provide temporary filter beds, settlement tanks, separators, and similar devices to purify effluent to levels acceptable to authorities having jurisdiction.
- C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction until permanent water service is in use. Sterilize temporary water piping before use.
- D. Water Service: Use of Owner's existing water service facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
1. Provide rubber hoses as necessary to serve Project site.
 2. As soon as water is required at each level, extend service to form a temporary water- and fire-protection standpipe. Provide distribution piping. Space outlets so water can be reached with a 100-foot (30-m) hose. Provide one hose at each outlet.
 3. Provide pumps to supply a minimum of 30-psi static pressure at highest point. Equip pumps with surge and storage tanks and automatic controls to supply water uniformly at reasonable pressures.
- E. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking-water fixtures. Comply with regulations and health codes for type, number, location, operation, and maintenance of fixtures and facilities.
1. Disposable Supplies: Provide toilet tissue, paper towels, paper cups, and similar disposable materials for each facility. Maintain adequate supply. Provide covered waste containers for disposal of used material.
 2. Toilets: Install self-contained toilet units. Shield toilets to ensure privacy. Provide separate facilities for male and female personnel.
 3. Wash Facilities: Install wash facilities supplied with potable water at convenient locations for personnel who handle materials that require wash up. Dispose of drainage properly. Supply cleaning compounds appropriate for each type of material handled.
 - a. Provide safety showers, eyewash fountains, and similar facilities for convenience, safety, and sanitation of personnel.

4. Drinking-Water Facilities: Provide bottled-water, drinking-water units.
 - a. Where power is accessible, provide electric water coolers to maintain dispensed water temperature at 45 to 55 deg F.
 5. Locate toilets and drinking-water fixtures so personnel need not walk more than two stories vertically or 200 feet (60 m) horizontally to facilities.
- F. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment from that specified that will not have a harmful effect on completed installations or elements being installed.
1. Maintain a minimum temperature of 50 deg F in permanently enclosed portions of building for normal construction activities, and 65 deg F for finishing activities and areas where finished Work has been installed.
- G. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment from that specified that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
- H. Electric Power Service: Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period. Include meters, transformers, overload-protected disconnecting means, automatic ground-fault interrupters, and main distribution switchgear.
1. Install electric power service underground, unless overhead service must be used.
 2. Install power distribution wiring overhead and rise vertically where least exposed to damage.
- I. Electric Distribution: Provide receptacle outlets adequate for connection of power tools and equipment.
1. Provide waterproof connectors to connect separate lengths of electrical power cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage ratio.
 2. Provide metal conduit, tubing, or metallic cable for wiring exposed to possible damage. Provide rigid steel conduits for wiring exposed on grades, floors, decks, or other traffic areas.
 3. Provide metal conduit enclosures or boxes for wiring devices.
 4. Provide 4-gang outlets, spaced so 100-foot extension cord can reach each area for power hand tools and task lighting. Provide a separate 125-V ac, 20-A circuit for each outlet.
- J. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations and traffic conditions.
1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

2. Provide one 100-W incandescent lamp per 500 sq. ft., uniformly distributed, for general lighting, or equivalent illumination.
 3. Provide one 100-W incandescent lamp every 50 feet in traffic areas.
 4. Provide one 100-W incandescent lamp per story in stairways and ladder runs, located to illuminate each landing and flight.
 5. Install exterior-yard site lighting that will provide adequate illumination for construction operations, traffic conditions, and signage visibility when the Work is being performed.
 6. Install lighting for Project identification sign.
- K. Telephone Service: Provide temporary telephone service throughout construction period for common-use facilities used by all personnel engaged in construction activities. Install separate telephone line for each field office and first-aid station.
1. Provide additional telephone lines for the following:
 - a. In field office with more than two occupants, install a telephone for each additional occupant or pair of occupants.
 - b. Provide a dedicated telephone line for each facsimile machine and computer with modem in each field office.
 - c. Provide a separate telephone line for Owner's use.
 - d. Install a telephone on every second or third story of construction.
 2. At each telephone, post a list of important telephone numbers.
 - a. Police and fire departments.
 - b. Ambulance service.
 - c. Contractor's home office.
 - d. Clerk of the Works (if retained by Owner)
 - e. Architect's office.
 - f. Engineers' offices.
 - g. Owner's office.
 - h. Principal subcontractors' field and home offices.
 3. Provide an answering machine on superintendent's telephone.
 4. Furnish superintendent with electronic paging device for use when away from field office.
 5. Provide a portable cellular telephone for superintendent's use in making and receiving telephone calls when away from field office.
 6. Provide internet service for superintendent's use in making and receiving construction related e-mails, correspondence and drawings.
 7. Install a coin-operated telephone station at a convenient grade-level location for convenience of personnel.

3.3 SUPPORT FACILITIES INSTALLATION

- A. General: Comply with the following:
1. Locate field offices, storage sheds, sanitary facilities, and other temporary construction and support facilities for easy access.

2. Provide incombustible construction for offices, shops, and sheds located within construction area or within **30 feet** of building lines. Comply with NFPA 241.
 3. Maintain support facilities until near Substantial Completion. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate to support loads and to withstand exposure to traffic during construction period. Locate temporary roads and paved areas in same location as permanent roads and paved areas. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.
1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
 2. Prepare subgrade and install subbase and base for temporary roads and paved areas according to Division 2 Section "Earthwork."
 3. Recondition base after temporary use, including removing contaminated material, regrading, proofrolling, compacting, and testing.
 4. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair hot-mix asphalt base-course pavement before installation of final course according to Division 2 Section "Hot-Mix Asphalt Paving."
- C. Traffic Controls: Provide temporary traffic controls at junction of temporary roads with public roads. Include warning signs for public traffic and "STOP" signs for entrance onto public roads. Comply with requirements of authorities having jurisdiction.
- D. Dewatering Facilities and Drains: Comply with requirements in applicable Division 2 Sections for temporary drainage and dewatering facilities and operations not directly associated with construction activities included in individual Sections. Where feasible, use same facilities. Maintain Project site, excavations, and construction free of water.
1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining property nor endanger permanent Work or temporary facilities.
 2. Before connection and operation of permanent drainage piping system, provide temporary drainage where roofing or similar waterproof deck construction is completed.
 3. Remove snow and ice as required to minimize accumulations.
- E. Project Identification and Temporary Signs: Prepare one (1) 48" x 96" high project identification signs of 3/4" MDO exterior plywood with applied lettering as required in this section and other signs in sizes indicated. Install signs where indicated to inform public and persons seeking entrance and exit to Project. Do not permit installation of unauthorized signs.
1. Engage an experienced sign painter to apply graphics for Project identification signs. Comply with details indicated.
 2. Prepare temporary signs to provide directional information to construction personnel and visitors.
 3. Construct signs of exterior-type Grade B-B high-density concrete form overlay plywood in sizes and thicknesses indicated. Support on posts or framing of preservative-treated wood or steel.

4. Paint sign panel and applied graphics with exterior-grade alkyd gloss enamel over exterior primer.
- F. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Containerize and clearly label hazardous, dangerous, or unsanitary waste materials separately from other waste. Comply with Division 1 Section "Execution Requirements" for progress cleaning requirements.
1. If required by authorities having jurisdiction, provide separate containers, clearly labeled, for each type of waste material to be deposited.
 2. Develop a waste management plan for Work performed on Project. Indicate types of waste materials Project will produce and estimate quantities of each type. Provide detailed information for on-site waste storage and separation of recyclable materials. Provide information on destination of each type of waste material and means to be used to dispose of all waste materials.
- G. Janitorial Services: Provide janitorial services on a daily basis for temporary offices, first-aid stations, toilets, wash facilities, lunchrooms, and similar areas.
- H. Common-Use Field Office: Provide an insulated, weathertight, heated and air-conditioned field office for use as a common facility by all personnel engaged in construction activities; of sufficient size to accommodate required office personnel and meetings of 10 persons at Project site. Keep office clean and orderly.
1. Furnish and equip offices as follows:
 - a. Desk and four chairs, four-drawer file cabinet, a plan table, a plan rack, and bookcase.
 - b. Water cooler and private toilet complete with water closet, lavatory, and medicine cabinet with mirror.
 - c. Coffee machine and supplies, including regular and decaffeinated coffee, filters, cups, stirring sticks, creamer, sugar, and sugar substitute.
 - d. Provide a room of not less than 240 sq. ft. for Project meetings. Furnish room with conference table, 12 folding chairs, and 4-foot square tack board.
 2. Construct framing, sheathing, and siding using fire-retardant-treated lumber and plywood.
 3. Paint exposed lumber and plywood with exterior-grade acrylic-latex emulsion over exterior primer. Paint interior walls with two coats of interior latex-flat wall paint.
 4. Provide resilient floor covering and painted gypsum wallboard walls and acoustical ceiling. Provide operable windows with adjustable blinds and insect screens.
 5. Provide an electric heater with thermostat capable of maintaining a uniform indoor temperature of 68 deg F. Provide an air-conditioning unit capable of maintaining an indoor temperature of 72 deg F.
 6. Provide fluorescent light fixtures capable of maintaining average illumination of 20 fc at desk height. Provide 110- to 120-V duplex outlets spaced at not more than 12-foot intervals, 1 per wall in each room.
- I. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment involved, including temporary utility services. Sheds may be open shelters or fully enclosed spaces within building or elsewhere on-site.

1. Construct framing, sheathing, and siding using fire-retardant-treated lumber and plywood.
2. Paint exposed lumber and plywood with exterior-grade acrylic-latex emulsion over exterior primer.

J. Construction Equipment:

- 1) The General Contractor shall furnish and maintain all, equipment such as temporary stairs, ladders, ramps, scaffolds, runways, cutes, dumpsters, etc. As required for the proper execution of the work, unless specifically included under the work of other trades.
- 2) All staging, exterior and interior, required to be over eight feet in height, shall be furnished and erected by the general contractor and maintained in safe condition by him/her without charge to and for the use of all trades as needed by them for proper execution of their work, except where specified to the contrary in any filed sub-bid section of the specifications.
- 3) All such apparatus, equipment and construction shall meet all requirements of the labor law and other state and local laws applicable thereto.

K. Temporary Elevator Usage: Refer to Division 14 Sections for temporary use of new elevators.

L. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate. Cover finished, permanent stairs with protective covering of plywood or similar material so finishes will be undamaged at time of acceptance.

1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If, despite such protection, stairs become damaged, restore damaged areas so no evidence remains of correction work.

M. Groundbreaking: The Contractor shall make available, at a on-site location to be determined by the Owner, as scheduled by the Owner, the following items for a groundbreaking ceremony. Verify quantities with the Owner:

1. Ten (10) clean and bright spade type shovels.
2. Ten (10) new white OSHA approved construction "hard-hats".
3. One (1) properly working portable public address system and one (1) lectern.
4. One (1) piece of earth moving equipment.
5. One (1) clean portable toilet, located in close proximity to the groundbreaking, for use by the public attending the ceremony.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects. Avoid using tools and equipment that produce harmful noise. Restrict use of noisemaking tools and equipment to hours that will minimize complaints from persons or firms near Project site.
- B. Stormwater Control: Provide earthen embankments and similar barriers in and around excavations and subgrade construction, sufficient to prevent flooding by runoff of stormwater from heavy rains.
- C. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from construction damage. Protect tree root systems from damage, flooding, and erosion.
- D. Tree and Plant Protection: Comply with requirements in Division 2 Section "Tree Protection and Trimming."
- E. Pest Control: Before deep foundation work has been completed, retain a local exterminator or pest-control company to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests. Engage this pest-control service to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Obtain extended warranty for Owner. Perform control operations lawfully, using environmentally safe materials.
- F. Site Enclosure Fence: Before construction operations begin install portable chain-link enclosure fence with lockable entrance gates. Locate where indicated, or enclose entire Project site or portion determined sufficient to accommodate construction operations. Install in a manner that will prevent people, dogs, and other animals from easily entering site except by entrance gates.
 - 1. Set fence posts in concrete bases.
 - 2. Provide gates in sizes and at locations necessary to accommodate delivery vehicles and other construction operations.
 - 3. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Provide Owner with one set of keys.
- G. Security Enclosure and Lockup: Install substantial temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.
- H. Barricades, Warning Signs, and Lights: Comply with standards and code requirements for erecting structurally adequate barricades. Paint with appropriate colors, graphics, and warning signs to inform personnel and public of possible hazard. Where appropriate and needed, provide lighting, including flashing red or amber lights.
 - 1. For safety barriers, sidewalk bridges, and similar uses, provide minimum **5/8-inch**- thick exterior plywood.

- I. Covered Walkway: Erect a structurally adequate, protective, covered walkway for passage of persons along egress routes. Coordinate with entrance gates, other facilities, and obstructions. Comply with regulations of authorities having jurisdiction.
 1. Construct covered walkways using scaffold or shoring framing.
 2. Provide wood-plank overhead decking, protective plywood enclosure walls, handrails, barricades, warning signs, lights, safe and well-drained walkways, and similar provisions for protection and safe passage.
 3. Extend back wall beyond the structure to complete enclosure fence.
 4. Paint and maintain in a manner approved by Owner and Architect.
 5. For safety barriers, sidewalk bridges, and similar uses, provide minimum **5/8-inch**-thick exterior plywood.

- J. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
 1. Where heating or cooling is needed and permanent enclosure is not complete, provide insulated temporary enclosures. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.
 2. Vertical Openings: Close openings of **25 sq. ft.** or less with plywood or similar materials.
 3. Horizontal Openings: Close openings in floor or roof decks and horizontal surfaces with load-bearing, wood-framed construction.
 4. Install tarpaulins securely using fire-retardant-treated wood framing and other materials.
 5. Where temporary wood or plywood enclosure exceeds **100 sq. ft.** in area, use fire-retardant-treated material for framing and main sheathing.

- K. Temporary Partitions: Erect and maintain dustproof partitions and temporary enclosures to limit dust and dirt migration and to separate areas from fumes and noise.
 1. Construct dustproof partitions of not less than nominal **4-inch** studs, **5/8-inch** gypsum wallboard with joints taped on occupied side, and **1/2-inch** fire-retardant plywood on construction side.
 2. Construct dustproof, floor-to-ceiling partitions of not less than nominal **4-inch** studs, 2 layers of **3-mil** polyethylene sheets, inside and outside temporary enclosure. Cover floor with 2 layers of **3-mil** polyethylene sheets, extending sheets **18 inches** up the side walls. Overlap and tape full length of joints. Cover floor with **3/4-inch** fire-retardant plywood.
 - a. Construct a vestibule and airlock at each entrance to temporary enclosure with not less than **48 inches** between doors. Maintain water-dampened foot mats in vestibule.
 3. Insulate partitions to provide noise protection to occupied areas.
 4. Seal joints and perimeter. Equip partitions with dustproof doors and security locks.
 5. Protect air-handling equipment.
 6. Weatherstrip openings.

- L. Temporary Fire Protection: Until fire-protection needs are supplied by permanent facilities, install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.

1. Provide fire extinguishers, installed on walls on mounting brackets, visible and accessible from space being served, with sign mounted above.
 - a. Field Offices: Class A stored-pressure water-type extinguishers.
 - b. Other Locations: Class ABC dry-chemical extinguishers or a combination of extinguishers of NFPA-recommended classes for exposures.
 - c. Locate fire extinguishers where convenient and effective for their intended purpose; provide not less than one extinguisher on each floor at or near each usable stairwell.
2. Store combustible materials in containers in fire-safe locations.
3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire-protection facilities, stairways, and other access routes for firefighting. Prohibit smoking in hazardous fire-exposure areas.
4. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition.
5. Permanent Fire Protection: At earliest feasible date in each area of Project, complete installation of permanent fire-protection facility, including connected services, and place into operation and use. Instruct key personnel on use of facilities.
6. Develop and supervise an overall fire-prevention and first-aid fire-protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
7. Provide hoses for fire protection of sufficient length to reach construction areas. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.
8. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.5 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage caused by freezing temperatures and similar elements.
 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
 2. Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.
- C. Operate Project-identification-sign lighting daily from dusk until 12:00 midnight.
- D. Temporary Facility Changeover: Except for using permanent fire protection as soon as available, do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

- E. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
1. Materials and facilities that constitute temporary facilities are the property of Contractor. Owner reserves right to take possession of Project identification signs.
 2. Remove temporary paving not intended for or acceptable for integration into permanent paving. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
 3. At Substantial Completion, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements in Division 1 Section "Closeout Procedures."

END OF SECTION 01500

SECTION 01600 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following administrative and procedural requirements: selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and comparable products.
- B. Related Sections include the following:
 - 1. Division 1 Section "Closeout Procedures" for submitting warranties for contract closeout.
 - 2. Divisions 2 through 16 Sections for specific requirements for warranties on products and installations specified to be warranted.

1.3 DEFINITIONS

- A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation, shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility, except that products consisting of recycled-content materials are allowed, unless explicitly stated otherwise. Products salvaged or recycled from other projects are not considered new products.
 - 3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
- C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.

- D. **Manufacturer's Warranty:** Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
- E. **Special Warranty:** Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.

1.4 SUBMITTALS

- A. **Product List:** Submit a list, in tabular form, showing specified products. Include generic names of products required. Include manufacturer's name and proprietary product names for each product.
 - 1. Coordinate product list with Contractor's Construction Schedule and the Submittals Schedule.
 - 2. Form: Tabulate information for each product under the following column headings:
 - a. Specification Section number and title.
 - b. Generic name used in the Contract Documents.
 - c. Proprietary name, model number, and similar designations.
 - d. Manufacturer's name and address.
 - e. Supplier's name and address.
 - f. Installer's name and address.
 - g. Projected delivery date or time span of delivery period.
 - h. Identification of items that require early submittal approval for scheduled delivery date.
 - 3. Initial Submittal: Within 30 days after date of commencement of the Work, submit 6 copies of initial product list. Include a written explanation for omissions of data and for variations from Contract requirements.
 - a. At Contractor's option, initial submittal may be limited to product selections and designations that must be established early in Contract period.
 - 4. Completed List: Within 60 days after date of commencement of the Work, submit 6 copies of completed product list. Include a written explanation for omissions of data and for variations from Contract requirements.
- B. **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. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified material or product cannot be provided.
 - b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.

- c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, where applicable or requested.
 - f. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
 - g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 - h. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
 - i. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.
 - j. Cost information, including a proposal of change, if any, in the Contract Sum.
 - k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
 - l. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.
 - a. Form of Acceptance: Change Order.
 - b. Use product specified if Architect cannot make a decision on use of a proposed substitution within time allocated.
- C. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 1 Section "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.
1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
 2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.
 - 1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
 - 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
 - 3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
 - 4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
 - 5. Store products to allow for inspection and measurement of quantity or counting of units.
 - 6. Store materials in a manner that will not endanger Project structure.
 - 7. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
 - 8. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
 - 9. Protect stored products from damage.
- B. Storage: Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.7 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.
 - 1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 - 2. Specified Form: Forms are included with the Specifications. Prepare a written document using appropriate form properly executed.
 - 3. Refer to Divisions 2 through 16 Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Division 1 Section "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT OPTIONS

- A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged, and unless otherwise indicated, that are new at time of installation.
1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
 4. Where products are accompanied by the term "as selected," Architect will make selection.
 5. Where products are accompanied by the term "match sample," sample to be matched is Architect's.
 6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.
 7. Or Equal: Where products are specified by name and accompanied by the term "or equal" or "or approved equal" or "or approved," comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.
- B. Product Selection Procedures: Procedures for product selection include the following:
1. Product: Where Specification paragraphs or subparagraphs titled "Product" name a single product and manufacturer, provide the product named.
 - a. Substitutions may be considered, unless otherwise indicated.
 2. Manufacturer/Source: Where Specification paragraphs or subparagraphs titled "Manufacturer" or "Source" name single manufacturers or sources, provide a product by the manufacturer or from the source named that complies with requirements.
 - a. Substitutions may be considered, unless otherwise indicated.
 3. Products: Where Specification paragraphs or subparagraphs titled "Products" introduce a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.
 - a. Substitutions may be considered, unless otherwise indicated.
 4. Manufacturers: Where Specification paragraphs or subparagraphs titled "Manufacturers" introduce a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.
 - a. Substitutions may be considered, unless otherwise indicated.

5. Available Products: Where Specification paragraphs or subparagraphs titled "Available Products" introduce a list of names of both products and manufacturers, provide one of the products listed or another product that complies with requirements. Comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.
6. Available Manufacturers: Where Specification paragraphs or subparagraphs titled "Available Manufacturers" introduce a list of manufacturers' names, provide a product by one of the manufacturers listed or another manufacturer that complies with requirements. Comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.
7. Product Options: Where Specification paragraphs titled "Product Options" indicate that size, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide either the specific product or system indicated or a comparable product or system by another manufacturer. Comply with provisions in "Product Substitutions" Article.
8. Basis-of-Design Products: Where Specification paragraphs or subparagraphs titled "Basis-of-Design Products" are included and also introduce or refer to a list of manufacturers' names, provide either the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.
 - a. Substitutions may be considered, unless otherwise indicated.
9. Visual Matching Specification: Where Specifications require matching an established Sample, select a product (and manufacturer) that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches satisfactorily.
 - a. If no product available within specified category matches satisfactorily and complies with other specified requirements, comply with provisions of the Contract Documents on "substitutions" for selection of a matching product.
10. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product (and manufacturer) that complies with other specified requirements.
 - a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, or texture from manufacturer's product line that does not include premium items.
 - b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, or texture from manufacturer's product line that includes both standard and premium items.

2.2 PRODUCT SUBSTITUTIONS

- A. Timing: Architect will consider requests for substitution if received within 60 days after commencement of the Work. Requests received after that time may be considered or rejected at discretion of Architect. **Contractor will not order proposed substitute products until such products are accepted by the Architect/Engineer. Contractor will be responsible for all restocking charges and other fees or cost associated with returning unaccepted proposed substitute products and purchasing required products.**
- 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. 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.
 2. Requested substitution does not require extensive revisions to the Contract Documents.
 3. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 4. Substitution request is fully documented and properly submitted.
 5. Requested substitution will not adversely affect Contractor's Construction Schedule.
 6. Requested substitution has received necessary approvals of authorities having jurisdiction.
 7. Requested substitution is compatible with other portions of the Work.
 8. Requested substitution has been coordinated with other portions of the Work.
 9. Requested substitution provides specified warranty.
 10. 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.

2.3 COMPARABLE PRODUCTS

- A. Where products or manufacturers are specified by name, submit the following, in addition to other required submittals, to obtain approval of an unnamed product:
1. Evidence that the proposed product does not require extensive revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
 2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 3. Evidence that proposed product provides specified warranty.
 4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
 5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

PART 4 - END OF SECTION 01600

SECTION 01700 - EXECUTION REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. General installation of products.
4. Coordination of Owner-installed products.
5. Progress cleaning.
6. Starting and adjusting.
7. Protection of installed construction.
8. Correction of the Work.

- B. Related Sections include the following:

1. Division 1 Section "Project Management and Coordination" for procedures for coordinating field engineering with other construction activities.
2. Division 1 Section "Submittal Procedures" for submitting surveys.
3. Division 1 Section "Cutting and Patching" for procedural requirements for cutting and patching necessary for the installation or performance of other components of the Work.
4. Division 1 Section "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

1.3 SUBMITTALS

- A. Qualification Data: For professional engineer to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- B. Certificates: Submit certificate signed by professional engineer certifying that location and elevation of improvements comply with requirements.
- C. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.
- D. Certified Surveys: Submit three copies signed by professional engineer.

- E. Final Property Survey: Submit 6 copies showing the Work performed and record survey data.

1.4 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.
 - 1. Before construction, verify the location and points of connection of utility services.
- B. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.
 - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.
 - 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- C. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
 - 1. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
 - a. Description of the Work.
 - b. List of detrimental conditions, including substrates.
 - c. List of unacceptable installation tolerances.
 - d. Recommended corrections.
 - 2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
 - 3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.

4. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
5. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Existing Utility Information: Furnish information to local utility & Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. 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 Architect, Owner not less than seven days in advance of proposed utility interruptions.
 2. Do not proceed with utility interruptions without Architect's and Owner's written permission.
- C. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- D. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- E. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.
- B. General: Engage a professional engineer to lay out the Work using accepted surveying practices.
 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
 2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
 3. Inform installers of lines and levels to which they must comply.

4. Check the location, level and plumb, of every major element as the Work progresses.
 5. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
 6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.4 FIELD ENGINEERING

- A. Identification: Owner will identify existing benchmarks, control points, and property corners.
- B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
 2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
 3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.
- D. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.

- E. Final Property Survey: Prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by professional engineer, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.
 - 1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
 - 2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

3.5 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 - 1. Make vertical work plumb and make horizontal work level.
 - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 - 3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
 - 4. Maintain minimum headroom clearance of **8 feet (2.4 m)** in spaces without a suspended ceiling.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- F. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 - 2. Allow for building movement, including thermal expansion and contraction.
- G. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- H. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 OWNER-INSTALLED PRODUCTS

- A. Site Access: Provide access to Project site for Owner's construction forces.

- B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction forces.
 - 1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
 - 2. Preinstallation Conferences: Include Owner's construction forces at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction forces if portions of the Work depend on Owner's construction.

3.7 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.
 - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 - 2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F (27 deg C).
 - 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
 - 1. Remove liquid spills promptly.
 - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Cutting and Patching: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.
 - 1. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged pipe covering to its original condition.

- H. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.
- I. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- J. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- K. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.8 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division 1 Section "Quality Requirements."

3.9 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.10 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 1 Section "Cutting and Patching."
 - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Restore permanent facilities used during construction to their specified condition.
- C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

- D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
- E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 01700

Section 01720 - SURVEYS AND RECORD DRAWINGS

1. SURVEYS

A. As required by HUD, the Contractor shall furnish to the owner a survey, signed by a Land Surveyor or Engineer registered in Massachusetts, certifying that the location of the building(s) and the principal lines, levels, and dimensions of the buildings are accurately established in accordance with the drawings.

1. This drawing shall be the same size as the other drawings in the Contract Documents.
2. One copy of this drawing shall be a wash of Mylar.

2. RECORD DRAWINGS

A. Record Drawings shall consist of all the Contract Drawings.

B. From the sets of drawings furnished by the Owner, the Contractor shall reserve one set for record purposes. From this set, the Contractor shall detach and furnish, at no charge to the Mechanical and Electrical Subcontractors the drawings of their portion of the Work for the same purpose.

C. The Contractor and the above Subcontractors shall keep their marked up As Built set on the site at all times and note on it in colored ink or pencil, neatly and accurately, at the end of each working day, the exact location of their work as actually installed. This shall include the location and dimensions of underground and concealed Work, and any architectural, mechanical, or electrical variations from the Contract Drawings. All changes, including those issued by Addendum, Change Order, or instructions by the Architect shall be recorded. Marked up As Built drawings shall be prepared for the entire project and include all Work, including but not limited to:

1. The location of all underground utilities and appurtenances referenced to permanent surface improvements, both horizontally and vertically at ten (10) foot intervals and at all changes of direction.
2. The location of all internal utilities and appurtenances, concealed by finish materials, including but not limited to valves, coils, dampers, vents, cleanouts, strainers, pipes, junction boxes, turning vanes, variable and constant volume boxes, ducts, traps, and maintenance devices.
 - a. The location of these, items shall be shown by offsets to structure and drawing grid lines.
 - b. The tolerance for the actual location of these items on the marked up As Built Drawings shall be plus or minus two (2) inches.
 - c. Each item shall be referenced by showing a tag number, areas served, and function on the marked up As Built drawing

D. The Architect may periodically inspect the marked up As Built drawings at the site. The proper and current maintenance of the information required on these drawings shall be a condition precedent to approval of the monthly applications for payment.

E. At Substantial Completion the Contractor shall submit the complete set of marked up As Built drawings to the Architect. The Contractor shall check all marked up As Built drawings prepared by

subcontractors and certify in writing on the title sheet of the drawings that they are complete and correct, prior to submission to the Architect.

- F. The Architect shall review the marked up As Built drawings and verify by letter to the Owner that the Work is complete. The Architect shall incorporate all changes onto to original drawings.
- G. The Contractor may make a written request for copies of the completed Record Drawings. The Contractor shall reimburse the Owner directly for the cost of printing of any requested Record Drawings.
- H. Submission of accurate marked up As Built drawings and their approval by the Architect shall be a condition precedent to final payment.

END OF SECTION

SECTION 01731 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes procedural requirements for cutting and patching.
- B. Related Sections include the following:
 - 1. Division 1 Section "Selective Demolition" for demolition of selected portions of the building for alterations.
 - 2. Division 7 Section "Through-Penetration Firestop Systems" for patching fire-rated construction.
 - 3. Divisions 2 through 16 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.
 - a. Requirements in this Section apply to mechanical and electrical installations. Refer to Divisions 15 and 16 Sections for other requirements and limitations applicable to cutting and patching mechanical and electrical installations.

1.3 DEFINITIONS

- A. Cutting: Removal of existing 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.

1.4 SUBMITTALS

- A. Cutting and Patching Proposal: Submit a proposal describing procedures at least 10 days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:
 - 1. Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.
 - 2. Changes to Existing Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
 - 3. Products: List products to be used and firms or entities that will perform the Work.

4. Dates: Indicate when cutting and patching will be performed.
5. Utilities: List utilities that cutting and patching procedures will disturb or affect. List utilities that will be relocated and those that will be temporarily out of service. Indicate how long service will be disrupted.
6. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.
7. Architect's Approval: Obtain written approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

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.
- 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.
- C. Miscellaneous Elements: Do not cut and patch the following 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.
 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.
- E. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.6 WARRANTY

- A. 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 of these Specifications.
- B. Existing Materials: Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing 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 existing 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 existing 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 existing 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.
- C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- D. Existing Services: Where existing services are required to be removed, relocated, or abandoned, bypass such services before cutting to minimize interruption of services to occupied 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 existing 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.

- B. Cutting: Cut existing 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. Existing Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 3. Concrete, stone, brick 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 Division 2 Sections where required by cutting and patching operations.
 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 6. 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 of these Specifications.
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.
 3. 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 existing 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.
 4. Ceilings: Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.
 5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

END OF SECTION 01731

SECTION 01741 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

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.

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for salvaging, recycling and disposing of construction waste.

1.2 RELATED SECTIONS

- A. Section 01732 – Selective Demolition:
 - 1. Selective demolition activities.

1.3 DEFINITIONS

- A. Asphalt Pavement, Brick, and Concrete (ABC) Rubble: Rubble that contains only weathered (cured) asphalt pavement, clay bricks and attached mortar normally used in construction, or concrete that may contain rebar. The rubble shall not be mixed with, or contaminated by, another waster or debris.
- B. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- C. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.
- D. 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.
- E. Recycle: Diversion of demolition and construction waste from the landfill for reuse.
- F. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- G. Salvage for Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.4 PERFORMANCE REQUIREMENTS

- A. General: Develop waste management plan that results in end-of-Project rates for salvage/recycling of 75 percent by weight of total waste generated by the Work.

- B. Salvage/Recycle Requirements: Salvage and recycle as much nonhazardous demolition and construction waste as possible including the following materials:
1. Demolition Waste:
 - a. Asphaltic concrete paving.
 - b. Concrete and concrete reinforcing steel.
 - c. Brick and concrete masonry units.
 - d. Wood studs, wood joists, plywood, oriented strand board, paneling and trim.
 - e. Casework and cabinetry.
 - f. Structural steel, miscellaneous steel and rough hardware.
 - g. Roofing.
 - h. Insulation.
 - i. Doors, door frames and door hardware.
 - j. Windows and glazing.
 - k. Metal studs.
 - l. Gypsum board (new unpainted scrap).
 - m. Acoustical tile and panels.
 - n. Carpet and carpet pad.
 - o. Demountable partitions.
 - p. Equipment.
 - q. Plumbing fixtures, piping, supports, hangers, valves and sprinklers.
 - r. Mechanical equipment and refrigerants.
 - s. Electrical conduit, copper wiring, lighting fixtures, lamps, and ballasts.
 - t. Electrical devices, switchgear, panelboards and transformers.
 2. Construction Waste:
 - a. Site-clearing waste.
 - b. Concrete and concrete reinforcing steel.
 - c. Masonry and CMU.
 - d. Lumber, wood sheet materials and wood trim.
 - e. Metals.
 - f. Roofing.
 - g. Insulation.
 - h. Carpet and pad.
 - i. Gypsum board.
 - j. Piping.
 - k. Wire and cable
 - l. Electrical conduit.
 - m. Packaging: 100 percent of the following uncontaminated packaging materials: Paper, cardboard, boxes, plastic sheet and film, polystyrene packaging, wood crates, plastic pails.
- C. In the event the Contractor encounters previously unidentified material that is reasonably believed to be hazardous, asbestos containing, coated with lead-based paint, or oily debris, the Contractor shall immediately stop work in the affected area and report the condition to the Architect. At no time shall such material be handled or disposed of by the Contractor. The Contractor agrees to cooperate with the Architect and any consultants engaged by the Owner to perform services with respect to the analysis, detection, removal, containment, treatment and disposal of such regulated materials.

1.5 SUBMITTALS

- A. Recycling Plan: Prior to preparation of the Waste Management Plan or engagement of waste or recycling subcontractors, submit the recycling plan to the Architect, Owners Representative and Consultant for approval.
- B. Waste Management Plan: Submit 3 copies of plan within 30 days of date established for the Notice to Proceed, in a format acceptable to the Architect, Owners Representative and Consultant.
- C. 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.
- D. 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.
- E. Record Keeping for Donations, Recycling and Landfill Disposal: Documentation shall be submitted by the Contractor and include the following:
 - 1. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.
 - 2. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.
 - 3. 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. Include documentation for backcharge fees, if any, for improperly segregated waste.
 - 4. 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.
- F. Facility Permitting Information: For ABC rubble crushing and/or recycling facilities, provide a statement from the facility that references its specific exemption from the solid waste regulations (per 310 CMR 16.05 (3) (e) or provide a copy of the facility's current solid waste management facility permit in accordance with 310 CMR 19.000.
- G. Qualification Data: For Waste Management Coordinator and refrigerant recovery technician.
- H. 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 and using equipment that has a current EPA Registration. Include name and address of technician, date refrigerant was recovered, amount of refrigerant recovered and shipped, and date of receipt of shipment by the reclaimer.

- I. Penalties and Assessments: Copies of penalty notices for non-compliance with regulations assessed by authorities having jurisdiction, and proof of payment.

1.6 QUALITY ASSURANCE

- A. Waste Management Coordinator Qualifications: LEED Accredited Professional by U.S. Green Building Council, or three years documented experience with construction waste management activities.
- B. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program, using recycling/recovery equipment that has a current EPA Registration.
- C. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction, including but not limited to, Massachusetts solid waste regulations contained in 310 CMR 16.00 and 310 CMR 19.000.
- D. Waste Management Conference: Conduct conference at Project site. 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.
 6. Provide recycling education and recycling information to Contractor and subcontractor employees working on the project.

1.7 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 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 ton). Include hauling and tipping fees and rental 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.
- 1.8 PROJECT CONDITIONS:
- A. Environmental Requirements:
1. Transport recyclable and recoverable waste materials from the Work Area to containers and carefully deposit in the containers without excess noise and interference with other activities, to minimize noise and dust.
 2. The Contractor shall ensure adequate erosion control and storm water control, if required, to prevent or minimize the negative impact to its surrounding environment.
 3. Provide measures to insure the containment of lead-based paint and dust, nails, asbestos-based products and any biological contaminants that may affect environmental health and safety conditions.
- B. Site Condition:
1. Signs and instructions should be clear, and easy to understand. All recycling containers should be clearly labeled and lists of acceptable and unacceptable materials will be posted throughout the site. Whenever possible, they should be in multiple-languages, especially in Spanish, and in graphic symbols.
 2. The Contractor shall ensure the safety of all personnel involved in the C&D process.
 3. A C&D site management plan shall be created including: work areas, materials processing areas, materials storage and disposal areas, worker hand-washing and changing stations, first aid and medical information.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

- A. General: Implement waste management plan as approved by the Architect, Owners Representative and Consultant. Provide containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
- B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan.
- 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.
 - 3. Provide recycling education for all workers, subcontractors and suppliers engaged in on-site activities.
 - 4. Distribute recycling educational literature.
 - 5. Provide appropriate recycling signage for containers and workspaces.
- 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 project requirements 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 Sale and Donation: Sale not permitted on Project site. Labor for loading donated items acceptable to local trade practices; union labor if applicable.

- C. Salvaged Items for User Agency'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 User Agency.
 - 4. Transport items to User Agency's storage area off-site.
 - 5. Protect items from damage during transport and storage.

- D. Doors and Hardware: Brace open end of door frames. 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 Receivers and Processors: Available recycling receivers and processors include, but are not limited to, those listed in the Massachusetts Recycling Directory, available from the Massachusetts State Bookstore (617-727-2834) located in the State Capitol Building, and (413-784-1376) located at 436 Dwight St., Spfld, Ma. and on-line at the following URL: <http://www.STATE.MA.US/DEP/recycle/files/rsd.pdf>. for recycling operations within the Commonwealth of Massachusetts.

- C. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to the User Agency

- D. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical. For waste which cannot be separated at Project site, co-mingle only with waste which is to be separated later at a recycling facility. Contamination of recycling containers with trash or other contaminants is subject to a penalty of \$750.00 per container, payable to the User Agency.
 - 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. 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 User Agency's property and transport to recycling receiver or processor.

- E. On-site crushing of asphalt pavement, brick, and concrete (ABC) rubble as described in 310 CMR 16.05, is not allowed. All ABC waste must be transported off-site to an asphalt batching plant or to an ABC crushing or recycling operation that is either conditionally exempt from 310 CMR 16.00 or has been sited and permitted in accordance with 310 CMR 16.00 and 310 CMR 19.000, respectively.

3.4 RECYCLING DEMOLITION WASTE

- A. Asphaltic Concrete Paving: Break up and transport paving to asphalt-recycling facility.
- B. Concrete: Deposit all debris in designated container to be transported to approved aggregate recycling facility to be crushed and screened for use as satisfactory soil for fill or sub-base.
- C. Masonry: Deposit all masonry debris in designated container to be transported to approved aggregate recycling facility to be crushed and screened for use as satisfactory soil for general fill or satisfactory soil for fill or sub-base. Clean and stack undamaged whole masonry units on wood pallets for reuse.
- D. Wood Materials: Sort and stack salvageable members according to size, type, and length. Separate lumber waste and deposit into appropriate container. Separate engineered wood products, panel products, and treated wood materials into designated containers.
- E. Metals: Separate metals by type if practical. Stack salvageable structural steel members according to size, type of member, and length.
- F. Asphalt Shingle Roofing: Organic and glass-fiber asphalt shingles and felts shall be disposed of at a facility permitted by Massachusetts Department of Environmental Protection (DEP) to process post-consumer (used) asphalt shingles. Recycle nails, staples acceptable, flashing trim and accessories as metals.
 - 1. Asbestos containing shingles shall be pre-abated and properly disposed of by a Massachusetts licensed asbestos abatement contractor, in accordance with all applicable regulations. Asbestos abatement work, including disposal of asbestos contain materials, is not included in the scope of the Work and will be performed by others.
- G. Gypsum Board: Deposit clean gypsum scrap into appropriate containers. Protect from weather. Remove edge trim and sort with other metals. Remove and dispose of fasteners and other contaminants.
- H. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets, stretch wrap and store in a dry location. Separate suspension system, trim, and other metals from panels and tile and sort with other metals.
- I. Carpet and Pad: Roll large pieces tightly after removing debris, trash, adhesive, and tack strips. Store clean, dry carpet and pad in a closed container or trailer provided by carpet reclamation agency or carpet recycler.
- J. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.
- K. Plumbing Fixtures: Separate by type and size fixtures suitable for reuse. Deposit all other fixtures into designated containers by material type to be transported to approved recycling facility.
- L. Piping: Separate piping materials by material composition. Deposit in designated containers. Separate supports, hangers, valves, sprinklers, and other components by material type and deposit in designated containers for transport to approved recycling facility.
- M. Lighting Fixtures: Separate lamps by type and protect from breakage.

- N. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.
- O. Conduit: Deposit conduit and fittings into designated container.

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.
- C. Concrete: Deposit all debris in designated container to be transported to approved aggregate recycling facility to be crushed and screened for use as satisfactory soil for fill or sub-base.
- D. Masonry: Deposit all masonry debris in designated container to be transported to approved aggregate recycling facility to be crushed and screened for use as satisfactory soil for general fill or satisfactory soil for fill or sub-base. Clean and stack undamaged whole masonry units on wood pallets for reuse.
- E. Asphalt Shingle Roofing: Deposit and recycle asphalt shingles(nails, staples acceptable, flashing trim and accessories recycle as metals
- F. Metals: Separate metals by material type if practical. Stack salvageable structural steel members according to size, type of member, and length.
- G. Wood Materials:
 - 1. Clean Cut-Offs of Lumber: Deposit into designated clean wood container to be transported to designated recycling facility for use as mulch or bio-fuel.
 - 2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.
- H. Clean Gypsum Board: Deposit scraps of clean gypsum board into designated container protected from weather and transport to appropriate gypsum recycling facility to be processed into new gypsum board.

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.
 3. For solid waste disposal facilities located in the Commonwealth of Massachusetts, dispose of materials only in facilities which currently comply with applicable regulations, including requirements of MGL Title XVI - Public Health, Chapter 111, Section 150A Solid Waste Disposal Facilities; Maintenance and Operation; Applications for Site Assignment and Section 150A 1/2 Standards and Criteria for Siting of Facilities; Rules and Regulations.
- B. Burning: Do not burn waste materials.
- C. Disposal: Transport waste materials off the property and legally dispose of waste materials.

END OF SECTION

SECTION 01770 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Inspection procedures.
2. HVAC Balancing Reports
3. Project Record Documents.
4. Operation and maintenance manuals.
5. Warranties.
6. Instruction of Owner's personnel.
7. Final cleaning.

- B. Related Sections include the following:

1. Division 1 Section "Payment Procedures" for requirements for Applications for Payment for Substantial and Final Completion.
2. Division 1 Section "Construction Progress Documentation" for submitting Final Completion construction photographs and negatives.
3. Division 1 Section "Execution Requirements" for progress cleaning of Project site.
4. Division 1 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
5. Divisions 2 through 16 Sections for specific closeout and special cleaning requirements for products of those Sections.

1.3 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.

1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
2. Advise Owner of pending insurance changeover requirements.
3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.

5. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction photographs and photographic negatives, damage or settlement surveys, property surveys, and similar final record information.
6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
8. Complete startup testing of systems.
9. Submit test/adjust/balance records.
10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
11. Advise Owner of changeover in heat and other utilities.
12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
13. Complete final cleaning requirements, including touchup painting.
14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
15. Perform fresh air flushing of interior spaces before occupancy to remove accumulated VOC's from building.

B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for Final Completion.

1.4 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:

1. Submit a final Application for Payment according to Division 1 Section "Payment Procedures."
2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report and warranty.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training videotapes.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements.

Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Preparation: Submit six copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
 1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
 2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
 3. Include the following information at the top of each page:
 - a. Project name.
 - b. Date.
 - c. Name of Architect.
 - d. Name of Contractor.
 - e. Page number.

1.6 PROJECT RECORD DOCUMENTS

- A. General: Do not use Project Record Documents for construction purposes. Protect Project Record Documents from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.
- B. Record Drawings: Maintain and submit one set of blue- or black-line white prints of Contract Drawings and Shop Drawings.
 1. Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
 - a. Give particular attention to information on concealed elements that cannot be readily identified and recorded later.
 - b. Accurately record information in an understandable drawing technique.
 - c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
 - d. Mark Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. Where Shop Drawings are marked, show cross-reference on Contract Drawings.
 2. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at the same location.

3. Mark important additional information that was either shown schematically or omitted from original Drawings.
 4. Note Construction Change Directive numbers, Change Order numbers, alternate numbers, and similar identification where applicable.
 5. Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location. Organize into manageable sets; bind each set with durable paper cover sheets. Include identification on cover sheets.
- C. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications. Mark copy to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
 3. Note related Change Orders, Record Drawings, and Product Data, where applicable.
- D. Record Product Data: Submit one copy of each Product Data submittal. Mark one set to indicate the actual product installation where installation varies substantially from that indicated in Product Data.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
 3. Note related Change Orders, Record Drawings, and Record Specifications, where applicable.
- E. Miscellaneous Record Submittals: Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.
- 1.7 OPERATION AND MAINTENANCE MANUALS
- A. Assemble a complete set of operation and maintenance data indicating the operation and maintenance of each system, subsystem, and piece of equipment not part of a system. Include operation and maintenance data required in individual Specification Sections and as follows:
1. Operation Data:
 - a. Emergency instructions and procedures.
 - b. System, subsystem, and equipment descriptions, including operating standards.
 - c. Operating procedures, including startup, shutdown, seasonal, and weekend operations.
 - d. Description of controls and sequence of operations.
 - e. Piping diagrams.

2. Maintenance Data:
 - a. Manufacturer's information, including list of spare parts.
 - b. Name, address, and telephone number of Installer or supplier.
 - c. Maintenance procedures.
 - d. Maintenance and service schedules for preventive and routine maintenance.
 - e. Maintenance record forms.
 - f. Sources of spare parts and maintenance materials.
 - g. Copies of maintenance service agreements.
 - h. Copies of warranties and bonds.

- B. Organize operation and maintenance manuals into suitable sets of manageable size. Bind and index data in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, with pocket inside the covers to receive folded oversized sheets. Identify each binder on front and spine with the printed title "OPERATION AND MAINTENANCE MANUAL," Project name, and subject matter of contents.

1.8 BALANCING REPORTS

- A. The General Contractor shall procure the services of an independent agency operating and specializing in testing and balancing of HVAC Systems to perform the balance as specified in the Mechanical Specifications Section of this Project Manual. The Heating Contractor shall not be allowed to perform his/her own balancing.

1.9 WARRANTIES

- A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.
- B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
- C. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
 1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

- D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 DEMONSTRATION AND TRAINING

- A. Instruction: Instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
 - 1. Provide instructors experienced in operation and maintenance procedures.
 - 2. Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at the start of each season.
 - 3. Schedule training with Owner, through Architect, with at least ten days' advance notice.
 - 4. Coordinate instructors, including providing notification of dates, times, length of instruction, and course content.
- B. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections. For each training module, develop a learning objective and teaching outline. Include instruction for the following:
 - 1. System design and operational philosophy.
 - 2. Review of documentation.
 - 3. Operations.
 - 4. Adjustments.
 - 5. Troubleshooting.
 - 6. Maintenance.
 - 7. Repair.

3.2 FINAL CLEANING

- A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - e. Remove snow and ice to provide safe access to building.
 - f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - h. Sweep concrete floors broom clean in unoccupied spaces.
 - i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
 - j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - k. Remove labels that are not permanent.
 - l. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
 - 1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
 - m. Wipe surfaces of mechanical and electrical equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - n. Replace parts subject to unusual operating conditions.
 - o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - q. Clean ducts, blowers, and coils if units were operated without filters during construction.
 - r. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters.
 - s. Perform fresh air flushing of interior spaces before occupancy to remove accumulated VOC's from building.
 - t. Leave Project clean and ready for occupancy.

- C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare a report.
- D. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

PROJECT CLOSEOUT 'CHECKLIST'

The following project checklist shall be part of the Architect's review and must be submitted prior to the final project review and closeout procedures. All items listed are required to be submitted by the General Contractor without exception.

CHECKLIST

As-Built Record Drawings

- 'As-Built' record drawings shall include 'as-built' schedules of each item installed. Include below grade improvements, fixtures, ballasts, panel boards, circuit breakers, mechanical units, motors, actuators, filters, sprinkler head, all doors, (including overhead rolling doors) frames, hardware, keying, underground conduits, lighting etc..
- Provide 'as-built' record drawings in the following format: one (1) set of mylar reproducibles, two (2) sets of full size 'E' drawing blue line prints and two (2) sets of AutoCAD drawing disks and specification disks.
- Closeout documents shall include copies of all shop drawings include Item #, manuf. and model.
- Each Contractor and subcontractor shall record any deviation of the installation of any item installed or provided for the project by marking original record set drawings with clouded notations in red ink.

Manufacturer's Warranty

- Provided an original warranty with each item installed on the Project. Each warranty shall be signed and dated by the manufacturer or designated representative and shall indicate the warranty coverage, term, expiration date, special exclusions and contact person with telephone number for warranty claims.

Contractors Warranty

- The Contractor shall provide a warranty for workmanship of installation for each item installed or a blanket warranty covering each item installed. The contractor's warranty shall be original and signed and dated. Warranty shall state the warranty coverage, term, expiration date, and contact person with telephone number for Warranty service.

- If the Contractor Warrants items of varying terms, a Master legend shall be created to indicate each component warranty term and expiration date.

Operation Manual

- Each item installed that requires operation by the user shall be provided with an operation manual that instructs the use or programming of the item.

Operation Training

- Each item installed that requires operation by the end user shall be provided with no less than one (1) hands-on training session for each component.

Maintenance Manual

- Each item installed that requires periodic maintenance shall be provided with a Maintenance Manual that outlines maintenance service and procedures.
- Each item installed that requires replacement of component(s) or fluid shall be identified in the Manual as “maintenance required” and identify each component manufacturer, model # of part, fluid type, capacity and name and telephone number of nearest part distributor.
- Maintenance Manual shall be categorized by dividers in correlation to the Master Spec Format or as sequenced in the Project Specifications.
- Maintenance Training shall be provided by the manufacturer for each item that requires maintenance.
- Each item installed shall be provided with a manufacturer, model #, part #, pattern name, color formulation and name, finish and manufacturer address and telephone number.

Extra Stock

- Supply each specification section’s extra stock requirements to the Owner.
- Supply a copy of the signed receipt by Owners personnel of acceptance of each extra stock item.

Balancing Report

- Submit a complete balancing report to the Engineer.

Punch List

- Project Punch List with all items indicated as completed, signed and acknowledged by the Contractor.
- All items of every trade have been completed and are functioning in conformance with the Project Documents as interpreted by the Architect, Engineer or Consultant.
- Manufacturer representatives have inspected and certified the installation and/or operation of their component as proper and warrantable.
- Copy of an executed 'CO', Certificate of Occupancy is submitted.

Certification Letter

- Letter from the Architect, Engineers and Contractor that the Project is complete and in full compliance with the Project Documents and final retainage may be released.
- Contractor has provided Affidavits of Lien Waivers from each sub-contractor through the previous Application for Payment.

Acceptance by Owner

- Extra stock as required for each category of the work has been received.
- All the Work of all the trades have been installed and are in good operating condition.
- 'CO', Certificate of Occupancy has been issued, signed by the Town Building Department.
- A properly executed 'Certification Letter' has been received.
- Maintenance & Operations Manuals have been submitted in the appropriate content & format.
- Affidavits of Lien Waivers for final payment have been submitted in requested format and content.
- All amendments have been executed in requested format and content.
- As-Built Record Drawings have been received in the appropriate content & format.
- Contractor and Sub-contractor Log has been received.
- Final Payment of Retainage has been completed. & Contractor back-charges have been deducted.

ASBESTOS ABATEMENT TECHNICAL SPECIFICATION

ASBESTOS ABATEMENT

PART 1 GENERAL

1.01 - RELATED DOCUMENTS

- A. Table 1 detailing Asbestos Containing Materials (ACMs) (provided at end of Specification).
- B. The *Additional Building Materials Sampling* letter report, dated November 2010 and the original *Limited Lead and Asbestos Inspection* reports, dated May, 2008 are provided at end of this Specification in Attachment 1.

1.02 - PROJECT/WORK IDENTIFICATION

- A. Specifications presented in this section were prepared by Mr. Christopher A. Coelho (Massachusetts Certified Asbestos Designer #AD 000027) of ECS and are dated November, 2010.
- C. Approximate locations and quantities referenced in this specification and related documents (Table 1) are guidelines for the convenience of the Contractor and are not guaranteed to be accurate. The Contractor shall verify the scope of work and determine all quantities involved. The contractor shall provide all labor, equipment and material necessary for removing and disposing all asbestos containing materials. It is the expectation of the Owner that all asbestos containing materials (ACMs) will receive the specified treatment in an area when the Contractor agrees to undertake such work. No credit will be given for changes in the scope of work unless hidden conditions, other than those for which allowances exist, are revealed during the construction process. Immediately notify ECS if any other materials are found which are suspected of containing asbestos.
- D. **HAP, Inc. and/or General Contractor will identify/locate/demarcate the areas of proposed abatement throughout the building for the Abatement Contractor. Site Plans/Sheets prepared by the HAP, Inc. will identify locations for work and estimated quantities of ACMs.**
- E. The Contractor should expect and it is reasonable to expect that demolition activities will be warranted to access and remove ACMs. The Contractor will perform all of their own cutting, capping, dismantling, and/or demolition to gain access to concealed materials. By way of example, the following are to be included in, but not limited to, this selective demolition: beneath cabinets, under room partitions, and/or within wet wall/pipe chases the contractor may be required to perform selective demolition as required to access and abate these materials.
- E. The cost of consultant or hygienist services (including a Project Monitor) shall be borne by the Owner. The Contractor shall be responsible for all cost of further sampling, monitoring, and clearances of the post-abatement air sampling, if quantitative results do not produce final clearance.

1.03 - ASBESTOS-CONTAINING MATERIALS

A. ECS has completed a Limited Asbestos Containing Building Materials Survey at the Stevens Memorial Building in Ludlow, Massachusetts. The inspection included bulk sampling and subsequent laboratory testing for asbestos containing materials (ACM). Those materials which tested positive for asbestos include:

- Various floor tiles and mastics and paper backing
- Gray cement board (Transite)
- Black mastic associated with wall paneling
- Black coating associated with sink
- Paper backing associated with tile patterned linoleum
- TSI air cell pipe insulation on straight runs
- Mudded TSI elbows
- Flex connectors associated with HVAC ductwork
- Window glazing compound
- Window casing caulking

Due to physical inaccessibility, worker safety considerations and/or irreparable damage caused by the implementation of “destructive sampling methods,” the *Limited Asbestos Containing Building Materials Survey* and the follow-up *Additional Building Materials Sampling* event’s observations were limited in the following areas;

- **Roofing materials**
- **Interior of Heating Ventilation and Air Conditioning (HVAC) equipment, machinery, and associated ductwork**
- **Below-grade**

B. **Additional ACM may be present in inaccessible areas. If unknown suspect materials are encountered, materials should be considered positive until laboratory analysis proves otherwise.**

1.04 - ABATEMENT REQUIREMENTS

A. Pre-Removal Requirements: The Asbestos Abatement Contractor will keep a three-ring binder notebook on the job site at all times with records on each employee on this project to include respirator fit-test documentation, training certificates, latest medical surveillance records, a copy of the company respiratory protection program, employee qualifications, and their health and safety program. The notebook will include a section on asbestos waste and record of all asbestos waste removed from the work area. The entry will include date, time, quantity (number of bags or cubic yards) destination of waste, name of approved hauler and EPA approved landfill and final chain of custody forms. The notebook will include copies of all permits and EPA, State and other notifications. Personal sampling results will also be maintained herein.

B. Personal Air Sampling: Daily personal and excursion limit sampling will be the responsibility of the Asbestos Abatement Contractor to check personal exposure levels versus respiratory protection and to check work practices. At least 25% of the workers in each shift, but not less

- than 2, shall be sampled. Personal sampling pumps should have a flow rate of two (2) liters per minute and sample duration will be as close to an eight-hour workday as possible. The Contractor is responsible for his own personal sampling as outlined in OSHA Regulation 1926.1101. The Contractor shall post the personal air sample results within 24 hours. The analytical laboratory shall be A.I.H.A. accredited for asbestos analytical work.
- C. Remedial Cleaning: Limited remedial cleaning of horizontal surfaces, ledges, and equipment will be required prior to masking and sealing operations of work areas. Cleaning will be done using HEPA vacuums and wet methods. Determinations of additional remedial cleaning will be made on the basis of hazard potential to workers and the outside environment relating to setup and masking and sealing operations. Respiratory protection and protective clothing will be required for all remedial cleaning activities prior to full containment or other removal methodologies (i.e. glove bags).
- D. Critical Barriers: The windows, doors, opening, ducts, drains, vents, pipe and conduit penetrations and other major opening of the buildings shall be masked and sealed in accordance with Part 3.02 of this Section prior to covering the floor and walls.
- E. Containments: Unless otherwise specified in Part 3.01, the Contractor shall remove ACM within full containments, with attached three stage decontamination chambers. Work areas will be masked and sealed in accordance with Part 3.02 of this Section.
- F. Decontamination Chambers: For the removals conducted under full containment, a single means of decontamination for personnel and equipment is acceptable. A decontamination unit consists of an equipment room, a shower and a clean room for personnel involved in asbestos removal in accordance with Part 3.02 of this Section. Each of these three rooms shall be of sufficient size to accommodate all of their intended functions. A decontamination unit will be required for each separate site of asbestos removal unless these sites are connected internally. The decontamination unit shall be the sole means of egress from the work site unless an emergency is in progress. For all other work conducted, a two chamber Mini-Decontamination Facility ("mini-decon") shall be constricted in a location readily accessible to the work sites in accordance with Part 3.02 of this Section.
- G. Variable Pressure: The Abatement Contractor shall establish negative pressure air filtration within the containment work areas. Install, operate, and maintain a sufficient number of negative Air Filtration Units (NAFU's) to meet the requirements of Part 3.05 of this Section. The NAFUs will be positioned in the work area opposite the decontamination unit, where possible. The NAFU will be exhausted outside the building. NAFUs which are exhausted to the building's interior shall be continuously monitored at the exhaust with a direct reading instrument equipped with a chart recorder.
- H. Removals: Removal of asbestos containing materials, unless specified otherwise, will be performed using negative air filtration techniques, wet methods, the masking and sealing of openings, ducts and vents, and mini-contaminants for glovebag removals. Removals will be as indicated and as specified herein, and will be performed in a neat and workman like manner to the limits indicated or specified.

Asbestos will be consistently and thoroughly wetted with a fine spray of amended water and will be carefully removed and immediately placed in approved and properly labeled six mil polyethylene disposal containers unless specified otherwise. After removal, surfaces will be free of visible debris and fibers and surfaces will be HEPA vacuumed clean.

- I. Decontamination: State of the art techniques for asbestos fiber control will be used throughout this abatement. The Project Monitor will inspect the work site to confirm proper erection of specified containment systems, operation of equipment, and confirmatory to standards, regulations and the specification. It shall remain the responsibility of the Contractor for compliance with applicable federal, state and local laws and the abatement to the standards required.
- J. Visual Inspections: Work areas shall pass a visual inspection conducted by the Site Supervisor responsible for the project and Project Monitor. The criterion for this inspection will be the absence of visible debris in accordance with ASTM standard E1368-90. All post removal and contaminated surfaces shall be thoroughly cleaned and dry prior to the visual inspection.

A certificate of visual inspection will be signed by the Project Monitor and the Site Supervisor after final inspection clearance. The certificate will be part of the Owner's documentation. The Abatement Contractor will be responsible for the costs of visual inspection and testing required for any work that fails clearance air quality criteria. If the Abatement Contractor and Project Monitor disagree on the asbestos content of debris found in the area, a licensed Inspector shall collect and analyze samples of such debris at the Contractor's expense. Once the work area has passed the visual inspection, the Contractor shall encapsulate the exposed surface areas with an EPA approved encapsulant and shall leave removal surfaces in a condition that is ready to receive replacement materials.

- K. Disposal: All waste will be disposed of in accordance with all applicable local, state, and federal regulations.

1.05 - WORKER PROTECTION

- A. This section does not include respiratory protection.
- B. The disturbance or dislocation of ACMs may cause asbestos fibers to be released into the building's atmosphere, thereby creating a potential health threat to workmen and building occupants. Apprise all workers, supervisory personnel, subcontractors and consultants who will be at the job site of the seriousness of the hazard and of proper work procedures to be followed. Full notification of all interested parties and isolation of the work area remains the responsibility of the Contractor.
- C. Where in the performance of the work, workers, supervisory personnel, subcontractors, or consultants may encounter, disturb, or otherwise function in the immediate vicinity of any identified asbestos-containing materials, take appropriate continuous measures as necessary to protect all building occupants from potential hazard of exposure to airborne asbestos. Such measures shall include the procedures and methods described herein, and compliance with regulations of applicable federal, state and local agencies.

1.06 - WORKER TRAINING

- A. All workers must receive training in accordance with the 29 CFR 1926 and 453 CMR 6.00. Documentation of such training in the form of current and valid Massachusetts Department of Occupational Safety (formerly Department of Labor and Industries) certification with picture I.D. must be on site whenever a worker is conducting asbestos associated work.

1.07 - MEDICAL EXAMINATIONS

- A. Provide annual medical examinations for all workers who may encounter an airborne fiber level of 0.1 f/cc or greater for an 8-hour time weighted average. In the absence of specific airborne fiber data provide medical examination for all workers who will enter the work area for any reason. Examination shall as a minimum meet OSHA requirements as set forth in 29 CFR 1926. In addition, provide an evaluation of the individuals ability to work environments capable of producing heat stress in the worker.
- B. Maintain on site a certification from a physician that each individual worker is physically able to work safely with a negative pressure respirator before issuing this type of equipment to workers.

1.08 - RESPIRATORY PROTECTION

- A. The Contractor must assure that each worker involved in asbestos abatement or maintenance and repair is trained in proper respiratory use and require that each worker wear a respirator, properly fitted on the face in the work area from the start of any operation which may cause airborne asbestos fibers until the work area is completely decontaminated. Use respiratory protection appropriate for the fiber level encountered in the work place or as required for other toxic or oxygen-deficient situations encountered.
- B. Standards: Except to the extent that more stringent requirements are written directly into the Contract Documents, the following regulations and standards have the same force and effect (and are made a part of the Contract Documents by reference) as if copied directly into the Contract Documents, or as if published copies were bound herein. Where there is a conflict in requirements set forth in these regulations and standards, meet the more stringent requirements.
 1. OSHA - U.S. Department of Labor Occupational Safety and Health Administration, Safety and Health Standards 29 CFR 1910 and 1926, Respiratory Protection; Final Rule (January 8, 1998).
 2. CGA - Compressed Gas Association, Inc., New York, Pamphlet G-7, "Compressed Air for Human Respiration", and Specification g-7.1, "Commodity Specification for Air".
 3. ANSI -American National Standard Practices for Respiratory Protection, ANSIZ88.2-1980.
 4. NIOSH -National Institute for Occupational Safety and Health
 5. MSHA - Mine Safety and Health Administration

1.09 - ADMINISTRATIVE AND SUPERVISORY PERSONNEL

- A. General Superintendent: Provide a full-time General Superintendent who is experienced in administration and supervision of asbestos abatement projects including work practices, protective measures for building and personnel, disposal procedure, federal and state regulation, etc. This person is the Competent Person as required by OSHA 29 CFR 1926 for the Contractor and is the Contractor's representative responsible for compliance with all applicable federal, state and local regulation, particularly those relating to asbestos-containing materials. This person must have completed a course at a Massachusetts D.L.W.D recognized training center as a job supervisor and hold a state certification as a supervisor/foreperson. This person must also have a minimum of two (2) years on-the-job training and meet any additional requirements set forth in 29 CFR 1926 for a Competent Person. The General Superintendent is to be accredited as an asbestos Abatement Supervisor in accordance with the AHERA regulations 40 CFR Part 763, Subpart E, Appendix C. The General Superintendent shall also be trained in 40 CFR Part 61, the NESHAP Revisions.
- B. Workers: Removal workers will have successfully completed an EPA approved asbestos training course within one year prior to the commencement of the work. Each removal worker shall be certified as required by Massachusetts Department and Labor Industries Regulations 453 CMR 6.00.
- C. Workforce: The Contractors shall maintain sufficient trained removal workers, through all phases of the project, as needed to meet the timetables as agreed upon with the Owner. If the Contractor falls behind on the timetable, and the Owner or the Agent determines additional manpower is required, the Contractor shall provide the additional trained and certified personnel as required to meet the contract completion date.
- D. Identification Cards: All persons engaged in asbestos abatement on the job site shall keep their certification identification card at the job site and shall be present it to the Agent, IH or representative of any state or federal regulatory agency upon request. No person is to enter the job site unless this card is present.
- E. All work shall be performed in strict accordance with the Specifications contained herein and with the regulations cited in the following paragraph. The following Federal, state and local standards and regulations, by reference, shall be made part of this section and shall be complied with. Whenever regulations are conflicting, the more stringent shall be complied with.
- F. The Contractor shall comply with the requirements of the following regulations, and maintain a copy of each at the work site:
1. U.S. Department of Labor, OSHA Asbestos Regulations (29 CFR 1926.58)
 2. U.S. Department of Labor, OSHA Respiratory Protection; Final Rule dated January 8, 1998 (29 CFR 1910 and 1926)
 3. U.S. EPA National Emission Standard for Asbestos (CFR Title 40 Subpart M)
 4. U.S. EPA AHERA Final Rule (40 CFR Part 763, Subpart G)
 5. U.S. Department of Labor, OSHA Confined Space Standard (29 CFR 1910.146)

6. Massachusetts Department of Labor and Workforce Development (453 CMR 6.00)
 7. Massachusetts Department of Environmental Protection (310 CMR 6.00-8.00)
 8. All local ordinances, regulations or rules pertaining to asbestos, including its storage, transportation and disposal.
- G. In addition, the Contractor shall be familiar with the following:
1. Ludlow Municipal and Zoning Ordinances as they affect the work.
 2. Massachusetts State Building Code (780 CMR).

1.10 - SUBMITTALS

- A. Except as otherwise indicated, submit special reports directly to the Project Monitor within one day of occurrence requiring special reports, and within seven (7) days of all other reports becoming available to the Contractor. Send a copy to any other persons affected by the occurrence. Pre-construction submittals (under B, C, and D) should be made in a timely manner to allow ample time for review before the start of the work.
- B. A Copy of the contractor's and superintendent's certifications from the Massachusetts Department of Occupational Safety/Department of Labor and Workforce Development (DOS/DLWD).
- C. A copy of notification forms to Massachusetts DOS/DLWD, Massachusetts DEP, and Environmental Protection Agency (if warranted). A copy of the completed forms must be submitted to the Project Monitor at least 2 weeks prior to the start of the project to allow ECS review and comment.
- D. A copy of medical examination certification of workers and worker's respiratory training certificates for each worker including the following:
1. Name, Social Security Number and Photostatic copy of current Asbestos Abatement Worker Certification.
 2. Physicians Written Opinion including at a minimum the following:
 - a). Whether the worker has any detected medical conditions that would place the worker at an increased risk of material health impairment from exposure to asbestos.
 - b). Statement that the worker has been informed by the physician of the results of the medical examination and of any medical conditions that may result from asbestos exposure.
 - c). Statement that the worker is able to wear and use the type of respiratory protection proposed for the project, and is able to work safely in an environment capable of producing heat stress in the worker.
 - d). Material Safety Data Sheet (MSDS) forms as per the OSHA Hazard Communication Standard for all chemical compounds used at the work site. Maintain a copy of forms

on site as required by OSHA. Provide a list of products proposed for use during the course of this work. At a minimum submit MSDS for the following products used on the work, including:

1. Surfactant
2. Bridging Encapsulant
3. Penetrating Encapsulant
4. Lock-down Encapsulant
5. Pigments mixed with any of the above
6. Cleaning Agents
7. Solvents

e). Health and Safety Plan/Contingency Plan shall be written that described in the plan should be clearly defined. It is recommended that all worker practice carrying out their roles in simulated emergency situations. The contingency plan should include planned responses to the following possible situations:

1. loss of negative pressure atmosphere
2. fiber counts above regulated maximums inside or outside of containment
3. injury to one or more workers
4. worker collapse
5. fire or smoke in the containment area
6. any other situation that would disrupt the plant of work

f). The design of the Variable Pressure System for review. Do not begin work until a copy of the submittal approved by the Project Monitor. At a minimum, include in the submittal:

1. Number of negative air machines required and calculations used to determine such. Provide sufficient number of negative air pressure units to maintain at least one air change each fifteen minutes throughout the work areas.
2. Locations of machines and exhausts.
3. Pressure differential across enclosures anticipated.
4. Description of projected air flows throughout the work areas.

g.) Hazard Communication/Right To Know Program to include MSDSs for all chemicals and potentially hazardous materials used or stored on the site during this project.

E. Submittals as Available:

- 1.) Unusual Event Reports: When an event of unusual or significant nature occurs at a site (examples: failure of variable pressure system, rupture of temporary enclosure), prepare and submit special report lists chain of events, persons participating, response of Contractor's personnel, evaluation of results or effects, and similar pertinent information. When such events are known or predictable in advance advise Project Monitor and Owner in advance at earliest possible date.
- 2.) Accident Reports: Prepare and submit reports of significant accidents, at site and anywhere else work is in progress. Record and document data and actions, comply with industry standards. For this purpose, a significant accident is defined to include events where

personal injury is sustained, or property loss of substance is sustained, or where the event poses a significant threat of loss or personal injury.

- 3.) Monitoring Reports: Personnel air monitoring reports are to be taken at least once a day in each containment area during the course of the actual abatement. Monitor at least one person per shift, and at least one third of all contractors' employees on the job who work within the containment structure.

F. Submittals at the Conclusion of the Work:

- 1.) Asbestos Disposal Reports: Receipt from the ultimate disposer of each load of asbestos debris showing the location, number of bags, drums or cubic yards, data, name of recipient's representative, and certification of proper disposal method according to NIOSH. Submit copies of all manifests and landfill receipts to the Project Monitor on a weekly basis for on-going projects. If waste is accepted by local community landfill, include documentation of the amount paid for disposal at the local landfill.
- 2.) Daily Log: Maintain within the Decontamination Unit area a daily log documenting the dates and times of all significant events during the course of the work, including, but not limited to the following:
 - a) Meetings - including purpose, attendees and brief discussion summary.
 - b) Visitations, names, authorization, purpose.
 - c) Personnel entering and leaving work area.
 - d) Special or unusual events.
 - e) Air monitoring test and results
 - f) Documentation of Contractor compliance with the following:
 - Initial inspection
 - Setup and removal of plastic barriers
 - Each stage of the work as it proceeds
 - Waste removal
 - g) Equipment maintenance procedures.
 - h) Final inspection, clearance air monitoring results.

1.11 - NOTIFICATIONS

A. Notifications are to be submitted to the following agencies with waiver requests:

- 1.) Department of Environmental Protection, P.O. Box 4062, Boston, MA 02211. Use the transmittal form provided by the DEP for Permit Application and Payment. All fees are to be paid by the Contractor.
- 2.) Regional DOS/DLWD at 399 Washington Street, 5th Floor, in Boston, MA 02108.

- L. Notification Posting: In clean room of personnel Decontamination Unit, post a list at least 8" by 10" in size, consisting of emergency telephone numbers and locations of emergency services, not limited to fire, ambulance, doctor, hospital, police, power company and telephone company.

- C. **The Owner's Representative (ECS) are to be notified, not less than ten (10) days before commencement, of the start of each phase of the work.**

1.12 - PROJECT SCHEDULE

- A. Pre-Construction Conference: An initial progress meeting recognized as "Pre-Construction Conference" shall be convened by ECS prior to the Start of the work. This is an organizational meeting, to review responsibilities and personnel assignments and to locate the containment and decontamination areas and temporary facilities including power, light, water, etc.

At this time ECS will also review the HASP for the entire site with the Contractor.

- B. Work to commence by others prior to and/or during asbestos abatement work includes demolition activities, and the removal, collection and disposal of various regulated materials.
- C. Work is to be coordinated so that the Owner is inconvenienced as little as possible and the work area can be sufficiently isolated from any site occupants or un-announced visitors.

1.13 - CONTRACTOR'S USE OF PREMISES AND CONDITIONS AFFECTING THE WORK

- A. Confine operations at the site to the areas presented during the pre-construction conference. Portions of the site beyond areas on which is indicated are not to be disturbed. The building may be occupied and not available to the contractor in its entirety during the work.
- B. Keep existing driveways and entrances to the site clear and available to the Owner and the Owner's employees or representatives at all times. The parking lot may be used by the contractor for essential equipment and storage units. However, the contractor may not park personally owned vehicles in this lot. Access to the dumpster serving the building must be maintained at all times, and as many parking spaces as possible must be maintained for use by authorized building staff. Sidewalks and public ways are to be kept clear and unencumbered.
- C. Selective Demolition Debris:
1. Selective demolition is to be done so as not to damage or degrade the structural or the watertight integrity of the building.
 2. Debris from selective demolition which is not ACM or is not contaminated with ACM shall be left in the building or removed and disposed of properly off site, at the contractor's option. Any such material left in the buildings must be neatly stockpiled in such a way that it does not create any hazard or encumbrance to subsequent demolition work and which does not inhibit collection of this material for recycling.
- D. Store flammable or hazardous waste in metal containers and remove from the work site daily.
- E. The Contractor will be allowed to arrange for the use of a portable bathroom (sani-can).
- F. Electricity and water will be the responsibility of the contractor.

- G. The Owner shall provide water for the use of the Contractor at designated locations. The Contractor is responsible for conducting that water through leak-tight conduits to the sites where it will be used. Excess water consumption may be cause of restriction by the Owner if it is being wasted in the opinion of the Owner.
- H. Hours of Work: Hours of work are weekdays from 7:00 a.m. until 5:00 p.m.
- I. Use of on-site dumpsters: The contractor may not place any debris into any on-site dumpsters.
- J. Condition of Buildings: Contractors should assume that any existing appliances, or equipment observed at the pre-bid walk-through will remain in place. The contractor will be responsible for moving this material as required to perform the work.
- K. Refuse Chute: A refuse chute for general construction debris may be used provided its construction and use complies with all applicable local, state and federal rules and regulations.
- L. Security:
 - 1. Interior door locks will NOT be removed or disabled prior to commencement of the work.
 - 2. Exterior Door Locks: The contractor will be responsible for securing the buildings to prevent unauthorized access both during and after working hours. The contractor's method of securing the buildings must, however, allow for any Emergency Response Team to gain access to the buildings in the event of an emergency.
 - 3. Windows, Exterior Doors, and Roofing: If the work requires the removal and/or loosening of windows, door frames, or roofing areas the openings must be re-secured properly so as to prevent unauthorized access into the building, and to pre-existing condition prior to completion of the project.

1.14 - STOP WORK

- A. If the Owner, Owner's representatives, any inspector from the offices of the Massachusetts DOS/DLWD, the DEP or the U.S. EPA, or the Project Monitor present written or verbal stop orders, immediately and automatically stop all work. Do not commence work until authorized in writing by the Owner.

1.15 - ASBESTOS ABATEMENT DEFINITIONS

A.C.B.M:	Asbestos Containing Building Material
A.C.M.:	Asbestos Containing Material
A.H.E.R.A.:	Asbestos Hazard Emergency Response Action (1986 for Schools)
Air Sampling:	Method of quantification of airborne asbestos at a particular time.
Decontamination chamber:	Area of clean room and showers through which one enters and exists the abatement area.
D.E.P. (MA):	Department of Environmental Protection
Door/Door System:	Single or double door system located on interior or exterior portions of building includes all building material layers (front, back, and interior) (glues, adhesives, mastics, caulking, glazings, etc.) to masonry substrate.
D.O.S.	Department of Occupational Safety
D.L.W.D. (MA):	Department of Labor and Workforce Development

D.O.T. (US):	Department of Transportation
Contractor	MA Licensed Asbestos Abatement Contractor
Encapsulation:	Application of liquid sealant to asbestos materials.
Enclosure:	Isolation of asbestos by wrapping and sealing air-tight.
E.P.A. (US):	Environmental Protection Agency
Fitting:	Includes seams, joints, unions, couplings, elbows, and tees. Abatement of a fitting is defined as the removal of 1 linear and/or 1 square foot of ACM regardless of the number of fittings within that area.
Friable:	Easily pulverized, crumbled or crushed by hand pressure.
H.E.P.A.:	High Efficient Particulate Air
Hygienist:	Certified Project Monitor under MA DLWD Regulation 453 CMR 6.00
I.H.:	Industrial Hygienist
N.I.O.S.H.:	National Institute for Occupational Safety and Health
O & M:	Operation and Maintenance
O.S.H.A.:	Occupational Safety and Health Administration
P.C.M.:	Phase Contract Microscopy
P.E.L.:	Permissible Exposure Limit, 0.2 fiber/cc air, 8 hour TWA
S.T.E.L.:	Short Term Exposure Limit
T.E.M.:	Transmission Electron Microscopy
T.W.A.:	Time Weighted Average
Window/Window System:	Single or double window system (regardless of size) located on interior or exterior portions of building includes all building material layers (front, back, and interior) (glues, adhesives, mastics, caulking, glazings, etc.) to masonry substrate.

PART 2 PRODUCTS

2.01 - PATENTS AND COPYRIGHTS

- A. The Contractor shall assume all responsibility for any patent payments due for equipment used on this project at the time of the project or as the result of any future court action.
- B. The Contractor shall indemnify and hold harmless the Owner, the Owners Consultants and agents and employees of any of them, and the Project Monitor for any lawsuit resulting from the Contractors choice of variable air system or equipment. Nothing in this specification shall compel the Contractor to infringe on patents held by G.P.A.C. Corp. or any other patent holder.

2.02 - VARIABLE PRESSURE

- A. All negative air pressure units must be in full operational condition. Damaged or bent units will not be acceptable. Maintain each unit complete with original filtration system, consisting of coarse and fine prefilters and HEPA filter. Maintain gaskets, gauges, and safety devices as per original design.
- B. Each unit will be equipped with a Magnehelic gauge or manometer and an audible alarm to indicate filter plugging or unit malfunctioning.
- C. Each unit shall be operated with a recording meter indicating differential pressure across critical barriers. Chart output shall be time and date stamped and saved as part of the project record.

2.03 - CONTAINMENTS

- A. Polyethylene Sheeting: Double polyethylene film in the largest sheet size possible shall be used as necessary to minimize seams, 4.0 or 6.0 mil thick as required, and clear in color. Material is to be fire resistant and so labeled.
- B. Duct Tape: Provide duct tape in 2" or 3" widths with an adhesive which is formulated to aggressively stick to polyethylene. Enhance adherence of duct tape to substrate with spray adhesives if necessary.
- C. Construction Fencing: Provide heavy grade orange plastic fencing properly installed with posts and stakes. The fence should stand at least 4' high. This may be required by the Owner or Owners Agents at any time for access and safety related issues for any areas deemed necessary.
- D. Scaffolding: if used, must be constructed in accordance with applicable OSHA regulations under 29 CMR 1926.
- E. Lumber: Must be adequate to provide containment durability and effectiveness throughout the duration of containment.

2.04 - DECONTAMINATION FACILITY

- A. Three Chamber decontamination Facility: Provide full decontamination unit consisting at a minimum of three separate chambers, the equipment room, the shower, and the clean room. Water for the showers shall be tempered. Filter wastewater through 0.5 micron filter before disposal. Provide an adequate supply of disposable bath towels at all times. Provide liquid soap from dispenser in the shower area.

2.05 - DECONTAMINATION

- A. The removal or disturbance of any asbestos-containing material will be conducted only after a thorough soaking first with amended water or a penetrating encapsulant. Submit manufacturer's information on all fiber control compounds to the Agent before the start of the work as part of the Hazard Communication/Right To Know Program.

2.06 - PROTECTIVE CLOTHING

- A. Coveralls: Provide and require that disposable full-body coveralls and disposable head covers be worn by all workers in the work area. Provide sufficient number for all required changes, for all workers and visitors to the work area. Coveralls to be securely taped to protective boots worn on job site.
- B. Goggles: Provide eye protection as required by OSHA for all workers involved in scraping, spraying or any other work which may potentially cause eye injury.
- C. Gloves: Provide work gloves to all workers and require that they be worn at all times in the work area. Do not remove work gloves from the work area and dispose as asbestos-contaminated waste at the end of the work.
- D. Boots: Provide appropriate sized work boots that are to remain within the containment structure during the course of the work. Do not allow street shoes to be used on the work site. Boots are to have steel toes. Thoroughly decontaminate work boots at the end of the work.

2.07 - ELECTRICAL PROTECTION

- A. All electrical circuits used on the job site will be protected by a ground fault circuit interrupter (GFCI). Each GFCI must be tested so as to confirm proper operation. Any existing circuits or outlets not so protected are to be locked out or sealed off as appropriate.
- B. Where modifications to existing electrical panels are required for operation of equipment by the Contractor, have all such modifications and the removal of such modifications conducted by a licensed electrician. Secure permits from the Electrical Inspector as required.

2.08 - RESPIRATOR SELECTION

- A. Choose from the following the appropriate respiratory protection:

<u>Respirator</u>	<u>Fit/Protection Factor</u>
Half-face Air Purifying Negative Pressure Respirator with HEPA filter.	10
Full-face Air Purifying Negative Pressure Respirator with HEPA filter. (Protection factor dependent on manufacturer's data and recommendations)	10-50
Powered Air Purifying Positive Pressure Respirator (PAPR), with half face mask.	1,000
Type C Supplied Air Continuous Flow Half or Full Face Respirator.	1,000
Type C Supplied Air Pressure Demand Regulated Full Face Respirator.	10,000

- B. Other types of respiratory protection only on prior approval of the Project Monitor. Conditions requiring the use of higher degrees of protection are not allowed under this contract.
- C. Operation: Maintain respirators in complete accordance with the manufactures recommendation and applicable standards. Maintain all respirators in original, unmodified condition. Maintain full inventory of repair parts and extra filter canisters for each brand of respirators used. Substitution of parts between Manufactures brands of respirators is strictly forbidden. Replace respirator filters at least once each 8 hour period, whenever resistance to normal breathing is encountered, or according to manufacturer's specifications. Keep on hand at least one spare of the appropriate type of respirator beyond anticipated needs for the use of the Agent.
- D. Fit Testing: All workers using respirators shall be fit tested at least once every year procedures detailed on OSHA 29 CFR 1926 and 1910, Respiratory Protection; Final Rule (January 8, 1998). Certifications for each workers signed by the tester are to be maintained on site during the course of the work.

PART 3 EXECUTION

3.01- ABATEMENT PROCEDURES

- A. The abatement of regulated ACM includes the removal of friable ACM or Category I non-friable ACM that has become friable when removed by cutting, sanding, grinding or abrading.
1. The removal of regulated ACM shall conform to the requirements of this section and must be abated under full containment utilizing wet methods prior to and during removal, and ACM shall be placed in adequately wet leak-tight containers.
 2. The removal of regulated ACM, in the form of TSI located on pipe and fittings, shall conform to the requirements of this section, and may be abated using glove-bag methodologies utilizing wet methods prior to and during removal, all ACM and glove-bags shall be placed in adequately wet leak-tight containers. If ACM in these forms cannot be abated using glove-bag methodologies then full containment methods must be used.
 3. The removal of regulated ACM in the form of sinks, duct flex connectors, wall paneling mastic, floor tile, floor tile mastic, underlayment, and transite paneling shall conform to the requirements of this section and must be abated under full containment utilizing wet methods prior to and during removal, and ACM shall be placed in adequately wet leak-tight containers.
 4. The removal of regulated ACM, in the form of window glazing compounds and window casing caulking as associated with all windows scheduled for removal, shall conform to the requirements of this section, and may be removed from its substrate via wet methods and by applying two layers of 6-mil poly, sealed with spray glue and duct tape if necessary from the inside of the building. A minimum 6-mil ground cloth will be placed and secured outside, adjacent to and below the window systems to be removed within a regulated work area delineated by “danger asbestos” tape. Pre-cleaning and stabilization of loose ACM shall be conducted prior to window removal via manual scraping and HEPA vacuuming implementing wet methodologies. The window will be removed from its substrate, wrapped with 6-mil poly sheeting and prepared for disposal. All affected components found to be free of visible asbestos debris as determined by the on-site Project Monitor.
 5. Limited demolition by the Abatement Contractor **may be required** to access ACMs.
 6. If removal of more than one ACM occurs within an area, then the more conservative containment measures shall be required.
 7. ACM debris will be remedially cleaned prior to full containment techniques.
 8. All Non-movable objects are to be covered per applicable regulations.
 9. Waste will be removed and placed into a lockable and approved on-site container for transport and disposal.
 10. Areas scheduled for abatement may not be available all at one time. Areas will be available for abatement based on the General Contractors schedule.
 11. It should be anticipated that other Contractors will be working in proximal areas.
 12. Any equipment, supplies or other items necessary to complete abatement is the responsibility of the abatement contractor. Any equipment, supplies or other items located on-site or owned by others should not be assumed to be available for use.
 13. If an alternate work practice (AWP) is requested it must be prepared by the Contractor, then reviewed by the owner and ECS, then submitted for approval to the appropriate

Regulatory Agency. No additional cost for preparation or extension of timelines will be granted.

3.02 - PREPARATION

A. Critical Barriers:

1. Prior to masking and sealing operations which will designate the asbestos removal work area, windows, doors, openings, ducts, drains, and vents will be masked and sealed with a minimum of one layer of six mil polyethylene sheeting. Voids in the walls, ceilings, or roof systems will be sealed with fire retardant spray foam.
2. Windows and doors along the exterior of the building will remain closed for the duration of the asbestos abatement project.
3. Large accessible openings such as a roof access way will be sealed with permanent, solid construction materials and made air tight in accordance with DLWD regulations 453 CMR 6.00.

B. Full Containments:

1. Full enclosure procedures as defined by 453 CMR 6.14 will be required for the work site.
2. Prior to the asbestos removal, all windows, doors, openings, ducts, drains and vents will be separately masked and sealed with a minimum of one 6-mil layer of polyethylene completely edge sealed around the opening. Shut down any local ventilation into or out of the work space, other than the HEPA filtered system. Large openings to be occupied areas, such as open doorways or passageways, shall be sealed with plastic.
3. Post the work area entrances outside the actual enclosed with Asbestos Hazard warning labels and barricade tape with imprinted labels notifying public of asbestos hazard.
4. If containments are warranted, completely isolate the work areas from other parts of the building so as to prevent asbestos-containing dust or debris from passing beyond the isolated area. Clean all surfaces in enclosure with HEPA vacuum or by wet wiping prior to the installation of plastic sheets. Provide mechanically supported plastic sheet barrier between work area and all other sections of the building. Floors shall be masked and sealed with two layers or six mill plastic sheeting with a minimum overlap of two feet at seams and up walls. Walls shall be covered with two layers of six mil polyethylene sheeting, arranged so each layer overlaps on the outside of the respective layer of floor polyethylene sheeting that has been run up the wall.
5. Should the area beyond the work areas become contaminated with asbestos-containing dust or debris as a consequence of the work, all work will stop, and cleaning those areas will continue after a decontamination plan is presented by the Contractor and approved by the Agent or Owner and Project Monitor. Perform all such required cleaning or decontamination at no additional cost to the Owner.

- C. Emergency Exits: Whenever possible there will be emergency exits from containment which are sealed but labeled and can be easily opened to allow workers to exit directly out of containment in case of a life threatening emergency.
- D. Decontamination Chambers:
1. It is the Abatement Contractor's responsibility to provide Decontamination Chambers consisting of an equipment room, shower and clean room for personnel involved in asbestos removal under full containment. The Chamber shall be masked and sealed with layers of six-mil polyethylene sheeting with flaps between each room.
 2. Each of the three rooms will be of a sufficient size to accommodate contaminated personnel and related equipment. The rooms will be framed, masked, sealed and attached and sealed to the entry/exist ways of asbestos worksite. The three rooms together will be referred to as the Decontamination Chamber. A Decontamination Chamber will be required for each separate contained removal worksite. Equipment rooms, Clean Rooms, and Showers may be part of the existing space with the approval of the Owner. Adequate heat and light will be safely provided.
 3. Decontamination Chambers that are constructed on the exterior of the building shall be free standing and framed with 2" x 4" studs with plywood walls. Exterior Decontamination Chambers shall be weather resistant and secured with locks when not in use. Masking and sealing requirements remain the same as those stated above.
 4. Equipment Room: The Equipment Room shall provide an intermediate area of lesser asbestos pollution for decontamination of personnel and removed asbestos-contaminated materials. This room will be periodically vacuumed and washed in order to prevent asbestos dust and debris accumulation. It also serves as access areas to the shower for personnel leaving the work area. Workers leaving containment shall remove and dispose of disposable protective suits and wear only respirators into the shower.
 5. Shower Room: The Shower Room shall have a continuous supply of cold and hot water, and be suitably arranged for complete showering during decontamination. The Shower Room with curtained doorways will comprise an airlock between contaminated and clean areas. All showers shall have a two stage filtering system for wastewater connected immediately off the drain pipe or sump pump outlet. The first stage shall efficiently filter fibers down to twenty (20) microns in length, and the second efficiently down to five (5) microns in length.
 6. Clean Room: The Clean Room shall store asbestos worker's street clothing, clean protective clothing and clean respirator equipment. It shall have lockers or shelves, and clean sealable plastic bags for storage of street clothes. Contaminated clothing, respirators, tools, equipment, or other materials shall not be allowed to be introduced into the Clean Room or into unmasked areas. The Clean Room will serve as an access for personnel entering the work area, and for the donning or respiratory protection and protective clothing. It will be equipped with a lockable door to secure the work place during off-shift hours.

7. The Abatement Contractor shall provide a minimum of one water heater per work area decontamination chamber. Wastewater will be filter by 20 micron and 5 micron filters in a series prior to discharge.
- E. Change Rooms: Mini-Containments require the installation of a single stage change room constructed on one layer of six-mill polyethylene sheeting. The change room shall be sealed and attached to the mini-containment to provide an intermediate area of lesser asbestos pollution for decontamination or personnel. Workers leaving the work areas shall remove and dispose of their protective suits in this room and either proceed to the remove decontamination unit of conduct a thorough washing of the hands and face.
- F. Waste Load Out Enclosure: The waste decontamination enclosure system when under full containment shall consist of two totally enclosed chambers and shall also comply with the following requirements:
1. The washroom will be constructed with an airlock to the work area and an airlock to the holding area.
 2. The holding area will be constructed with an airlock doorway to the washroom and a lockable door to the outside.
 3. The water shall pass through shower filtering system and will be filtered down to five (5) micron particle size.
 4. These chambers will be constructed with impermeable barriers at exterior walls and doors will be secured at the end of each shift.
- G. Alternate Methods: Alternative masking and sealing methods, procedures, and design will be considered if any elements of proper and safe procedures to prevent contamination and exposure can be demonstrated. If an alternate work practice (AWP) is requested it must be prepared by the Contractor, then reviewed by the owner and ECS, then submitted for approval to the appropriate Regulatory Agency. No additional cost for preparation, or extension of timelines will be granted.

3.03 - HEPA FILTRATION REQUIREMENTS

- A. General: After masking and sealing is completed and the asbestos worksite is contained and before work begins, the Abatement Contractor and Project Monitor shall smoke test to confirm negative pressure inside the contained worksite. The volume of air within the contained worksite should be changed at least four (4) times per hour or once every fifteen (15) minutes. If the Project Monitor determined that the requirements compromise containment integrity, the capacity of the NAFU system may be reduced.
- B. Testing Requirements: The Contractor shall be responsible for the use of negative air pressure with continuous recording charts to confirm a negative air pressure of at least 0.02 inches of water column per full containment. Equipment used for producing a negative pressure shall have a filtering device in conformance with ANSI A9.2, and shall operate 24 hours a day.

All pressure measurement and recording is subject to confirmation by the Project Monitor. All HEPA filtration units utilized will be DOP tested within the last six (6) months. Certificates of testing for each identified unit will be provided to the Project Monitor upon operation of the units.

- C. 2000 CFM HEPA units inside the work area during abatement. The additional unit will be utilized upon failure of any operation units.
- D. NAFU Equipment Requirements: The HEPA filtration units will be equipped with the following:
 - 1. Magnehelic gauge to monitor the units' air pressure difference across the filters and be able to interpret magnehelic reading to cubic feet per minute (CFM).
 - 2. An affixed label, clearly marked and conspicuous, showing the most recent installation date and hour reading of the primary internal HEPA filter. Hourmeter, to record unit operation time.
 - 3. Automatic shut off for filter failure or filter absence.
 - 4. Audible alarm with or without flashing red light for unit shutdown.
 - 5. Amber flashing warning light for filter loading.
 - 6. Must have safety system that prevents unit from being operated with the HEPA filter backwards
 - 7. All flexible ducting, vent tubing, adapter plates and other equipment used for the passable of filtered air will be undamaged and free of air leaks at all points.
- E. Prefilters: Prefilters will be changed frequently during removal (at least once per hour under heavy removal conditions). They will be changed before air-flow is altered to drop worksite air exchange below four air changes per hour.
- F. NAFU Exhaust: HEPA air filtration units will be exhausted outdoors and at least fifteen (15) feet above the ground whenever possible. At no time shall the negative pressure ventilation unit exhaust within 40 feet of a receptor or adversely affect the air intake ports, louvers, or entrances of the building or adjacent buildings. NAFUs which are exhausted to the building's interior shall be monitored during abatement work by the Project Monitor.

3.04 - CLEANING AND ENCAPSULATION

- A. Amended Water: A fine spray of amended water will be used to keep top layers of asbestos in the waste bags and containers damp to minimize potential asbestos dust release. Wetting of asbestos is to be done with low pressure spray equipment, using water amended with a wetting agent/surfactant containing fifty percent (50%) polyoxyethylene ether and fifty percent (50%) polyoxethylene ester, or the equivalent mixed one once to five gallons of water.

- B. Removal of Waste: Containerized waste will be removed from the work area through the decontamination chamber or waste load out. All tools and equipment will be removed from the work area and decontaminated in the decontamination chamber. Cloth, mops, and other cleaning aids will be disposed of as asbestos-containing waste material. No final inspection or testing can be performed with contaminated materials or bags of asbestos waste on site.
- C. Encapsulation: Prior to dismantling primary and secondary containment barriers, a bridging encapsulation/lock-down sealant will be applied to polyethylene surfaces. The chosen encapsulant must be compatible with the replacement materials and must conform to the proper edition of applicable fire and electrical standards. These do include, but are not necessarily limited to:
1. National Fire Prevention Association - Codes 90a 2-1.3.1 through 3-3.8.1
 2. National Electrical Code - Code 300-21.
- After removal and disposal of secondary polyethylene sheeting and clearance of the visual inspection, a bridging encapsulant/lockdown sealant will be applied to remaining surfaces in direct contact with removal operations, polyethylene sheeting and on any porous surfaces within the work site. Final air clearance samples will be taken after the containment is dry.
- D. Removal of Containment Barriers: After successful clearance air monitoring, the isolation barriers will be removed in conjunction with the use of a HEPA vacuum.
- E. Spills: The Contractor will be responsible for necessary precautions to prevent pollution by spillage during the performance of services and shall assume full responsibility for caused spills, which will be cleaned up at the Contractor's expense.

3.05 - DISPOSAL

- A. General: The Contractor will be responsible for asbestos disposal, which will be done as soon as possible. Procedures for hauling and disposal shall comply with 40 CFR 61 Subpart M, Federal Emission Standards and other applicable state, regional and local government standards.
- B. Waste Disposal Sites: Waste disposal sites for asbestos materials will be in accordance with 40 CFR 61.25, Waste Disposal Sites. The Contractor shall provide and submit to the Agent or Owner and Project Monitor written evidence that the site is approved for asbestos disposal by the EPA, State and local regulatory agencies.
- C. Daily Disposal: At the end of each work day the Contractor shall remove the debris accumulated during that day's work activities using procedures outlined in the Specifications. The Abatement Contractor shall provide a daily tally of all quantities removed.
- D. Temporary Storage of Waste: An area for temporary storage of asbestos waste must be approved by the Owner. Asbestos waste may only be stored in a restricted area or enclosed container which is posted and secured whenever not in use. Asbestos waste material shall be loaded into a waste transportation vehicle/dumpster and hauled away as soon as there is a sufficient quantity

available for direct transportation to the approved disposal site. Vehicles hauling asbestos waste materials will be covered to prevent emission of asbestos in route to the disposal site.

- E. Labeling of Disposal Containers: Warning labels having waterproof print and permanent, waterproof adhesive will be affixed to bags, drums (lid and sides), and other containers used for asbestos waste. Labels will be conspicuous and legible and shall contain the following warning:

DANGER
CONTAINS ASBESTOS FIBERS
AVOID CREATING DUST
CANCER AND LUNG DISEASE HAZARD

A DOT "class 9" shipping label and DOT mark shall be applied to or be printed on each packaging of asbestos containing materials. The AAC is directed to properly label waste bag in accordance with the latest NESHAP standard Section 61.150, with the following information:

Asbestos Abatement Contractor's Name
SITE OWNER'S NAME
SITE NAME

- F. Contractor's Responsibilities: The Contractor shall fulfill waste generator responsibilities as specified by 40 CFR 61, Subpart M, Federal Emission Standards for Asbestos, revised November 20, 1990, and other applicable state, regional and local government standards.

The Contractor shall maintain Waste Shipment Records and shall provide a copy of the Waste Shipment Records and shall provide a copy of the Waste Shipment Record, designating the number of bags or cubic yard (s) of asbestos waste. This record will be provided to the Owner or Project Monitor and signed by all transporters and the designated disposal site owner/operator. If the completed Waste Shipment Records is not received by the Contractor from the disposal site owner/operator within 45 days of the date of waste was accepted by the initial transporter, the Contractor shall immediately provide the Owner with a copy of the report sent to the EPA regarding the status of the Waste Shipment Record.

- G. Manifests: A qualified person must sign all hazardous waste manifests.

3.06 - OTHER TRADES

- A. When other trades personnel (electrician, plumber, etc.) are required to enter the contained asbestos removal areas to perform emergency work the following procedures will be followed:

1. Sign in and out of the bound log book and enter the date and time.
2. Wear a NIOSH/MSHA approved respirator as required by these specifications. Fit test and medical surveillance records shall be provided to the Owner prior to entering containment.
3. Wear disposable full body protective clothing as required by these specifications.

4. Full shower and decontamination procedures will be followed, along with the proper decontamination of any tools or equipment brought into the work area.
5. Respiratory protection and protective clothing to be provided by the Abatement Contractor, unless otherwise agreed upon.
6. Personnel entering the regulated, contained work areas must have the required training and possess a valid workers license as required by Commonwealth of Massachusetts DOS/DLWD regulations.

3.07 - QUALITY CONTROL AND TESTING

- A. Review of Work Practices: The Project Monitor will review the Contractor's work practices prior to the start of removal in each work area and will report any Specification violations to the Owner. Removal of ACMs may begin with the approval of the Project Monitor once the deficiencies are corrected. If the Contractor fails to correct deficiencies in a timely manner, the Owner will be notified in writing.

The Project Monitor will review containment structures and negative air conditions before work begins and after the Abatement Contractor Site Supervisor has give approval. If at any time the results of the area air sampling from the interior of the building work area perimeter or negative air filtration unit exhaust exceed 0.03 f/cc work will be stopped until the source of the elevated fiber counts can be determined.

At no time during the course of this work should the airborne concentration of asbestos fibers exceed 0.2 fibers per cubic centimeter (<0.2 f/cc), 8 hour TWA, inside a containment structure as measured by daily personnel monitoring. If fiber levels exceed this level, stop operations and contact the Project Designer to determine additional procedures to minimize fiber release.

- B. Air Sampling Equipment:

1. Cassettes will be loaded with the filters under clean laboratory conditions. A 5.0 micron pore-size cellulose ester backing filter will be placed behind the collecting filter, followed by the cellulose support pad and the cassette base. A metal cowl or an electrically conductive cowl will be used in conjunction with the sampling train.
2. The filter assembly will be upstream of components in the sampling train except for an optional size selective inlet or wind and rain shield. The air flow measuring device will be downstream of the filter and the pump assembly, or integral with the pump assembly.
3. The air flow measuring/metering device will be a high quality rotometer, mass flow, dry gas meter or critical orifice. Measuring devices shall have a range of at least 1.5 times the desired flow rate and be readable to at least 0.1 of the desired flow rate. It will be calibrated against standards of higher accuracy before and after sampling for each asbestos project. The calibrations will be recorded.

4. Sampling for analysis by phase contrast microscopy shall employ cellulose ester collection filters with 0.8 micron pore size.
 5. Sampling for analysis by transmission electron microscopy shall employ 25 mm diameter polycarbonate collection filters, preferably with 0.4 micron pore size. Cellulose ester filters, preferably with 0.45 micron pore size can be used if significant levels of contaminated organic material are present in the air. Organic contaminants will be identified and reported.
- C. Air Sampling Requirements: The following minimum schedule of samples will be required by the Project Monitor, during the abatement process.
1. Background Samples: Air and the appropriate dust samples (as necessary) will be taken to represent conditions before the Abatement Contractor starts masking and sealing operations. At least five samples will be taken inside each proposed regulated area and one outside each major opening. These area samples shall require enough volume of air to assure the lower detectable limit of no greater than 0.005 fibers/cc.
 2. Area Samples During Removal: During removal area samples will be collected outside major openings, at the discharge of negative air filtration units, in the clean room, at other critical points outside the work areas. Furthermore the Project Monitor will take samples as necessary to monitor and document air quality outside of the asbestos worksites and/or upwind and downwind during asbestos related work with at least one location between the work area occupied portions of the site. Outside containment samples shall require sufficient volume of air to assure a lower detectable limit of 0.005 fiber/cc by the NIOSH 7400 Method.
 3. Post-abatement Clearance Air Monitoring: Post Abatement clearance air samples will be taken from containments twenty-four (24) hours after cleaning of surfaces is completed, a visual inspection by the Project Monitor detects no visible debris and surfaces are encapsulated (if warranted) and dry. All final air clearance samples will be collected in accordance with AHERA final air testing/clearance requirements. The worksite must have containment barriers, HEPA filtration system and the decontamination unit remaining in place and functional.
 - a. Phase Contrast Microscopy (PCM) Clearance Testing: PCM testing will be performed for background, area, and final air sampling. All samples should not exceed a concentration of 0.010 fibers/cc or the background levels previously detected. All final clearance samples shall require sufficient volume of air to assure a lower detectable limit of 0.005 fibers/cc by NIOSH 7400 Method.
 - b. Transmission Electron Microscopy (TEM) Clearance Testing: TEM clearance testing may be performed to confirm the completion of removal, encapsulation or enclosure. Areas requiring TEM clearing air sampling shall be required to pass PCM clearance air sampling prior to the collection of TEM clearance air samples if the job site outside the contained work area is visibly dusty. The contained worksite must not be wet and a fan or leaf blower will be blown against walls, ceilings, floors, ledges, and other surfaces to circulate air and simulate real conditions for at least 5

minutes per 1,000 square feet. Stationary fans shall be directed towards the ceiling and operated on slow speed. One fan shall be used for each 10,000 cubic feet or work area. A minimum of five final clearance air samples will be collected inside the contained removal worksites or regulated area and after the clearance or visual inspection criteria. Additionally, five clearance air samples will be collected at the same time outside of contained removal worksite or regulated areas. These outside containment samples shall be representative of the make-up air entering the containment or regulated area.

Work in the contained removal worksite or regulated area shall be considered complete when the average concentration of asbestos of the five inside containment air samples is not statistically different, as determined by the Z-test calculation found in Appendix A of 40 CFR 763 Subpart E, from the average asbestos concentration of the five outside containment air samples and average asbestos concentration of the three field blanks is below the filter background level of 70 structures per square millimeter (70 s/mm). Not meeting the above TEM air clearance criteria shall require the Abatement Contractor to reclean the designated worksite followed by a repeat of the final clearance testing. Cleaning and testing will be repeated until the TEM air clearance criteria is complied with. All TEM final clearance samples shall require minimum volume of 1,200 liters, but should not exceed 1,800 liters.

- D. Methods of Measurement: All determination of airborne concentration of asbestos fibers during the project will be made by the membrane filter method using phase contrast illumination and 400-450X magnification, with sample mounted in high viscosity solution of membrane filter material in accordance with NIOSH P & CAM 239 and 7400 Methods, USEPA document 600-4-85-049 (Nov. 1995) and USEPA publication 560/5-85-024 (June 1984). Final air clearance testing to be performed by TEM analytical methods shall be analyzed in accordance with Appendix A of USEPA 40 CFR 763 Subpart E.
- E. Posting of Air Sample Results: Air sampling results will be posted no more than 24 hours after the completion of a sampling cycle. The document shall list each sample's results, sampling time and date, exact location of where it was taken, flow rate, microscope field area, fields counted and cassette size. Air sample analysis will be reported in fibers per cubic centimeter. Samples shall have a chain of custody record.

TABLE 1
ASBESTOS CONTAINING BUILDING MATERIALS
STEVENS MEMORIAL BUILDING
12 CHESTNUT STREET
LUDLOW, MASSACHUSETTS

Functional Space (s)	Material Description	Material Class	Sample Number	Friability & Access	Condition Assessment	Estimated Qty**
Basement – Closet 1,2,3 Entry Way Foyer/Reception Computer Lab Kids Stuff Area Girls and boys saunas	9" x 9" beige with tan flecks floor tile and associated mastic	<input checked="" type="checkbox"/> Miscellaneous	07A 08A	<input checked="" type="checkbox"/> Non-Friable <input checked="" type="checkbox"/> Accessible	<input checked="" type="checkbox"/> Intact	3,500 SF
Basement- Girls Sauna Boys Sauna 2 nd Floor Mezzanine- Projector Room	Gray Cement Board (Transite)	<input checked="" type="checkbox"/> Miscellaneous	12A 30A	<input checked="" type="checkbox"/> Non-Friable <input checked="" type="checkbox"/> Accessible	<input checked="" type="checkbox"/> Intact	600 SF
1 st Floor- Game Room Storage	Black mastic assoc. w/ wall paneling	<input checked="" type="checkbox"/> Miscellaneous	18A	<input checked="" type="checkbox"/> Non-Friable <input checked="" type="checkbox"/> Accessible	<input checked="" type="checkbox"/> Intact	75 SF
1 st Floor- Kitchen	Black coating assoc.w/sink	<input checked="" type="checkbox"/> Miscellaneous	19A	<input checked="" type="checkbox"/> Non-Friable <input checked="" type="checkbox"/> Accessible	<input checked="" type="checkbox"/> Intact	8 SF
1 st Floor- Kitchen	Paper Backing associated with Tile Patterned Linoleum	<input checked="" type="checkbox"/> Miscellaneous	20A	<input checked="" type="checkbox"/> Friable <input checked="" type="checkbox"/> Accessible	<input checked="" type="checkbox"/> Intact	250 SF
1 st Floor- Stairwell B-1	Beige marbled 9"x9" floor tile, assoc. black mastic and paper backing	<input checked="" type="checkbox"/> Miscellaneous	24A 25A 26A	<input checked="" type="checkbox"/> Non-Friable <input checked="" type="checkbox"/> Accessible	<input checked="" type="checkbox"/> Intact	150 SF
1 st Floor- Small Gym	Paper Backing assoc.w/tile patterned linoleum beneath sink	<input checked="" type="checkbox"/> Miscellaneous	32A	<input checked="" type="checkbox"/> Friable <input checked="" type="checkbox"/> Accessible	<input checked="" type="checkbox"/> Intact	8 SF
2 nd Floor- Storage, Stage Right	Air Cell Pipe insulation on straight runs	<input checked="" type="checkbox"/> Thermal System Insulation	37A 37B 37C	<input checked="" type="checkbox"/> Friable <input checked="" type="checkbox"/> Accessible	<input checked="" type="checkbox"/> Intact	15 LF
2 nd Floor- Storage, Stage Right	Mudded Elbows assoc. w/air cell pipe insulation	<input checked="" type="checkbox"/> Thermal System Insulation	38A 38B 38C	<input checked="" type="checkbox"/> Friable <input checked="" type="checkbox"/> Accessible	<input checked="" type="checkbox"/> Intact	
Basement- Bathroom	HVAC Duct Flex- Connectors	<input checked="" type="checkbox"/> Miscellaneous	10-1-03A 10-1-03B	<input checked="" type="checkbox"/> Friable <input checked="" type="checkbox"/> Accessible	<input checked="" type="checkbox"/> Intact	2 each
Exterior	Window Glazing Compound	<input checked="" type="checkbox"/> Miscellaneous	10-1-06A*	<input checked="" type="checkbox"/> Non-friable <input checked="" type="checkbox"/> Accessible	<input checked="" type="checkbox"/> Damaged	60 units
Exterior	Window Casing Caulking	<input checked="" type="checkbox"/> Miscellaneous	10-1-07A* 10-1-07B*	<input checked="" type="checkbox"/> Non-friable <input checked="" type="checkbox"/> Accessible	<input checked="" type="checkbox"/> Damaged	

NOTES: SF = Square Feet LF = Linear Feet
TSI may be located within walls and ceiling spaces. ACM floorings may be located in multiple layers.
Italic materials identified in the Limited Asbestos and Lead Inspection Report, dated May 6, 2008.
Materials presented in regular face type were identified as part of this supplemental inspection.
* Additional TEM-NOB analysis. TEM NOB analysis confirmed asbestos with concentrations ranging between 1.73% to 2.57%.
Approximate locations and quantities referenced in this report are not guaranteed to be accurate and should be verified by the bidding contractor.

**NOTE- THE ABATEMENT OF ACMs IS IN SELECT AREAS ONLY. SEE SITE
PLANS/SHEETS FOR LOCATIONS OF PROPOSED WORK.**

END OF SECTION

SECTION 02080 - ASBESTOS ABATEMENT TECHNICAL SPECIFICATION

The following report is hereby made a part of this Contract and shall be executed as referred to in other sections of this Specification.

**STEVENS MEMORIAL BUILDING
12 CHESTNUT STREET
LUDLOW, MA.**

ASBESTOS ABATEMENT TECHNICAL SPECIFICATION

this document
prepared by
owner's environmental consultant

Environmental Compliance Services, Inc.
588 Silver Street
Agawam, Ma. 01101

• *Consultants Report Follows* •

LEAD-BASED PAINT HANDLING SPECIFICATION

SECTION 02090 LEAD-BASED PAINT HANDLING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Limited Asbestos and Lead Inspection Report prepared by Environmental Compliance Services, Inc. (ECS) dated May 2008.
- B. Table 1 detailing Total Lead Analysis Results which is provided in Section 1.02

1.02 LEAD CONTAINING PAINT SURVEY

- A. ECS collected a total of 14 bulk samples of paint for total lead determination. These materials were also deemed homogenous with other similar building materials. Exact sample locations are detailed on the table below. Laboratory test results INDICATED THE PRESENCE OF LEAD above method detection limits. All samples were submitted to ProScience Analytical Services an accredited laboratory for lead determination.

TABLE 1
TOTAL LEAD ANALYSIS RESULTS
STEVENS MEMORIAL BUILDING
12 CHESTNUT STREET, LUDLOW, MASSACHUSETTS

Sample ID	Description	Substrate and location	Pb Result Weight %
Pb-01	Beige	2 nd Floor, Stairwell - Brick Wall	0.20
Pb-02	Red	Basement, Pool Mechanical Room - Tank	2.19
Pb-03	Light Blue	Basement, Pool Room – Ceiling	10.35
Pb-04	Dark Blue	Basement, Pool Room – Wall	Below Detectable Levels of 0.01%
Pb-05	White	1 st Floor, Hallway – Structural Beam	0.04
Pb-06	White	Basement, Boy's Locker Room – Structural	.032
Pb-07	Gray	Basement, Hallway – Floor	0.09
Pb-08	Black	2 nd Floor, Mezzanine – Handrails	1.19
Pb-09	Beige	2 nd Floor, Mezzanine – Window	28.20
Pb-10	White	Basement – Plumbing	0.13
Pb-11	Beige	2 nd Floor, Mezzanine – HVAC Ductwork	0.45
Pb-12	Red	3 rd Floor – Stairwell	2.14
Pb-13	Gray	2 nd Floor – Window	17.41
Pb-14	Beige	2 nd Floor, Mezzanine – Brick Wall	18.90

1.03 DESCRIPTION OF WORK

- A. If Demolition activities impact surfaces with lead containing paint, then the provisions set forth in this Section will apply. Painted surfaces will be disturbed, at a minimum, on all painted/coated surfaces.
- B. General. The contractor is responsible for compliance with the following OSHA Construction Regulations: Lead in Construction Regulation 1926.62 when abrasive blasting, welding, cutting, burning on structures, manual scraping or sanding, and manual demolition of structures or any other activity may produce an exposure above the action level for any of the identified metals. The work practices described in the following sections are intended to adequately protect the workers from exposure to metal hazards, provide a safe workplace, and protect the environment.
- C. Materials and Equipment. The work of this Section, without limiting the generality thereof, includes the furnishing of labor, materials, tools, equipment, services and incidentals necessary to safely accomplish tasks which will disturb lead containing paint.
- D. Approval and Inspections. Temporary facilities, work procedures, equipment, materials, services, and agreements must fully comply with EPA, OSHA, and NIOSH recommendations, standards and guidelines, as well as any other applicable federal, state and local regulations. Where an overlap of these regulations and guidelines exists, the most stringent shall apply.
- E. Disposal: The Contractor shall dispose of the scraped paint and demolition debris in accordance with the Resource Conservation and Recovery Act (RCRA) and Massachusetts Solid Waste Disposal requirements. Once generated, painted wastes shall be characterized by the contractor for hazardous waste by the EPA Toxicity Characteristic Leaching Procedures prior to disposal. The building owner has not performed any TCLP sampling or analysis, any waste stream characterization sampling and analysis required is the responsibility of the Contractor. Metal or steel substrates removed intact may be recycled without pre-characterization.

1.04 DEFINITIONS

- A. Action Level: Action level as defined by OSHA 29 CFR 1926 or 1910 shall refer to employee exposure without regard to the use of respirators, to an airborne concentration of the following metals:
 - Lead of 30 micrograms per cubic meter of air ($30 \mu\text{g}/\text{m}^3$) calculated as an 8-hour-time-weighted average (TWA).
- B. Competent Person. Competent Person shall referred to a person who is capable of identifying existing and predictable hazards in the surroundings or working conditions and who has authorization to take prompt corrective measures to eliminate them.
- C. HEPA filter. HEPA filter shall refer to a filter capable of filtering out monodispersed particles of 0.3 microns or greater diameter from a body of air at 99.97 percent efficiency or greater.
- D. Permissible Exposure Limit (PEL): PEL shall refer to employee exposure, without regard to the use of respirators, to an airborne concentration of the following metals:

- Lead of 50 micrograms per cubic meter of air ($50 \mu\text{g}/\text{m}^3$) calculated as an 8-hour-time-weighted average (TWA).

If an employee is exposed to a metal for more than 8 hours in any work day, the TWA for that day shall be reduced according to the OSHA Regulation.

- E. TCLP: TCLP shall refer to the Toxicity Characteristic Leaching Procedure which is used to characterize waste generated from this project. The Contractor shall notify the Owner of any TCLP results prior to the transport of waste for disposal.

1.05 PERMITS AND INSPECTIONS

- A. Notifications/Approvals: The Contractor shall make, in proper and timely fashion, any necessary notifications to relevant Federal, State, and local authorities and shall obtain and comply with the provisions of all permits or applications required by the work specified, as well as make all required submittals required under those auspices. The Contractor shall indemnify the Owner, their representatives and agents from, and pay for claims resulting from failure to adhere to these provisions. The costs for permits, applications, and the like, are to be assumed by the Contractor.
- B. Fees, Permits and Licenses: The Contractor shall pay licensing fees, royalties, and other costs necessary for the use of any copyrighted or patented product, design, invention, or processing the performance of the job specified in this Section. The Contractor shall be solely responsible for costs, damages or losses resulting from any infringement of these patent rights or copyrights. The Contractor shall hold the Owner and Project Designer harmless from any costs, damages, and losses resulting from any infringement of these patent rights or copyrights. If the Specification requests the use of the product, design, invention, or process that requires a licensing fee or royalty fee for use in the performance of the job, the Contractor shall be responsible for the fee or royalty and shall disclose the existence of such rights.

The Contractor shall be responsible for costs for licensing requirements and notification requirements and other fees related to the ability to perform the work in this Section. The Contractor shall be responsible for securing necessary permits for work under this Section, including removal, materials usage, or any other permits required to perform the specified work.

1.06 SUBMITTALS

- A. Pre-Construction Submittals: Prior to the commencement of the required work, the Contractor shall provide the Owner with copies of the following:
1. Copies of certifications, notifications and all applicable licenses;
 2. Written Respirator and Hazardous Communications Programs;
 3. Copy of Training, Fit Test and Medical Surveillance Records, as applicable;
 4. Written Compliance Program in accordance with OSHA 29 CFR 1926 for handling metals as required for each individual metal;
 5. Name and qualifications of bidder's chosen laboratory for personnel exposure monitoring and TCLP analysis, subject to Owner's approval;
 6. Any additional information required by the Owner or Designer.
- B. Post-Construction Submittals: Final payment to the Contractor shall not be made unless the following items are submitted to the Owner:

1. Original Copy of the Waste Disposal Manifests acknowledging disposal of hazardous and non-hazardous waste material from the project showing delivery date, quantity, and appropriate signature of landfill's authorized representative;
2. TCLP analytical results;
3. Copy of Personal Air Sample Results;
4. Original Bound Log Book;
5. Copy of clearance documentation.

1.07 QUALITY CONTROL/ASSURANCE

- A. Training Requirements: Workers who will or may have the potential of Lead exposure above the Action Level shall have proof of successfully completing a training course which covers the topics required by 29 CFR 1926 for each Lead. Contractors are also advised that training in other areas may be required and are responsible to ensure that all training requirements for appropriate trades and procedures are met.
- B. Specified Supervisor Qualifications: The Contractor shall specify an on-site Supervisor or Competent Person who is fully qualified in all aspects of safe work practices and procedures with Lead containing materials, and have (or will have) completed a training course within the previous year prior to the commencement of lead related work. The lead training course will cover all topics required by 29 CFR 1926 for each Lead present as well as training in relevant federal, state and local, regulations, requirements, procedures and standards (including 454 CMR 10.00), supervisory techniques, and proper disposal procedures.
- C. Site Specific Written Compliance Program: The program will be evaluated to ensure the elements required by 29 CFR 1926 for each Lead present are specified to the conditions at the job site.
- D. Respiratory Protection Program. The contractor must provide for review a written respiratory protection program in accordance with 29 CFR 1910.134 if respiratory protection is to be worn during this project.
- E. Fit Test Records: If respiratory protection is to be worn as part of this project, records of successful respirator fit testing performed by a qualified individual within the past year, for each employee to be used on this project with the employee's name and social security number with each record.
- F. Medical Surveillance: The Contractor shall provide biological monitoring to workers who have the potential of exposure to identified Leads above the Action Level. This monitoring shall be performed in accordance with 29 CFR 1926. If workers are expected to exceed the action level for more than 30 days in consecutive 12 months of the contractor shall institute a medical surveillance program in accordance with 29 CFR 1926 for each identified Lead, as required. Biological sampling and analysis shall be conducted by a laboratory approved by OSHA.
- G. Analytical Laboratory: The name and address of Contractor's Analytical Laboratory (for analysis of personal air samples) including certification(s) of AIHA accreditation for heavy metal analysis and name and address of Contractor's Massachusetts DEP certified laboratory for TCLP and hazardous waste characterization.

1.08 CODES AND STANDARDS

- A. Work shall conform to the standards set by applicable federal, state and local laws, regulations, ordinances, and guidelines in such form in which they exist at the time of the work on the contract and as may be required by subsequent regulations.
- B. This project is subject to compliance with 29 CFR Part 1926, "Safety and Health Regulations for Construction" with specific emphasis on Leads that are identified as being potentially impacted on this project.
- C. In addition to any detailed requirements of the Specifications, the Contractor shall at his own cost and expense comply with all laws, ordinances, rules and regulations of federal, state, regional, and local authorities regarding handling and storing of lead waste material.
- D. At a minimum, to be in full compliance with all aspects of the following regulations:
 - 1. Department of Environmental Protection, Massachusetts Hazardous Materials Regulation at 310 CMR 30.00.
 - 2. Department of Labor, Occupational Safety and Health Administration Title 29 CFR 1926.62.
 - 3. Massachusetts Division of Occupational Safety 454 CMR 10.00

Regulations by the above and other governing agencies in their most current version are applicable throughout this project. Where there is a conflict between this Specification and the cited federal, state or local regulations or guidelines, the more restrictive or stringent requirements shall prevail. This section refers to many requirements found in these references, but in no way is it intended to cite or reiterate all provisions therein or elsewhere. It is the Contractor's responsibility to know, understand, and abide by all such regulations, guidelines and common practices.

PART 2.0 PRODUCTS

2.01 PROTECTIVE CLOTHING

- A. Coveralls (whole body protective coverings): Protective work clothing must prevent Leads from contacting employees' work or street clothes, undergarments, or skin. Coveralls or similar full-body work clothing shall be worn by all workers exposed to Lead containing paint in the work area until exposure monitoring results indicate exposures to be below the PEL at which time the Contractor has the option to continue or discontinue the use of coveralls. Sleeves shall be secured at the wrist and pant leg at the ankle with tape. Disposable protective work clothing which is frequently ripped or fall apart under normal use is not considered "appropriate protective work clothing." All coveralls shall be cleaned after each wearing in accordance to the provision for cleaning in 29 CFR 1926. Any protective work clothing which has been rendered inappropriate, (e.g., when coveralls develop rips or tears) must be promptly repaired or replaced. Effective protection against contamination of employees' skin, hair, and garments must be maintained at all times.
- B. Boots: Work boots with non-skid soles shall be worn by all workers and where required by worksite conditions, safety boots (Steel toe or steel tow and shank) shall be worn.

- C. Other Items: Whatever other items of protective clothing and safety equipment are required, shall be provided by the Contractor, including but not limited to goggles, heavy gloves, hard hats and protective clothing.
- D. Pumps and Filters: Personal sampling pumps, and filter cassettes shall be provided by the Contractor to carry out the air monitoring program.
- E. Respiratory Protection: The Contractor shall provide workers, foremen, and superintendent exposed to Lead containing paint in the work area respirators approved by NIOSH that will afford appropriate protection for anticipated exposure levels. These respirators shall be worn until personal exposure sampling indicates that exposures are below the PEL at which time the Contractor has the option to continue or discontinue the use of respirators. Authorized visitors (i.e. Federal, State, and Local inspectors) must provide current health and medical report certifying them as approved to wear half-face respirators. When respirators and disposable filters are employed, sufficient replacement filters will be provided by the Contractor for the workers and any visitors.

Workers inside the work area will wear the proper respirator for the lead dust level generated. Workers must be properly trained in the care, use, and maintenance of respirators. A formal respiratory protection program must be implemented in accordance with 29 CFR 1910.134. Respirators will not be removed until the worker enters the washing area of the decontamination chamber.

PART 3.0 EXECUTION

3.01 WORKER PROTECTION

- A. Initial Determination: The Contractor shall determine, through personal exposure monitoring on the job site or through relevant documentation from other similar jobs, where workers will be exposed to airborne Leads at or above the OSHA Action Level and Permissible Exposure Limit. If exposure at or above the action level is documented, appropriate health and safety procedures identified herein or the OSHA Regulations shall be followed. If levels below the action level are documented, the Contractor shall exercise an appropriate level of care to ensure that exposures above the action level do not occur.

Whenever there is a change of equipment, process, control, personnel or a new task has been initiated that may result in additional employees being exposed to lead at or above the action level or may result in employees already exposed at or above the action level being exposed above the PEL, the Contractor shall conduct additional monitoring.

- B. Biological Monitoring: Until a negative initial determination is achieved, any worker has the potential of lead exposure must have biological monitoring as indicated in OSHA 1926.
- C. Personal Hygiene Practices: Where exposures to airborne lead above the OSHA PEL occur or may be expected to occur, the Contractor shall enforce and follow good personal hygiene practices. These practices shall be performed until personal exposure sampling indicates that exposures are below the PEL at which time the Contractor has the option to continue to or discontinue the use of personal hygiene facilities. These practices shall include but not be limited to the following:

1. The Contractor shall assure that food, beverages or tobacco products are not present or used, and cosmetics are not applied, in the work area or any areas where employees are exposed to lead above the PEL. The Contractor will provide a clean space, separated from the work area for these activities. Employees shall not enter lunchroom facilities or eating areas with protective work clothing or equipment unless surface lead dust has been removed by vacuuming, downdraft booth, or other cleaning method that limits dispersion of paint or metal coating dust.
2. The Contractor shall provide a clean change area for employees whose airborne exposure to lead is above the PEL, and as interim protection for employees performing abrasive blasting, welding, cutting or torch burning prior to an exposure assessment without regard to the use of respirators. Change areas shall be equipped with separate storage facilities for protective work clothing and equipment and for street clothes which prevent cross-contamination.
3. The Contractor shall provide shower facilities, where feasible, for use by employees whose airborne exposure to lead is above the PEL. Employees shall shower at the end of the work shift and an adequate supply of cleansing agents and towels for use by affected employees shall be provided. Where showers are not provided the Contractor shall assure that employees wash their hands and face at the end of the work-shift.
4. Wash facilities will be provided by the Contractor. This wash facility will consist of, at least, running potable water, towels, and a HEPA vacuum. Upon leaving the work area, each worker will remove and dispose of work suit, wash and dry face and hands, and vacuum clothes.
5. A lavatory facility must be provided and located adjacent to the work area. The eating and drinking area, clean room, and the lavatory must be maintained in a clean and orderly fashion at all times. The Contractor will provide portable lavatories when needed and disinfect them daily.

3.02 WORK AREA SET UP

- A. Site Safety: The Contractor is responsible for all safety at the work site. This includes, but is not limited to, electrical safety, mechanical (tool) safety, fire safety, and personnel protective safety. Safety requirements are, for the most part, common sense and sound business practice; however, the Contractor is advised that federal, state, and local regulations exist which govern safety on the work site. Therefore, in addition to the following, the Contractor is responsible for adhering to the most stringent requirements if effect.
- B. Safety Regulations: The following are applicable Regulations.
 - 29 CFR 1910 General Industry Standards;
 - 29 CFR 1926 Construction Industry Standards;
 - American National Standard (ANSI) Publications;
 - 454 CMR 10.00

- C. Signage: Prior to the preparation for work which will disturb Lead containing paint, the Contractor shall place warning signs immediately outside all entrances and exits to the area for each Lead identified, warning that work is being conducted in the vicinity that will impact Leads. The signs shall meet the specifications of OSHA 1926 for Lead.

D. Exterior Paint Disturbance

1. Exterior paint disturbance may include the demolition of loose, chipped, cracking, flaking, blistering, or chalking paint.
2. Exterior paint disturbance may also include the intact removal of painted building components. The Contractor shall remove painted building components in a manner that does not generate airborne hazardous contaminated dust.
3. One layer of polyethylene sheeting will be laid on the ground cover and over any shrubbery and shall extend from the building a minimum distance of 10 feet (where feasible, 20 feet is recommended) prior to the start of any exterior scraping activities or the removal of any exterior building components. Extreme care shall be taken to ensure that no paint chips are allowed to migrate beyond the sheeting.
4. All visible debris shall be cleaned up at the end of each workday. Prior to removal, all protective polyethylene sheeting will be HEPA vacuumed.
5. Containerized painted waste from any exterior scraping activities and removed painted building components shall be segregated and disposed of in accordance with Section 3.06.

3.03 WORK PROCEDURES

- A. General: These procedures detail generalities of component work procedures. Resulting bundles of “containers” of removed components and/or debris shall be carefully handled to reduce the potential of ripping, bursting or otherwise diminishing the integrity of the bundle or “container”. Care must be taken so that painted materials are neither burned, nor dusted, nor result in further exposure to workers, residents or observers. Paint chips shall be contained either in the HEPA vacuum or in approved six-mil polyethylene disposal bags.
- B. Adequate environmental controls shall be used to contain or control the release of airborne concentrations of Lead Containing Paint or materials with Lead Containing Paint.

3.04 AIR SAMPLING-CONTRACTOR

- A. Personal Exposure Monitoring: Work practices may cause disturbance of Lead Containing Paint potentially resulting in airborne concentrations of Leads at or above the Action Level, the Contractor shall perform personal exposure sampling to monitor personal exposure levels to airborne Leads identified. Samples shall be taken for the duration of the work shift or for eight hours, whichever is greater. Personal samples need not be taken every day after the first day if working conditions remain unchanged, but must be taken every time there is a change in the removal operation, either in terms of the location or the type of work. Sampling will be used to determine eight-hour Time-Weighted-Averages (TWA). The Contractor is responsible for personal sampling as outlined in OSHA Standard 29 CFR 1926.

Air sampling results shall be transmitted to the Owner and individual workers available at the job site in written form no more than forty-eight (48) hours after the completion of a sampling cycle. The reporting document shall list each sample's result sampling time and date, personnel monitored and their social security numbers, flow rate, sample duration, sample yield, cassette size, and the analysts' name and company, and shall include an interpretation of the results. Air sample analysis results will be reported in micrograms/cubic meter ($\mu\text{g}/\text{m}^3$).

- B. Laboratory: The Contractor's testing lab shall be AIHA accredited for heavy metals. Contractor shall submit for the Owner's review and acceptance the name and address of the laboratory, certification(s) of AIHA, accreditation for heavy metal analysis, listing of relevant experience in air lead analysis, and presentation of a documented Quality Assurance and Quality Control program.
- C. Frequency: Air monitoring frequency will be established in accordance with the requirements set forth in 29 CFR 1926 for Lead.

3.05 CLEAN-UP PROCEDURES

- A. When work is in progress, the work site shall be cleaned at end of each day's activities. The building shall be secured to prevent entry by any person after termination of work day. Durable equipment, such as power and hand tools, generators, and machinery shall be cleaned before leaving the site.
- B. Equipment shall be cleaned by HEPA vacuuming. Surfaces shall be maintained as free as practicable of accumulations of lead containing dust and debris. Clean-up lead containing dust and debris shall be accomplished with a HEPA vacuum or wet methods. The debris shall be misted with water with an airless type sprayer and collected with a mop or broom.

3.06 DISPOSAL OF WASTE MATERIAL

- A. The Contractor is responsible for any required testing and for the ultimate disposal of all waste generated from the Work of this section. This waste may include, but is not limited to, lead-painted building components, lead paint chips, waste water, dust from HEPA filters and from damp sweeping, solvents and caustics used in any stripping process, wash water, disposable work clothes and respirator filters.
- B. All Lead Containing Painted building components shall be recycled when feasible. The Contractor shall submit laboratory analysis indicating that the waste is below the regulatory requirement for TCLP. The Contractor shall also notify the recycling facility in writing, with a copy to the Owner, of the presence of lead-based paint in the waste stream. The Contractor shall provide written certification from the disposal or recycling facility that they have reviewed the TCLP information and that they are permitted to accept the waste. Copies of all such documentation shall be delivered to the Owner at least 10 days prior to shipment of the waste.
- C. For all other Lead waste (chips, lead dust, waste water, filters, solvents, work clothes, etc.), the Contractor shall store waste in appropriate, compatible containers/drums for disposal as hazardous waste and shall be labeled and stored in accordance with all applicable regulations. The Contractor shall also submit the name, address and proof of permit for the landfill that has agreed to accept the containerized lead waste to the Owner at least 10 days prior to shipment.

- D. The Contractor is responsible for completing all disposal documents, which may include, but are not limited to, waste profiles, hazardous waste manifests and land ban restriction forms. Disposal of any hazardous wastes generated by the Contractor shall be the sole responsibility of the Contractor. Copies of all disposal documents shall be delivered to the Owner at least 10 days prior to shipment. For lead waste that is being shipped and disposed of using a hazardous waste manifest, the Contractor shall provide the original, bottom three copies of the manifest to the Owner at the time of shipment for distribution to the appropriate agencies. The Owner reserves the right to reject any facility or hauler if appropriate licenses, permits and certification cannot be demonstrated.

3.07 RECYCLING OF METAL COMPONENTS

- A. General.: The Contractor shall not dispose of Lead containing painted metal components as construction waste. Instead, the Contractor shall send these materials to a scrap recycling facility. Provide proof of transfer of these materials to the Owner.
- B. Storage Requirements: Metal components shall be kept inaccessible to persons other than Contractor personnel. This waste shall be kept segregated from non-metal, painted materials.

END OF SECTION

SECTION 02090 – LEAD BASED PAINT HANDLING SPECIFICATION

The following report is hereby made a part of this Contract and shall be executed as referred to in other sections of this Specification.

**STEVENS MEMORIAL BUILDING
12 CHESTNUT STREET
LUDLOW, MA.**

LEAD BASED PAINTED HANDLING SPECIFICATION

this document
prepared by
owner's environmental consultant

Environmental Compliance Services, Inc.
588 Silver Street
Agawam, Ma. 01101

• *Consultants Report Follows* •

SECTION 02095 - UTILITY MATERIALS

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.

1.2 SUMMARY

- A. This Section includes the following utility materials and methods to complement other Division 2 Sections:
 - 1. Piping materials and installation instructions common to most piping systems.
 - 2. Concrete base construction requirements.
 - 3. Equipment nameplate data requirements.
 - 4. Nonshrink grout for equipment installations.
 - 5. Field-fabricated metal and wood equipment supports.
 - 6. Utility piping demolition.
 - 7. Cutting and patching.
 - 8. Touchup painting and finishing.
- B. Pipe and pipe fitting materials are specified in Division 2 piping Sections.
- C. Related Sections include the following:
 - 1. Division 2 Section "Earthwork" for excavating, trenching, and backfilling.
 - 2. Division 3 Section "Cast-in-Place Concrete" for bases and thrust restraints.
 - 3. Division 15 Section "Basic Mechanical Materials and Methods" for sleeves and installation requirements for pipe penetrating walls and slabs.

1.3 DEFINITIONS

- A. Exposed Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions.
- B. Concealed Installations: Concealed from view and protected from weather conditions and physical contact by building occupants, but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- C. The following are industry abbreviations for plastic materials:
 - 1. ABS: Acrylonitrile-butadiene-styrene.
 - 2. CPVC: Chlorinated polyvinyl chloride.
 - 3. PE: Polyethylene.
 - 4. PVC: Polyvinyl chloride.

1.4 SUBMITTALS

- A. Product Data: For identification materials and devices.
- B. Samples of color, lettering style, and other graphic representation required for each identification material and device.
- C. Shop Drawings: Detail fabrication and installation for metal and wood supports, and anchorage for utility piping materials and equipment.
- D. Coordination Drawings: Detail major elements, components, and systems of utility equipment and materials in relation to other systems, installations, and building components. Show space requirements for installation and access. Indicate whether sequence and coordination of installations are important to efficient flow of the Work. Include the following:
 - 1. Planned piping layout, including valve and specialty locations and valve-stem movement.
 - 2. Clearances for installing and maintaining insulation.
 - 3. Clearances for servicing and maintaining equipment, accessories, and specialties, including space for disassembly required for periodic maintenance.
 - 4. Equipment and accessory service connections and support details.
 - 5. Building, exterior wall, and foundation penetrations.
 - 6. Sizes and location of required concrete bases.
 - 7. Scheduling, sequencing, movement, and positioning of large equipment during construction.
 - 8. Floor plans, elevations, and details to indicate penetrations in floors and walls, and their relationship to other penetrations and installations.
- E. Welding Certificates: Copies of certificates indicating compliance of welding procedures and personnel with requirements specified in the "Quality Assurance" Article of this Section.

1.5 QUALITY ASSURANCE

- A. Qualify welding processes and operators for structural steel according to AWS D1.1, "Structural Welding Code--Steel."
- B. Qualify welding processes and operators for piping according to the ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
 - 1. Comply with provisions of ASME B31 Series, "Code for Pressure Piping."
 - 2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.
- C. Comply with ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.
- D. Equipment Selection: Equipment of greater or larger power, dimensions, capacities, and ratings may be furnished provided such proposed equipment is approved in writing and connecting mechanical and electrical services, circuit breakers, conduit, motors, bases, and equipment spaces are increased. If larger equipment is approved, no additional costs will be approved for

these increases. If minimum energy ratings or efficiencies of equipment are specified, equipment must meet design requirements and commissioning requirements.

- E. Provide and install “Green Building Products” to the greatest extent possible. Submit materials with a high recycled content and low VOC emissions for acceptance.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and entrance of dirt, debris, and moisture.
- B. Protect stored pipes and tubes from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor, if stored inside.
- C. Protect flanges, fittings, and piping specialties from moisture and dirt.
- D. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7 SEQUENCING AND SCHEDULING

- A. Coordinate equipment installation with other components.
- B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- C. Sequence, coordinate, and integrate installations of materials and equipment for efficient flow of the Work.
- D. Coordinate connection of piping systems with other exterior underground and overhead utilities and services. Comply with requirements of authorities having jurisdiction, franchised service companies, and controlling agencies.
- E. Coordinate installation of identifying devices after completing covering and painting, if devices are applied to surfaces.

PART 2 - PRODUCTS

2.1 PIPE AND PIPE FITTINGS

- A. Refer to individual Division 2 Sections for pipe and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.2 JOINING MATERIALS

- A. Refer to individual Division 2 piping Sections for special joining materials not listed below.

- B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
 - 1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness, unless otherwise indicated.
 - a. Full-Face Type: For flat-face, Class 125 cast-iron and cast-bronze flanges.
 - b. Narrow-Face Type: For raised-face, Class 250 cast-iron and steel flanges.
 - 2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
- C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- D. Plastic Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
- E. Solder Filler Metal: ASTM B 32.
 - 1. Alloy Sn95 or Alloy Sn94: Approximately 95 percent tin and 5 percent silver, with 0.10 percent lead content.
 - 2. Alloy E: Approximately 95 percent tin and 5 percent copper, with 0.10 percent maximum lead content.
 - 3. Alloy HA: Tin-antimony-silver-copper zinc, with 0.10 percent maximum lead content.
 - 4. Alloy HB: Tin-antimony-silver-copper nickel, with 0.10 percent maximum lead content.
 - 5. Alloy Sb5: 95 percent tin and 5 percent antimony, with 0.20 percent maximum lead content.
- F. Brazing Filler Metals: AWS A5.8.
 - 1. BCuP Series: Copper-phosphorus alloys.
 - 2. BAg1: Silver alloy.
- G. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- H. Solvent Cements: Manufacturer's standard solvent cements for the following:
 - 1. ABS Plastic Piping: ASTM D 2235.
 - 2. CPVC Plastic Piping: ASTM F 493.
 - 3. PVC Plastic Piping: ASTM D 2564. Include primer according to ASTM F 656.
 - 4. ABS to PVC Plastic Piping Transition: ASTM D 3138.
- I. Plastic Pipe Seals: ASTM F 477, elastomeric gasket.
- J. Flanged, Ductile-Iron-Pipe Gaskets, Bolts, and Nuts: AWWA C110, rubber gasket, carbon-steel bolts and nuts.
- K. Couplings: Iron-body sleeve assembly, fabricated to match OD of plain-end, pressure pipes.
 - 1. Sleeve: ASTM A 126, Class B, gray iron.
 - 2. Followers: ASTM A 47 malleable iron or ASTM A 536 ductile iron.

3. Gaskets: Rubber.
4. Bolts and Nuts: AWWA C111.
5. Finish: Enamel paint.

2.3 PIPING SPECIALTIES

- A. Dielectric Fittings: Assembly or fitting with insulating material isolating joined dissimilar metals, to prevent galvanic action and to stop corrosion.
 1. Description: Combination of copper alloy and ferrous; threaded, solder, plain, and weld neck end types; and matching piping system materials.
 2. Insulating Material: Suitable for system fluid, pressure, and temperature.
 3. Dielectric Unions: Factory-fabricated union assembly, for 250-psig minimum working pressure at 180 deg F.
 4. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.
 5. Dielectric-Flange Insulation Kits: Field-assembled, companion-flange assembly; full-face or ring type. Components include neoprene or phenolic gasket, phenolic or PE bolt sleeves, phenolic washers, and steel backing washers.
 - a. Provide separate companion flanges and steel bolts and nuts for 150- or 300-psig minimum working pressure as required to suit system pressures.
 6. Dielectric Couplings: Galvanized-steel coupling; with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.
 7. Dielectric Nipples: Electroplated steel nipple; with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.
- B. Mechanical sleeve seals for pipe penetrations through exterior building walls are specified in Division 15 Section "Basic Mechanical Materials and Methods."
- C. Sleeves: The following materials are for wall, floor, slab, and roof penetrations:
 1. Steel Sheet Metal: 0.0239-inch minimum thickness, galvanized, round tube closed with welded longitudinal joint.
 2. Steel Pipe: ASTM A 53, Type E, Grade A, Schedule 40, galvanized, plain ends.
 3. Cast Iron: Cast or fabricated wall pipe equivalent to ductile-iron pressure pipe, with plain ends and integral water stop, unless otherwise indicated.
 4. PVC Plastic: Manufactured, permanent, with nailing flange for attaching to wooden forms.
 5. PVC Plastic Pipe: ASTM D 1785, Schedule 40.
 6. PE Plastic: Manufactured, reusable, tapered, cup-shaped, smooth outer surface; with nailing flange for attaching to wooden forms.

2.4 IDENTIFYING DEVICES AND LABELS

- A. General: Manufacturer's standard products of categories and types required for each application as referenced in other Division 2 Sections. If more than one type is specified for application, selection is Installer's option, but provide one selection for each product category.
- B. Equipment Nameplates: Metal nameplate with operational data engraved or stamped; permanently fastened to equipment.
 - 1. Data: Manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and similar essential data.
 - 2. Location: An accessible and visible location.
- C. Stencils: Standard stencils, prepared for required applications with letter sizes complying with recommendations of ASME A13.1 for piping and similar applications, but at least **1-1/4-inch**-high letters for ductwork and at least **3/4-inch**-high letters for access door signs and similar operational instructions.
 - 1. Material: Fiberboard.
 - 2. Material: Brass.
 - 3. Stencil Paint: Standard exterior-type stenciling enamel; black, unless otherwise indicated; either brushing grade or pressurized spray-can form and grade.
 - 4. Identification Paint: Standard identification enamel of colors indicated or, if not otherwise indicated for piping systems, comply with ASME A13.1 for colors.
- D. Snap-On Plastic Pipe Markers: Manufacturer's standard preprinted, semirigid, snap on, color-coded, complying with ASME A13.1.
- E. Pressure-Sensitive Pipe Markers: Manufacturer's standard preprinted, permanent-adhesive, color-coded, pressure-sensitive vinyl, complying with ASME A13.1.
- F. Plastic Duct Markers: Manufacturer's standard color-coded laminated plastic. Comply with the following color-codes:
 - 1. Green: Cold air.
 - 2. Yellow: Hot air.
 - 3. Yellow/Green or Green: Supply air.
 - 4. Blue: Exhaust, outside, return, and mixed air.
 - 5. For hazardous exhausts, use colors and designs recommended by ASME A13.1.
 - 6. Nomenclature: Include the following:
 - a. Direction of airflow.
 - b. Duct service.
 - c. Duct origin.
 - d. Duct destination.
 - e. Design **cubic feet/minute**.
- G. Engraved Plastic-Laminate Signs: ASTM D 709, Type I, cellulose, paper-base, phenolic-resin-laminate engraving stock; Grade ES-2, black surface, black phenolic core, with white melamine subcore, unless otherwise indicated.

1. Fabricate in sizes required for message.
 2. Engraved with engraver's standard letter style, of sizes and with wording to match equipment identification.
 3. Punch for mechanical fastening.
 4. Thickness: **1/16 inch**, unless otherwise indicated.
 5. Thickness: **1/8 inch**, unless otherwise indicated.
 6. Thickness: **1/16 inch**, for units up to **20 sq. in.** or **8 inches** long; **1/8 inch** for larger units.
 7. Fasteners: Self-tapping stainless-steel screws or contact-type permanent adhesive.
- H. Plastic Equipment Markers: Color-coded laminated plastic. Comply with the following color-codes:
1. Green: Cooling equipment and components.
 2. Yellow: Heating equipment and components.
 3. Yellow/Green: Combination cooling and heating equipment and components.
 4. Brown: Energy reclamation equipment and components.
 5. Blue: Equipment and components that do not meet any criteria above.
 6. For hazardous equipment, use colors and designs recommended by ASME A13.1.
 7. Nomenclature: Include the following, matching terminology on schedules as closely as possible:
 - a. Name and plan number.
 - b. Equipment service.
 - c. Design capacity.
 - d. Other design parameters such as pressure drop, entering and leaving conditions, and revolutions/minute.
 8. Size: Approximate **2-1/2 by 4 inches** for control devices, dampers, and valves; and **4-1/2 by 6 inches** for equipment.
- I. Lettering and Graphics: Coordinate names, abbreviations, and other designations used in mechanical identification with corresponding designations indicated. Use numbers, lettering, and wording indicated for proper identification and operation/maintenance of mechanical systems and equipment.
1. Multiple Systems: If multiple systems of same generic name are indicated, provide identification that indicates individual system number and service.
- 2.5 GROUT
- A. Nonshrink, Nonmetallic Grout: ASTM C 1107, Grade B.
1. Characteristics: Post-hardening, volume-adjusting, dry, hydraulic-cement grout; nonstaining; noncorrosive; nongaseous; and recommended for interior and exterior applications.
 2. Design Mix: **5000 psig**, 28-day compressive strength.
 3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. General: Install piping as described below, unless piping Sections specify otherwise. Individual Division 2 piping Sections specify unique piping installation requirements.
- B. General Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated, unless deviations to layout are approved on Coordination Drawings.
- C. Install piping at indicated slopes.
- D. Install components with pressure rating equal to or greater than system operating pressure.
- E. Install piping free of sags and bends.
- F. Install exposed interior and exterior piping at right angles or parallel to building walls. Diagonal runs are prohibited, unless otherwise indicated.
- G. Locate groups of pipes parallel to each other, spaced to permit valve servicing.
- H. Install fittings for changes in direction and branch connections.
- I. Install couplings according to manufacturer's written instructions.
- J. Sleeves are not required for core drilled holes.
- K. Permanent sleeves are not required for holes formed by PE plastic removable sleeves.
- L. Verify final equipment locations for roughing-in.
- M. Refer to equipment specifications in other Division 2 Sections for roughing-in requirements.
- N. Piping Joint Construction: Join pipe and fittings as follows and as specifically required in individual piping Sections:
 - 1. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
 - 2. Remove scale, slag, dirt, and debris from inside and outside pipe and fittings before assembly.
 - 3. Soldered Joints: Construct joints according to AWS's "Soldering Manual," Chapter "The Soldering of Pipe and Tube"; or CDA's "Copper Tube Handbook."
 - 4. Soldered Joints: Construct joints according to AWS's "Soldering Manual," Chapter "The Soldering of Pipe and Tube."
 - 5. Soldered Joints: Construct joints according to CDA's "Copper Tube Handbook."
 - 6. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."

7. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - a. Note internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint.
 - b. Apply appropriate tape or thread compound to external pipe threads, unless dry seal threading is specified.
 - c. Align threads at point of assembly.
 - d. Tighten joint with wrench. Apply wrench to valve end into which pipe is being threaded.
 - e. Damaged Threads: Do not use pipe or pipe fittings with corroded or damaged threads. Do not use pipe sections that have cracked or open welds.
 8. Welded Joints: Construct joints according to AWS D10.12, "Recommended Practices and Procedures for Welding Low Carbon Steel Pipe," using qualified processes and welding operators according to "Quality Assurance" Article.
 9. Flanged Joints: Align flange surfaces parallel. Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly using torque wrench.
 10. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join pipe and fittings according to the following:
 - a. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
 - b. ABS Plastic Piping: ASTM D 2235 and ASTM D 2661.
 - c. CPVC Plastic Piping: ASTM D 2846 and ASTM F 493.
 - d. PVC Plastic, Pressure Piping: ASTM D 2672.
 - e. PVC Plastic, Nonpressure Piping: ASTM D 2855.
 - f. ABS to PVC Plastic, Nonpressure Transition Fittings: Procedure and solvent cement according to ASTM D 3138.
 11. Plastic Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657 procedures and manufacturer's written instructions.
 - a. Plain-End Pipe and Fittings: Use butt fusion.
 - b. Plain-End Pipe and Socket Fittings: Use socket fusion.
- O. Piping Connections: Make connections according to the following, unless otherwise indicated:
1. Install unions, in piping **2-inch NPS** and smaller, adjacent to each valve and at final connection to each piece of equipment with **2-inch NPS** or smaller threaded pipe connection.
 2. Install flanges, in piping **2-1/2-inch NPS** and larger, adjacent to flanged valves and at final connection to each piece of equipment with flanged pipe connection.
 3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.

4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.2 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment according to approved submittal data. Portions of the Work are shown only in diagrammatic form. Refer conflicts to Architect.
- B. Install equipment level and plumb.
- C. Install equipment to facilitate service, maintenance, and repair or replacement of equipment components. Connect equipment for ease of disconnecting, with minimum interference with other installations. Extend grease fittings to an accessible location.
- D. Install equipment giving right of way to piping systems installed at required slope.

3.3 LABELING AND IDENTIFYING

- A. Piping Systems: Install pipe markers on each system. Include arrows showing normal direction of flow.
 1. Stenciled Markers: According to ASME A13.1.
 2. Plastic markers, with application systems. Install on insulation segment if required for hot noninsulated piping.
 3. Locate pipe markers on exposed piping according to the following:
 - a. Near each valve and control device.
 - b. Near each branch, excluding short takeoffs for equipment and terminal units. Mark each pipe at branch if flow pattern is not obvious.
 - c. Near locations if pipes pass through walls or floors, or enter inaccessible enclosures.
 - d. At manholes and similar access points that permit view of concealed piping.
 - e. Near major equipment items and other points of origination and termination.
- B. Equipment: Install engraved plastic-laminate sign or equipment marker on or near each major item of equipment.
 1. Lettering Size: Minimum **1/4-inch**- high lettering for name of unit if viewing distance is less than **24 inches** , **1/2 inch** high for distances up to **72 inches** , and proportionately larger lettering for greater distances. Provide secondary lettering two-thirds to three-fourths of size of principal lettering.
 2. Text of Signs: Provide name of identified unit. Include text to distinguish between multiple units, inform user of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.
- C. Adjusting: Relocate identifying devices that become visually blocked by work of this or other Divisions.

3.4 PAINTING AND FINISHING

- A. Refer to Division 9 Section "Painting" for paint materials, surface preparation, and application of paint.
- B. Apply paint to exposed piping according to the following, unless otherwise indicated:
 - 1. Ferrous Piping: Use semigloss, acrylic-enamel finish. Include 2 finish coats over rust-inhibitive metal primer.
 - 2. Galvanized-Steel Piping: Use semigloss, acrylic-enamel finish. Include 2 finish coats over galvanized metal primer.
 - 3. Ferrous Supports: Use semigloss, acrylic-enamel finish. Include 2 finish coats over rust-inhibitive metal primer.
- C. Do not paint piping specialties with factory-applied finish.
- D. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.5 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated, but not less than **4 inches** larger in both directions than supported unit. Follow supported equipment manufacturer's setting templates for anchor bolt and tie locations. Use **3000 psig**, 28-day compressive strength concrete and reinforcement as specified in Division 3 Section, "Cast-in-Place Concrete."

3.6 ERECTION OF METAL SUPPORTS AND ANCHORAGE

- A. Cut, fit, and place miscellaneous metal supports in location, alignment, and elevation to support and anchor utility piping materials and equipment.
- B. Field Welding: Comply with AWS D1.1, "Structural Welding Code--Steel."

3.7 ERECTION OF WOOD SUPPORTS AND ANCHORAGE

- A. Cut, fit, and place wood grounds, nailers, blocking, and anchorage to support and anchor utility materials and equipment.
- B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood members.
- C. Attach to substrates as required to support applied loads.

3.8 DEMOLITION

- A. Disconnect, demolish, and remove work specified in Division 2 Sections.

- B. If pipe, insulation, or equipment to remain is damaged or disturbed, remove damaged portions and install new products of equal capacity and quality.
- C. Accessible Work: Remove indicated exposed pipe in its entirety.
- D. Work Abandoned in Place: Cut and remove underground pipe a minimum of 2 inches beyond face of adjacent construction. Cap and patch surface to match existing finish.
- E. Removal: Remove indicated equipment from Project site.
- F. Temporary Disconnection: Remove, store, clean, reinstall, reconnect, and make operational equipment indicated for relocation.

3.9 CUTTING AND PATCHING

- A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for utility piping installations. Perform cutting by skilled mechanics of trades involved.
- B. Repair cut surfaces to match adjacent surfaces.

3.10 GROUTING

- A. Install nonmetallic, nonshrink grout for equipment-support bearing surfaces, pump and other equipment support plates, and anchors. Mix grout according to manufacturer's written instructions.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placing of grout.
- E. Place grout on concrete bases to provide smooth bearing surface for equipment.
- F. Place grout around anchors.
- G. Cure placed grout according to manufacturer's written instructions.

END OF SECTION 02090

SECTION 02230 – DEMOLITION, SITE CLEARING AND GRUBING

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.

1.2 SUMMARY

- A. This Section includes the following:

1. Protecting existing trees and vegetation to remain.
2. Removing trees and other vegetation scheduled to be removed.
3. Clearing and grubbing.
4. Topsoil stripping.
5. Removing free standing boiler room structure and contents.
6. Removing metal chimney, breeching and brackets.
7. Removing above-grade site improvements including but not limited to:
 - a. Bituminous and concrete pavement.
 - b. Signs and bases.
 - c. Drainage structures.
 - d. Lighting, wires, conduits, poles & bases.
 - e. Masonry and concrete stairs.
 - f. Metal stairs.
 - g. Retaining walls.
 - h. Fencing & guardrails.
 - i. Above grade fossil fuel storage tank.
 - j. Bollards
 - k. Debris and rubble with-in project area.
 - l. All other items shown or required to be removed due to new improvements scheduled.
8. Disconnecting, capping or sealing, and removing site utilities and below grade improvements and structures.

- B. Related Sections include the following:

1. Division 1 Section "Construction Facilities and Temporary Controls" for temporary utilities, temporary construction and support facilities, temporary security and protection facilities, and environmental protection measures during site operations.
2. Division 1 Section " Construction Waste Management And Disposal " for administrative and procedural requirements for salvaging, recycling and disposing of waste materials.
3. Division 2 Section "Earthwork" for soil materials, excavating, backfilling, and site grading.

1.3 DEFINITIONS

- A. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches in diameter; and free of weeds, roots, and other deleterious materials.

1.4 JOB CONDITIONS;

- A. Dust Control: Use all means necessary to prevent the spread of dust generated from work on this project Thoroughly moisten all dry surfaces as required to prevent dust from being a nuisance to all site residence, passerbys and abutters. Prevent mud and soft surfaces from becoming a nuisance by allowing overly wet areas to dry out. Spread gravel in traveled areas to allow for firm surface passage.

1.5 MATERIALS OWNERSHIP

- A. Except for materials indicated to be stockpiled or to remain Owner's property, cleared materials shall become Contractor's property and shall be removed from the site.

1.6 SUBMITTALS

- A. Photographs or videotape, sufficiently detailed, of existing conditions of trees and plantings, adjoining construction, and site improvements that might be misconstrued as damage caused by site clearing.
- B. Record drawings according to Division 1 Section "Contract Closeout."
 - 1. Identify and accurately locate capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.7 QUALITY ASSURANCE

- A. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."
- B. All bidders shall visit the site and thoroughly inspect and familiarize him/herself with all existing conditions prior to submitting bid and performing the work. No additional charges will be allowed because of a contractors failure to do so.

1.8 PROJECT CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing 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 authorities having jurisdiction.
- B. Salvagable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.
- C. Notify utility locator service for area where Project is located before site clearing.

PART 2 - PRODUCTS (Not Applicable)

2.1 SOIL MATERIALS

- A. Satisfactory Soil Materials: Requirements for satisfactory soil materials are specified in Division 2 Section "Earthwork."
 1. Obtain approved borrow soil materials off-site when satisfactory soil materials are not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Provide erosion-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- C. Locate and clearly flag trees and vegetation to remain or to be relocated.
- D. Protect existing site improvements to remain from damage during construction.
 1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TREE PROTECTION

- A. Do not excavate within drip line of trees, unless otherwise indicated.
- B. Where excavation for new construction is required within drip line of trees, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible.
 1. Cover exposed roots with burlap and water regularly.
 2. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.
 3. Coat cut faces of roots more than **1-1/2 inches** in diameter with an emulsified asphalt or other approved coating formulated for use on damaged plant tissues.

4. Cover exposed roots with wet burlap to prevent roots from drying out. Backfill with soil as soon as possible.

C. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, in a manner approved by Architect.

1. Employ a qualified arborist, licensed in jurisdiction where Project is located, to submit details of proposed repairs and to repair damage to trees and shrubs.

3.3 UTILITIES

A. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed.

1. Arrange to shut off indicated utilities with utility companies.

B. Excavate for and remove underground utilities indicated to be removed.

3.4 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, grass, and other vegetation to permit installation of new construction. Removal includes digging out stumps and obstructions and grubbing roots.

1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.

2. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.

3. Completely remove stumps, roots, obstructions, and debris extending to a depth of **18 inches** below exposed subgrade.

4. Use only hand methods for grubbing within drip line of remaining trees.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is indicated.

1. Place fill material in horizontal layers not exceeding **8-inch** loose depth, and compact each layer to a density equal to adjacent original ground.

3.5 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.

1. Strip surface soil of unsuitable topsoil, including trash, debris, weeds, roots, and other waste materials.

C. Stockpile topsoil materials away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Limit height of topsoil stockpiles to **72 inches**.

2. Do not stockpile topsoil within drip line of remaining trees.

3. Dispose of excess topsoil as specified for waste material disposal.
4. Stockpile surplus topsoil and allow for respreading deeper topsoil.

3.6 POLLUTION CONTROLS

- A. Dust Control: Use water mist, temporary enclosures, and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations.
 1. Do not use water when it may damage existing construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.
- B. Disposal: Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- C. Cleaning: Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

3.7 SITE IMPROVEMENTS

- A. Remove existing above- and below-grade improvements as listed, indicated on plans and as necessary to facilitate new construction.
- B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.
 1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut length of existing pavement to remain before removing existing pavement. Saw-cut faces vertically.

3.8 BUILDING DEMOLITION

- A. Proceed with demolition of structural framing members systematically, from higher to lower level. Complete building demolition operations above each floor or tier before disturbing supporting members on the next lower level.
- B. Equipment: Disconnect equipment at nearest fitting connection to services, complete with service valves. Remove as whole units, complete with controls.
- C. Below-Grade Construction: Remove all below grade construction including but not limited to existing basements, footings, areaways, steps, foundation walls and other below-grade construction completely, remove from site and legally dispose.
 1. Rough grade below-grade areas ready for further excavation or new construction.
- D. Existing Utilities: Properly terminate and remove to property line all existing utilities and below-grade utility structures. Cut utilities flush with grade. Fill all resulting voids with clean soil materials according to backfill requirements in Division 2 Section "Earthwork."
 1. Piping: Disconnect piping at unions, flanges, valves, or fittings.
 2. Wiring Ducts: Disassemble into unit lengths and remove plug-in and disconnecting devices.

3.9 RECYCLING DEMOLISHED MATERIALS

- A. General: Refer to Section 01741 Construction Waste Management for salvaging, recycling and disposing of waste materials.

3.10 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.
 - 1. Do not allow demolished materials to accumulate on-site. Remove all materials and associated elements from the site at the time the materials are removed from the building undergoing demolition.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Burning: Do not burn demolished materials on the site.
- C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.
 - 1) On site burial of debris, trees, plants, and other components demolished is strictly prohibited.
 - 2) Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials, including trash and debris, and legally dispose of them off Owner's property.

END OF SECTION 02230

SECTION 02300 - EARTHWORK

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.

1.2 SUMMARY

- A. This Section includes the following:

1. Preparing subgrades for slabs-on-grade, walks, pavements, lawns, and plantings.
2. Excavating and backfilling for buildings and structures.
3. Excavating temporary fill, in place from demolition work, and placement of new controlled structural soils backfilling required for new building and foundations.
4. Drainage course for slabs-on-grade.
5. Subbase course for concrete walks and pavements.
6. Base course for asphalt paving.
7. Subsurface drainage backfill for walls and trenches.
8. Excavating and backfilling trenches within building lines.
9. Excavating and backfilling trenches for buried mechanical and electrical utilities and pits for buried utility structures.
10. "Dewatering" for lowering and disposing of ground water during construction.
11. Ledge removal.

- B. Related Sections include the following:

1. Division 1 Section "Construction Facilities and Temporary Controls."
2. Division 2 Section "Demolition, Clearing and Grubbing" for site stripping, grubbing, removing topsoil, and protecting trees to remain.
3. Division 2 Section "Excavation Support and Protection."
4. Division 2 Section "Subdrainage" for drainage of footings, slabs-on-grade, and walls.
5. Division 2 Section "Landscaping" for finish grading, including placing and preparing topsoil for lawns and plantings.
6. Division 3 Section "Cast-in-Place Concrete" for granular course over vapor retarder.
7. Division 15 and 16 Sections for excavating and backfilling buried mechanical and electrical utilities and buried utility structures.

1.3 DEFINITIONS

- A. Backfill: Soil materials used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

- B. Base Course: Layer placed between the subbase course and asphalt paving.
- C. Bedding Course: Layer placed over the excavated subgrade in a trench before laying pipe.
- D. Borrow: Satisfactory soil imported from off-site for use as fill or backfill.
- E. Drainage Course: Layer supporting slab-on-grade used to minimize capillary flow of pore water.
- F. Excavation: Removal of material encountered above subgrade elevations.
 - 1. Additional Excavation: Excavation below subgrade elevations as directed by Architect. Additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
 - 2. Bulk Excavation: Excavations more than 10 feet in width and pits more than 30 feet in either length or width.
 - 3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.
- G. Fill: Soil materials used to raise existing grades.
- H. Rock: Rock material in beds, ledges, unstratified masses, and conglomerate deposits and boulders of rock material exceeding 1 cu. yd. for bulk excavation or 3/4 cu. yd. for footing, trench, and pit excavation that cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:
 - 1. Excavation of Footings, Trenches, and Pits: Late-model, track-mounted hydraulic excavator; equipped with a 42-inch wide, short-tip-radius rock bucket; rated at not less than 120-hp flywheel power with bucket-curling force of not less than 25,000 lbf and stick-crowd force of not less than 18,700 lbf; measured according to SAE J-1179.
 - 2. Bulk Excavation: Late-model, track-mounted loader; rated at not less than 210-hp flywheel power and developing a minimum of 45,000-lbf breakout force; measured according to SAE J-732.
- I. Rock: Rock material in beds, ledges, unstratified masses, and conglomerate deposits and boulders of rock material 3/4 cu. yd. or more in volume that when tested by an independent geotechnical testing agency, according to ASTM D 1586, exceeds a standard penetration resistance of 100 blows/2 inches.
- J. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- K. Subbase Course: Layer placed between the subgrade and base course for asphalt paving, or layer placed between the subgrade and a concrete pavement or walk.
- L. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.

- M. Utilities include on-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.4 SUBMITTALS

- A. Product Data: For the following:

1. Each type of plastic warning tape.
2. Drainage fabric.
3. Separation fabric.

- B. Samples: For the following:

1. **30-lb** samples, sealed in airtight containers, of each proposed soil material from on-site or borrow sources.
2. **12-by-12-inch** sample of drainage fabric.
3. **12-by-12-inch** sample of separation fabric.

- C. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:

1. Classification according to ASTM D 2487 of each on-site or borrow soil material proposed for fill and backfill.
2. Laboratory compaction curve according to ASTM D 698 for each on-site or borrow soil material proposed for fill and backfill.
3. Laboratory compaction curve according to ASTM D 1557 for each on-site or borrow soil material proposed for fill and backfill.

- D. Seismic survey agency report, for record purposes.

1.5 QUALITY ASSURANCE

- A. Comply with applicable requirements of NFPA 495, "Explosive Materials Code."

- B. Seismic Survey Agency: An independent testing agency, acceptable to authorities having jurisdiction, experienced in seismic surveys and blasting procedures to perform the following services:

1. Report types of explosive and sizes of charge to be used in each area of rock removal, types of blasting mats, sequence of blasting operations, and procedures that will prevent damage to site improvements and structures on Project site and adjacent properties.
2. Seismographic monitoring services during blasting operations.

- C. Geotechnical Testing Agency Qualifications: An independent testing agency qualified according to ASTM E 329 to conduct soil materials and rock-definition testing, as documented according to ASTM D 3740 and ASTM E 548.

- D. Preexcavation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

- E. Tests: The Contractor agrees to accept as final the results of tests secured by a qualified testing laboratory engaged by the General Contractor. Tests will be conducted in accordance with the 'Conditions Of The Contract'.

1.6 REQUIRMENTS OF REGULATORY AGENCIES

- A. All work shall conform to the Contract Documents and all applicable codes, permits and applicable regulations.
- B. Comply with the rules, regulations, ordinances and laws of the City Of Holyoke, Massachusetts and other authorities having proper jurisdiction. All labor, materials, equipment, and services necessary to make the work comply with such requirements shall be provided at no additional cost.
- C. The Contractor shall procure and pay all charges related to required permits and licenses for the complete work required by the contract documents.
- D. Comply with OSHA and Massachusetts Department Of Public Safety.
- E. Comply with 401 Water Quality Certification issued by the Mass DEP.
- F. Comply with NPDES General Permit requirements for storm water discharge for Construction Sites, issued by US EPA.

1.7 PROJECT CONDITIONS

- A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Architect and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Architect not less than two days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Architect's written permission.
 - 3. Contact utility-locator service for area where Project is located before excavating.
- B. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.
- C. Ledge/Rock: Ledge is present at the site, Contractor will anticipate encountering ledge in all interior and exterior excavations and trenching and shall include ledge removal in his/her bid.

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: ASTM D 2487 soil classification groups GW, GP, GM, SW, SP, and SM, or a combination of these group symbols; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
- C. Unsatisfactory Soils: ASTM D 2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT, or a combination of these group symbols.
 - 1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
- D. Backfill and Fill: Satisfactory soil materials.
- E. Subbase: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- F. Base: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.
- G. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- H. Bedding: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.
- I. Drainage Fill: Washed, narrowly graded mixture of crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.
- J. 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 sieve and 0 to 5 percent passing a No. 4 sieve.
- K. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.2 CONTROLLED LOW-STRENGTH MATERIAL

- A. Controlled Low-Strength Material: Low-density, self-compacting, flowable concrete material as follows:
 - 1. Portland Cement: ASTM C 150, Type I.
 - 2. Fly Ash: ASTM C 618, Class C or F.
 - 3. Normal-Weight Aggregate: ASTM C 33, 3/4-inch nominal maximum aggregate size.
 - 4. Foaming Agent: ASTM C 869.
 - 5. Water: ASTM C 94/C 94M.
 - 6. Air-Entraining Admixture: ASTM C 260.

2.3 ACCESSORIES

- A. Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, **6 inches** wide and **4 mils** thick, continuously inscribed with a description of the utility; colored as follows:
- B. Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, minimum **6 inches** wide and **4 mils** thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to **30 inches** deep; colored as follows:
 - 1. Red: Electric.
 - 2. Yellow: Gas, oil, steam, and dangerous materials.
 - 3. Orange: Telephone and other communications.
 - 4. Blue: Water systems.
 - 5. Green: Sewer systems.
- C. Drainage Fabric: Nonwoven geotextile, specifically manufactured as a drainage geotextile; made from polyolefins, polyesters, or polyamides; and with the following minimum properties determined according to ASTM D 4759 and referenced standard test methods:
 - 1. Grab Tensile Strength: **110 lbf**; ASTM D 4632.
 - 2. Tear Strength: **40 lbf**; ASTM D 4533.
 - 3. Puncture Resistance: **50 lbf**; ASTM D 4833.
 - 4. Water Flow Rate: **150 gpm per sq. ft.**; ASTM D 4491.
 - 5. Apparent Opening Size: **No. 50**; ASTM D 4751.
- D. Separation Fabric: Woven geotextile, specifically manufactured for use as a separation geotextile; made from polyolefins, polyesters, or polyamides; and with the following minimum properties determined according to ASTM D 4759 and referenced standard test methods:
 - 1. Grab Tensile Strength: **200 lbf**; ASTM D 4632.
 - 2. Tear Strength: **75 lbf**; ASTM D 4533.
 - 3. Puncture Resistance: **90 lbf**; ASTM D 4833.
 - 4. Water Flow Rate: **4 gpm per sq. ft.**; ASTM D 4491.
 - 5. Apparent Opening Size: **No. 30**; ASTM D 4751.

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 earthwork operations.
- B. Protect subgrades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.

- C. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

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.
 - 2. Install a dewatering system to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.

3.3 EXPLOSIVES

- A. Explosives: Do not use explosives.

3.4 EXCAVATION, GENERAL

- A. Unclassified Excavation: Excavation to subgrade elevations regardless of the character of surface and subsurface conditions encountered, including rock, soil materials, and obstructions.
 - 1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
- B. Classified Excavation: Excavation to subgrade elevations classified as earth and rock. Rock excavation will be paid for by adjusting the Contract Sum according to unit prices included in the Contract Documents.
 - 1. Earth excavation includes excavating pavements and obstructions visible on surface; underground structures, utilities, and other items indicated to be removed; together with soil, boulders, and other materials not classified as rock or unauthorized excavation.
 - a. Intermittent drilling; blasting, if permitted; ram hammering; or ripping of material not classified as rock excavation is earth excavation.
 - 2. Rock excavation includes removal and disposal of rock. Remove rock to lines and subgrade elevations indicated to permit installation of permanent construction without exceeding the following dimensions:
 - a. **24 inches** outside of concrete forms other than at footings.
 - b. **12 inches** outside of concrete forms at footings.
 - c. **6 inches** outside of minimum required dimensions of concrete cast against grade.
 - d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
 - e. **6 inches** beneath bottom of concrete slabs on grade.

- f. 6 inches beneath pipe in trenches, and the greater of 24 inches wider than pipe or 42 inches wide.

3.5 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. 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.
 2. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended for bearing surface.

3.6 EXCAVATION FOR WALKS AND PAVEMENTS

- A. Excavate surfaces under walks and pavements to indicated cross sections, elevations, and grades.

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 a working clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit, unless otherwise indicated.
 1. Clearance: 12 inches on each side of pipe or conduit.
 2. Clearance: As indicated.
- C. Trench Bottoms: Excavate trenches 4 inches deeper than bottom of pipe elevation to allow for bedding course. Hand excavate for bell of pipe.
 1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

3.8 APPROVAL OF SUBGRADE

- 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.

1. Additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
- C. Proof roll subgrade with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof roll wet or saturated subgrades.
- D. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect.

3.9 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill may be used when approved by Architect.
 1. Fill unauthorized excavations under other construction or utility pipe as directed by Architect.
- B. If Architect determines that unauthorized excavation has occurred and General Contractor disagrees, General Contractor at his Own Expense can hire a site engineer to survey the site and the amount of stockpile present prior to removal of any material off site to determine the amount of excavation that has occurred and submit findings to the Architect for review. It is the General Contractors responsibility to verify existing and proposed grades, bottom of footing elevations and floor elevations prior to starting excavation. Contractor must contact Architect immediately if conflicts are discovered.

3.10 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow materials and satisfactory excavated soil materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.11 BACKFILL

- A. Place and compact backfill in excavations promptly, but not before completing the following:
 1. Construction below finish grade including, where applicable, dampproofing, waterproofing, and perimeter insulation.
 2. Surveying locations of underground utilities for record documents.
 3. Inspecting and testing underground utilities.
 4. Removing concrete formwork.
 5. Removing trash and debris.
 6. Removing temporary shoring and bracing, and sheeting.
 7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

3.12 UTILITY TRENCH BACKFILL

- A. 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.
- B. Backfill trenches excavated under footings and within **18 inches** of bottom of footings; fill with concrete to elevation of bottom of footings.
- C. Provide **4-inch** thick, concrete-base slab support for piping or conduit less than **30 inches** below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of **4 inches** of concrete before backfilling or placing roadway subbase.
- D. Provide **4-inch** thick, concrete encasement for ALL underground electrical duct banks as per local electrical utility specifications.
- E. Place and compact initial backfill of subbase material, free of particles larger than **1 inch**, to a height of **12 inches** over the utility pipe or conduit.
 - 1. Carefully compact material under pipe haunches and bring backfill evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of utility system.
- F. Coordinate backfilling with utilities testing.
- G. Fill voids with approved backfill materials while shoring and bracing, and as sheeting is removed.
- H. Place and compact final backfill of satisfactory soil material to final subgrade.
- I. Install warning tape directly above utilities, **12 inches** below finished grade, except **6 inches** below subgrade under pavements and slabs.
- J. Backfill utility trenches located within Town of Spencer Right of Ways with Flowable Fill Controlled Low-Strength Material, Low-density, self-compacting, flowable concrete material to final subgrade elevation.

3.13 FILL

- A. Preparation: Remove vegetation, topsoil, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface before placing fills.
- B. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- C. 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.

3.14 MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill layer before compaction to within 2 percent of optimum moisture content.
 1. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
 2. Remove and replace, or scarify and air-dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.15 COMPACTION OF BACKFILLS AND FILLS

- A. Place backfill and fill materials in layers not more than **8 inches** in loose depth for material compacted by heavy compaction equipment, and not more than **4 inches** in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
- C. Compact soil 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** of existing subgrade and each layer of backfill or fill material at 95 percent.
 2. Under walkways, scarify and recompact top **6 inches** below subgrade and compact each layer of backfill or fill material at 92 percent.
 3. Under lawn or unpaved areas, scarify and recompact top **6 inches** below subgrade and compact each layer of backfill or fill material at 85 percent.

3.16 GRADING

- A. General: Uniformly grade areas to a smooth surface, free from 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 Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
 1. Lawn or Unpaved Areas: Plus or minus **1 inch**.
 2. Walks: Plus or minus **1 inch**.
 3. Pavements: Plus or minus **1/2 inch**.

- C. Grading inside Building Lines: Finish subgrade to a tolerance of **1/2 inch** when tested with a **10-foot** straightedge.

3.17 SUBSURFACE DRAINAGE

- A. Drainage Piping: Drainage pipe is specified in Division 2 Section "Foundation Drainage Systems."
- B. Subsurface Drain: Place a layer of drainage fabric around perimeter of drainage trench as indicated. Place a **6-inch** course of filter material on drainage fabric to support drainage pipe. Encase drainage pipe in a minimum of **12 inches** of filter material and wrap in drainage fabric, overlapping sides and ends at least **6 inches**.
 - 1. Compact each course of filter material to 95 percent of maximum dry unit weight according to ASTM D 698.
- C. Drainage Backfill: Place and compact filter material over subsurface drain, in width indicated, to within **12 inches** of final subgrade. Overlay drainage backfill with one layer of drainage fabric, overlapping sides and ends at least **6 inches**.
 - 1. Compact each course of filter material to 95 percent of maximum dry density according to ASTM D 698.
 - 2. Place and compact impervious fill material over drainage backfill to final subgrade.

3.18 SUBBASE AND BASE COURSES

- A. Install separation fabric on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
- B. Under pavements and walks, place subbase course on prepared subgrade and as follows:
 - 1. Place base course material over subbase.
 - 2. Compact subbase and base courses 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 1557.
 - 3. Shape subbase and base to required crown elevations and cross-slope grades.
 - 4. When thickness of compacted subbase or base course is **6 inches** or less, place materials in a single layer.
 - 5. When thickness of compacted subbase or base course exceeds **6 inches** place materials in equal layers, with no layer more than **6 inches** thick or less than **3 inches** thick when compacted.
- C. Pavement Shoulders: Place shoulders along edges of subbase and base course to prevent lateral movement. Construct shoulders, at least **12 inches** 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 1557.

3.19 DRAINAGE COURSE

- A. Under slabs-on-grade, install drainage fabric on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends. Place drainage course on drainage fabric and as follows:
- B. Under slabs-on-grade, place drainage course on prepared subgrade and as follows:
 - 1. Compact drainage course to required cross sections and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 698.
 - 2. When compacted thickness of drainage course is **6 inches** or less, place materials in a single layer.
 - 3. When compacted thickness of drainage course exceeds **6 inches** place materials in equal layers, with no layer more than **6 inches** thick or less than **3 inches** thick when compacted.

3.20 FIELD QUALITY CONTROL

- A. Testing Agency: General Contractor will engage a qualified independent geotechnical engineering testing agency to perform field quality-control testing.
- B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.
- C. 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.
- D. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:
 - 1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every **2000 sq. ft.** or less of paved area or building slab, but in no case fewer than three tests.
 - 2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for each **100 feet** or less of wall length, but no fewer than two tests.
 - 3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for each **150 feet** or less of trench length, but no fewer than two tests.
- E. 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 to depth required; recompact and retest until specified compaction is obtained.

3.21 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 the greatest extent possible.

3.22 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.
- B. Disposal: Transport surplus satisfactory soil to designated storage areas on Owner's property. Stockpile or spread soil as directed by Architect.
 - 1. Remove waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION 02300

SECTION 02511 - HOT-MIX ASPHALT PAVING

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.

1.2 SUMMARY

- A. This Section includes the following:

1. Hot-mix asphalt paving.
2. Asphalt surface treatments:
 - a. Fog seals.
 - b. Slurries.
3. Pavement-marking paint.
4. Hot-mix asphalt curbs.

- B. Related Sections include the following:

1. Division 2 Section "Earthwork" for aggregate subbase and base courses and aggregate pavement shoulders.
2. Division 7 Section "Paving Joint Sealants" for joint sealants and fillers at paving terminations.

1.3 SYSTEM DESCRIPTION

- A. Provide hot-mix asphalt pavement according to the materials, workmanship, and other applicable requirements of the standard specifications of the state or of authorities having jurisdiction.
 1. Standard Specification: As indicated.
 2. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

1.4 SUBMITTALS

- A. Product Data: For each product specified. Include technical data and tested physical and performance properties.
- B. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.

- C. Samples: 12 by 12 inches minimum, of paving fabric.
- D. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- E. Material Certificates: Certificates signed by manufacturers certifying that each material complies with requirements.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer who has completed hot-mix asphalt paving similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- B. Manufacturer Qualifications: Engage a firm experienced in manufacturing hot-mix asphalt similar to that indicated for this Project and with a record of successful in-service performance.
 - 1. Firm shall be a registered and approved paving mix manufacturer with authorities having jurisdiction or with the DOT of the state in which Project is located.
- C. Regulatory Requirements: Conform to applicable standards of authorities having jurisdiction for asphalt paving work on public property.
- D. Asphalt-Paving Publication: Comply with AI's "The Asphalt Handbook," except where more stringent requirements are indicated.
- E. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings" Review methods and procedures related to asphalt paving including, but not limited to, the following:
 - 1. Review proposed sources of paving materials, including capabilities and location of plant that will manufacture hot-mix asphalt.
 - 2. Review condition of substrate and preparatory work performed by other trades.
 - 3. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.
 - 4. Review and finalize construction schedule for paving and related work. Verify availability of materials, paving Installer's personnel, and equipment required to execute the Work without delays.
 - 5. Review inspection and testing requirements, governing regulations, and proposed installation procedures.
 - 6. Review forecasted weather conditions and procedures for coping with unfavorable conditions.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pavement-marking materials to Project site in original packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.
- B. Store pavement-marking materials in a clean, dry, protected location and within temperature range required by manufacturer. Protect stored materials from direct sunlight.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not apply asphalt materials if substrate is wet or excessively damp or if the following conditions are not met:
 - 1. Prime and Tack Coats: Minimum surface temperature of 60 deg F.
 - 2. Slurry Coat: Comply with weather limitations of ASTM D 3910.
 - 3. Asphalt Base Course: Minimum surface temperature of 40 deg F and rising at time of placement.
 - 4. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement.
- B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F for oil-based materials, 50 deg F for water-based materials, and not exceeding 95 deg F.

PART 2 - PRODUCTS

2.1 AGGREGATES

- A. General: Use materials and gradations that have performed satisfactorily in previous installations.
- B. Coarse Aggregate: Sound; angular crushed stone; crushed gravel; or properly cured complying with ASTM D 692.
- C. Fine Aggregate: Sharp-edged natural sand or sand prepared from stone; gravel or combinations thereof; complying with ASTM D 1073.
 - 1. For hot-mix asphalt, limit natural sand to a maximum of 10 (ten) percent by weight of the total aggregate mass.
- D. Mineral Filler: Rock or slag dust, hydraulic cement, or other inert material complying with ASTM D 242.

2.2 ASPHALT MATERIALS

- A. Asphalt Cement: ASTM D 3381 for viscosity-graded material; ASTM D 946 for penetration-graded material.

- B. Asphalt Cement: ASTM D 3381 for viscosity-graded material.
- C. Undersealing Asphalt: ASTM D 3141, pumping consistency.
- D. Prime Coat: ASTM D 2027; medium-curing cutback asphalt; MC-30, MC-70, or MC-250.
- E. Prime Coat: Asphalt emulsion prime conforming to state DOT requirements.
- F. Fog Seal: ASTM D 977, emulsified asphalt or ASTM D 2397, cationic emulsified asphalt, slow setting, factory diluted in water, of suitable grade and consistency for application.
- G. Water: Potable.

2.3 AUXILIARY MATERIALS

- A. Herbicide: Commercial chemical for weed control, registered by Environmental Protection Agency (EPA). Provide granular, liquid, or wettable powder form.
- B. Sand: ASTM D 1073, Grade Nos. 2 or 3.
- C. Paving Geotextile: Nonwoven polypropylene, specifically designed for paving applications, resistant to chemical attack, rot, and mildew.
- D. Pavement-Marking Paint: Alkyd-resin type, ready-mixed, complying with FS TT-P-115, Type I, or AASHTO M-248, Type N.
 - 1. Color: As indicated.
- E. Glass Beads: AASHTO M-247.

2.4 MIXES

- A. Hot-Mix Asphalt: Provide dense, hot-laid, hot-mix asphalt plant mixes approved by authorities having jurisdiction and designed according to procedures in AI's "Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types."
 - 1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.
 - 2. Provide mixes complying with the composition, grading, and tolerance requirements of ASTM D 3515 for the following nominal, maximum aggregate sizes:
 - a. Base Course: **1 inch.**
 - b. Surface Course: **1/2 inch.**
- B. Emulsified-Asphalt Slurry: ASTM D 3910, consisting of emulsified asphalt, fine aggregates, and mineral fillers and as follows:
 - 1. Composition: Type 2.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that subgrade is dry and in suitable condition to support paving and imposed loads.
- B. Proof-roll subbase using heavy, pneumatic-tired rollers to locate areas that are unstable or that require further compaction.
- C. Notify Architect in writing of any unsatisfactory conditions. Do not begin paving installation until these conditions have been satisfactorily corrected.

3.2 COLD MILLING

- A. Clean existing paving surface of loose and deleterious material immediately before cold milling. Remove existing asphalt pavement, including hot-mix asphalt and, as necessary, unbound-aggregate base course, by cold milling to grades and cross sections indicated.
 - 1. Repair or replace curbs, manholes, and other construction damaged during cold milling.

3.3 PATCHING AND REPAIRS

- 1. Tack coat faces of excavation and allow to cure before paving.
 - 2. Fill excavation with dense-graded, hot-mix asphalt base mix and, while still hot, compact flush with adjacent surface.
 - 3. Partially fill excavation with dense-graded, hot-mix asphalt base mix and compact while still hot. Cover asphalt base course with compacted, hot-mix surface layer finished flush with adjacent surfaces.
- B. Portland Cement Concrete Pavement: Break cracked slabs and roll as required to reseat concrete pieces firmly.
 - 1. Pump hot undersealing asphalt under rocking slabs until slab is stabilized or, if necessary, crack slab into pieces and roll to reseat pieces firmly.
 - 2. Remove disintegrated or badly broken pavement. Prepare and patch with hot-mix asphalt.
 - C. Leveling Course: Install and compact leveling course consisting of dense-graded, hot-mix asphalt surface course to level sags and fill depressions deeper than **1 inch** in existing pavements.
 - 1. Install leveling wedges in compacted lifts not exceeding **3 inches** thick.
 - D. Crack and Joint Filling: Remove existing filler material from cracks or joints to a depth of **1/4 inch**. Refill with asphalt joint-filling material to restore watertight condition. Remove excess filler that has accumulated near cracks or joints.

- E. Tack Coat: Apply uniformly to existing surfaces of previously constructed asphalt or portland cement concrete paving and to surfaces abutting or projecting into new, hot-mix asphalt pavement. Apply at a uniform rate of 0.05 to 0.15 gal./sq. yd. of surface.
 - 1. Allow tack coat to cure undisturbed before paving.
 - 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.4 SURFACE PREPARATION

- A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.
 - 1. Sweep loose granular particles from surface of unbound-aggregate base course. Do not dislodge or disturb aggregate embedded in compacted surface of base course.
- B. Herbicide Treatment: Apply herbicide according to manufacturer's recommended rates and written application instructions. Apply to dry, prepared subgrade or surface of compacted-aggregate base before applying paving materials.

3.5 GEOTEXTILE INSTALLATION

- A. Apply bond coat, consisting of asphalt cement, uniformly to existing surfaces at a rate of 0.20 to 0.30 gal./sq. yd..
- B. Place paving geotextile promptly according to manufacturer's written instructions. Broom or roll geotextile smooth and free of wrinkles and folds. Overlap longitudinal joints 4 inches and transverse joints 6 inches.
 - 1. Protect paving geotextile from traffic and other damage and place overlay paving the same day.

3.6 HOT-MIX ASPHALT PLACING

- A. Machine place hot-mix asphalt mix on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness, when compacted.
 - 1. Place hot-mix asphalt base course in number of lifts and thicknesses indicated.
 - 2. Place hot-mix asphalt surface course in single lift.
 - 3. Spread mix at minimum temperature of 250 deg F.
 - 4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes, unless otherwise indicated.
 - 5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.
- B. Place paving in consecutive strips not less than 10 feet wide, except where infill edge strips of a lesser width are required.

1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete asphalt base course for a section before placing asphalt surface course.
- C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.7 JOINTS

- A. Construct joints to ensure continuous bond between adjoining paving sections. Construct joints free of depressions with same texture and smoothness as other sections of hot-mix asphalt course.
 1. Clean contact surfaces and apply tack coat.
 2. Offset longitudinal joints in successive courses a minimum of **6 inches**.
 3. Offset transverse joints in successive courses a minimum of **24 inches**.
 4. Construct transverse joints by bulkhead method or sawed vertical face method as described in AI's "The Asphalt Handbook."
 5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
 6. Compact asphalt at joints to a density within 2 percent of specified course density.

3.8 COMPACTION

- A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or vibratory-plate compactors in areas inaccessible to rollers.
 1. Complete compaction before mix temperature cools to **185 deg F**.
- B. Breakdown Rolling: Accomplish breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Repair surfaces by loosening displaced material, filling with hot-mix asphalt, and rerolling to required elevations.
- C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling, while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:
 1. Average Density: 96 percent of reference laboratory density according to ASTM D 1559, but not less than 94 percent nor greater than 100 percent.
- D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.
- E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while still hot, with back of rake or smooth iron. Compact thoroughly using tamper or other satisfactory method.

- F. Repairs: Remove paved areas that are defective or contaminated with foreign materials. Remove paving course over area affected and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.
- G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
- H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.9 INSTALLATION TOLERANCES

- A. Thickness: Compact each course to produce the thickness indicated within the following tolerances:
 - 1. Base Course: Plus or minus **1/2 inch**.
 - 2. Surface Course: Plus **1/4 inch**, no minus.
- B. Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a **10-foot** straightedge applied transversely or longitudinally to paved areas:
 - 1. Base Course: **1/4 inch**.
 - 2. Surface Course: **1/8 inch**.Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is **1/4 inch**.

3.10 ASPHALT CURBS

- A. Construct hot-mix asphalt curbs over compacted pavement surfaces. Apply a light tack coat, unless pavement surface is still tacky and free from dust. Spread mix at minimum temperature of **250 deg F**.
 - 1. Asphalt Mix: Same as pavement surface-course mix.
- B. Place hot-mix asphalt to curb cross section indicated or, if not indicated, to local standard shapes, by machine or by hand in wood or metal forms. Tamp hand-placed materials and screed to smooth finish. Remove forms after hot-mix asphalt has cooled.

3.11 SURFACE TREATMENTS

- A. Fog Seals: Apply fog seal at a rate of **0.10 to 0.15 gal./sq. yd.** to existing asphalt pavement and allow to cure. Lightly dust areas receiving excess fog seal with a fine sand.
- B. Slurry Seals: Apply slurry coat in a uniform thickness according to ASTM D 3910 and allow to cure.
 - 1. Roll slurry seal to smooth ridges and provide a uniform, smooth surface.

3.12 PAVEMENT MARKING

- A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.
- B. Allow paving to cure for 30 days before starting pavement marking.
- C. Sweep and clean surface to eliminate loose material and dust.
- D. Apply paint with mechanical equipment to produce pavement markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.
 - 1. Broadcast glass spheres uniformly into wet pavement markings at a rate of 6 lb/gal..

3.13 FIELD QUALITY CONTROL

- A. Testing Agency: The Contractor will engage a qualified independent testing agency to perform field inspections and tests and to prepare test reports.
- B. Tests: The Contractor agrees to accept as final the results of tests secured by a qualified testing laboratory engaged by the Contractor. Tests will be conducted in accordance with the 'Conditions Of The Contract'.
 - 1. Testing agency will conduct and interpret tests and state in each report whether tested Work complies with or deviates from specified requirements.
- C. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.
- D. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.
- E. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.
- F. In-Place Density: Samples of uncompacted paving mixtures and compacted pavement will be secured by testing agency according to ASTM D 979.
 - 1. Reference laboratory density will be determined by averaging results from 4 samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 1559, and compacted according to job-mix specifications.
 - 2. Reference maximum theoretical density will be determined by averaging results from 4 samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.
 - 3. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.
 - a. One core sample will be taken for every 1000 sq. yd. or less of installed pavement, but in no case will fewer than 3 cores be taken.

- b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.

- G. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

END OF SECTION 02511

SECTION 02520 - PORTLAND CEMENT CONCRETE PAVING

PART 1 - GENERAL

RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

SUMMARY

Extent of portland cement concrete paving is shown on drawings, including curbs, gutters, walkways, and pavement.

Prepared subbase is specified in "Earthwork" section.

Concrete and related materials are specified in Division 3.

Joint fillers and sealers are specified in Division 7.

Cast In Place Tactile/Detectable Warning Surface Tile are specified in Division 9.

SUBMITTALS

Provide samples, manufacturer's product data, test reports, and materials' certifications as required in referenced sections for concrete and joint fillers and sealers.

QUALITY ASSURANCE

Codes and Standards: Comply with local governing regulations if more stringent than herein specified.

JOB CONDITIONS

Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

Coordinate with requirements for "Temporary Facilities" specified in Division 1.

PART 2 - PRODUCTS

MATERIALS

Forms: Steel, wood, or other suitable material of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects.

Use flexible spring steel forms or laminated boards to form radius bends as required.

Coat forms with a nonstaining form release agent that will not discolor or deface surface of concrete.

Welded Wire Mesh: Welded plain cold-drawn steel wire fabric, ASTM A 185.

Furnish in flat sheets, not rolls, unless otherwise acceptable to Architect.

Reinforcing Bars: Deformed steel bars, ASTM A 615, Grade 60.

Fabricated Bar Mats: Welded or clip-assembled steel bar or rod mats, ASTM A 184. Use ASTM A 615, Grade 60 steel bars, unless otherwise indicated.

Joint Dowel Bars: Plain steel bars, ASTM A 615, Grade 60. Cut bars true to length with ends square and free of burrs.

Hook Bolts: ASTM A 307, Grade A bolts, internally and externally threaded. Design hook bolt joint assembly to hold coupling against pavement form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.

Concrete Materials: Comply with requirements of applicable Division 3 sections for concrete materials, admixtures, bonding materials, curing materials, and others as required.

Expansion Joint Materials: Comply with requirements of applicable Division 7 sections for preformed expansion joint fillers and sealers.

Antispalling Compound: Combination of boiled linseed oil and mineral spirits, complying with AASHTO M-233.

CONCRETE MIX, DESIGN, AND TESTING

Comply with requirements of applicable Division 3 sections for concrete mix design, sampling and testing, and quality control and as herein specified.

Design mix to produce normal-weight concrete consisting of portland cement, aggregate, water-reducing or high-range water-reducing admixture (superplasticizer), air-entraining admixture, and water to produce the following properties:

Compressive Strength: 3000 psi, minimum at 28 days, unless otherwise indicated.

Slump Limit: 8 inches minimum for concrete containing high-range water-reducing admixture (superplasticizer); 3 inches for other concrete.

Air Content: 5 to 8 percent.

PART 3 - EXECUTION

SURFACE PREPARATION

Remove loose material from compacted subbase surface immediately before placing concrete.

Proof-roll prepared subbase surface to check for unstable areas and need for additional compaction. Do not begin paving work until such conditions have been corrected and are ready to receive paving.

PAVING THICKNESS

4" for pedestrian walks.

5" for landings at exterior doors, stairs and patios.

6" for electrical transformer, excess drive and chiller pad.

FORM CONSTRUCTION

Set forms to required grades and lines, braced and secured. Install forms to allow continuous progress of work and so that forms can remain in place at least 24 hours after concrete placement.

Check completed formwork for grade and alignment to following tolerances:

Top of forms not more than 1/8 inch in 10 feet.

Vertical face on longitudinal axis, not more than 1/4 inch in 10 feet.

Clean forms after each use and coat with form release agent as required to ensure separation from concrete without damage.

Slope step treads at 1/4 inch per foot to drain.

REINFORCEMENT

Locate, place, and support reinforcement as specified in Division 3 sections, unless otherwise indicated.

CONCRETE PLACEMENT

General: Comply with requirements of Division 3 sections for mixing and placing concrete, and as herein specified.

Do not place concrete until subbase and forms have been checked for line and grade. Moisten subbase if required to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

Place concrete by methods that prevent segregation of mix. Consolidate concrete along face of forms and adjacent to transverse joints with internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand-spreading and consolidation. Consolidate with care to prevent dislocation of reinforcing, dowels, and joint devices.

Use bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

Deposit and spread concrete in a continuous operation between transverse joints as far as possible. If interrupted for more than 1/2 hour, place a construction joint.

When adjacent pavement lanes are placed in separate pours, do not operate equipment on concrete until pavement has attained sufficient strength to carry loads without injury.

Fabricated Bar Mats: Keep mats clean and free from excessive rust, and handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities or replace units as required before placement. Set mats for a minimum 2- inch overlap to adjacent mats.

Place concrete in 2 operations; strike off initial pour for entire width of placement and to the required depth below finish surface. Lay fabricated bar mats immediately in final position. Place top layer of concrete, strike off, and screed.

Remove and replace portions of bottom layer of concrete that have been placed more than 15 minutes without being covered by top layer or use bonding agent if acceptable to Architect.

JOINTS

General: Construct expansion, weakened-plane (contraction), and construction joints true to line with face perpendicular to surface of concrete. Construct transverse joints at right angles to the centerline, unless otherwise indicated.

When joining existing structures, place transverse joints to align with previously placed joints, unless otherwise indicated.

Weakened-Plane (Contraction) Joints: Provide weakened-plane (contraction) joints, sectioning concrete into areas as shown on drawings. Construct weakened-plane joints for a depth equal to at least 1/4 concrete thickness, as follows:

Tooled Joints: Form weakened-plane joints in fresh concrete by grooving top portion with a recommended cutting tool and finishing edges with a jointer.

Construction Joints: Place construction joints at end of placements and at locations where placement operations are stopped for more than 1/2 hour, except where such placements terminate at expansion joints.

Construct joints as shown or, if not shown, use standard metal keyway-section forms.

Where load transfer-slip dowel devices are used, install so that one end of each dowel bar is free to move.

Expansion Joints: Provide premolded joint filler for expansion joints abutting concrete curbs, catch basins, manholes, inlets, structures, walks, and other fixed objects, unless otherwise indicated.

Locate expansion joints at 50 feet o.c. for each pavement lane unless otherwise indicated.

Extend joint fillers full width and depth of joint, not less than 1/2 inch or more than 1 inch below finished surface where joint sealer is indicated. If no joint sealer, place top of joint filler flush with finished concrete surface.

Furnish joint fillers in one-piece lengths for full width being placed wherever possible. Where more than one length is required, lace or clip joint filler sections together.

Protect top edge of joint filler during concrete placement with a metal cap or other temporary material. Remove protection after concrete has been placed on both sides of joint.

Fillers and Sealants: Comply with requirements of applicable Division 7 sections for preparation of joints, materials, installation, and performance. All snap-ties will be removed and all voids filled with non-shrink grout prior to damproffing and backfilling operation typical all basement areas.

CONCRETE FINISHING

After striking-off and consolidating concrete, smooth surface by screeding and floating. Use hand methods only where mechanical floating is not possible. Adjust floating to compact surface and produce uniform texture.

After floating, test surface for trueness with a 10-ft. straight edge. Distribute concrete as required to remove surface irregularities, and refloat repaired areas to provide a continuous smooth finish.

Work edges of slabs, gutters, back top edge of curb, and formed joints with an edging tool, and round to 1/2-inch radius, unless otherwise indicated. Eliminate tool marks on concrete surface.

After completion of floating and when excess moisture or surface sheen has disappeared, complete troweling and finish surface as follows:

Broom finish by drawing a fine-hair broom across concrete surface perpendicular to line of traffic. Repeat operation if required to provide a fine line texture acceptable to Architect.

On inclined slab surfaces, provide a coarse, non-slip finish by scoring surface with a stiff-bristled broom, perpendicular to line of traffic.

Do not remove forms for 24 hours after concrete has been placed. After form removal, clean ends of joints and point-up any minor honeycombed areas. Remove and replace areas or sections with major defects, as directed by Architect.

CURING

Protect and cure finished concrete paving in compliance with applicable requirements of Division 3 sections. Use membrane-forming curing and sealing compound or approved moist-curing methods.

Antispalling Treatment: Apply treatment to concrete surfaces no sooner than 28 days after placement, to clean, dry concrete free of oil, dirt, and other foreign material. Apply curing and sealing compound at a maximum coverage rate of 300 s.f. per gallon. Apply antispalling compound in 2 sprayed applications. First application at rate of 40 sq. yds. per gal.; second application, 60 sq. yds. per gallon. Allow complete drying between applications.

REPAIRS AND PROTECTIONS

Repair or replace broken or defective concrete, as directed by Architect.

Drill test cores where directed by Architect when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy adhesive.

Protect concrete from damage until acceptance of work. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.

Sweep concrete pavement and wash free of stains, discolorations, dirt, and other foreign material just before final inspection.

END OF SECTION 02520

SECTION 02630 - STORM DRAINAGE

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.

1.2 SUMMARY

- A. This Section includes storm drainage outside the building including manholes, catch basins, leaching structures, pipe and all necessary and required fixtures, accessories, items and operations.
- B. Pay all cost related to connecting storm drainage system to existing services. File applications, details, drawings and calculations required by the local authority.
- C. Related Sections include the following:
 - 1. Division 2 Section "Foundation Drainage Systems" for foundation drains connecting to storm drainage.
 - 2. Division 3 Section "Cast-in-Place Concrete" for concrete structures.

1.3 DEFINITIONS

- A. HDPE: high-density polyethylene.

1.4 PERFORMANCE REQUIREMENTS

- A. Gravity-Flow, Nonpressure-Piping Pressure Ratings: At least equal to system test pressure.

1.5 SUBMITTALS

- A. Product Data: For the following:
 - 1. Drains.
 - 2. Stormwater disposal systems.
- B. Shop Drawings: Include plans, elevations, details, and attachments for the following:
 - 1. Precast concrete manholes and other structures, including frames, covers, and grates.

- C. Coordination Drawings: Show manholes and other structures, pipe sizes, locations, and elevations. Include details of underground structures and connections. Show other piping in same trench and clearances from sewerage system piping. Indicate interface and spatial relationship between piping and proximate structures.
- D. Coordination Profile Drawings: Show system piping in elevation. Draw profiles at horizontal scale of not less than 1 inch equals 50 feet and vertical scale of not less than 1 inch equals 5 feet. Indicate underground structures and pipe. Show types, sizes, materials, and elevations of other utilities crossing system piping.
- E. Design Mix Reports and Calculations: For each class of cast-in-place concrete.
- F. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not store plastic structures, pipe, and fittings in direct sunlight.
- B. Protect pipe, pipe fittings, and seals from dirt and damage.
- C. Handle precast concrete manholes and other structures according to manufacturer's written rigging instructions.

1.7 PROJECT CONDITIONS

- A. Site Information: Perform site survey, research public utility records, and verify existing utility locations.
- B. Locate existing structures and piping to be closed and abandoned.

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. Stormwater Disposal Systems:
 - a. Advanced Drainage Systems, Inc.

2.2 PIPING MATERIALS

- A. Refer to Part 3 "Piping Applications" Article for applications of pipe and fitting materials.

2.3 PIPES AND FITTINGS

- A. Corrugated PE Drainage Tubing and Fittings: AASHTO M 252, Type S, with smooth waterway for coupling joints.
 - 1. Silttight Couplings: PE sleeve with ASTM D 1056, Type 2, Class A, Grade 2 gasket material that mates with tube and fittings to form silttight joints.
- B. Corrugated PE Pipe and Fittings: AASHTO M 294, Type S, with smooth waterway for coupling joints.
 - 1. Silttight Couplings: PE sleeve with ASTM D 1056, Type 2, Class A, Grade 2 gasket material that mates with pipe and fittings to form silttight joints.

2.4 MANHOLES

- A. Normal-Traffic Precast Concrete Manholes: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for rubber gasketed joints.
 - 1. Diameter: 48 inches minimum, unless otherwise indicated.
 - 2. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation.
 - 3. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and having separate base slab or base section with integral floor.
 - 4. Riser Sections: 4-inch minimum thickness, and lengths to provide depth indicated.
 - 5. Top Section: Eccentric-cone type, unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
 - 6. Gaskets: ASTM C 443, rubber.
 - 7. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch- diameter frame and cover.
 - 8. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast or anchor into base, riser, and top section sidewalls with steps at 12- to 16-inch intervals. Omit steps for manholes less than 60 inches deep.
 - 9. Steps: ASTM C 478, individual steps or ladder. Omit steps for manholes less than 60 inches deep.
 - 10. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.
- B. Manhole Frames and Covers: ASTM A 536, Grade 60-40-18, ductile-iron castings designed for heavy-duty service. Include 24-inc ID by 7- to 9-inch riser with 4-inch minimum width flange, and 26-inch- diameter cover. Include indented top design with lettering "STORM SEWER" cast into cover.

2.5 CATCH BASINS

- A. Normal-Traffic, Precast Concrete Catch Basins: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for rubber gasketed joints.
1. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and having separate base slab or base section with integral floor.
 2. Riser Sections: 4-inch minimum thickness, 48-inch diameter, and lengths to provide depth indicated.
 3. Top Section: Eccentric-cone type, unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
 4. Gaskets: ASTM C 443, rubber.
 5. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch- diameter frame and grate.
 6. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast steps or anchor ladder into base, riser, and top section sidewalls at 12- to 16-inch intervals. Omit steps for catch basins less than 60 inches deep.
 7. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.
- B. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for heavy-duty service. Include flat grate with small square or short-slotted drainage openings.
1. Size: 24 by 24 inches minimum, unless otherwise indicated.
 2. Grate Free Area: Approximately 50 percent, unless otherwise indicated.

2.6 CONCRETE

- A. General: Cast-in-place concrete according to ACI 318, ACI 350R, and the following:
1. Cement: ASTM C 150, Type II.
 2. Fine Aggregate: ASTM C 33, sand.
 3. Coarse Aggregate: ASTM C 33, crushed gravel.
 4. Water: Potable.
- B. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water-cementitious ratio.
1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
 2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.

2.7 PROTECTIVE COATINGS

- A. Description: One- or two-coat, coal-tar epoxy; 15-mil minimum thickness, unless otherwise indicated; factory or field applied to the following surfaces:
1. Concrete Manholes: On exterior surface.
 2. Catch Basins: On exterior surface.

2.8 STORMWATER DISPOSAL SYSTEMS

- A. Pipe Systems: Perforated manifold, header, and lateral piping complying with AASHTO M 252M for NPS 10 and smaller, AASHTO M 294M for NPS 12 to NPS 48, and AASHTO MP7 for NPS 54 and NPS 60. Include proprietary fittings, couplings, seals, and filter fabric.
1. Available Manufacturers:
 - a. Advanced Drainage Systems, Inc.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Excavating, trenching, and backfilling are specified in Division 2 Section "Earthwork."

3.2 IDENTIFICATION

- A. Materials and their installation are specified in Division 2 Section "Earthwork." Arrange for installing green warning tapes directly over piping and at outside edges of underground structures.
1. Use warning tape or detectable warning tape over ferrous piping.
 2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.3 INSTALLATION, GENERAL

- A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical.
- B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab or drag in line, and pull past each joint as it is completed.

- C. Use manholes for changes in direction, unless fittings are indicated. Use fittings for branch connections, unless direct tap into existing sewer is indicated.
- D. Use proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.
- E. Install gravity-flow piping and connect to building's storm drains, of sizes and in locations indicated. Terminate piping as indicated.
 - 1. Install piping pitched down in direction of flow, at minimum slope of 1 percent, unless otherwise indicated.
 - 2. Install piping with 48-inch minimum cover.
 - 3. Install piping with restrained joints at horizontal and vertical changes in direction. Use cast-in-place concrete supports and anchors or corrosion-resistant rods and clamps.
- F. Extend storm drainage piping and connect to building's storm drains, of sizes and in locations indicated. Terminate piping as indicated.
- G. Tunneling: Install pipe under streets or other obstructions that cannot be disturbed by tunneling, jacking, or a combination of both.

3.4 PIPE JOINT CONSTRUCTION AND INSTALLATION

- A. General: Join and install pipe and fittings according to installations indicated.
- B. Refer to Division 2 Section "Utility Materials" for basic piping joint construction and installation.
- C. PE Pipe and Fittings: As follows:
 - 1. Join pipe, tubing, and fittings with couplings for soiltight joints according to manufacturer's written instructions.
 - 2. Install according to ASTM D 2321 and manufacturer's written instructions.
 - 3. Install corrugated piping according to the Corrugated Polyethylene Pipe Association's "Recommended Installation Practices for Corrugated Polyethylene Pipe and Fittings."
- D. System Piping Joints: Make joints using system manufacturer's couplings, unless otherwise indicated.
- E. Join piping made of different materials or dimensions with couplings made for this application. Use couplings that are compatible with and that fit both systems' materials and dimensions.

3.5 MANHOLE INSTALLATION

- A. General: Install manholes, complete with appurtenances and accessories indicated.
- B. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3 inches above finished surface elsewhere, unless otherwise indicated.
- C. Install precast concrete manhole sections with gaskets according to ASTM C 891.

3.6 CATCH-BASIN INSTALLATION

- A. Construct catch basins to sizes and shapes indicated.
- B. Set frames and grates to elevations indicated.

3.7 CONCRETE PLACEMENT

- A. Place cast-in-place concrete according to ACI 318 and ACI 350R.

3.8 DRAIN INSTALLATION

- A. Install type of drains in locations indicated.
- B. Embed drains in 4-inch minimum depth of concrete around bottom and sides.
- C. Fasten grates to drains if indicated.
- D. Set drain frames and covers with tops flush with pavement surface.

3.9 STORMWATER DISPOSAL SYSTEM INSTALLATION

- A. Piping Systems: Excavate trenches of width and depth, and install piping system, filter fabric, and backfill according to piping manufacturer's written instructions.

3.10 CLOSING ABANDONED STORM DRAINAGE SYSTEMS

- A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:
 - 1. Close open ends of piping with at least 8-inch- thick, brick masonry bulkheads.
 - 2. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Do not use wood plugs.

- B. Abandoned Structures: Excavate around structure as required and use one procedure below:
 - 1. Remove structure and close open ends of remaining piping.
 - 2. Remove top of structure down to at least 36 inches below final grade. Fill to within 12 inches of top with stone, rubble, gravel, or compacted dirt. Fill to top with concrete.
 - 3. Backfill to grade according to Division 2 Section "Earthwork."

3.11 FIELD QUALITY CONTROL

- A. Clear interior of piping and structures of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed.
 - 1. In large, accessible piping, brushes and brooms may be used for cleaning.
 - 2. Place plug in end of incomplete piping at end of day and when work stops.
 - 3. Flush piping between manholes and other structures to remove collected debris, if required by authorities having jurisdiction.
- B. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
 - 1. Submit separate reports for each system inspection.
 - 2. Defects requiring correction include the following:
 - a. Alignment: Less than full diameter of inside of pipe is visible between structures.
 - b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
 - c. Crushed, broken, cracked, or otherwise damaged piping.
 - d. Infiltration: Water leakage into piping.
 - e. Exfiltration: Water leakage from or around piping.
 - 3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
 - 4. Reinspect and repeat procedure until results are satisfactory.
- C. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
 - 1. Do not enclose, cover, or put into service before inspection and approval.
 - 2. Test completed piping systems according to authorities having jurisdiction.
 - 3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
 - 4. Submit separate reports for each test.
 - 5. Leaks and loss in test pressure constitute defects that must be repaired.
 - 6. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

END OF SECTION 02630

SECTION 02764 - PAVEMENT JOINT SEALANTS

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.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Expansion and contraction joints within portland cement concrete pavement.
 - 2. Joints between portland cement concrete and asphalt pavement.
- B. Related Sections include the following:
 - 1. Division 2 Section "Hot-Mix Asphalt Paving" for constructing joints between concrete and asphalt pavement.
 - 2. Division 2 Section "Portland Cement Concrete Paving" for constructing joints in concrete paving.
 - 3. Division 7 Section "Joint Sealants" for sealing nontraffic and traffic joints in locations not specified in this Section.

1.3 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Samples for Verification: For each type and color of joint sealant required. Install joint-sealant samples 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. Product Certificates: Signed by manufacturers of joint sealants certifying that products furnished comply with requirements and are suitable for the use indicated.
- D. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- E. Compatibility and Adhesion Test Reports: From joint sealant manufacturer indicating the following:
 - 1. Materials forming joint substrates and joint-sealant backer materials 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. Product Test Reports: From a qualified testing agency indicating joint sealants comply with requirements, based on comprehensive testing of current product formulations.

G. Provide and install "Green Building Products" to the greatest extent possible. Submit materials with a high recycled content and low VOC emissions for acceptance.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this Project and whose work has resulted in joint-sealant installations with a record of successful in-service performance.

B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

C. Product Testing: Obtain test results for "Product Test Reports" Paragraph in "Submittals" Article from a qualified testing agency, based on testing current sealant formulations within a 36-month period.

D. Preconstruction Compatibility and Adhesion Testing: Submit to joint sealant manufacturer, for testing indicated below, samples of materials that will contact or affect joint sealants.

1. Use manufacturer's standard test methods to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.

a. Perform tests under environmental conditions replicating those that will exist during installation.

2. Submit not fewer than nine pieces of each type of material, including joint substrates, joint-sealant backer materials, secondary seals, and miscellaneous material.

3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.

4. For materials failing tests, obtain joint sealant manufacturer's written instructions for corrective measures, including the use of specially formulated primers.

5. Testing will not be required if joint sealant manufacturer submits 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.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multicomponent materials.

- B. Store and handle materials to comply with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: 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.
 - 2. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 40 deg F.
 - 3. When joint substrates are wet.
- B. Joint-Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than that allowed by joint sealant manufacturer for application indicated.
- C. Joint-Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with their adhesion are removed from joint substrates.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint sealant manufacturer based on testing and field experience.
- B. Colors of Exposed Joint Sealants: Match Architect's samples.
- C. Colors of Exposed Joint Sealants: As indicated by referencing manufacturer's designations.
- D. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range for this characteristic.

2.2 COLD-APPLIED JOINT SEALANTS

- A. Type NS Silicone Sealant for Concrete: Single-component, low-modulus, neutral-curing, nonsag silicone sealant complying with ASTM D 5893 for Type NS.
- B. Type SL Silicone Sealant for Concrete and Asphalt: Single-component, low-modulus, neutral-curing, self-leveling silicone sealant complying with ASTM D 5893 for Type SL.
- C. Multicomponent Low-Modulus Sealant for Concrete and Asphalt: Proprietary formulation consisting of reactive petropolymer and activator components producing a pourable, self-leveling sealant.

- D. Available Products: Subject to compliance with requirements, cold-applied joint sealants that may be incorporated into the Work include, but are not limited to, the following:
- E. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Type NS Silicone Sealant for Concrete:
 - a. Roadsaver Silicone-SL; Crafcro Inc.
 - b. 888; Dow Corning.
 - 2. Type SL Silicone Sealant for Concrete and Asphalt:
 - a. 890-SL; Dow Corning.
 - 3. Multicomponent Low-Modulus Sealant for Concrete and Asphalt:
 - a. SOF-SEAL; W.R. Meadows, Inc.

2.3 HOT-APPLIED JOINT SEALANTS

- A. Elastomeric Sealant for Concrete: Single-component formulation complying with ASTM D 3406.
- B. Sealant for Concrete and Asphalt: Single-component formulation complying with ASTM D 3405.
- C. Available Products: Subject to compliance with requirements, hot-applied joint sealants that may be incorporated into the Work include, but are not limited to, the following:
- D. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Elastomeric Sealant for Concrete:
 - a. Superseal 444/777; Crafcro, Inc.
 - b. POLY-JET 3406; W.R. Meadows, Inc.
 - 2. Sealant for Concrete and Asphalt:
 - a. ROADSAYER 221; Crafcro Inc.
 - b. Product #9005; Koch Materials Company.
 - c. Product #9030; Koch Materials Company.
 - d. SEALTIGHT HI-SPEC; W.R. Meadows, Inc.

2.4 JOINT-SEALANT BACKER MATERIALS

- A. General: Provide joint-sealant backer materials that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by joint sealant manufacturer based on field experience and laboratory testing.

- B. Round Backer Rod for Cold- and Hot-Applied Sealants: ASTM D 5249, Type 1, of diameter and density required to control sealant depths and prevent bottom-side adhesion of sealant.
- C. Backer Strips for Cold- and Hot-Applied Sealants: ASTM D 5249; Type 2; of thickness and width required to control sealant depths, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.
- D. Round Backer Rods for Cold-Applied Sealants: ASTM D 5249, Type 3, of diameter and density required to control sealant depths and prevent bottom-side adhesion of sealant.

2.5 PRIMERS

- A. Primers: Product 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.

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.
- B. Joint Priming: Prime joint substrates where indicated or 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.

3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint sealant manufacturer's written installation instructions applicable to products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

- C. Install backer materials 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 backer materials.
 - 2. Do not stretch, twist, puncture, or tear backer materials.
 - 3. Remove absorbent backer materials that have become wet before sealant application and replace them with dry materials.

- D. Install sealants by proven techniques to 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 provided for each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

- E. 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 sealants from surfaces adjacent to joint.
 - 2. Use tooling agents that are approved in writing by joint sealant manufacturer and that do not discolor sealants or adjacent surfaces.

- F. Provide joint configuration to comply with joint sealant manufacturer's written instructions, unless otherwise indicated.

- G. Provide recessed joint configuration for silicone sealants of recess depth and at locations indicated.

3.4 CLEANING

- A. Clean off excess sealants or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved 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 the original work.

END OF SECTION 02764

SECTION 02820 – WOOD FENCING

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.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Screen Fence Sections.
 - 2. Wood post.
- B. Related Sections include the following:
 - 1. Division 3 Section "Cast In-Place Concrete"
 - 2. Division 9 Section "Painting"

1.3 DEFINITIONS

- A. Lumber grading agencies, and the abbreviations used to reference them, include the following:
 - 1. NELMA - Northeastern Lumber Manufacturers Association.
 - 2. NLGA - National Lumber Grades Authority.
 - 3. SPIB - Southern Pine Inspection Bureau.
 - 4. WCLIB - West Coast Lumber Inspection Bureau.
 - 5. WWPA - Western Wood Products Association.

1.4 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. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
 - 3. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

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. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece, or omit grade stamp and provide certificates of grade compliance issued by grading agency.
 3. 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.
 4. Provide dressed lumber, S4S, unless otherwise indicated.
 5. Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominal thickness or less, unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment by Pressure Process: AWPA C2 lumber, except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWPA C31 with inorganic boron (SBX).
1. Preservative Chemicals: Acceptable to authorities having jurisdiction and one of the following:
 - a. Ammoniacal copper zinc arsenate (ACZA).
 - b. Ammoniacal, or amine, copper quat (ACQ).
 - c. Copper bis (dimethyldithiocarbamate) (CDDC).
 - d. Ammoniacal copper citrate (CC).
 - e. Copper azole, Type A (CBA-A).
 - f. Oxine copper (copper-8-quinolinolate) in a light petroleum solvent.
 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. 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.

1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece, or omit marking and provide certificates of treatment compliance issued by inspection agency.
- D. Application: Treat items indicated on Drawings, and the following:
 1. Wood post members in contact with masonry or concrete.

2.3 LUMBER

- A. General: Provide dimension lumber of grades indicated according to the American Lumber Standards Committee National Grading Rule provisions of the grading agency indicated.
- B. For pickets and rails, provide lumber with 19 percent maximum moisture content and any of the following species and grades:
 1. Spruce-pine-fir (south) or Spruce-pine-fir #1 grade; NELMA, NLGA, WCLIB, or WWPA.
 2. White cedar, #1 grade; NLGA or WWPA.
- C. Post: Construction or No. 2 grade and any of the following species:
 1. Southern pine; SPIB.
 2. Mixed southern pine; SPIB.
 3. Spruce-pine-fir (south); NELMA, WCLIB, or WWPA.
 4. Spruce-pine-fir; NLGA.

2.4 FENCE COMPONENTS

- A. Fence Sections:
 1. Screen fence Sections are 6 feet high by 8 feet wide constructed of alternating 2 inch by 6 inch pickets, fastened to 2 inch by 6 inch horizontal rails, three per section.
- B. Post:
 1. Screen Fence: Pressure treated 6 inch by 6 inch with beveled tops.
- C. Mortise and tenon rail and post connections

2.5 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, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M or 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. Lag Bolts: ASME B18.2.1.
- F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

2.6 METAL FRAMING ANCHORS

- A. General: Provide galvanized steel framing anchors of structural capacity, type, and size indicated and acceptable to authorities having jurisdiction.
- B. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 coating designation.

2.7 CONCRETE

- A. General: Concrete: Minimum 28 day compressive strength of 3,000 psi (20 MPa).

PART 3 - PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify areas to receive fencing are completed to final grades and elevations.
- B. Ensure property lines and legal boundaries of work are clearly established.

3.2 INSTALLATION

- A. Install fence in accordance with manufacturer's instructions.
- B. Space posts uniformly at 8' OC maximum .
- C. Concrete Set Posts: Drill hole in firm, undisturbed or compacted soil. Holes shall have diameter 4 times greater than nominal outside dimension of post, and depths approximately 6" (152 mm) deeper than post bottom. Excavate deeper as required for adequate support in soft and loose soils and for posts with heavy lateral loads. Set post bottom 36" (914 mm) below surface when in firm, undisturbed soil. Place concrete around post in a continuous pour. Trowel finish around posts and slope to direct water away from posts.
 - 1. Gate Posts and Hardware: Set keepers, stops, sleeves and other accessories into concrete.
- D. Check each post for vertical and top alignment, and maintain in position during placement and finishing operation.

3.3 GATE INSTALLATION

- A. Install gates plumb, level and secure for full opening without interference.
- B. Attach hardware by means which will prevent unauthorized removal.
- C. Adjust hardware for smooth operation.

3.4 CLEANING

- A. Clean up debris and unused material and remove from site.

END OF SECTION 02820

SECTION 02862 – ALL WEATHER SOUND PANELS

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.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Exterior All Weather Sound Panels.
- B. Related Sections include the following:
 - 1. Division 2 Section “Wood Fencing”.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication and installation details for sound panels, including plans, elevations, sections, details, and attachments to other Work.
- C. Samples for Verification: 12-by-12-inch units of sound panel. Include samples of installation devices and accessories.
- D. Product Certificates: Signed by manufacturers of sound panels certifying that products furnished comply with requirements.
- E. Maintenance Data: For sound panels and facings to include in maintenance manuals specified in Division 1.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in manufacturing sound panels similar to those indicated for this Project and with a record of successful in-service performance.
- B. Source Limitations for Sound Panels: Obtain sound panels from one source with resources to provide products of consistent quality in appearance and physical properties.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect acoustical panels from the elements when shipping, storing, and handling. Deliver in unopened bundles and store in a dry place with adequate air circulation. Protect panel edges from crushing and impact.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install sound panels until construction in space area is complete.
 - 1. Field Measurements: Coordinate with fence installer to ensure standard panels will fit and fill the full length of fenced area with no gaps and indicate measurements on Shop Drawings. Coordinate fence construction to ensure that actual surface dimensions correspond to required dimensions. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.7 WARRANTY

- A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Special Warranty: Written warranty, signed by manufacturer agreeing to repair or replace components of sound system that fail in performance, materials, or workmanship within specified warranty period. Failure in performance includes, but is not limited to, acoustical performance. Failure in materials includes, but is not limited to, sagging or distortion of facing or warping of core.
- C. Warranty Period: Life time from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Acoustiblok Inc. : Acoustiblok All Weather Sound Panels.

2.2 SOUND PANELS, GENERAL:

A high STC & NRC sound panel capable of outdoor exposure in full sunlight & weather 4' x 8' x 2.425", welded 18 gauge 304 stainless steel frame, threaded solid brass eyelets I.D. 0.320 in., STC of 30, NRC of 1.0, weight of approximately 77.5 LB dry, 95 LB wet. Cover fabric washable & UV tolerant, tensile strength of 460 LB., bursting 690 PSI.

Weight (Dry)	77.5 LBS
Weight (Wet)	95 LBS
Frame Construction	18 ga. Stainless Steel, Welded

A.

NRC (Noise reduction coefficient)	1.00 (Riverbank Acoustical Laboratories)*
STC (Sound Transmission Class)	30 (Riverbank Acoustical Laboratories)*
R Value	8.9

*per Riverbank Acoustical Laboratory in compliance with ASTM designations E90-02, E 413087, and other pertinent standards.

B.

ASTMD 5034 Grab Method (lb)	460 LBS
Mullen Bursting Strength	690 PSI
Bond Strength (CS 248-64)	100 LBS

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and blocking, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting sound panel performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

Install sound panels in locations indicated with vertical surfaces and edges plumb, top edges level and in alignment with other panels. Screw through eyelet holes in edges to post w/ stainless steel screws. Connect panels edge to edge with steel ties. Comply with panel manufacturer's written instructions for installation of panels using type of mounting accessories recommended by manufacturer.

3.3 CLEANING

- A. Remove surplus materials, rubbish, and debris resulting from sound panel installation, on completion of the Work, and leave areas of installation in a neat and clean condition.

3.4 PROTECTION

- A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure sound panels are without damage or deterioration at time of Substantial Completion.
- B. Replace panels that cannot be cleaned and repaired, in a manner approved by Architect, before time of Substantial Completion.

END OF SECTION 02862

SECTION 02900 - LANDSCAPE WORK

General Landscape Requirements:

Submit planting schedule showing coordination of normal planting times with construction schedule for other (related) work.

Layout areas of planting and mark location of each major plant for review by Architect prior to start of planting.

Plant Size and Quality: Provide sizes of plants as indicated or scheduled, and conforming to ANSI Z60.1 "American Standard for Nursery Stock" for shape and quality.

Furnish balled and burlapped (B&B) trees and shrubs, except container-grown plants may be furnished if indicated size is below limit established in ANSI Z60.1.

Deciduous shrubs may be furnished in bare root condition if adequately maintained and protected from drying through transplanting period.

Furnish ground cover plants in removable containers or integral peat pots.

Warranty lawns, through specified lawn maintenance period and until final acceptance.

Warranty plants, shrubs and trees for a period of one year against death and unhealthy condition, except as a result of neglect by Owner, damage by others, and unusual phenomena beyond Contractor's control. Replace at optimum planting time.

Topsoil is available at the site for reuse as indicated.

Provide topsoil to supplement that (if any) available for reuse at site. Proved clean, fertile, friable, natural loam obtained from a local, well drained source.

Provide fertilizer, peat humus and other soil amendments of a type which are known to improve pH condition of soil for particular plant material to be planted. Mix peat humus with topsoil in the ratio of 1:3 for use in planting. For basis of quantity, assume existing topsoil which has not been stripped is 4 inches in depth.

Fertilize topsoil for planting trees, shrubs and ground cover with a 5-10-5 (5 percent nitrogen, 10 percent phosphorus and 5 percent potash) commercial fertilizer, applied and mixed at rate of not less than 0.25 pounds per cubic foot of soil/humus mixture.

Fertilize topsoil for planting grass with a high-nitrogen content commercial fertilizer, containing 4 percent phosphorus, 2 percent potash and nitrogen in sufficient quantity to supply not less than 1.0 pounds of actual nitrogen per 1000 square feet of lawn area.

Planting Trees:

Excavate planting pits to a width 1-1/2 times diameter of tree ball and not less than 6 inches deeper than tree ball. Place and compact a layer of topsoil in pit to locate collar of tree slightly above finish grade. Backfill around ball with topsoil, rod and tamp to eliminate voids and air pockets, watering thoroughly as layers are placed. Build a 3 inch high berm of topsoil beyond edge of excavation. Apply a 3 inch thick mulch of shredded hardwood bark, bark chips, peat, or other recognized organic planting mulch.

Prune trees to remove damaged branches, improve natural shape, thin out structure and remove not more than 15 percent of branches. Do not prune back terminal leader.

Wrap trunk from ground to first branch with tree wrapping tape.

Guy and stake trees 3 directions with galvanized wire, through flexible hose chafing guards, with wooden stake anchors.

Planting Shrubs:

Excavate planting pits or trenches to width of 1-1/2 times diameter of plant balls or containers, or 1'-0" wider than spread of roots (whichever is larger), and 3 inches deeper than required for positioning at proper height. Lightly compact a layer of topsoil in bottom before placing plants. Backfill around plants with topsoil, rod and tamp to eliminate voids and air pockets. Water thoroughly as layers are placed. Form grade slightly dished, and bermed at edges of excavation. Apply a 2 inch thick mulch of shredded hardwood bark, peat, or other recognized organic planting mulch.

Prune shrubs to remove damaged branches, improve natural shape, thin out structure and remove not more than 15 percent of branches.

Planting Ground Cover:

Till soil to depth of 8 inches in areas where topsoil has not been stripped.

Loosen subgrade to depth of 4 inches in areas where topsoil has been stripped, and spread topsoil to depth of 4 inches.

Space plants 2'-0" apart both ways, except as otherwise indicated. Dig holes large enough to allow for spreading of roots. Compact backfill to eliminate voids, and leave grade slightly dished at each plant. Water thoroughly. Apply a 2 inch mulch of shredded hardwood bark, bark chips, peat, or other recognized organic planting mulch over entire planting bed, lifting plant foliage above mulch.

During periods of hot sun and wind at time of planting, provide protective cover for several days.

Planting Lawns:

Grass Seed: A blend of predominantly Kentucky Bluegrass seed, with approximately 20 percent "nurse-grass" seeds, complying with standards of Official Seed Analysis of North America, for 85 percent purity, 80 percent germination and

1 percent (maximum) weed seed, recommended by producer for full-sun exposure of lawns in geographic location of project.

Cultivate to a depth of 6 inches in areas where topsoil has not been stripped, add specified soil amendments and mix thoroughly into top 4 inches of soil, tilling surface to a level, fine texture.

Loosen subgrade to depth of 4 inches in areas where topsoil has been stripped, spread 2 inches depth of topsoil, till to mix topsoil with subsoil, spread additional 2 inches depth of topsoil, add specified soil amendments and mix thoroughly into top 4 inches of topsoil, till surface to level, fine texture.

Grade and roll prepared lawn surface. Water thoroughly but do not create muddy soil condition.

Sow grass seed uniformly in two directions in the quantity recommended by the seed producer, except as otherwise indicated. Rake seed lightly into top 1/8 inch of lawn surface. Water thoroughly with fine spray.

Protect seeded areas against erosion by spreading straw to a uniform loose depth of 1-1/2 inches.

Miscellaneous Landscape Work:

Steel Edging: 4 inches by 3/16 inch steel edging with preformed stake loops at 3'-0" on center and at interlocking end joints; green-black painted finish. Provide complete with 18" long steel stakes.

Wood Edging: Redwood, cypress, cedar, or pressure preservative treated pine edging units of size indicated, with matching 2 inches by 2 inches wood stakes 24 inches long, spaced 3'-0" o.c. and nailed to edging units with hot-dip galvanized screw-shank finish nails.

Gravel Beds: Natural, water-worn, hard, clean gravel, size range of 1-1/2 inches to 3/4 inch. Place in uniform 4 inches deep layer on 8-mil black polyethylene sheet laid over compacted subgrade. Lap edges of sheet 4 inch minimum.

Landscape Maintenance:

Maintain landscape work for a period of 60 days immediately following complete installation of each major category of work. Include watering, weeding, cultivating, restoration of grade, mowing and trimming of grass, pruning of trees and shrubs, protection from insects and diseases, fertilizing, and similar operations as needed to ensure healthy, vigorous growth.

END OF SECTION 02900

SECTION 03300 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

SUMMARY

This Section specifies cast-in place concrete, including formwork, reinforcing, mix design, placement procedures, and finishes.

Concrete paving and walks are specified in Division 2.

Precast concrete is specified in other Division 3 Sections.

Mechanical finishes and concrete floor toppings are specified in other Division 3 Sections.

SUBMITTALS

General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

Product data for proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds, waterstops, joint systems, curing compounds, dry-shake finish materials, and others as requested by Architect.

Samples of materials as requested by Architect, including names, sources, and descriptions, as follows:

Normal weight aggregates.
Waterstops.

Fibrous reinforcement.
Vapor retarder.

Reglets.

Laboratory test reports for concrete materials and mix design test. Provide Architect with test cylinder breaks for all pours over 3 c.y. @ 7 days, 28 days and one additional break reserved for cylinders failing to meet design mix requirement, break as determine by Architect.

Materials certificates in lieu of materials laboratory test reports when permitted by Architect. Materials certificates shall be signed by manufacturer and Contractor, certifying that each material item complies with or exceeds specified requirements. Provide certification from admixture manufacturers that chloride content complies with specification requirements.

QUALITY ASSURANCE

Codes and Standards: Comply with provisions of following codes, specifications, and standards, except where more stringent requirements are shown or specified:

ACI 318, "Building Code Requirements for Reinforced Concrete."

Concrete Reinforcing Steel Institute (CRSI), "Manual of Standard Practice."

Concrete Testing Service: Engage a testing laboratory acceptable to Architect to perform material evaluation tests and to design concrete mixes.

Materials and installed work may require testing and retesting at any time during progress of work. Tests, including retesting of rejected materials for installed work, shall be done at Contractor's expense.

PART 2 - PRODUCTS

FORM MATERIALS

Forms for Exposed Finish Concrete: Plywood, metal, metal-framed plywood faced, or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings.

Use overlaid plywood complying with U.S. Product Standard PS-1 "A-C or B-B High Density Overlaid Concrete Form," Class I.

Forms for Cylindrical Columns and Supports: Recycled paper or fiber tubes. Provide paper or fiber tubes of laminated plies with water-resistant adhesive and wax-impregnated exterior for weather and moisture protection. Provide units with sufficient wall thickness to resist wet concrete loads without deformation.

Form Coatings: Provide commercial formulation, biodegradable, form-coating compounds with a zero VOC that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

Form Ties: Factory-fabricated, adjustable-length, removable or snap-off metal form ties, designed to prevent form deflection and to prevent spalling concrete upon removal. Provide units that will leave no metal closer than 1-1/2 inches to exposed surface.

Provide ties that, when removed, will leave holes not larger than 1-inch diameter in concrete surface.

REINFORCING MATERIALS

Reinforcing Bars: ASTM A 615, Grade 60, deformed.

Welded Wire Fabric: ASTM A 185, welded steel wire fabric.

Supports for Reinforcement: Recycled engineering grade plastic devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Use wire-bar-type supports complying with CRSI specifications.

For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs.

For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with legs that are plastic protected (CRSI, Class 1) or stainless steel protected (CRSI, Class 2).

CONCRETE MATERIALS

Portland Cement: ASTM C 150, Type I.

Use one brand of cement throughout project unless otherwise acceptable to Architect.

Fly Ash: ASTM C 618, Type C or Type F.

Normal Weight Aggregates: ASTM C 33 and as herein specified. Provide aggregates from a single source for exposed concrete.

For exterior exposed surfaces, do not use fine or coarse aggregates containing spalling-causing deleterious substances.

Local aggregates not complying with ASTM C 33 but that special tests or actual service have shown to produce concrete of adequate strength and durability may be used when acceptable to Architect.

Lightweight Aggregates: ASTM C 330.

Water: Drinkable.

Admixtures, General: Provide admixtures for concrete that contain not more than 0.1 percent chloride ions.

RELATED MATERIALS

Waterstops: Provide flat, dumbbell-type or centerbulb-type waterstops at construction joints and other joints as indicated. Size to suit joints.

Rubber Waterstops: Corps of Engineers CRD-C 513.

Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the following:

The Burke Co.

Progress Unlimited.

Williams Products, Inc.

Granular Base: Evenly graded mixture of fine and coarse aggregates to provide, when compacted, a smooth and even surface below slabs on grade.

Sand Cushion: Clean, manufactured or natural sand.

Vapor Retarder: Provide vapor retarder cover over prepared base material where indicated below slabs on grade. Use only materials that are resistant to deterioration when tested in accordance with ASTM E 154, as follows:

Polyethylene sheet not less than 8 mils thick.

Vapor Barrier: Premoulded membrane, seven-ply construction consisting of reinforced core and carrier sheet with fortified bitumen layers, protective weathercoating, and plastic antistick sheet. Water vapor transmission rate of 0.00 grains/sq. ft./hr. when tested in accordance with ASTM E 96, Method B. Provide manufacturer's recommended mastics and gusset tape.

Product: "Sealtight Premoulded Membrane With Plasmatic Core," W.R. Meadows, Inc.

Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 oz. per sq. yd., complying with AASHTO M 182, Class 2.

Moisture-Retaining Cover: One of the following, complying with ASTM C 171.

Waterproof paper.

Polyethylene film.

Polyethylene-coated burlap.

PROPORTIONING AND DESIGN OF MIXES

Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. If trial batch method used, use an independent testing facility acceptable to Architect for preparing and reporting proposed mix designs. The testing facility shall not be the same as used for field quality control testing.

Limit use of fly ash to not exceed 25 percent of cement content by weight.

Submit written reports to Architect of each proposed mix for each class of concrete at least 15 days prior to start of work. Do not begin concrete production until proposed mix designs have been reviewed by Architect.

Design mixes to provide normal weight concrete with the following properties, as indicated on drawings and schedules:

3000-psi, 28-day compressive strength; W/C ratio, 0.58 maximum (non-air-entrained), 0.46 maximum (air-entrained).

Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, as accepted by Architect. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Architect before using in work.

ADMIXTURES

Use admixtures as directed by Architect/Engineer

Water-Cement Ratio: Provide concrete for following conditions with maximum water-cement (W/C) ratios as follows:

Subjected to freezing and thawing; W/C 0.45.

Subjected to deicers/watertight; W/C 0.40.

Subjected to brackish water, salt spray, or deicers; W/C 0.40.

Slump Limits: Proportion and design mixes to result in concrete slump at point of placement as follows:

Ramps, slabs, and sloping surfaces: Not more than 3 inches.

Reinforced foundation systems: Not less than 1 inch and not more than 3 inches.

Concrete containing HRWR admixture (Superplasticizer): Not more than 8 inches after addition of HRWR to site-verified 2-inch to 3-inch slump concrete.

Other concrete: Not more than 4 inches.

CONCRETE MIXING

HUD 023-EE241

Job-Site Mixing: Mix materials for concrete in appropriate drum- type batch machine mixer. For mixers of one cu. yd. or smaller capacity, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released. For mixers of capacity larger than one cu. yd., increase minimum 1-1/2 minutes of mixing time by 15 seconds for each additional cu. yd. or fraction thereof.

Provide batch ticket for each batch discharged and used in work, indicating project identification name and number, date, mix type, mix time, quantity, and amount of water introduced.

Ready-Mix Concrete: Comply with requirements of ASTM C 94, and as specified.

When air temperature is between 85 deg F (30 deg C) and 90 deg F (32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes, and when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

GENERAL

Coordinate the installation of joint materials and vapor retarders with placement of forms and reinforcing steel.

FORMS

General: Design, erect, support, brace, and maintain formwork to support vertical and lateral, static and dynamic loads that might be applied until concrete structure can support such loads. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation, and position. Maintain formwork construction tolerances complying with ACI 347.

Construct forms to sizes, shapes, lines, and dimensions shown and to obtain accurate alignment, location, grades, level, and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in work. Use selected materials to obtain required finishes. Solidly butt joints and provide backup at joints to prevent leakage of cement paste.

Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like, for easy removal.

Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement, and for placement of concrete. Securely brace temporary openings and set tightly to forms to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

Chamfer exposed corners and edges as indicated, using wood, metal, PVC, or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.

Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses, and chases from trades providing such items. Accurately place and securely support items built into forms.

Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris just before concrete is placed. Retighten forms and bracing before concrete placement as required to prevent mortar leaks and maintain proper alignment.

VAPOR RETARDER/BARRIER INSTALLATION

General: Following leveling and tamping of granular base for slabs on grade, place vapor retarder/barrier sheeting with longest dimension parallel with direction of pour.

Lap joints 6 inches and seal vapor barrier joints with manufacturers' recommended mastic and pressure-sensitive tape.

After placement of vapor retarder/barrier, cover with sand cushion and compact to depth as shown on drawings.

PLACING REINFORCEMENT

General: Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars," for details and methods of reinforcement placement and supports and as herein specified.

Avoiding cutting or puncturing vapor retarder during reinforcement placement and concreting operations.

Clean reinforcement of loose rust and mill scale, earth, ice, and other materials that reduce or destroy bond with concrete.

Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as approved by Architect.

Place reinforcement to obtain at least minimum coverages for concrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

Install welded wire fabric in as long lengths as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

JOINTS

Construction Joints: Locate and install construction joints as indicated or, if not indicated, locate so as not to impair strength and appearance of the structure, as acceptable to Architect.

Provide keyways at least 1-1/2 inches deep in construction joints in walls and slabs and between walls and footings. Accepted bulkheads designed for this purpose may be used for slabs.

Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints except as otherwise indicated. Do not continue reinforcement through sides of strip placements.

Use bonding agent on existing concrete surfaces that will be joined with fresh concrete.

Waterstops: Provide waterstops in construction joints as indicated. Install waterstops to form continuous diaphragm in each joint. Make provisions to support and protect exposed waterstops during progress of work. Field-fabricate joints in waterstops in accordance with manufacturer's printed instructions.

Isolation Joints in Slabs-on-Ground: Construct isolation joints in slabs-on-ground at points of contact between slabs-on-ground and vertical surfaces, such as column pedestals, foundation walls, grade beams, and elsewhere as indicated.

Joint filler and sealant materials are specified in Division 7 Sections of these specifications.

Contraction (Control) Joints in Slabs-on-Ground: Construct contraction joints in slabs-on-ground to form panels of patterns as shown. Use saw cuts 1/8 inch wide by 1/4 slab depth or inserts 1/4 inch wide by 1/4 of slab depth, unless otherwise indicated.

Form contraction joints by inserting premolded plastic, hardboard, or fiberboard strip into fresh concrete until top surface of strip is flush with slab surface. Tool slab edges round on each side of insert. After concrete has cured, remove inserts and clean groove of loose debris.

Contraction joints in unexposed floor slabs may be formed by saw cuts as soon as possible after slab finishing as may be safely done without dislodging aggregate.

If joint pattern not shown, provide joints not exceeding 15 feet in either direction and located to conform to bay spacing wherever possible (at column centerlines, half bays, third bays).

Joint sealant material is specified in Division 7 Sections of these specifications.

INSTALLATION OF EMBEDDED ITEMS

General: Set and build into work anchorage devices and other embedded items required for other work that is attached to or supported by cast-in-place concrete. Use setting drawings, diagrams, instructions, and directions provided by suppliers of items to be attached thereto.

Forms for Slabs: Set edge forms, bulkheads, and intermediate screed strips for slabs to obtain required elevations and contours in finished surfaces. Provide and secure units to support screed strips using strike-off templates or compacting-type screeds.

PREPARATION OF FORM SURFACES

General: Coat contact surfaces of forms with an approved, nonresidual, low-VOC, form-coating compound before reinforcement is placed.

Do not allow excess form-coating material to accumulate in forms or to come into contact with in-place concrete surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.

Coat steel forms with a nonstaining, rust-preventative material. Rust-stained steel formwork is not acceptable.

CONCRETE PLACEMENT

Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in. Notify other crafts to permit installation of their work; cooperate with other trades in setting such work.

General: Comply with ACI 304, "Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete," and as herein specified.

Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete that has hardened sufficiently to cause the formation of seams or planes of weakness. If a section cannot be

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placed continuously, provide construction joints as herein specified. Deposit concrete to avoid segregation at its final location.

Placing Concrete in Forms: Deposit concrete in forms in horizontal layers not deeper than 24 inches and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.

Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures for consolidation of concrete in accordance with ACI 309.

Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine. Place vibrators 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 set. At each insertion limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix.

Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until the placing of a panel or section is completed.

Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.

Bring slab surfaces to correct level with straightedge and strike off. Use bull floats or darbies to smooth surface, free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.

Maintain reinforcing in proper position during concrete placement.

Cold-Weather Placing: Comply with provisions of ACI 306 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

When air temperature has fallen to or is expected to fall below 40 deg F (4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.

Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

Do not use calcium chloride, salt, and other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix designs.

Hot-Weather Placing: When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified.

Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 deg F (32 deg C). Mixing water may be chilled, or chopped ice may be used to control temperature

provided water equivalent of ice is calculated to total amount of mixing water. Use of liquid nitrogen to cool concrete is Contractor's option.

Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.

Fog spray forms, reinforcing steel, and subgrade just before concrete is placed.

Use water-reducing retarding admixture when required by high temperatures, low humidity, or other adverse placing conditions, when acceptable to Architect.

FINISH OF FORMED SURFACES

Rough Form Finish: For formed concrete surfaces not exposed to view in the finish work or concealed by other construction. This is the concrete surface having texture imparted by form-facing material used, with tie holes and defective areas repaired and patched and fins and other projections exceeding 1/4 inch in height rubbed down or chipped off.

Smooth Form Finish: For formed concrete surfaces exposed to view or to be covered with a coating material applied directly to concrete, or a covering material applied directly to concrete, such as waterproofing, dampproofing, veneer plaster, painting, or other similar system. This is an as-cast concrete surface obtained with selected form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch defective areas with fins and other projections completely removed and smoothed.

Grout-Cleaned Finish: Provide grout-cleaned finish to scheduled concrete surfaces that have received smooth form finish treatment.

Combine one part portland cement to 1-1/2 parts fine sand by volume, and a 50:50 mixture of acrylic or styrene butadiene-based bonding admixture and water to consistency of thick paint. Blend standard portland cement and white portland cement, amounts determined by trial patches, so that final color of dry grout will match adjacent surfaces.

Thoroughly wet concrete surfaces, apply grout to coat surfaces, and fill small holes. Remove excess grout by scraping and rubbing with clean burlap. Keep damp by fog spray for at least 36 hours after rubbing.

Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces occurring 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.

MONOLITHIC SLAB FINISHES

Scratch Finish: Apply scratch finish to monolithic slab surfaces to receive concrete floor topping or mortar setting beds for tile, portland cement terrazzo, and other bonded applied cementitious finish flooring material, and as otherwise indicated.

After placing slabs, plane surface to tolerances for floor flatness (Ff) of 15 and floor levelness (Fl) of 13. Slope surfaces uniformly to drains where required. After leveling, roughen surface before final set with stiff brushes, brooms, or rakes.

Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as hereinafter specified; slab surfaces to be covered with membrane or elastic waterproofing, membrane or elastic roofing, or sand-bed terrazzo; and as otherwise indicated.

After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating, using float blades or float shoes only, when surface water has disappeared, when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats or by hand-floating if area is small or inaccessible to power units. Check and level surface plane to tolerances of Ff 18 - Fl 15. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.

Trowel Finish: Apply trowel finish to monolithic slab surfaces to be exposed to view and slab surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile, paint, or other thin film finish coating system.

After floating, begin first trowel finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance, and with surface leveled to tolerances of Ff 20 - Fl 17. Grind smooth surface defects that would telegraph through applied floor covering system.

Trowel and Fine Broom Finish: Where ceramic or quarry tile is to be installed with thin-set mortar, apply trowel finish as specified, then immediately follow with slightly scarifying surface by fine brooming.

Nonslip Broom Finish: Apply nonslip broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.

Immediately after float finishing, slightly roughen concrete surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

CONCRETE CURING AND PROTECTION

General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. In hot, dry, and windy weather, protect concrete from rapid moisture loss before and during finishing operations with an evaporation-control material. Apply in accordance with manufacturer's instructions after screeding and bull floating, but before power floating and troweling.

Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 7 days.

Curing Methods: Perform curing of concrete by curing and sealing compound, by moist curing, by moisture-retaining cover curing, and by combinations thereof, as herein specified.

Provide moisture curing by following methods.

Cover concrete surface with specified absorptive cover, thoroughly saturate cover with water, and keep continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4-inch lap over adjacent absorptive covers.

Provide curing and sealing compound to exposed interior slabs and to exterior slabs, walks, and curbs as follows:

Apply specified curing and sealing compound to concrete slabs as soon as final finishing operations are complete (within 2 hours and after surface water sheen has disappeared). Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.

Use membrane curing compounds that will not affect surfaces to be covered with finish materials applied directly to concrete.

Curing Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces, by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.

Curing Unformed Surfaces: Cure unformed surfaces, such as slabs, floor topping, and other flat surfaces, by application of appropriate curing method.

Final cure concrete surfaces to receive liquid floor hardener or finish flooring by use of moisture-retaining cover, unless otherwise directed.

SHORES AND SUPPORTS

General: Comply with ACI 347 for shoring and reshoring in multistory construction, and as herein specified.

Extend shoring from ground to roof for structures 4 stories or less, unless otherwise permitted.

Remove shores and reshore in a planned sequence to avoid damage to partially cured concrete. Locate and provide adequate reshoring to support work without excessive stress or deflection.

Keep reshores in place a minimum of 15 days after placing upper tier, and longer if required, until concrete has attained its required 28-day strength and heavy loads due to construction operations have been removed.

REMOVAL OF FORMS

General: Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form-removal operations, and provided curing and protection operations are maintained.

Formwork supporting weight of concrete, such as beam soffits, joists, slabs, and other structural elements, may not be removed in less than 14 days and until concrete has attained at least 75 percent of design minimum compressive strength at 28 days. Determine potential compressive strength of in-place concrete by testing field-cured specimens representative of concrete location or members.

Form-facing material may be removed 4 days after placement only if shores and other vertical supports have been arranged to permit removal of form-facing material without loosening or disturbing shores and supports.

REUSE OF FORMS

Clean and repair surfaces of forms to be reused in work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-coating compound as specified for new formwork.

When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use "patched" forms for exposed concrete surfaces except as acceptable to Architect.

MISCELLANEOUS CONCRETE ITEMS

Filling In: Fill in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place, and cure concrete as herein specified, to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete work.

Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

Equipment Bases and Foundations: Provide machine and equipment bases and foundations, as shown on drawings. Set anchor bolts for machines and equipment to template at correct elevations, complying with certified diagrams or templates of manufacturer furnishing machines and equipment.

Reinforced Masonry: Provide concrete grout for reinforced masonry lintels and bond beams where indicated on drawings and as scheduled. Maintain accurate location of reinforcing steel during concrete placement.

CONCRETE SURFACE REPAIRS

Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removal of forms, when acceptable to Architect.

Cut out honeycomb, rock pockets, voids over 1/4 inch in any dimension, and holes left by tie rods and bolts, down to solid concrete but in no case to a depth of less than 1 inch. Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water, and brush-coat the area to be patched with specified bonding agent. Place patching mortar before bonding compound has dried.

For exposed-to-view surfaces, blend white portland cement and standard portland cement so that, when dry, patching mortar will match color surrounding. Provide test areas at inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.

Repair of Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Architect. Surface defects, as such, include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets, fins and other projections on surface, and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes, fill with dry-pack mortar, or precast cement cone plugs secured in place with bonding agent.

Repair concealed formed surfaces, where possible, that contain defects that affect the durability of concrete. If defects cannot be repaired, remove and replace concrete.

Repair of Unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface plane to tolerances specified for each surface and finish. Correct low and high areas as herein specified. Test unformed surfaces sloped to drain for trueness of slope and smoothness by using a template having required slope.

Repair finished unformed surfaces that contain defects that affect durability of concrete. Surface defects, as such, include crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through nonreinforced sections regardless of width, spalling, popouts, honeycomb, rock pockets, and other objectionable conditions.

Correct high areas in unformed surfaces by grinding after concrete has cured at least 14 days.

Correct low areas in unformed surfaces during or immediately after completion of surface finishing operations by cutting out low areas and replacing with patching compound. Finish repaired areas to blend into adjacent concrete. Proprietary underlayment compounds may be used when acceptable to Architect.

Repair defective areas, except random cracks and single holes not exceeding 1 inch in diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding compound. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

Repair isolated random cracks and single holes not over 1 inch in diameter by dry-pack method. Groove top of cracks and cut out holes to sound concrete and clean of dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Mix dry-pack, consisting of one part portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing. Place dry-pack before bonding compound has dried. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for not less than 72 hours.

Perform structural repairs with prior approval of Architect for method and procedure, using specified epoxy adhesive and mortar.

Repair methods not specified above may be used, subject to acceptance of Architect.

QUALITY CONTROL TESTING DURING CONSTRUCTION

General: The Contractor will employ a testing laboratory to perform tests and to submit test reports.

Sampling and testing for quality control during placement of concrete may include the following, as directed by Architect.

Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.

Slump: ASTM C 143; one test at point of discharge for each day's pour of each type of concrete; additional tests when concrete consistency seems to have changed.

Air Content: ASTM C 173, volumetric method for lightweight or normal weight concrete; ASTM C 231 pressure method for normal weight concrete; one for each day's pour of each type of air-entrained concrete.

Concrete Temperature: Test hourly when air temperature is 40 deg F (4 deg C) and below, when 80 deg F (27 deg C) and above, and each time a set of compression test specimens is made.

Compression Test Specimen: ASTM C 31; one set of 4 standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory-cured test specimens except when field-cure test specimens are required.

Compressive Strength Tests: ASTM C 39; one set for each day's pour exceeding 5 cu. yds. plus additional sets for each 50 cu. yds. more than the first 25 cu. yds. of each concrete class placed in any one day; one specimen tested at 7 days, two specimens tested at 28 days, and one specimen retained in reserve for later testing if required.

When frequency of testing will provide fewer than 5 strength tests for a given class of concrete, conduct testing from at least 5 randomly selected batches or from each batch if fewer than 5 are used.

When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.

Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength, and no individual strength test result falls below specified compressive strength by more than 500 psi.

Test results will be reported in writing to Architect, Structural Engineer, Ready-Mix Producer, and Contractor within 24 hours after tests. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-day tests and 28-day tests.

Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.

Additional Tests: The testing service will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Architect. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed. Contractor shall pay for such tests when unacceptable concrete is verified.

END OF SECTION 03300

PART 1 - SECTION 04810 - UNIT MASONRY ASSEMBLIES

GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general conditions of the Contract, including General and Supplementary General Conditions and all Division 1 Sections, apply to the work of this section.

1.2 SUMMARY

- A. This Section includes unit masonry assemblies consisting of the following:
1. Concrete masonry units.
 2. Light weight, fire rated masonry units.
 3. Concrete brick.
 4. Mortar and grout.
 5. Reinforcing steel.
 6. Masonry joint reinforcement.
 7. Ties and anchors.
 8. Miscellaneous masonry accessories.
 9. Masonry-cell insulation.
- B. Related Sections include the following:
1. Division 4 Section "Masonry Restoration And Cleaning" for masonry wall rebuilding.
 2. Division 7 Section "Sheet Metal Flashing and Trim" for exposed sheet metal flashing.
 3. Division 7 Section "Firestopping" for firestopping at tops of masonry walls and at openings in masonry walls.
 4. Division 10 Section "Louvers and Vents" for wall vents (brick vents).
- C. Products to be furnished and installed, under this Section include the following:
1. Anchor sections of adjustable masonry anchors for connecting to structural frame, installed under Division 5 Section "Structural Steel."
- D. Products installed, but not furnished, under this Section include the following:
1. Steel lintels for unit masonry, furnished under Division 5 Section "Metal Fabrications."
 2. Manufactured reglets in masonry joints for metal flashing, furnished under Division 7 Section "Sheet Metal Flashing and Trim."
 3. Hollow-metal frames in unit masonry openings, furnished under Division 8 Section "Steel Doors and Frames."

1.3 DEFINITIONS

- A. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 SUBMITTALS

- A. Product Data: For each different masonry unit, accessory, and other manufactured product specified.
- B. Shop Drawings: Show fabrication and installation details for the following:
 - 1. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement."
 - 2. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.
- C. Qualification Data: For firms and persons specified in "Quality Assurance" Article.
- D. Material Test Reports: From a qualified testing agency indicating and interpreting test results of the following for compliance with requirements indicated:
 - 1. Each type of masonry unit required.
 - a. Include test results, measurements, and calculations establishing net-area compressive strength of masonry units.
 - 2. Mortar complying with property requirements of [ASTM C 270]
 - 3. Grout mixes complying with compressive strength requirements of [ASTM C 476] Include description of type and proportions of grout ingredients.
- E. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements:
 - 1. Each type of masonry unit required.
 - a. Include test data, measurements, and calculations establishing net-area compressive strength of masonry units.
 - 2. Each cement product required for mortar and grout, including name of manufacturer, brand, type, and weight slips at time of delivery.
 - 3. Each combination of masonry unit type and mortar type. Include statement of net-area compressive strength of masonry units, mortar type, and net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602
 - 4. Each material and grade indicated for reinforcing bars.
 - 5. Each type and size of joint reinforcement.
 - 6. Each type and size of anchor, tie, and metal accessory.
- F. Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with cold-weather requirements.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1093 to conduct the testing indicated, as documented according to ASTM E 548.

- B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source or producer for each aggregate.
 - 1. Concrete Masonry Unit Test: For each concrete masonry unit indicated, per ASTM C 140.
 - 2. Mortar Test: For mortar properties per ASTM C 270
 - 3. Grout Test: For compressive strength per ASTM C 1019
- C. 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 another means, as acceptable to authorities having jurisdiction.
- D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

1.6 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.
 - 1. Protect Type I concrete masonry units from moisture absorption so that, at the time of installation, the moisture content is not more than the maximum allowed at the time of delivery.
- 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.

1.7 PROJECT CONDITIONS

- A. 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.

- B. 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.
- C. 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 coverings spread 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.
- D. 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.
- E. Hot-Weather Requirements: Protect unit masonry work when temperature and humidity conditions produce excessive evaporation of water from mortar and grout. Provide artificial shade and wind breaks and use cooled materials as required.
 - 1. When ambient temperature exceeds **100 deg F**, or **90 deg F** with a wind velocity greater than **8 mph**, do not spread mortar beds more than **48 inches** ahead of masonry. Set masonry units within one minute of spreading mortar.

PART 2 - PRODUCTS

2.1 CONCRETE MASONRY UNITS

- A. General: Provide shapes indicated and as follows:
 - 1. Provide special shapes for lintels, corners, jambs, sash, control joints, headers, bonding, and other special conditions.
 - 2. Provide bullnose units for outside corners, unless otherwise indicated.
- B. Concrete Masonry Units: [ASTM C 90] and as follows:
 - 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of **2800 psi**
 - 2. Weight Classification: Lightweight, unless otherwise indicated.
 - 3. Provide Type I, moisture-controlled units.
 - 4. Size Width: Manufactured to the following dimensions:

- a. 4 inches nominal; 3-5/8 inches actual.
 - b. 6 inches nominal; 5-5/8 inches actual.
 - c. 8 inches nominal; 7-5/8 inches actual.
 - d. 12 inches nominal; 11-5/8 inches actual.
5. Exposed Faces: Manufacturer's standard color and texture, unless otherwise indicated.
 - a. Where units are to be left exposed, provide color and texture matching the range represented by Architect's sample. Do not lay up any units which have been damaged, chipped or display nicked corners
 6. Provide Type I, moisture-controlled units.
 7. Finish: Exposed faces of the following general description matching color, pattern, and texture of Architect's samples.
 - a. Lightweight aggregate, ground finish.
 - 1) Provide units made with aggregate matching aggregate in Architect's sample.
 8. Integral Water Repellent: Provide units made with liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive according to ASTM E 514, with test period extended to 24 hours, show no visible water or leaks on the back of the test specimen.
 - 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) Block Plus W-10; Addiment Inc.
 - 2) Dry-Block; W. R. Grace & Co., Construction Products Division.
 - 3) Rheopel; Master Builders.
- C. Concrete Building Brick: ASTM C 55 and as follows:
1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 3500 psi.
 2. Weight Classification: Lightweight
 3. Provide Type I, moisture-controlled units.
 4. Size: Manufactured to the following actual dimensions:
 - a. Modular: 3-5/8 inches wide by 2-1/4 inches high by 7-5/8 inches long.
 5. Exposed Faces: Manufacturer's standard color and texture, unless otherwise indicated.

2.2 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. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C 150, Type I or Type III, and hydrated lime complying with ASTM C 207.
- D. Mortar Cement: ASTM C 1329
- E. Aggregate for Mortar: ASTM C 144; except for joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
- F. Aggregate for Grout: ASTM C 404.
- G. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494, Type C, and recommended by the manufacturer for use in masonry mortar of composition indicated.
- H. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with concrete masonry units, containing integral water repellent by same manufacturer.
- I. Water: Potable.
- J. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Mortar Cement:
 - a. Magnolia Superbond Mortar Cement; Blue Circle Cement.
 - b. Lafarge Mortar Cement; Lafarge Corporation.
 - 2. Cold-Weather Admixture:
 - a. Accelguard 80; Euclid Chemical Co.
 - b. Morseled; W. R. Grace & Co., Construction Products Division.
 - c. Trimix-NCA; Sonneborn, Div. of ChemRex, Inc.
 - 3. Water-Repellent Admixture:
 - a. Mortar Tite; Addiment Inc.
 - b. Dry-Block Mortar Admixture; W. R. Grace & Co., Construction Products Division.
 - c. Rheopel; Master Builders.

2.3 REINFORCING STEEL

- A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M; ASTM A 616/A 616M, including Supplement 1; or ASTM A 617/A 617M, Grade 60.

2.4 MASONRY JOINT REINFORCEMENT

- A. General: ASTM A 951 and as follows:
 - 1. Hot-dip galvanized, carbon-steel wire for both interior and exterior walls.
 - 2. Wire Size for Side Rods: W2.8 or 0.188-inch diameter.

3. Wire Size for Cross Rods: W2.8 or 0.188-inch diameter.
 4. Provide in lengths of not less than 10 feet , with prefabricated corner and tee units where indicated.
- B. For single-wythe masonry, provide truss type with single pair of side rods and cross rods spaced not more than 16 inches o.c.

2.5 TIES AND ANCHORS, GENERAL

- A. General: Provide ties and anchors, specified in subsequent articles, made from materials that comply with this Article, unless otherwise indicated.
- B. Hot-Dip Galvanized Carbon-Steel Wire: ASTM A 82; with ASTM A 153, Class B-2 coating.
- C. Galvanized Steel Sheet: ASTM A 653/A 653M, G60, commercial-quality, steel sheet zinc coated by hot-dip process on continuous lines before fabrication.
- D. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

2.6 RIGID ANCHORS

- A. General: Fabricate from steel bars as follows:
 1. 1-1/2 inches wide by 1/4 inch thick by 24 inches long, with ends turned up 2 inches or with cross pins.
 2. As indicated.
 3. Finish: Hot-dip galvanized to comply with ASTM A 153.

2.7 MISCELLANEOUS ANCHORS

- A. Anchor Bolts: 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, Class C; of diameter and length indicated and in the following configurations:
 1. Headed bolts.
 2. Type: Expansion or epoxy anchors

2.8 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: Material as indicated below, designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
 1. Styrene-Butadiene-Rubber Compound: ASTM D 2000, Designation M2AA-805.
 2. PVC: ASTM D 2287, Type PVC-65406.

- C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).
- D. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells with loops for holding reinforcing bars in center of cells. Units are formed from **0.187-inch** steel wire, hot-dip galvanized after fabrication.
 - 1. Provide units with either two loops or four loops as needed for number of bars indicated.
- E. Available Products: Subject to compliance with requirements, cavity drainage materials that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Reinforcing Bar Positioners:
 - a. D/A 816; Dur-O-Wal, Inc.
 - b. No. 376 Rebar Positioner; Heckman Building Products, Inc.
 - c. #RB Rebar Positioner; Hohmann & Barnard, Inc.
 - d. #RB-Twin Rebar Positioner; Hohmann & Barnard, Inc.
 - e. O-Ring Rebar Positioner; Masonry Reinforcing Corporation of America.

2.9 MASONRY-CELL INSULATION

- A. Molded-Polystyrene Insulation Units: Rigid, cellular thermal insulation formed by the expansion of polystyrene-resin beads or granules in a closed mold to comply with ASTM C 578, Type I. Provide specially shaped units designed for installing in cores of masonry units.

2.10 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. Add cold-weather admixture (if used) at the same rate for all mortar, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in the form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C 270 Property Specification.
 - 1. Extended-Life Mortar for Unit Masonry: Mortar complying with ASTM C 1142 may be used instead of mortar specified above, at Contractor's option.
 - 2. Limit cementitious materials in mortar to portland cement, mortar cement, and lime.
 - 3. Limit cementitious materials in mortar for exterior [and reinforced] masonry to portland cement, mortar cement, and lime.
 - 4. For masonry below grade, in contact with earth, and where indicated, use Type M
 - 5. For reinforced masonry and where indicated, use Type S

6. 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; for calcium silicate cast stone masonry trim and units and for other applications where another type is not indicated, use Type N .

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 5 of 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.

2.11 SOURCE QUALITY CONTROL

- A. Concrete Masonry Unit Tests: For each type of concrete masonry unit indicated, units will be tested according to ASTM C 140.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance.
 2. Verify that foundations are within tolerances specified.
 3. Verify that reinforcing dowels are properly placed.
 4. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Before installation, examine rough-in and built-in construction to verify actual locations of piping connections.

3.2 INSTALLATION, GENERAL

- A. Thickness: Build single-wythe walls to the actual widths of masonry units, using units of widths indicated.
- B. Build chases and recesses to accommodate items specified in this Section and in other Sections of the Specifications.
- C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to the opening.

- D. Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide a continuous pattern and to fit adjoining construction. Where possible, use full-size units without cutting. Allow units cut with water-cooled saws to dry before placing, unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

3.3 CONSTRUCTION TOLERANCES

- A. Comply with tolerances in ACI 530.1/ASCE 6/TMS 602 and the following:
- B. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than **1/4 inch in 20 feet** , nor **1/2 inch** maximum.
- C. For vertical alignment of exposed head joints, do not vary from plumb by more than **1/4 inch in 10 feet** , nor **1/2 inch** maximum.
- D. For conspicuous horizontal lines, such as exposed lintels, sills, parapets, and reveals, do not vary from level by more than **1/4 inch in 20 feet** , nor **1/2 inch** maximum.
- E. 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**.
- F. 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** .

3.4 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: Lay exposed masonry in the following bond pattern; do not use units with less than nominal **4-inch** horizontal face dimensions at corners or jambs.
 - 1. One-half running bond with vertical joint in each course centered on units in courses above and below.
- C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than **2 inches**. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal **4-inch** horizontal face dimensions at corners or jambs.
- D. Stopping and Resuming Work: In each course, rack back one-half-unit length for one-half running bond or one-third-unit length for one-third running bond; do not tooth. Clean exposed surfaces of set masonry, wet clay masonry units lightly if required, and remove loose masonry units and mortar before laying fresh masonry.
- E. Built-in Work: As construction progresses, build in items specified under this and other Sections of the Specifications. Fill in solidly with masonry around built-in items.

- F. Fill space between hollow-metal frames and masonry solidly with mortar, unless otherwise indicated.
- G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath in the joint below and rod mortar or grout into core.
- H. Fill cores in hollow concrete masonry units with grout **24 inches** under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.
- I. 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. At fire-rated partitions, install firestopping in joint between top of partition and underside of structure above to comply with Division 7 Section "Firestopping."

3.5 MORTAR BEDDING AND JOINTING

- A. Lay hollow masonry units as follows:
 - 1. With full mortar coverage on horizontal and vertical face shells.
 - 2. Bed webs in mortar in starting course on footings and in all courses of piers, columns, and pilasters, and where adjacent to cells or cavities to be filled with grout.
 - 3. For starting course on footings where cells are not grouted, spread out full mortar bed, including areas under cells.
- B. Lay solid brick-size 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 the 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.

3.6 MASONRY-CELL INSULATION

- A. Install molded-polystyrene insulation units into masonry unit cells before laying units.

3.7 MASONRY JOINT REINFORCEMENT

- A. General: Provide continuous masonry joint reinforcement as indicated. 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**.
 - 1. Space reinforcement not more than **16 inches** o.c.
 - 2. Space reinforcement not more than **8 inches** o.c. in foundation walls and parapet walls.

3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings.

- a. Reinforcement above is in addition to continuous reinforcement.

- B. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.
- C. Provide continuity at corners and wall intersections by using prefabricated "L" and "T" sections. Cut and bend reinforcing units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.8 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 or other rigid materials.
 2. Anchor masonry to structural members with flexible 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.

3.9 CONTROL AND EXPANSION JOINTS

- A. General: Install control and expansion joints in unit masonry where indicated. Build-in related items as masonry progresses. Do not form a continuous span through movement joints unless provisions are made to prevent in-plane restraint of wall or partition movement.
- B. Form control joints in concrete masonry as follows:
 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 joints in exposed faces.
 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 joint.
 4. Install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete.
 5. Build in joint fillers where indicated.
 6. Form open joint of width indicated, but not less than 3/8 inch for installation of sealant and backer rod specified in Division 7 Section "Joint Sealants." Keep joint free and clear of mortar.
- C. Build in horizontal, pressure-relieving joints where indicated; construct joints by either leaving an air space or inserting a compressible filler of width required for installing sealant and backer rod specified in Division 7 Section "Joint Sealants."

1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry veneer and attached to structure behind masonry veneer.

3.10 LINTELS

- A. Install steel lintels where indicated.
- B. Provide masonry lintels where shown and where openings of more than **12 inches** for brick-size units and **24 inches** for block-size units are shown without structural steel or other supporting lintels.
 1. Provide precast lintels made from concrete matching concrete masonry units in color, texture, and compressive strength and with reinforcing bars indicated or required to support loads indicated. Cure precast lintels by the same method used for concrete masonry units.
- C. Provide minimum bearing of **8 inches** at each jamb, unless otherwise indicated.

3.11 REINFORCED UNIT MASONRY INSTALLATION

- A. Placing Reinforcement: Comply with requirements of ACI 530.1/ASCE 6/TMS 602
- B. Grouting: Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist grout pressure.
 1. Comply with requirements of ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.

3.12 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.
- 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 non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing the surfaces thoroughly with clear water.
5. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2 applicable to type of stain on exposed surfaces.

END OF SECTION 04810

SECTION 04901 - MASONRY RESTORATION AND CLEANING

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.

1.2 SUMMARY

- A. This Section includes restoration and cleaning of brick and stone as follows:
 - 1. Repairing clay masonry and stone, including replacing damaged units.
 - 2. Reanchoring veneers.
 - 3. Repointing mortar joints.
 - 4. Removing plant growth.
 - 5. Cleaning exposed clay masonry and stone surfaces.
- B. Related Sections include the following:
 - 1. Division 4 Section "Unit Masonry Assemblies" for new clay masonry construction.
 - 2. Division 7 Section "Sheet Metal Flashing and Trim" for metal flashing installed in or on restored clay masonry and stone.
 - 3. Division 7 Section "Joint Sealants" for sealing joints in restored clay masonry and stone.
- C. Unit Prices: Unit prices for clay masonry restoration and cleaning are specified in Division 1 Section "Unit Prices."
 - 1. Unit prices apply to additions to and deletions from Work as authorized by Change Orders.

1.3 DEFINITIONS

- A. Low-Pressure Spray: 50 psi.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include recommendations for application and use. Include test data substantiating that products comply with requirements.

- B. Samples for Verification: Before erecting mockup, submit samples of the following:
1. Each type of exposed masonry unit to be used for replacing existing units.
 - a. For each brick type, provide straps or panels containing at least four bricks.
 2. Each type of sand used for pointing mortar.
 - a. For blended sands, provide samples of each component and blend.
 - b. Identify sources, both supplier and quarry, of each type of sand.
 3. Each type of pointing mortar in the form of sample mortar strips, 6 inches long by 1/2 inch wide, set in aluminum or plastic channels.
 - a. Include with each sample a list of ingredients with proportions of each. Identify sources, both supplier and quarry, of each type of sand and brand names of cementitious materials and pigments if any.
 4. Each type of masonry patching compound in the form of briquettes, at least 3 inches long by 1-1/2 inches wide. Document each sample with manufacturer and stock number or other information necessary to order additional material.
- C. Qualification Data: For restoration specialists including field supervisors and chemical manufacturer.
- D. Restoration Program: For each phase of restoration process, provide detailed description of materials, methods, equipment, and sequence of operations to be used for each phase of restoration work including protection of surrounding materials on building and Project site.
1. Include methods for keeping pointing mortar damp during curing period.
 2. If materials and methods other than those indicated are proposed for any phase of restoration work, provide a written description, including evidence of successful use on comparable projects, and a testing program to demonstrate their effectiveness for this Project.
- E. Cleaning Program: Describe cleaning process in detail, including materials, methods, and equipment to be used and protection of surrounding materials on building and Project site, and control of runoff during operations.
1. If materials and methods other than those indicated are proposed for cleaning work, provide a written description, including evidence of successful use on comparable projects, and a testing program to demonstrate their effectiveness for this Project.

1.5 QUALITY ASSURANCE

- A. Restoration Specialist Qualifications: Engage an experienced masonry restoration and cleaning firm to perform work of this Section. Firm shall have completed work similar in material, design, and extent to that indicated for this Project with a record of successful in-service performance.

1. At Contractor's option, work may be divided between two specialist firms: one for cleaning work and one for repair work.
 2. Field Supervision: Restoration specialist firms shall maintain experienced full-time supervisors on Project site during times that clay masonry restoration and cleaning are in progress. Supervisors shall not be changed during Project except for causes beyond the control of restoration specialist firm.
 3. Restoration Worker Qualifications: Persons who are experienced and specialize in restoration work of types they will be performing. When masonry units are being patched, assign at least one worker among those performing patching work who is trained and certified by manufacturer of patching compound to apply its products.
- B. Chemical Manufacturer Qualifications: A firm regularly engaged in producing masonry cleaners that have been used for similar applications with successful results, and with factory-trained representatives who are available for consultation and Project-site inspection and assistance at no additional cost.
- C. Source Limitations: Obtain each type of material for masonry restoration (face brick, cement, sand, etc.) from one source with resources to provide materials of consistent quality in appearance and physical properties.
- D. Preconstruction Testing Service: Engage a qualified independent testing agency to test the following. Provide test specimens and assemblies as indicated.
1. **Contractor must submit sample of existing mortar to qualified testing lab for analyses prior to performing any repointing & repair work.**
- E. Mockups: Prepare mockups of restoration and cleaning as follows to demonstrate aesthetic effects and qualities of materials and execution. Prepare mockups on existing walls under same weather conditions to be expected during remainder of the Work.
1. Repair an area approximately 36 inches high by 48 inches wide for each type of masonry material indicated to be rebuilt or replaced.
 2. Patch three small areas at least 1 inch in diameter for each type of masonry material indicated to be patched.
 3. Clean an area approximately 25 sq. ft. for each type of clay masonry and surface condition.
 - a. Test cleaners and methods on samples of adjacent materials for possible adverse reactions unless cleaners and methods are known to have deleterious effect.
 - b. Allow a waiting period of not less than seven days after completion of sample cleaning to permit a study of sample panels for negative reactions.
 4. Rake out joints in two separate areas approximately 36 inches high by 72 inches wide for each type of repointing required and repoint one of the two areas.
- 1.6 DELIVERY, STORAGE, AND HANDLING
- A. Deliver masonry units to Project site strapped together in suitable packs or pallets or in heavy-duty cartons.

- B. Deliver other materials to Project site in manufacturer's original and unopened containers, labeled with manufacturer's name and type of products.
- C. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- D. Store hydrated lime in manufacturer's original and unopened containers. Discard lime if containers have been damaged or have been opened for more than two days.
- E. Store lime putty covered with water in sealed containers.
- F. Store sand where grading and other required characteristics can be maintained and contamination avoided.

1.7 PROJECT CONDITIONS

- A. Repoint mortar joints and repair masonry only when air temperature is between and 40 and 90 deg F and is predicted to remain so for at least 7 days after completion of work.
- B. Cold-Weather Requirements: Comply with the following procedures for masonry repair and mortar-joint pointing:
 - 1. When air temperature is below 40 deg F, heat mortar ingredients, masonry repair materials, and existing masonry walls to produce temperatures between 40 and 120 deg F.
 - 2. When mean daily air temperature is below 40 deg F, provide enclosure and heat to maintain temperatures above 32 deg F within the enclosure for 7 days after repair and pointing.
- C. Hot-Weather Requirements: Protect masonry repair and mortar-joint pointing when temperature and humidity conditions produce excessive evaporation of water from mortar and repair materials. Provide artificial shade and wind breaks and use cooled materials as required. Do not apply mortar to substrates with temperatures of 90 deg F and above.
- D. Patch masonry only when air and surface temperatures are between and 55 and 100 deg F and are predicted to remain above 55 deg F for at least 7 days after completion of work. On days when air temperature is predicted to go above 90 deg F, schedule patching work to coincide with time that surface being patched will be in shade or during cooler morning hours.
- E. Clean masonry surfaces only when air temperature is 40 deg F and above and is predicted to remain so for at least 7 days after completion of cleaning.

1.8 SEQUENCING AND SCHEDULING

- A. Order replacement materials at earliest possible date, to avoid delaying completion of the Work.
- B. Order sand for repointing mortar immediately after approval of mockups. Take delivery of and store at Project site a sufficient quantity of sand to complete Project.

- C. Perform masonry restoration work in the following sequence:
1. Remove plant growth.
 2. Remove paint.
 3. Clean masonry surfaces.
 4. Repair existing masonry, including replacing existing masonry with new masonry materials.
 5. Rake out joints that are to be repointed.
 6. Point mortar joints.
- D. As scaffolding is removed, patch anchor holes used to attach scaffolding. Patch holes in masonry units to comply with Part 3 "Masonry Unit Patching" Article. Patch holes in mortar joints to comply with Part 3 "Repointing Masonry" Article.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products specified.
 2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

2.2 MASONRY MATERIALS

- A. Face Brick and Accessories: Provide face brick and accessories, including specially molded, ground, cut, or sawed shapes where required to complete masonry restoration work.
1. Provide units with colors, surface texture, size, and shape to match existing brickwork and with physical properties not less than those determined from preconstruction testing of selected existing units.
 - a. For existing brickwork that exhibits a range of colors, provide brick that matches that range rather than brick that matches an individual color within that range.
 2. Provide units with colors, surface texture, and physical properties to match Architect's sample. Match existing units in size and shape.
 - a. For sample that exhibits a range of colors, provide brick that matches that range rather than brick that matches an individual color within that range.
 3. Provide specially molded shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.
 4. Provide specially ground units, shaped to match patterns, for arches and where indicated.

- B. Building Brick: Provide building brick complying with ASTM C 62, of same vertical dimension as face brick, for masonry work concealed from view.
 - 1. Grade SW where in contact with earth.
 - 2. Grade SW, MW, or NW for concealed backup.

2.3 STONE MATERIALS

- A. Stone: Provide natural building stone of variety, color, and finish to match existing. Match existing stone in size and shape.
- B. Pre Cast: Provide precast of variety, color, and finish to match existing. Match existing precast in size and shape.

2.4 MORTAR MATERIALS

- A. Portland Cement: ASTM C 150, Type I or Type II.
 - 1. Provide white cement containing not more than 0.60 percent total alkali when tested according to ASTM C 114.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Quicklime: ASTM C 5, pulverized lime.
- D. Factory-Prepared Lime Putty: Screened, fully-slaked lime putty, prepared from pulverized lime complying with ASTM C 5.
- E. Mortar Sand: ASTM C 144, unless otherwise indicated.
 - 1. Color: Provide natural sand or ground marble, granite, or other sound stone; of color necessary to produce required mortar color.
 - 2. For pointing mortar, provide sand with rounded edges.
 - 3. Match size, texture, and gradation of existing mortar sand as closely as possible. Blend several sands, if necessary, to achieve suitable match.
- F. Mortar Pigments: Natural and synthetic iron oxides, compounded for mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortars.
- G. Water: Potable.

2.5 PAINT REMOVERS

- A. Alkaline Paste Paint Remover: Manufacturer's standard alkaline paste formulation for removing paint coatings from masonry.
 - 1. Products:
 - a. ProSoCo; Sure Klean Heavy-Duty Paint Stripper.

2.6 CLEANING MATERIALS

- A. Water for Cleaning: Potable.
- B. Acidic Cleaner: Manufacturer's standard acidic masonry restoration cleaner composed of hydrofluoric acid blended with other acids, detergents, wetting agents, and inhibitors.
 - 1. Products:
 - a. ProSoCo; Sure Klean Heavy-Duty Restoration Cleaner

2.7 MISCELLANEOUS MATERIALS

- A. Masonry Patching Compound: Factory-mixed cementitious product that is custom manufactured for patching masonry, is vapor- and water permeable, exhibits low shrinkage, and develops high bond strength to all types of masonry.
 - 1. Formulate patching compound used for patching brick in colors and textures to match brick being patched. Provide not less than three colors to enable matching each brick.
 - 2. Formulate patching compound used for patching unglazed terra cotta in colors and textures to match terra cotta being patched.
 - 3. Available Products:
 - a. Cathedral Stone Products, Inc.; Jahn Restoration Mortar.
 - b. Edison Coatings, Inc.; Custom System 45.
- B. Liquid Strippable Masking Agent: Manufacturer's standard liquid, film-forming, strippable masking material for protecting glass, metal, and polished stone surfaces from damaging effects of acidic and alkaline masonry cleaners.
 - 1. Products:
 - a. ProSoCo; Sure Klean Strippable Masking.
- C. Masonry Repair Anchors, Expansion Type: Mechanical fasteners designed for masonry veneer stabilization consisting of 1/4-inch- diameter, Type 304 stainless-steel rod with brass expanding shells at each end and water-shedding washer in the middle. Expanding shells shall be designed to provide positive mechanical anchorage to veneer on one end and backup masonry on the other.
 - 1. Products:
 - a. Dur-O-Wal, a Dayton Superior Company; Mechanical Repair Anchors.
- D. Masonry Repair Anchors, Spiral Type: Type 304 stainless-steel spiral rods designed to anchor to backing and veneer. Anchors are flexible in plane of veneer but rigid perpendicular to it.
 - 1. Provide adhesive-installed anchors complete with manufacturer's standard epoxy adhesive and injection tubes, screens, sleeves, or other devices required for installation.
 - 2. Provide driven-in anchors designed to be installed in drilled holes and relying on screw effect rather than adhesive to secure them to backup and veneer.

3. Products:

a. Dur-O-Wal, a Dayton Superior Company; Dur-O-Flex.

E. Stone Anchors: Type and size indicated or, if not indicated, to match existing anchors in size and type. Fabricate anchors and dowels from Type 304 stainless steel.

F. Stone-to-Stone Adhesive: 2-part polyester or epoxy-resin stone adhesive with a 15- to 45-minute cure at 70 deg F or 1-part cementitious stone adhesive, recommended by adhesive manufacturer for type of stone repair indicated, and matching stone color.

1. Available Products:

a. Two-Part Polyester or Epoxy:

- 1) Akemi North America; Akepox.
- 2) Bonstone Materials, Inc.; A-199-T/B-439-T.
- 3) Edison Coatings, Inc.; Flexi-Weld 520T.

b. One-Part Cementitious Stone Adhesive:

- 1) Cathedral Stone Products, Inc.; Jahn Restoration Adhesive.

2.8 MORTAR MIXES

A. Preparing Lime Putty: Slake quicklime and prepare lime putty according to appendix to ASTM C 5 and manufacturer's written instructions.

B. Measurement and Mixing: Measure cementitious materials and sand in a dry condition by volume or equivalent weight. Do not measure by shovel; use known measure. Mix materials in a clean, mechanical batch mixer.

1. Mixing Pointing Mortar: Thoroughly mix cementitious materials and sand together before adding any water. Then mix again adding only enough water to produce a damp, unworkable mix that will retain its form when pressed into a ball. Maintain mortar in this dampened condition for 15 to 30 minutes. Add remaining water in small portions until mortar reaches desired consistency. Use mortar within one hour of final mixing; do not retemper or use partially hardened material.

C. Colored Mortar: Produce mortar of color required by using selected ingredients. Do not alter specified proportions without Architect's approval.

1. Mortar Pigments: Where mortar pigments are indicated, do not exceed a pigment-to-cement ratio of 1:10 by weight.

D. Do not use admixtures of any kind in mortar, unless otherwise indicated.

E. Mortar Proportions: Mix mortar materials in the following proportions:

1. Pointing Mortar for Brick: 1 part portland cement, 2 parts lime, and 6 parts sand.

a. Add mortar pigments to produce mortar colors required.

2. Rebuilding (Setting) Mortar: Comply with ASTM C 270, Proportion Specification, Type N, unless otherwise indicated; with cementitious material content limited to portland cement and lime.

2.9 CHEMICAL CLEANING SOLUTIONS

- A. Dilute chemical cleaners with water to produce solutions not exceeding concentration recommended by chemical cleaner manufacturer.
- B. Acidic Cleaner Solution for Brick: Dilute with water to produce hydrofluoric acid content of 3 percent or less, but not greater than that recommended by chemical cleaner manufacturer.
- C. Acidic Cleaner Solution for Unpolished Stone: Dilute with water to produce hydrofluoric acid content of 3 percent or less, but not greater than that recommended by chemical cleaner manufacturer.
 1. Use only on unpolished granite, unpolished dolomite marbles, and siliceous sandstone.

PART 3 - EXECUTION

3.1 RESTORATION SPECIALISTS

- A. Available Restoration Specialist Firms: Subject to compliance with requirements, firms that may provide clay masonry and stone restoration and cleaning include, but are not limited to, the following:

3.2 PROTECTION

- A. Protect persons, motor vehicles, surrounding surfaces of building being restored, building site, plants, and surrounding buildings from harm resulting from masonry restoration work.
 1. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during course of restoration and cleaning work.
- B. Comply with chemical cleaner manufacturer's written instructions for protecting building and other surfaces against damage from exposure to its products. Prevent chemical cleaning solutions from coming into contact with pedestrians, motor vehicles, landscaping, buildings, and other surfaces that could be harmed by such contact.
 1. Cover adjacent surfaces with materials that are proven to resist chemical cleaners used unless chemical cleaners being used will not damage adjacent surfaces. Use materials that contain only waterproof, UV-resistant adhesives. Apply masking agents to comply with manufacturer's written instructions. Do not apply liquid masking agent to painted or porous surfaces. When no longer needed, promptly remove masking to prevent adhesive staining.
 2. Keep wall wet below area being cleaned to prevent streaking from runoff.

3. Do not clean masonry during winds of sufficient force to spread cleaning solutions to unprotected surfaces.
 4. Neutralize and collect alkaline and acid wastes for disposal off Owner's property.
 5. Dispose of runoff from cleaning operations by legal means and in a manner that prevents soil erosion, undermining of paving and foundations, damage to landscaping, and water penetration into building interiors.
- C. Prevent mortar from staining face of surrounding masonry and other surfaces.
1. Cover sills, ledges, and projections to protect from mortar droppings.
 2. Keep wall area wet below rebuilding and pointing work to discourage mortar from adhering.
 3. Immediately remove mortar in contact with exposed masonry and other surfaces.
 4. Clean mortar splatters from scaffolding at end of each day.
- D. Remove gutters and downspouts adjacent to masonry and store during masonry restoration and cleaning. Reinstall when masonry restoration and cleaning is complete.
1. Provide temporary rain drainage during work to direct water away from building.

3.3 UNUSED ANCHOR REMOVAL

- A. Remove masonry anchors, brackets, wood nailers, and other extraneous items no longer in use unless identified as historically significant or indicated to remain.
1. Remove items carefully to avoid spalling or cracking masonry.
 2. If item cannot be removed without damaging surrounding masonry, cut off item flush with surface and core drill surrounding masonry and item as close around item as practical.
 3. Patch holes where items were removed unless directed to remove and replace units.

3.4 BRICK REMOVAL AND REPLACEMENT

- A. At locations indicated, remove bricks that are damaged, spalled, or deteriorated. Carefully demolish or remove entire units from joint to joint, without damaging surrounding masonry, in a manner that permits replacement with full-size units.
1. When removing single bricks, remove material from center of brick and work toward outside edges.
- B. Support and protect remaining masonry that surrounds removal area. Maintain flashing, reinforcement, lintels, and adjoining construction in an undamaged condition.
- C. Notify Architect of unforeseen detrimental conditions including voids, cracks, bulges, and loose masonry units in existing masonry backup, rotted wood, rusted metal, and other deteriorated items.

- D. Remove in an undamaged condition as many whole bricks as possible.
 - 1. Remove mortar, loose particles, and soil from brick by cleaning with hand chisels, brushes, and water.
 - 2. Store brick for reuse, as indicated.
 - 3. Deliver cleaned brick not required for reuse to Owner, unless otherwise directed.
- E. Clean bricks surrounding removal areas by removing mortar, dust, and loose particles in preparation for replacement.
- F. Install replacement brick into bonding and coursing pattern of existing brick. If cutting is required, use a motor-driven saw designed to cut masonry with clean, sharp, unchipped edges.
- G. Lay replacement brick with completely filled bed, head, and collar joints. Butter ends with sufficient mortar to fill head joints and shove into place. Wet both replacement and surrounding bricks that have ASTM C 67 initial rates of absorption (suction) of more than 30 g/30 sq. in. per min.. Use wetting methods that ensure that units are nearly saturated but surface is dry when laid. Maintain joint width for replacement units to match existing joints.
 - 1. Tool exposed mortar joints in repaired areas to match joints of surrounding existing brickwork.
 - 2. Rake out mortar used for laying brick before mortar sets and point new mortar joints in repaired area to comply with requirements for repointing existing masonry, and at same time as repointing of surrounding area.

3.5 REANCHORING VENEERS

- A. Install masonry repair anchors in horizontal mortar joints and according to manufacturer's written instructions. Install at not more than 16 inches o.c. vertically and 32 inches o.c. horizontally, unless otherwise indicated. Install at locations to avoid penetrating flashing.
- B. Recess anchors at least 5/8 inch from surface of mortar joint and fill recess with pointing mortar.

3.6 MASONRY UNIT PATCHING

- A. Patch the following masonry units:
 - 1. Units with holes.
 - 2. Units with chipped edges or corners.
 - 3. Units with small areas of deep deterioration.
- B. Remove and replace existing patches, unless otherwise indicated or approved by Architect.
- C. Patching Clay Masonry:
 - 1. Remove loose material from masonry surface. Remove additional material so patch will not have feathered edges and will be at least 1/4 inch thick, but not less than recommended by patching compound manufacturer.
 - 2. Mask or remove surrounding mortar joints if patch will extend to edge of units.

3. Mix patching compound in individual batches to match each unit being patched. Combine one or more colors of patching compound, as needed, to produce exact match.
4. Rinse surface to be patched and leave damp, but without standing water.
5. Brush-coat surfaces with slurry coat of patching compound according to manufacturer's written instructions.
6. Place patching compound in layers as recommended by patching compound manufacturer, but not less than 1/4 inch or more than 2 inches thick. Roughen surface of each layer to provide a key for next layer.
7. Trowel, scrape, or carve surface of patch to match texture and surface plane of surrounding brick. Shape and finish surface before or after curing, as determined by testing, to best match existing brick.
8. Keep each layer damp for 72 hours or until patching compound has set.

3.7 STONE REMOVAL AND REPLACEMENT

- A. At locations indicated, remove stone that has deteriorated or is damaged beyond repair. Carefully demolish or remove entire units from joint to joint, without damaging surrounding stone, in a manner that permits replacement with full-size units.
- B. Support and protect remaining stonework that surrounds removal area. Maintain flashing, reinforcement, lintels, and adjoining construction in an undamaged condition.
- C. Notify Architect of unforeseen detrimental conditions including voids, cracks, bulges, and loose masonry units in existing masonry backup, rotted wood, rusted metal, and other deteriorated items.
- D. Remove in an undamaged condition as many whole stone units as possible.
 1. Remove mortar, loose particles, and soil from stone by cleaning with hand chisels, brushes, and water.
 2. Remove sealants by cutting close to stone with utility knife and cleaning with solvents.
 3. Store stone for reuse, as indicated.
 4. Deliver cleaned stone not required for reuse to Owner, unless otherwise directed.
- E. Clean stone surrounding removal areas by removing mortar, dust, and loose particles in preparation for replacement.
- F. Replace removed stone with other removed stone, where possible, or with new stone matching existing stone, including size. Butter vertical joints for full width before setting and set units in full bed of mortar, unless otherwise indicated. Replace existing anchors with new anchors of size and type indicated.
 1. Tool exposed mortar joints in repaired areas to match joints of surrounding existing stonework.
 2. Rake out mortar used for laying stone before mortar sets and point new mortar joints in repaired area to comply with requirements for repointing existing stone, and at same time as repointing of surrounding area.

3.8 PARTIAL STONE REPLACEMENT (DUTCHMAN REPAIR)

- A. At locations indicated, remove rectangular portion of stone units. Carefully remove stone by making vertical and horizontal saw cuts at face of stone and demolishing corner portion of stone unit to depth required for fitting partial replacement (Dutchman). Make edges of stone at cuts smooth and square to each other and to finished surface. Make back of removal area flat and parallel to stone face.
- B. Remove mortar from joints that abut area of stone removal to same depth as stone was removed. Remove loose mortar particles and other debris from surfaces to be bonded and surfaces of adjacent stone units that will receive mortar by cleaning with stiff-fiber brush.
- C. Trim partial replacement (Dutchman) to accurately fit area where stone was removed.
- D. Apply stone-to-stone adhesive to comply with adhesive manufacturer's written instructions. Coat bonding surfaces of existing stone and partial replacement, completely filling all crevices and voids.
- E. Apply partial replacement while adhesive is still tacky and hold securely in place until adhesive has cured. Use shims, clamps, wedges, or other devices as necessary to align face of partial replacement with face of stone unit being repaired.
- F. After adhesive has fully cured, further anchor partial replacements where indicated with 1/4-inch- diameter, plain stainless-steel rods set into 1/4-inch- diameter holes drilled at a 45-degree downward angle through face of stone. Center and space anchor rods between 3 and 5 inches apart and at least 2 inches from any edge. Insert rods at least 2 inches into backing stone and 2 inches into partial replacements with end countersunk at least 3/4 inch from exposed face of stone.
- G. Clean residual adhesive from exposed surfaces and patch chipped areas and drill holes as specified in "Stone Patching" Article.

3.9 STONE PLUG REPAIR

- A. At locations indicated, remove cylindrical piece of damaged stone by core-drilling perpendicular to stone surface.
- B. Prepare a replacement plug by core-drilling replacement stone. Use a drill sized to produce a core that will fit into hole drilled in damaged stone with only minimum gap necessary for adhesive.
- C. Apply stone-to-stone adhesive to comply with adhesive manufacturer's written instructions. Coat bonding surfaces of existing stone and plug, completely filling all crevices and voids.
- D. Apply plug while adhesive is still tacky and hold securely in place until adhesive has cured.
- E. Clean residual adhesive from exposed surfaces.

3.10 STONE REPAIR

- A. Carefully remove loose stone fragments in areas indicated to be repaired. Reuse only stone fragments that are in sound condition.
- B. Remove soil, loose stone particles, mortar, and other debris or foreign material from fragment surfaces to be bonded and stone from which fragments were removed by cleaning with stiff-fiber brush.
- C. Apply stone-to-stone adhesive to comply with adhesive manufacturer's written instructions. Coat bonding surfaces of fragments and stone from which fragments were removed, completely filling all crevices and voids.
- D. Fit stone fragments onto building stone while adhesive is still tacky and hold fragment securely in place until adhesive has cured.
- E. After adhesive has fully cured, further anchor stone fragments where indicated with 1/4-inch-diameter, plain stainless-steel rods set into 1/4-inch-diameter holes drilled at a 45-degree downward angle through face of stone. Center and space anchor rods between 3 and 5 inches apart and at least 2 inches from any edge. Insert rods at least 2 inches into backing stone and 2 inches into stone fragments with end countersunk at least 3/4 inch from exposed face of stone.
- F. Clean residual adhesive from exposed surfaces and patch chipped areas and drilled holes as specified in "Stone Patching" Article.

3.11 CRACK INJECTION

- A. General: Comply with cementitious crack filler manufacturer's written instructions.
- B. Drill 1/4-inch-diameter, downward-sloping injection holes as follows:
 - 1. Transverse Cracks Less Than 3/8 inch Wide: Drill holes through center of crack at 12 to 18 inches o.c.
 - 2. Transverse Cracks More Than 3/8 inch Wide: Drill holes through center of crack at 18 to 36 inches o.c.
 - 3. Delaminations: Drill holes at approximately 18 inches o.c. both vertically and horizontally.
 - 4. Drill holes 2 inches deep. Where possible drill holes in mortar joints.
- C. Clean out drill holes and cracks with compressed air and water. Remove dirt and organic matter, loose material, sealants, and failed crack repair materials.
- D. Place plastic injection ports in drilled holes and seal face of cracks between injection ports with clay or other nonstaining, removable plugging material. Leave openings at upper ends of cracks for air release.

- E. Inject cementitious crack filler through ports sequentially, beginning at one end of area and working to opposite end; where possible begin at lower end of injection area and work upward. Inject filler until it extrudes from adjacent ports. After port has been injected, plug with clay or other suitable material and begin injecting filler at adjacent port, repeating process until all ports have been injected.
- F. Clean cementitious crack filler from face of stone before it sets by scrubbing with water.
- G. After cementitious crack filler has set, remove injection ports, plugging material, and excess filler. Patch injection holes and surface of cracks as specified in "Stone Patching" Article.

3.12 STONE PATCHING

- A. Patch the following stone units:
 - 1. Units indicated to be patched.
 - 2. Units with holes.
 - 3. Units with chipped edges or corners.
 - 4. Units with small areas of deep deterioration.
- B. Remove and replace existing patches, unless otherwise indicated or approved by Architect.
- C. Cut out deteriorated stone and adjacent stone that has begun to deteriorate. Remove additional material so patch will not have feathered edges and will be at least 1/4 inch thick, but not less than recommended by patching compound manufacturer.
 - 1. Remove loose particles, soil, debris, oil, and other contaminants from existing stone units at locations to be patched by cleaning with stiff-fiber brush.
- D. Mix patching compound in individual batches to match each stone unit being patched. Combine one or more colors of patching compound, as needed, to produce exact match.
- E. Brush-coat stone surfaces with slurry coat of patching compound according to manufacturer's written instructions.
- F. Place patching compound in layers as recommended by patching compound manufacturer, but not less than 1/4 inch or more than 2 inches thick. Roughen surface of each layer to provide a key for next layer.
 - 1. Trowel, scrape, or carve surface of patch to match texture and surface plane of surrounding stone. Shape and finish surface before or after curing, as determined by testing, to best match existing stone.
 - 2. Build patch up 1/4 inch above surrounding stone and carve surface to match adjoining stone after patching compound has hardened.
- G. Keep each layer damp for 72 hours or until patching compound has set.
- H. Remove and replace patches with hairline cracks or that show separation from stone at edges, and those that do not match adjoining stone in color or texture

3.13 CLEANING MASONRY, GENERAL

- A. Proceed with cleaning in an orderly manner; work from top to bottom of each scaffold width and from one end of each elevation to the other.
- B. Use only those cleaning methods indicated for each masonry material and location.
 - 1. Do not use wire brushes or brushes that are not resistant to chemical cleaner being used. Do not use plastic-bristle brushes if natural-fiber brushes will resist chemical cleaner being used.
 - 2. Use spray equipment that provides controlled application at volume and pressure indicated, measured at spray tip. Adjust pressure and volume to ensure that cleaning methods do not damage masonry.
 - a. Equip units with pressure gages.
 - 3. For chemical cleaner spray application, use low-pressure tank or chemical pump suitable for chemical cleaner indicated, equipped with cone-shaped spray tip.
 - 4. For water spray application, use fan-shaped spray tip that disperses water at an angle of 25 to 50 degrees.
- C. Perform each cleaning method indicated in a manner that results in uniform coverage of all surfaces, including corners, moldings, and interstices, and that produces an even effect without streaking or damaging masonry surfaces.
- D. Removing Plant Growth: Completely remove plant, moss, and shrub growth from masonry surfaces. Carefully remove plants, creepers, and vegetation by cutting at roots and allowing to dry as long as possible before removal. Remove loose soil and debris from open masonry joints to whatever depth they occur.
- E. Preliminary Cleaning: Before beginning general cleaning, remove extraneous substances that are resistant to cleaning methods being used. Extraneous substances include paint, calking, asphalt, and tar.
 - 1. Carefully remove heavy accumulations of material from surface of masonry with a sharp chisel. Do not scratch or chip masonry surface.
 - 2. Remove paint and calking with alkaline paint remover.
 - a. Comply with requirements for paint removal.
 - b. Repeat application up to two times if needed.
 - 3. Remove asphalt and tar with solvent-type paint remover.
 - a. Apply only to asphalt and tar by brush without prewetting.
 - b. Allow paint remover to remain on surface for 10 to 30 minutes.
 - c. Rinse off with cold water using low-pressure spray.
 - d. Repeat application if needed.
- F. Water Spray Applications: Unless otherwise indicated, hold spray nozzle at least 6 inches from surface of masonry and apply water in horizontal back and forth sweeping motion, overlapping previous strokes to produce uniform coverage.

- G. Chemical Cleaner Application Methods: Apply chemical cleaners to masonry surfaces to comply with chemical cleaner manufacturer's written instructions; use brush or spray application methods, at Contractor's option. Do not spray apply at pressures exceeding 50 psi. Do not allow chemicals to remain on surface for periods longer than those indicated or recommended by manufacturer.
- H. Rinse off chemical residue and soil by working upward from bottom to top of each treated area at each stage or scaffold setting. Periodically during each rinse, test pH of rinse water running off of cleaned area to determine that chemical cleaner is completely removed.
 - 1. Apply neutralizing agent and repeat rinse, if necessary, to produce tested pH of between 6.7 and 7.5.
- I. After cleaning is complete, remove protection no longer required. Remove tape and adhesive marks.

3.14 PAINT REMOVAL

- A. Paint Removal with Alkaline Paste Paint Remover:
 - 1. Apply paint remover to dry, painted masonry with brushes.
 - 2. Allow paint remover to remain on surface for period recommended by manufacturer.
 - 3. Rinse with cold water applied by low-pressure spray to remove chemicals and paint residue.
 - 4. Repeat process, if necessary, to remove all paint.
 - 5. Apply acidic cleaner to masonry, while surface is still wet, using low-pressure spray equipment or soft-fiber brush. Let cleaner remain on surface for period recommended by chemical cleaner manufacturer.
 - 6. Rinse with cold water applied by low-pressure spray to remove chemicals and soil.

3.15 CLEANING BRICKWORK

- A. Cold-Water Wash: Use cold water applied by low-pressure spray.
- B. Cold Water Soak:
 - 1. Apply cold water by intermittent soaking.
 - 2. Use perforated hoses or other means that will apply a fine water mist to entire surface being cleaned.
 - 3. Apply water in cycles with at least 30 minutes between cycles.
 - 4. Continue water application until surface encrustation has softened sufficiently to permit its removal by water wash, as indicated by cleaning tests.
 - 5. Remove soil and softened surface encrustation from masonry with cold water applied by low-pressure spray.
- C. Acidic Chemical Cleaning:
 - 1. Wet masonry with cold water applied by low-pressure spray.

2. Apply cleaner to masonry in two applications by brush or low-pressure spray. Let cleaner remain on surface for period indicated below:
 - a. As recommended by chemical cleaner manufacturer.
 - b. As established by mockup.
 - c. Two to three minutes.
3. Rinse with cold water applied by low-pressure spray to remove chemicals and soil.
4. Repeat cleaning procedure above where required to produce cleaning effect established by mockup. Do not repeat more than once. If additional cleaning is required, use steam wash.

3.16 REPOINTING MASONRY

- A. Rake out and repoint mortar joints to the following extent:
 1. All joints in areas indicated.
 2. Joints where mortar is missing or where they contain holes.
 3. Cracked joints where cracks can be penetrated at least 1/4 inch by a knife blade 0.027 inch thick.
 4. Cracked joints where cracks are 1/8 inch or more in width and of any depth.
 5. Joints where they sound hollow when tapped by metal object.
 6. Joints where they are worn back 1/4 inch or more from surface.
 7. Joints where they are deteriorated to point that mortar can be easily removed by hand.
 8. Joints, other than those indicated as sealant-filled joints, where they have been filled with substances other than mortar.
- B. Do not rake out and repoint joints where not required.
- C. Rake out joints as follows:
 1. Remove mortar from joints to depth of 2-1/2 times joint width, but not less than 1/2 inch or not less than that required to expose sound, unweathered mortar.
 2. Remove mortar from masonry surfaces within raked-out joints to provide reveals with square backs and to expose masonry for contact with pointing mortar. Brush, vacuum, or flush joints to remove dirt and loose debris.
 3. Do not spall edges of masonry units or widen joints. Replace or patch damaged masonry units as directed by Architect.
 - a. Cut out mortar by hand with chisel and mallet. Do not use power-operated grinders without Architect's written approval based on submission by Contractor of a satisfactory quality-control program and demonstrated ability of operators to use tools without damaging masonry. Quality-control program shall include provisions for supervising performance and preventing damage due to worker fatigue.
 - b. Cut out center of mortar bed joints using angle grinders with diamond-impregnated metal blades. Remove remaining mortar by hand with chisel and mallet. Strictly adhere to written quality-control program. Quality-control program shall include provisions for demonstrating ability of operators to use tools without damaging masonry, supervising performance, and preventing damage due to worker fatigue.

Power tools may be used only by qualified personal and with the expressed written permission of the Architect.

- D. Notify Architect of unforeseen detrimental conditions including voids in mortar joints, cracks, loose masonry units, rotted wood, rusted metal, and other deteriorated items.
- E. Point joints as follows:
 - 1. Rinse masonry-joint surfaces with water to remove dust and mortar particles. Time rinsing application so, at time of pointing, joint surfaces are damp but free of standing water. If rinse water dries, dampen masonry-joint surfaces before pointing.
 - 2. Apply pointing mortar first to areas where existing mortar was removed to depths greater than surrounding areas. Apply in layers not greater than 3/8 inch until a uniform depth is formed. Fully compact each layer thoroughly and allow it to become thumbprint hard before applying next layer.
 - 3. After low areas have been filled to same depth as remaining joints, point all joints by placing mortar in layers not greater than 3/8 inch. Fully compact each layer and allow to become thumbprint hard before applying next layer. Where existing bricks have worn or rounded edges, slightly recess finished mortar surface below face of masonry to avoid widened joint faces. Take care not to spread mortar over edges onto exposed masonry surfaces or to feathered mortar.
 - 4. When mortar is thumbprint hard, tool joints to match original appearance of joints. Remove excess mortar from edge of joint by brushing.
- F. Cure mortar by maintaining in thoroughly damp condition for at least 72 hours including weekends and holidays.
 - 1. Acceptable curing methods include covering with wet burlap and plastic sheeting, periodic hand misting, and periodic mist spraying using system of pipes, mist heads, and timers.
 - 2. Adjust curing methods to ensure that pointing mortar is damp throughout its depth without eroding surface mortar.
- G. Where repointing work precedes cleaning of existing masonry, allow mortar to harden at least 30 days before beginning cleaning work.

3.17 FINAL CLEANING

- A. After mortar has fully hardened, thoroughly clean exposed masonry surfaces of excess mortar and foreign matter; use wood scrapers, stiff-nylon or -fiber brushes, and clean water, spray applied at low pressure.
 - 1. Do not use metal scrapers or brushes.
 - 2. Do not use acidic or alkaline cleaners.
- B. Wash adjacent woodwork and other nonmasonry surfaces. Use detergent and soft brushes or cloths.
- C. Clean masonry debris from roof; remove debris from gutters and downspouts. Rinse off roof and flush gutters and downspouts.

- D. Sweep and rake adjacent pavement and grounds to remove masonry debris. Where necessary, pressure wash surfaces to remove mortar, dust, dirt, and stains.

3.18 FIELD QUALITY CONTROL

- A. Inspectors: Owner will engage qualified independent inspectors to perform inspections and prepare test reports. Allow inspectors use of lift devices and scaffolding, as needed, to perform inspections.
- B. Architect's Project Representatives: Architect will assign Project representatives to help carry out Architect's responsibilities at the site, including observing progress and quality of portion of the Work completed. Allow Architect's Project representatives use of scaffolding, as needed, to observe progress and quality of portion of the Work completed.
- C. Notify inspectors and Architect's Project representatives in advance of times when lift devices and scaffolding will be relocated. Do not relocate lift devices and scaffolding until inspectors and Architect's Project representatives have had reasonable opportunity to make inspections and observations of work areas at lift device or scaffold location.

END OF SECTION 04901

Capital Advance Program
Construction Contract
Lump Sum

U.S. Department of Housing and Urban Development
Office of Housing
Federal Housing Commissioner

OMB Approval No. 2502-0011
(exp. 8/31/2013)

For use under Section 202 of the Housing Act of 1959
or Section 811 of the National Affordable Housing Act)

Public reporting burden for this collection of information is estimated to average 16 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

The Department of Housing and Urban Development (HUD) is authorized to collect this information by provisions set forth in Article 1.E of the National Housing Act (Public Law 479, 48 Stat. 1246, 12 U.S.C., 1701 et. seq.).

Privacy Act Notice. The United States Department of Housing and Urban Development, Federal Housing Administration, is authorized to solicit the information requested in this form by virtue of Title 12, United States Code, Section 1701 et seq., and regulations promulgated thereunder at Title 12, Code of Federal Regulations.

This Agreement, made the _____ day of _____, 20____, between _____

(hereinafter called the "Contractor") and _____

(hereinafter called the "Owner").

Witnesseth, that the Contractor and the Owner, for the consideration hereinafter set out, agree as follows:

Article 1 - Scope of Contract

A. The Contract between the parties is set forth in the "Contract Documents" which consists of this Agreement, the Drawings and Specifications, together with any addenda thereto, the current edition of AIA Document A201, "General Conditions of the Contract for Construction," except all paragraphs concerning arbitration, and Form HUD 2554, "Supplementary Conditions of the Contract for Construction."

B. The Contractor shall furnish all of the materials and perform all of the work (within the property lines) shown on, and in accordance with, the Drawings and Specifications entitled _____

_____ ,

HUD Project No. _____, dated _____.

C. The Drawings, which are numbered _____, and the Specifications, the pages of which are numbered _____,

and addenda numbered _____, have been prepared by _____, ("Design Architect").

The Architect administering the Construction Contract (hereinafter, and elsewhere in the Contract Documents, referred to as the "Architect") is _____

D. A master set of said Drawings and Specifications, identified by the parties hereto and by the Design Architect, the Architect, and the

Contractor's Surety or Guarantor have been placed on file with the Department of Housing and Urban Development ("HUD"), and shall govern in all matters which arise with respect to such Drawings and Specifications.

E. Changes in the Drawings and Specifications or any terms of the Contract Documents, or orders for extra work, or changes by altering or adding to the work, or which will change the design concept, may be affected only with the prior written approval of HUD under such conditions as HUD may establish.

Article 2 - Time

A. The work to be performed under this Contract shall be commenced within _____ days of this Agreement, and shall be completed by _____, 20____. The time by which the work shall be completed may be extended in accordance with the terms of the said AIA General Conditions only with the prior written approval of HUD.

B. The Contractor shall correct any defects due to faulty materials or workmanship which appear within one year from the date of final completion.

C. If the work is not brought to final completion in accordance with the Drawings and Specifications, including any authorized changes, by the date specified above, or by such date to which the contract time may be extended, the sum stated in Article 3A below shall be reduced by the actual cost of taxes and insurance, as approved by HUD, for the period from the scheduled date of completion through the date construction was actually completed, shall be determined. This cost shall be reduced by an amount equal to the project's net operating income (as determined by HUD) for the period upon which the aforementioned actual costs are based.

D. The Owner and Contractor may amend this contract prior to initial endorsement, in a form prescribed by the Commissioner, to provide for an incentive payment to the Contractor, which will result in an increase in the contract sum stated in Article 3A below, if the work is completed before the date specified in this contract. The Contractor will not be entitled to any incentive payment resulting

from early completion if HUD determines that the Contractor's cost certification, if required by Article 7, is fraudulent or materially misrepresents the Contractor's actual cost of construction.

E. The date of final completion shall be the date the HUD representative signs the final HUD Representative's Trip Report provided that the trip report is subsequently endorsed by the Chief Architect.

Article 3 – Contract Sum and Payments

A. The Owner shall pay the Contractor for the performance of the Contract, as hereinafter provided, the sum of \$ _____

B. Each month after the commencement of work hereunder, the Contractor shall make a monthly request on Form HUD 92448 for payment by the Owner for work done during the preceding month. Each request for payment shall be filed at least _____ days before the date payment is desired. Subject to the approval of HUD, the Contractor shall be entitled to payment thereon in an amount equal to (1) the total value of classes of the work acceptably complete; plus (2) the value of materials and equipment not incorporated in the work, but delivered to and suitably stored at the site; plus (3) the value of components stored off-site in compliance with applicable HUD requirements less (4) 10 percent holdback and less prior payments. The "values" of (1), (2) and (3) shall be computed in accordance with the amounts assigned to classes of the work in the "Contractor's and/or Mortgager's Cost Breakdown," attached hereto as Exhibit "A". The Contractor agrees that no materials or equipment required by the Specifications will be purchased under a conditional sale contract or with the use of any security agreement or the vendor's title or lien retention instrument.

C. The balance due the Contractor hereunder shall be payable upon the expiration of 30 days after the work hereunder is fully complete, provided the following have occurred:

(1) All work hereunder requiring inspection by municipal or other governmental authorities having jurisdiction has been inspected and approved by such authorities and by the rating or inspection organization, bureau, association or office having jurisdiction;

(2) All certificates of occupancy, or other approvals, with respect to all units of the project have been issued by State or local governmental authorities having jurisdiction; and

(3) Permission(s) To Occupy (Form HUD-92485) for all units of the project have been issued by HUD.

D. With its final application for payment by the Owner, the Contractor shall disclose, on a form prescribed by HUD, all unpaid obligations contracted in connection with the work performed under this Contract. The Contractor agrees that, within 15 days following receipt of final payment, it will pay such obligations in cash and furnish satisfactory evidence of such payment to the Owner.

Article 4 – Receipts and Releases of Liens

The Owner may require the Contractor to attach to each request for payment its acknowledgement of payment and all subcontractors' and material supplier's acknowledgements of payment for work done and materials, equipment and fixtures furnished through the date covered by the previous payment. Concurrently with the final payment, the Owner may require the Contractor to obtain similar waivers or releases from all subcontractors and material suppliers.

Article 5 – Requirements of Contractor

A. The Contractor shall furnish, at its own expense, all building and

other permits, licenses, tools, equipment and temporary structures necessary for the construction of the project. The Contractor shall give all required notices and shall comply with all applicable codes, laws, ordinances, rules and regulations, and protective covenants, and with the current regulations of the National Board of Fire Underwriters, wherever applicable. The Contractor further shall comply with the provisions of the Occupational Safety and Health Act of 1970. The Contractor shall immediately notify HUD of the delivery of all permits, licenses, certificates of inspection, certificates of occupancy, and any other such certificates and instruments required by law, regardless of to whom issued, and shall cause them to be displayed to HUD upon request.

B. If the Contractor observes that the Drawings and Specifications are at variance with any applicable codes, laws, ordinances, rules or regulations, or protective covenants, it shall promptly notify the Architect in writing, and any necessary changes shall be made as provided in this Contract for changes in the Drawings and Specifications. If the Contractor performs any work knowing it to be contrary to such codes, laws, ordinances, rules or regulations, or protective covenants, without giving such notice to the Architect, it shall bear all cost arising therefrom.

C. Upon completion of construction, the Contractor shall furnish to the Owner a survey showing the location on the site of all improvements constructed thereon, and showing the location of all water, sewer, gas and electric lines and mains, and of all existing utility easements. Such survey shall be prepared by a licensed surveyor who shall certify that the work is installed and erected entirely upon the land covered by the mortgage and within any building restriction lines on said land, and does not overhang or otherwise encroach upon any easement or right-of-way of others. In addition, the Contractor shall furnish additional surveys when required by the Owner for any improvements, including structures and utilities, not theretofore located on a survey. The Contractor shall furnish copies of such survey required hereunder for HUD.

D. The Contractor shall assume full responsibility for the maintenance of all landscaping which may be required by the Drawings and Specifications until such time as both parties to this Contract shall receive written notice from HUD that such landscaping has been finally completed. The Owner hereby agrees to make available to the Contractor, for such purpose, without cost to the latter, such facilities as water, hose and sprinkler.

Article 6 – Assurance of Completion

The Contractor shall furnish to the Owner assurance of completion of the work in the form of (specify) _____

Such assurance of completion shall run to the Owner and HUD as obligees.

Article 7 – Cost Certification

An identity of interest between the Owner and the Contractor is prohibited. In the event HUD determines that there is an identity of interest between the Owner and the Contractor, the Contractor shall certify on a form prescribed by HUD, its cost incurred in the performance of work under this Contract.

Article 8 – Right of Entry and Interpretation

A. HUD, its agents or assigns, at all times during construction, has the right of entry and free access to the project and the right to inspect all work done and materials, equipment and fixtures furnished, installed or stored in and about the project. For such purpose, the Contractor shall furnish such enclosed working space as HUD may require and find acceptable as to location, size, accommodations and furnishings.

B. HUD shall also have the right to interpret the Contract Documents and to determine compliance therewith.

Article 9 – Assignments, Subcontracts and Termination

A. This Contract shall not be assignable by either party without prior written consent of the other party and HUD, except that the Owner may assign the Contract, or any rights hereunder, to HUD.

B. The Contractor shall not subcontract all of the work to be performed hereunder without the prior written consent of the Owner and HUD.

C. Upon request by the Owner, or HUD, the Contractor shall disclose the names of all persons with whom it has contracted or will contract with respect to work to be done and materials and equipment to be furnished hereunder.

D. The Contractor understands that the work under this contract is to be financed by a capital advance to be secured by a mortgage and subject to the terms of a Capital Advance Agreement between the Owner and HUD.

The Contractor further understands that said Capital Advance Agreement provides that in the event of the failure of the Owner to perform its obligations to HUD thereunder, HUD may, as attorney-in-fact for the Owner, undertake the completion of the project in accordance with this Contract. In the event HUD elects not to undertake such completion, the Contractor's obligations under this Contract shall terminate.

In Witness Whereof, the parties to these presents have executed this contract in six (6) counterparts, each of which shall be deemed an original, in the year and day first above mentioned.

(Seal) Attest:	Owner
Witness	By
Witness	Title

(Seal)	Contractor
Witness	By
Witness	Title

Note: If Contractor or Owner is a corporation, Secretary should attest.

Contractor's and/or Mortgagor's Cost Breakdown

U.S. Department of Housing and
Urban Development
Office of Housing
Federal Housing Commissioner

OMB No. 2502-0044 (exp. 12/31/2009)

Schedules of Values

Public reporting burden for this collection of information is estimated to average 4 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. This information is required to obtain benefits. HUD may not collect this information, and you are not required to complete this form, unless it displays a currently valid OMB Control Number.

Section 227 of the National Housing Act (Section 126 of the Housing Act of 1954, Public Law 560, 12 U.S.C., 1715r), authorizes the collection of this information. The information is required for a general contractor when an identity of interest exists between the general contractor and the mortgagor or when the mortgagor is a non-profit entity and a cost plus contract has been used. The information is used by HUD to facilitate the advances of mortgage proceeds and their monitoring.

Privacy Act Notice. The United States Department of Housing and Urban Development, Federal Housing Administration, is authorized to solicit the information requested in this form by virtue of Title 12, United States Code, Section 1701 et seq., and regulations promulgated thereunder at Title 12, Code of Federal Regulations. While no assurances of confidentiality is pledged to respondents, HUD generally discloses this data only in response to a Freedom of Information request.

Date	Sponsor		
Project No.	Building Identification		
Name of Project			Location

This form represents the Contractors and/or Mortgagors firm costs and services as a basis for disbursing dollar amounts when insured advances are requested. Detailed instructions for completing this form are included on the reverse side.

Line	Div.	Trade Item	Cost	Trade Description
1	3	Concrete		
2	4	Masonry		
3	5	Metals		
4	6	Rough Carpentry		
5	6	Finish Carpentry		
6	7	Waterproofing		
7	7	Insulation		
8	7	Roofing		
9	7	Sheet Metal		
10	8	Doors		
11	8	Windows		
12	8	Glass		
13	9	Lath and Plaster		
14	9	Drywall		
15	9	Tile Work		
16	9	Acoustical		
17	9	Wood Flooring		
18	9	Resilient Flooring		
19	9	Painting and Decorating		
20	10	Specialties		
21	11	Special Equipment		
22	11	Cabinets		
23	11	Appliances		
24	12	Blinds and Shades, Artwork		
25	12	Carpets		
26	13	Special Construction		
27	14	Elevators		
28	15	Plumbing and Hot Water		
29	15	Heat and Ventilation		
30	15	Air Conditioning		
31	16	Electrical		
32		Subtotal (Structures)		
33		Accessory Structures		
34		Total (Lines 32 and 33)		

Line	Div.	Trade Item	Cost	Trade Description			
35	2	Earth Work					
36	2	Site Utilities					
37	2	Roads and Walks					
38	2	Site Improvements					
39	2	Lawns and Planting					
40	2	Unusual Site Condition		Nonresidential and Special Exterior Land Improvement (costs included in trade item breakdown)		Offsite Costs (costs not included in trade item breakdown)	
41		Total Land Improvements		Description	Est. Cost	Description	Est. Cost
42		Total Struct. & Land Imprvts.					
43	1	General Requirements					
44		Subtotal (Lines 42 and 43)					
45		Builder's Overhead					
46		Builder's Profit		Total \$			
47		Subtotal (Lines 44 thru 46)		Other Fees		Total \$	
48				Demolition (costs not included in trade item breakdown)			
49		Other Fees				Description	Est. Cost
50		Bond Premium					
51		Total for All Improvements					
52		Builder's Profit Paid by Means Other Than Cash					
53		Total for All Improvements Less Line 52		Total \$		Total \$	

I hereby certify that all the information stated herein, as well as any information provided in the accompaniment herewith, is true and accurate.

Warning: HUD will prosecute false claims and statements. Conviction may result in criminal and/or civil penalties. (18 U.S.C. 1001, 1010, 1012; 31 U.S.C. 3729, 3802)

Mortgagor	By	Date	
Contractor	By	Date	
FHA (Processing Analyst)	Date	FHA (Chief, Cost Branch or Cost Analyst)	Date
FHA (Chief Underwriter)		Date	

Instructions for Completing Form HUD-2328

This form is prepared by the contractor and/or mortgagor as a requirement for the issuance of a firm commitment. The firm replacement cost of the project also serves as a basis for the disbursement of dollar amounts when insured advances are requested. A detailed breakdown of trade items is provided along with spaces to enter dollar amounts and trade descriptions.

A separate form is prepared through line 32 for each **structure type**. A summation of these structure costs are entered on line 32 of a master form. Land improvements, General Requirements and Fees are completed through line 53 on the master 2328 **only**.

Date—Date form was prepared.

Sponsor—Name of sponsor or sponsoring organization.

Project No.—Eight-digit assigned project number.

Building Identification—Number(s) or Letter(s) of each building as designated on plans.

Name of Project—Sponsors designated name of project.

Location—Street address, city and state.

Division—Division numbers and trade items have been developed from the cost accounting section of the uniform system.

Accessory Structures—This item reflects structures, such as: community, storage, maintenance, mechanical, laundry and project office buildings. Also included are garages and carports or other buildings.

When the amount shown on line 33 is \$20,000.00 or 2% of line 32 whichever is the lesser, a separate form HUD-2328 will be prepared through line 32 for Accessory Structures.

Unusual Site Conditions—This trade item reflects rock excavation, high water table, excessive cut and fill, retaining walls, erosion, poor drainage and other on-site conditions considered unusual.

Cost—Enter the cost being submitted by the Contractor or bids submitted by a qualified subcontractor for each trade item. These costs will include, as a minimum, prevailing wage rates as determined by the Secretary of Labor.

Trade Description—Enter a brief description of the work included in each trade item.

Other Fees—Includable are fees to be paid by the Contractor, such as sewer tap fees not included in the plumbing contract. Fees paid or to be paid by the Mortgagor are not to be included on this form.

Total For All Improvements—This is the sum of lines 1 through 50 and is to include the total builder's profit (line 46).

Line 52—When applicable, enter that portion of the builder's profit (line 46) to be paid by means other than cash and/or any part of the builder's profit to be waived during construction.

Non-Residential and Special Exterior Land Improvement Costs—Describe and enter the cost of each improvement, i.e. on-site parking facilities including individual garages and carports, commercial facilities, swimming pools with related facilities and on-site features provided to enhance the environment and livability of the project and the neighborhood. The Design Representative and Cost Analyst shall collaborate with the mortgagor or his representative in designating the items to be included.

Off-Site Costs—Enter description and dollar amount including fees and bond premium for off-site improvements.

Demolition—Enter description and dollar amount of demolition work necessary to condition site for building improvements including the removal of existing structures, foundations, utilities, etc.

Other Fees—Enter a brief description of item involved and cost estimate for each item.

Signatures—Enter the firm name, signature of authorized officer of the contractor and/or mortgagor and date the form was completed.

Payment Bond

U.S. Department of Housing
and Urban Development
Office of Housing
Federal Housing Commissioner

OMB Approval No. 2502-0470
(Expires 8/31/2013)

(This Bond is issued simultaneously with Performance Bond in favor of Owner conditioned on the full and faithful performance of the contract)

Project Number: _____

Know All Men By These Presents, **that we,** _____ of _____

as Principal, (hereinafter called the Principal) and _____

_____, a _____ as

Surety, (hereinafter called the Surety) are held and firmly bound unto _____

as Obligee, (hereinafter called the "Owner"), for the use and benefit of claimants as hereinafter defined, in the sum of

_____ Dollars \$ _____, lawful money of the United States of America,

for the payment of which Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

Whereas, Principal has entered into a Construction Contract dated _____ with Owner for the construction of a Housing Project designated as _____ a copy of which Construction Contract is by reference made a part hereof; and is hereinafter referred to as the Contract.

Now, therefore, the conditions of this obligation is such that, if Principal shall promptly make payment to all claimants as hereinafter defined, for all labor and material used or reasonably required for use in the performance of the Contract, then this obligation shall be void; otherwise it shall remain in full force and effect, subject, however, to the following conditions:

1. A Claimant is defined as one having a direct contract with the Principal or with a subcontractor of the Principal for labor, material, or both, used or reasonably required for use in the performance of the contract, labor and material being construed to include that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental of equipment directly applicable to the Contract.

2. The above name Principal and Surety hereby jointly and severally agree with the Owner that every claimant as herein defined, who has not been paid in full before the expiration of a period of ninety (90) days after the date on which the last of such claimant's work or labor was done or performed, or materials were furnished by such claimant, may sue on this bond for the use of such claimant, prosecute the suit to final judgment for such sum or sums as may be justly due claimant, and have execution thereon. The Owner shall not be liable for the payment of any costs or expenses of any such suit.

3. No suit or action shall be commenced hereunder by any claimant:

a) Unless claimant, other than one having direct contract with the Principal, shall have given written notice to any two of the following: The Principal, the Owner, or the Surety above named,

within ninety (90) days after such claimant did or performed the last of the work or labor, or furnished the last of the materials for which said claim is made, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were furnished, or for whom the work or labor was done or performed. Such notice shall be served by mailing the same by registered mail or certified mail, postage prepaid, in an envelope addressed to the Principal, Owner or Surety, at any place where an office is regularly maintained for the transaction of business, or served in any manner in which legal process may be served in the state in which the aforesaid project is located, save that such service need not be made by a public officer.

b) After the expiration of one (1) year following the date on which Principal ceased work on said Contract, it being understood, however, that if any limitation embodied in this bond is prohibited by any law controlling the construction hereof, such limitation shall be deemed to be amended so as to be equal to the minimum period of limitation permitted by such law.

c) Other than in a state court of competent jurisdiction in and for the county or other political subdivision of the state in which the project, or any part thereof, is situated, or in the United States District Court for the district in which the project, or any part thereof, is situated, and not elsewhere.

4. The amount of this bond shall be reduced by and to the extent of any payment or payments made in good faith hereunder, inclusive of the payment by Surety of mechanics' liens which may be filed of record against said improvement, whether or not claim for the amount of such lien be presented under and against this bond.

Signed and Sealed this _____ day of _____, 20_____.

Witness as to Principal: _____ (Seal)

(Principal)

By: _____

By: _____ (Surety)

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. HUD may not collect this information, and you are not required to complete this form, unless it displays a currently valid OMB control number.

This information collection is necessary to ensure that viable projects are developed. It is important to obtain information from applicants to assist HUD in determining if nonprofit organizations initially funded continue to have the financial and administrative capacity needed to develop a project and that the project design meets the needs of the residents. The Department will use this information to determine if the project meets statutory requirements with respect to the development and operation of the project, as well as ensuring the continued marketability of the projects. This information is required in order to obtain benefits. This information is considered non-sensitive and no assurance of confidentiality is provided.

\$ _____

(Surety)

PAYMENT BOND

No. _____

On Behalf of

To

Date _____, 20 _____

Expires _____, 20 _____

GENERAL DECISION: MA20100004 11/26/2010 MA4

Date: November 26, 2010

General Decision Number: MA20100004 11/26/2010

Superseded General Decision Number: MA20080004

State: Massachusetts

Construction Type: Residential

Counties: Barnstable, Berkshire, Bristol, Essex, Hampden, Hampshire, Middlesex, Norfolk, Plymouth, Suffolk and Worcester Counties in Massachusetts.

RESIDENTIAL CONSTRUCTION PROJECTS (including single family homes and apartments up to and including 4 stories)

Modification Number	Publication Date
0	03/12/2010
1	03/19/2010
2	03/26/2010
3	04/02/2010
4	04/16/2010
5	04/23/2010
6	05/07/2010
7	05/14/2010
8	06/04/2010
9	07/09/2010
10	07/23/2010
11	08/06/2010
12	08/20/2010
13	08/27/2010
14	09/03/2010
15	10/08/2010
16	10/22/2010
17	11/26/2010

BRMA0001-026 03/01/2010

LOWELL CHAPTER

MIDDLESEX COUNTY (Acton, Asby, Ashland, Ayer, Bedford, Billerica, Boxboro, Carlisle, Chemsford, Dracut, Dunstable, Framingham, Ft. Devens, Groton, Holliston, Hopkinton, Hudson, Littleton, Lowell, Maynard, Natick, North Acton, Pepperell, Sherborn, Shirley, South Acton, Stow, Tewksbury, Townsend, Tyngsboro, West Acton, Westford, Wilmington) NORFOLK (Medfield, Medway, Mills) WORCESTER (Ashburnham, Athol, Fitchburg, Gardner, Harvard, Hopedale, Hubbardston, Lancaster, Leominster, Lunenburg, Milford, Petersham, Phillipston, Princeton, Royalston, Southboro, Sterling, Templeton, Westminster, Winchendon)

	Rates	Fringes
Bricklayer, Plasterer, Stonemason.....	\$ 43.86	24.15

BRMA0001-027 03/01/2010

SPRINGFIELD/PITTSFIELD CHAPTER
BERKSHIRE, HAMPDEN, HAMPSHIRE, WORCESTER (Warren) COUNTIES

	Rates	Fringes
Bricklayer, Plasterers, Stonemasons, Tile Layers.....	\$ 33.75	22.42

BRMA0001-028 03/01/2010

FOXBORO CHAPTER
BRISTOL (Attleboro, Berkley, Dighton, Mansfield, North
Attleboro, Norton, Raynham, Rehoboth, Seekonk, Taunton) NORFOLK
(Bellingham, Canton, Dedham, Foxboro, Franklin, Norfolk,
Norwood, Plainville, Sharon, Walpole, Westwood, Wrentham)
PLYMOUTH (Lakeville)

	Rates	Fringes
BRICKLAYER.....	\$ 43.86	24.15

BRMA0001-029 03/01/2010

WORCESTER CHAPTER
(Auburn, Barre, Blackstone, Berlin, Bolton, Boylston,
Brookfield, Charlton, Clinton, Douglas, Dudley, Grafton,
hardwick, Holden, Leicester, Mendon, Millbury, Millville, New
Braintree, Northboro, Northbridge, Oakham, Oxford, Paxton,
Rutland, Shrewbury, Southbridge, Spencer, Sturbridge, Sutton,
Upton, Uxbridge, Webster, Westboro, West Boylston, Worcester)

	Rates	Fringes
Bricklayer, Plasterer, Stonemason.....	\$ 43.86	24.15

BRMA0003-026 02/01/2010

BOSTON CHAPTER
MIDDLESEX (Arlington, Cambridge, Everett, Malden, Medford,
Melrose, Somerville) NORFOLK (Brookline, Milton) SUFFOLK

	Rates	Fringes
BRICKLAYER.....	\$ 44.61	23.84

BRMA0003-027 02/01/2010

LYNN CHAPTER
ESSEX (Amesbury, Andover, Beverly, Boxford, Danvers, Essex,
Georgetown, Gloucester, Groveland, Hamilton, Haverhill,
Ipswich, Lawrence, Lynn, Lynnfield, Manchester, Nahant,
Newbury, Newburyport, North Andover, Peabody, Rockport, Rowley,
Salisbury, Salem, Saugus, Swampscott, Topsfield, Wakefield,
Wenham, West Newbury) MIDDLESEX (Reading, North Reading,
Wakefield)

	Rates	Fringes
Bricklayer, Plasterer.....	\$ 44.61	23.84

BRMA0003-028 02/01/2010

NEWTON CHAPTER
MIDDLESEX (Newton); NORFOLK (Dover, Needham, Wellesley)

	Rates	Fringes
Bricklayer, Plasterer.....	\$ 44.61	23.84

BRMA0003-029 02/01/2010

NEW BEDFORD CHAPTER
BARNSTABLE, BRISTOL (Acushnet, Darmouth, Fairhave, Fall River, Freetown, New Bedford, Somerset, Swansea, Westport) PLYMOUTH (Marion, Mattapoisett, Rochester, Wareham)

	Rates	Fringes
BRICKLAYER.....	\$ 44.61	23.84

BRMA0003-030 02/01/2010

QUINCY CHAPTER
NORFOLK (Avon, Braintree, Cohasset, Holbrook, Quincy, Randolph, Stoughton, Weymouth) PLYMOUTH (Abington, Bridgewater, Brockton, Carver, Duxbury, East Bridgewater, Halifax, hanover, Hanson, Hingham, Hull, Kingston, Marshfield, Middleboro, Norwell, Pembroke, Plymouth, Rockland, Scituate, West Bridgewater, Whitman)

	Rates	Fringes
Bricklayer, Plasterer.....	\$ 44.61	23.84

BRMA0003-031 02/01/2010

WALTHAM CHAPTER
MIDDLESEX (Belmont, Burlington, Concord, Lixington, Lincoln, Stoneham, Sudbury, Waltham, Watertown, Wayland, Weston, Winchester, Woburn)

	Rates	Fringes
Bricklayer, Plasterer.....	\$ 44.61	23.84

BRMA0003-032 02/01/2010

BARNSTABLE, BRISTOL, SUFFOLK AND WORCESTER

	Rates	Fringes
Tile Layer.....	\$ 44.65	23.62

CARP0026-007 03/01/2010

BRISTOL (Attleborough, North Attleborough) ESSEX, MIDDLESEX (Except Belmont, Cambridge, Everett, Malden, Medford, Somerville) NORFOLK (Bellingham, Canton, Foxboro, Franklin, Medfield, Medway, Millis, Needham, Norfolk, Norwood, Plainville, Quincy, Sharon, Walpole, Wellesley, Westwood, Wrentham) and PLYMOUTH (Duxbury, Hanover, Hingham, Hull, Marshfield, Norwell, Pembroke, Rockland and Scituate)

	Rates	Fringes
Carpenters (Including Drywall Hanging & Acoustical Ceiling Installation).....	\$ 31.73	23.56

CARP0033-006 03/01/2010

MIDDLESEX (Belmont, Cambridge, Everett, Malden, Medford,
Somerville) NORFOLK (Brookline, Dedham, Milton) and SUFFOLK

	Rates	Fringes
Carpenters (Including Drywall Hanging & Acoustical Ceiling Installation).....	\$ 37.03	24.94

CARP0107-011 03/01/2010

WORCESTER COUNTY
(except Gilbertville, Hardwick, Warren, West Brookfield)

	Rates	Fringes
Carpenters (Including Drywall Hanging & Acoustical Ceiling Installation).....	\$ 31.73	23.56

CARP0108-012 10/05/2009

BERKSHIRE, HAMPDEN, HAMPSHIRE AND WORCESTER (Gilbertville,
Hardwick, Warren, West Brookfield)

	Rates	Fringes
Carpenters (Including Drywall Hanging & Acoustical Ceiling Installation).....	\$ 28.36	18.48

CARP0624-008 03/01/2010

BARNSTABLE, BRISTOL (Except Attleboro and North Attleboro) AND
PLYMOUTH (Bridgewater, Brockton, Kingston, Lakeville,
Middleboro, Plymouth, South Hanover, Whitman)

	Rates	Fringes
Carpenters (Including Drywall Hanging & Acoustical Ceiling Installation).....	\$ 31.73	23.56

CARP0723-001 09/01/2009

ZONE 2
BARNSTABLE, BERKSHIRE, BRISTOL, ESSEX, HAMPDEN, HAMPSHIRE,
PLYMOUTH and WORCESTER COUNTIES
(All other cities and towns in Massachusetts)

	Rates	Fringes
CARPENTER (New Wood Frame Construction not exceeding 4		

stories including basement).....\$ 23.96 12.17

 CARP0723-002 09/01/2009

ZONE 1

MIDDLESEX, NORFOLK AND SUFFOLK COUNTIES (Consists of Arlington, Belmont, Boston, Braintree, Brookline, Cambridge, Chelsea, Dedham, Everett, Malden, Medford, Milton, Newton, Quincy, Revere, Somerville, Waltham, Watertown, and Winthrop)

Rates Fringes

Carpenters (New Wood Frame Construction not exceeding 4 stories including basement).....\$ 27.21 12.17

 ELEC0007-008 01/01/2010

HAMPDEN (Except Chester and Holyoke); HAMPSHIRE (Belchertown, Ware); WORCESTER (Warren)

Rates Fringes

ELECTRICIAN.....\$ 32.41 16.42

 ELEC0007-009 06/01/2010

BERKSHIRE; HAMPDEN (Chester, Holyoke); HAMPSHIRE (Except Belchertown, Ware)

Rates Fringes

ELECTRICIAN.....\$ 32.41 16.42
 Teledata System Installer (Berkshire County).....\$ 21.44 13.59

 ELEC0096-004 06/01/2010

MIDDLESEX (Ashby, Ashland, Ayer, Ft. Devens, Groton, Hopkinton, Hudson, Marlboro, Pepperell, Shirley, Stow, Townsend); WORCESTER (Except Warren)

Rates Fringes

ELECTRICIAN.....\$ 35.91 17.58
 Teledata System Installer.....\$ 26.91 14.31

 ELEC0099-005 06/01/2010

BRISTOL (North & South Attleboro, Seekonk)

Rates Fringes

ELECTRICIAN.....\$ 25.56 6.68%+11.47

 ELEC0103-002 09/01/2010

ESSEX (Amesbury, Andover, Boxford, Georgetown, Groveland, Haverhill, Lawrence, Merrimac, Methuen, Newbury, Newburyport, North Andover, Rowley, Salisbury, West Newbury); MIDDLESEX (Bedford, Billerica, Boxboro, Burlington, Carlisle, Chelmsford, Dracut, Dunstable littleton, Lowell, North Reading, Tewksbury,

Tyngsboro, Westford, Wilmington)

	Rates	Fringes
ELECTRICIAN.....	\$ 41.45	26.05

 ELEC0103-004 09/01/2010

ESSEX (Beverly, Danvers, Essex, Gloucester, Hamilton, Ipswich, Manchester, Marblehead, Middleton, Peabody, Rockport, Salem, Topsfield, Wenham)

	Rates	Fringes
ELECTRICIAN.....	\$ 41.45	26.05

 ELEC0103-010 09/01/2010

ESSEX (Lynn, Lynnfield, Nahant, Saugus, Swampscott); MIDDLESEX (Acton, Arlington, Belmont, Cambridge, Concord, Everett, Framingham, Holliston, Lexington, Lincoln, Malden, Maynard, Medford, Melrose, Natick, Newton, Reading, Sherborn, Somerville, Stoneham, Sudbury, Wakefield, Waltham, Watertown, Wayland, Weston, Winchester, Woburn); NORFOLK (Bellingham, Braintree, Brookline, Canton, Coahasset, Dedham, Dover, Foxboro, Franklin, Medfield, Medway, Millis, Milton, Needham, Norfolk, Norwood, Quincy, Sharon, Walpole, Wellesley, Westwood, Weymouth, Wrentham); PLYMOUTH (Hingham and Hull); SUFFOLK

	Rates	Fringes
ELECTRICIAN.....	\$ 41.45	26.05

Teledata System Installer
 (ESSEX; MIDDLESEX {Excluding
 Ashby, Ashland, Ayer, Ft.
 Devens, Groton, Hokinton,
 Hudson, Marlboro, Pepperell,
 Shirley, Stow, Townsend;
 NORFOLK {Excluding Avon,
 Holbrook, Plainville,
 Randolph, Stoughton; SUFFOLK)...\$ 31.09

24.30

 ELEC0223-011 09/01/2010

BARNSTABLE, BRISTOL (Except Attleboro, North Attleboro, Seekonk); NORFOLK (Avon, Halbrook, Randolph, Sloughton); PLYMOUTH (Except Hingham and Hull Townships)

	Rates	Fringes
ELECTRICIAN.....	\$ 34.74	18.31

Teledata System Installer
 (PLYMOUTH COUNTY (except
 Townships of Hingham and
 Hull)).....\$ 29.53

16.65

 ELEV0004-003 01/01/2010

BARNSTABLE, BRISTOL, ESSEX, MIDDLESEX, NORFOLK AND SUFFOLK

Rates	Fringes
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ELEVATOR MECHANIC.....\$ 48.43 20.035+a

a. FOOTNOTE FOR ELEVATOR MECHANICS

Employer contributes 8% of basic hourly rate for 5 years or more of service and 6% for 6 months to 5 years of service asvacation pay.

Eight (8) Paid Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Veteran's Day, Thanksgiving Day, the Friday after Thanksgiving Day and Christmas Day

ELEV0041-007 01/01/2010

BERKSHIRE, HAMPDEN AND HAMPSHIRE

 Rates Fringes

ELEVATOR MECHANIC.....\$ 43.35 20.035+a

FOOTNOTES:

a. Employer contributes 8% of regular basic hourly rate as vacation pay credit for employees with more than 5 years of service; and 6% for 6 months to 5 years of service.

8 Paid Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Veteran's Day, Thanksgiving Day and Christmas Day

ENGI0004-017 12/01/2009

BARNSTABLE; BRISTOL; ESSEX; MIDDLESEX, NORFOLK; PLYMOUTH; SUFFOLK; and WORCESTER (Remainder of County)

 Rates Fringes

Power Equipment Operator:
Excavators & Loaders.....\$ 38.48 20.84+A

FOOTNOTE:

a. PAID HOLIDAYS: New Year's Day, Washington's Birthday, Labor Day, Memorial day, Independence Day, Patriot's Day, Columbus Day, Veteran's Day, Thanksgiving Day and Christmas Day.

ENGI0004-018 12/01/2009

WORCESTER (Athol, Barre, Brookfield, East Brookfield, hardwick, New Braintree, North Brookfield, Oakham, Petersham, Phillipston, Royalston, Struthbridge, Templeton, Warren, West Brookfield, Winchendon)

 Rates Fringes

Power Equipment Operator:
Excavators & Loaders.....\$ 32.69 20.84+A

FOOTNOTES:

a. New Year's Day, Washington's Birthday, Memborial Day, Independence Day, Labor Day, Patriots Day, Columbus Day, Veteran's Day, Thanksgiving Day and Christmas Day.

 ENGI0098-012 12/01/2009

BERKSHIRE; HAMPDEN and HAMPSHIRE COUNTIES

	Rates	Fringes
Power Equipment Operator: Excavators & Loaders.....	\$ 29.12	16.52+A

FOOTNOTE:

a. PAID HOLIDAYS: New Year's Day, Washington's Birthday,
 Memorial Day, Independence Day, Labor Day, Columbus Day,
 Veteran's Day, Thanksgiving Day and Christmas Day

 LABO0022-014 06/01/2010

	Rates	Fringes
Laborers: Mason Tender, Stone/Stucco.....	\$ 27.85	17.35

 LABO0473-003 06/01/2010

BERKSHIRE, HAMPSHIRE (Chesterfield, Cummington, Goshen,
 Middlefield, Plainfield and Worthington)

	Rates	Fringes
Laborers: Mason Tender, Stone/Stucco.....	\$ 17.80	15.25

 LABO0596-007 06/01/2010

HAMPDEN, HAMPSHIRE (except Chesterfield, Cummington, Goshen,
 Middlefield, Plainfield and Worthington)

	Rates	Fringes
Laborers: Mason Tender, Stone/Stucco.....	\$ 24.69	15.78

 PLAS0534-006 07/01/2010

MIDDLESEX; NORFOLK AND SUFFOLK COUNTIES

	Rates	Fringes
PLASTERER.....	\$ 35.00	27.91

 PLUM0004-006 09/01/2010

MIDDLESEX (Ashby, Ayer-West of Greenville branch of Boston and
 Maine Railroad, Ft. Devens, Groton, Shirley, Townsend)
 WORCESTER (except Hopedale and Southboro)

	Rates	Fringes
Plumbers, Pipefitters (including HVAC work).....	\$ 38.54	22.83

PLUM0012-008 09/01/2010

ESSEX (Lynn, Lynnfield, Nahant, Saugus, Swampscott); MIDDLESEX (Acton, Arlington, Ashland, Ayer-except west of Greenville Branch of Boston & Maine Rail Road, Bedford, Belmont, Billerica, Boxboro, Burlington, Cambridge, Carlisle, Chelmsford, Concord, Dracut, Dunstable, Everett, Framingham, Hudson, Holliston, Hopkinton, Lexington, Lincoln, Littleton, Lowell, Malden, Marlboro, Maynard, Medford, Melrose, Natick, Newton, North Reading, Pepperell, Reading, Sherborn, Somerville, Stoneham, Stow, Sudbury, Tewksbury, Tyngsboro, Wakefield, Waltham, Watertown, Wayland, Westford, Wilmington, Winchester, Woburn); NORFOLK (Bellingham, Braintree, Brookline, Canton, Cohasset, Dedham, Dover, Foxboro, Franklin, Medfield, Medway, Millis, Milton, Needham, Norfolk, Norwood, Plainville, Quincy, Sharon, Walpole, Wellesley, Westwood, Weymouth, Wrentham); PLYMOUTH (Hingham, Hull, Scituate); SUFFOLK; WORCESTER (Hopedale and Southboro)

	Rates	Fringes
PLUMBER.....	\$ 45.22	22.98

PLUM0051-006 03/01/2010

BARNstable; BRISTOL; PLYMOUTH (Except Hingham, Hull, Scituate)

	Rates	Fringes
Plumbers, Pipefitters (including HVAC work).....	\$ 34.36	24.47

PLUM0104-005 09/17/2010

BERKSHIRE (Becket, Otis, Sandisfield); HAMPDEN; HAMPSHIRE

	Rates	Fringes
Plumbers, Pipefitters (including HVAC work).....	\$ 34.36	21.25

PLUM0104-011 09/17/2010

BERKSHIRE (Except Becket, Otis, Sandisfield)

	Rates	Fringes
Plumbers, Pipefitters (including HVAC work).....	\$ 32.83	21.25

PLUM0138-003 04/01/2010

ESSEX (Ames, Andover, Beverly, Boxford, Byfield, Danvers, Essex, Georgetown, Gloucester, Groveland, hamilton, Haverhill, Ipswich, Lawrence, Manchester, Marblehead, Merrimac, Methuen, Middleton, Newbury, Newburyport, North Andover, Peabody, Rockport, Rowley, Salem, Salisbury, Topsfield, Wenham, West Newbury)

	Rates	Fringes
Plumbers, Pipefitters		

(including HVAC work).....\$ 41.14 22.98

* PLUM0537-006 09/01/2010

PLYMOUTH (Hingham, Hull, Scituate)

	Rates	Fringes
Pipefitter including HVAC work...	\$ 46.09	23.31

ROOF0033-006 08/01/2009

BARNSTABLE, BRISTOL, ESSEX, MIDDLESEX, NORFOLK, SUFFOLK, WORCESTER

	Rates	Fringes
Rofer, Waterproofers/Caulkers...	\$ 34.56	19.87

ROOF0248-004 07/16/2010

BERKSHIRE, HAMPDEN, HAMPSHIRE

	Rates	Fringes
Rofer, Waterproofers/Caulkers...	\$ 25.90	18.56
ROOFER: Slate & Tile Roof.....	\$ 26.40	19.06

SHEE0017-004 04/01/2010

WORCESTER (Harvard, Lancaster)

	Rates	Fringes
Sheet metal worker.....	\$ 39.37	27.65

SHEE0017-010 04/01/2010

BARNSTABLE, BRISTOL (Acushnet, Dartmouth, Dighton, Fairhaven, Fall River, Freetown, New Bedford, Rehoboth, Seekonk, Somerset, Swansea, Westport); PLYMOUTH (Marion, Mattapoisett, Rochester, Wareham)

	Rates	Fringes
Sheet Metal Worker.....	\$ 32.61	21.90

SHEE0017-011 04/01/2010

BRISTOL (Attleboro, Berkley, Easton, Mansfield, North Attleboro, Norton, Raynham, Taunton); ESSEX; MIDDLESEX; NORFOLK; PLYMOUTH (Except Marion Mattapoisett, Rochester, Wareham); SUFFOLK

	Rates	Fringes
Sheet Metal Worker.....	\$ 39.37	27.65

SHEE0063-002 06/01/2010

WORCESTER (Except Harvard & Lancaster)

	Rates	Fringes
Sheet metal worker.....	\$ 30.19	21.98

SHEE0063-004 06/01/2010

BERKSHIRE, HAMPDEN AND HAMPSHIRE COUNTIES

	Rates	Fringes
Sheet metal worker.....	\$ 30.19	21.98

SUMA2003-001 01/08/2003

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER...	\$ 39.38	
FLOOR LAYER: Carpet.....	\$ 31.96	
LABORER		
Unskilled.....	\$ 18.73	6.33
PAINTER		
Brush & Roller, excluding drywall finishing.....	\$ 30.86	

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.
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Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

In the listing above, the "SU" designation means that rates listed under the identifier do not reflect collectively bargained wage and fringe benefit rates. Other designations indicate unions whose rates have been determined to be prevailing.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- * an existing published wage determination
- * a survey underlying a wage determination
- * a Wage and Hour Division letter setting forth a position on a wage determination matter
- * a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the

Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISION

SECTION 05120 - STRUCTURAL STEEL

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.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Structural steel.
 - 2. Grout.
- B. Related Sections include the following:
 - 1. Division 1 Section "Quality Requirements" for independent testing agency procedures and administrative requirements.
 - 2. Division 5 Section "Metal Fabrications" for miscellaneous steel fabrications not defined as structural steel.

1.3 DEFINITIONS

- A. Structural Steel: Elements of structural-steel frame, as classified by AISC's "Code of Standard Practice for Steel Buildings and Bridges," that support design loads.

1.4 PERFORMANCE REQUIREMENTS

- A. Structural Performance Engineer structural steel connections required by the Contract Documents to be selected or completed by the fabricator to withstand design loading indicated.
- B. Engineering Responsibility: Engage a fabricator to prepare calculations, Shop Drawings and other structural data for structural steel connections.

1.5 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Section.
- B. Product Data: For each type of product specified.

- C. Shop Drawings: Show fabrication of structural-steel components.
 - 1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
 - 2. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
 - 3. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify high –strength bolted slip-critical, direct-tension, or tensioned shear/bearing connections.
 - 4. Include Shop Drawings signed and sealed by the qualified professional engineer responsible for their preparation.

- D. Qualification Data: For firms and persons specified in “Quality Assurance” article to demonstrate their capabilities and experience. Include list of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

- E. Mill Test Reports: Signed by manufacturers certifying that the following products comply with requirements:
 - 1. Structural steel including chemical and physical properties.
 - 2. Bolts, nuts, and washers including mechanical properties and chemical analysis.
 - 3. Direct-tension indicators.
 - 4. Shear stud connectors.
 - 5. Shop primers.
 - 6. Nonshrink grout.

- F. Source quality-control test reports.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer who has completed structural steel work similar in material, design, and extent to that indicated for this project and with a record of successful in-service performance.

- B. Fabricator Qualifications: Engage a firm experienced in fabricating structural steel similar to that indicated for this project and with a record of successful in-service performance as well as sufficient production capacity to fabricate structural steel without delaying the work.

- C. Comply with applicable provisions of the following specifications and documents:
 - 1. AISC's "Seismic Provisions for Structural Steel Buildings."
 - 2. AISC's "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design"
 - 3. AISC's "Specification for Allowable Stress Design of Single-Angle Members."
 - 4. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
 - 5. ASTM A 6 "Specification for General Requirements for Rolled Steel Plates, Shapes, Sheet Piling, and Bars for Structural Use."

- D. Professional Engineer Qualifications: A professional engineer who is legally authorized 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 projects with structural steel framing that are similar to that indicated for this project in material, design and extent.
- E. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code-Steel"
 - 1. Present evidence that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.
- F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver structural steel to Project site in such quantities and at such times to ensure continuity of installation.
- B. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from erosion and deterioration.
 - 1. Store fasteners in a protected place. Clean and relubricate bolts and nuts that become dry or rusty before use.
 - 2. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

1.8 COORDINATION

- A. Furnish anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

- A. W-Shapes: High-Strength, Low-Alloy Columbium-Vanadium Steel: ASTM A 572, Grade 50.
- B. Channels, Angles, Shapes: ASTM A 36, Grade 50.
- C. Plate and Bar: ASTM A 36, Grade 50.
- D. Corrosion-Resisting Structural Steel: ASTM A 588, Grade 50.

- E. Steel Pipe: ASTM A 53, Type E or S, Grade B.
 - 1. Weight Class: Standard, unless otherwise noted.
 - 2. Finish: Grey, except where indicated to be galvanized.
- F. Carbon Steel Castings: ASTM A 27, **Grade 65-35**, medium-strength carbon steel.
- G. High-Strength Steel Castings: ASTM A 148/A 148M, **Grade 80-50**, carbon or alloy steel.
- H. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

- A. High-Strength Bolts, Nuts, and Washers: **ASTM A 325**, Type 1, heavy hex steel structural bolts; **ASTM A 563** heavy hex carbon-steel nuts; and **ASTM F 436** hardened carbon-steel washers.
 - 1. Finish: Plain ,uncoated unless otherwise noted.
 - 2. Finish: Hot-dip zinc coating,ASTM A 153, Class C as indicated.
 - 3. Direct-Tension Indicators: **ASTM F 959, Type 325** compressible-washer type.
 - a. Finish: Plain, uncoated.
- B. Anchor Rods, Bolts, Nuts, and Washers:
 - 1. Unheaded Bolts:ASTM A 687, high strength.
 - 2. Headed Bolts:ASTM A 325, Type 1, heavy hax steel structural bolts and heavy heax carbon steel nuts.
 - 3. Plate Washers: ASTM A 36/A 36M carbon steel.
 - 4. Washers: **ASTM F 436** hardened carbon steel.
 - 5. Finish: Plain
- C. Turnbuckles: ASTM A 108, Grade 1035, cold-finished carbon steel.
- D. Eye Bolts and Nuts: ASTM A 108, Grade 1030, cold-finished carbon steel.
- E. Sleeve Nuts: ASTM A 108, Grade 1018, cold-finished carbon steel.

2.3 PRIMER

- A. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with performance requirements of FS TT-P-664, color grey.
- B. Galvanizing Repair Paint: Complying with DOD-P-21035A or SSPC-Paint 20.

2.4 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.5 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC's "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design"
 - 1. Camber structural-steel members where indicated.
 - 2. Identify high-strength structural steel according to ASTM A 6 and maintain markings until structural steel has been erected.
 - 3. Mark and match-mark materials for field assembly.
 - 4. Fabricate for delivery a sequence that will expedite erection and minimize field handling of structural steel.
 - 5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
- B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
 - 1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1.
- C. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.
- D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
- E. Holes: Provide holes required for securing other work to structural steel and for passage of other work through steel framing members.
 - 1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
 - 2. Base-Plate Holes: Drill holes perpendicular to steel surfaces.
 - 3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.6 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: Slip critical.
- B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.
 - 1. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.

2. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.
3. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent weld show-through on exposed steel surfaces.
 - a. Grind butt welds flush.
 - b. Grind or fill exposed fillet welds to smooth profile. Dress exposed welds.

2.7 SHOP PRIMING

- A. Shop prime steel surfaces except the following:
 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of **2 inches**.
 2. Surfaces to be field welded.
 3. Surfaces to be high-strength bolted with slip-critical connections.
 4. Surfaces to receive sprayed fire-resistive materials.
 5. Galvanized surfaces.
- B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
 1. SSPC-SP 2, "Hand Tool Cleaning."
- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a dry film thickness of not less than **1.5 mils**. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

2.8 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/ A 123M.
 1. Fill vent holes and grind smooth after galvanizing.
 2. Galvanize lintels located in exterior walls.

2.9 SOURCE QUALITY CONTROL

- A. Engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports.
 1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

- B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.
- C. Bolted Connections: Shop-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- D. Welded Connections: In addition to visual inspection, shop-welded connections will be tested and inspected according to AWS D1.1 and the following inspection procedures, at testing agency's option:
 - 1. Liquid Penetrant Inspection: ASTM E 165.
 - 2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
 - 3. Ultrasonic Inspection: ASTM E 164.
 - 4. Radiographic Inspection: ASTM E 94.
- E. In addition to visual inspection, shop-welded shear connectors will be tested and inspected according to requirements in AWS D1.1 for stud welding and as follows:
 - 1. Bend tests will be performed if visual inspections reveal either a less-than- continuous 360-degree flash or welding repairs to any shear connector.
 - 2. Tests will be conducted on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments, with steel erector present, for compliance with requirements.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place, unless otherwise indicated.
 - 1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design."
- B. Base and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting base and bearing plates. Clean bottom surface of base and bearing plates.
 - 1. Set base and bearing plates for structural members on wedges, shims, or setting nuts as required.
 - 2. Weld plate washers to top of base plate.
 - 3. Tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of base or bearing plate before packing with grout.
 - 4. Promptly pack grout solidly between bearing surfaces and base or bearing plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."
- D. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 - 1. Level and plumb individual members of structure.
 - 2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.
- E. Splice members only where indicated.
- F. Remove erection bolts on welded, architecturally exposed structural steel; fill holes with plug welds; and grind smooth at exposed surfaces.
- G. Do not use thermal cutting during erection.
- H. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

3.4 FIELD CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: Slip critical.

- B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.
 - 1. Comply with AISC's "Code of Standard Practice for Steel Buildings and Bridges" and "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design" for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
 - 2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
 - 3. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.
 - 4. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent weld show-through on exposed steel surfaces.
 - a. Grind butt welds flush.
 - b. Grind or fill exposed fillet welds to smooth profile. Dress exposed welds.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.
- B. Bolted Connections: Shop-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- C. Welded Connections: Field welds will be visually inspected according to AWS D1.1.
 - 1. In addition to visual inspection, field welds will be tested according to AWS D1.1 and the following inspection procedures, at testing agency's option:
 - a. Liquid Penetrant Inspection: ASTM E 165.
 - b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
 - c. Ultrasonic Inspection: ASTM E 164.
 - d. Radiographic Inspection: ASTM E 94.
- D. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

3.6 REPAIRS AND PROTECTION

- A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists and accessories, bearing plates, and abutting structural steel.

1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
 2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.
- C. Touchup Painting: Cleaning and touchup painting are specified in Division 9 painting Sections.

END OF SECTION 05120

SECTION 05310 - STEEL DECK

General:

Shop Drawings and Data: Show complete details and schedules (if required) for layout and types of deck panels, anchorage, supplementary framing, cut openings, and accessories.

Codes and Standards: American Iron and Steel Institute (AISI) "Specification for the Design of Cold-Formed Steel Structural Members"; American Welding Society (AWS) "Structural Welding Code," Steel Deck Institute (SDI) "Design Manual for Composite Decks, Form Decks and Roof Decks"; comply with applicable provisions except as otherwise indicated.

Provide metal deck units listed in UL "Fire Resistance Directory," bearing UL label and marking for the system detailed.

FM Listing: Provide metal roof deck units which have been evaluated by Factory Mutual System and are listed in "Factory Mutual Approval Guide" for "Class I" fire-rated construction.

Products:

Manufacturers: Provide steel deck as fabricated by one of the following;

Bowman Metal Deck
Consolidated Systems, Inc.
Epic Metals Corp.
Marlyn Steel Products, Inc.
Roll Form Products, Inc.
Roof Deck, Inc.
United Steel Deck, Inc.
Vulcraft/Div. Nucor Corp.
Wheeling Corrugating Co.

Steel for Galvanized Units: ASTM A 446, Grade A.

Steel Shapes: ASTM A 36.

Sheet Metal Accessories: ASTM A 526, galvanized.

Galvanizing: ASTM A 525, G60.

Galvanizing Repair: ASTM A780.

Fabrication: Form deck units in lengths to span at least 3 supports; flush, telescoped, or nested 2-inch end laps; nested or interlocked side laps, unless otherwise indicated.

Deck Units: Comply with SDI requirements for type of sections, of metal thickness, width, and depth indicated.

Accessories: Provide cover plates, closure strips, roof sump pans, cant strips, as required; use deck manufacturer's standard unless otherwise shown.

Execution:

Installation: Place deck units and secure to adjacent framing by fusion welding 12 inches o.c. to supports, with a minimum of 2 welds at each support.

Mechanical fasteners, either powder-actuated or pneumatically driven, may be used in lieu of welding. Locate mechanical fasteners and install in accordance with deck manufacturers' instructions.

Secure roof deck units at ends and side laps at spacings recommended by deck manufacturer to provide resistance for gross uplift of 45 psf at eave overhang and 30 psf for other roof areas.

Place accessory units in accordance with manufacturer's recommendations unless otherwise shown.

Touch-up shop paint after installation. Clean field welds and abraded areas, and apply same type paint as used in shop. Use galvanizing repair materials to correct damaged galvanized surfaces.

SECTION 05500 - METAL FABRICATIONS

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.

1.2 SUMMARY

- A. This Section includes the following:

1. Steel framing and supports for mechanical and electrical equipment.
2. Steel framing and supports for applications where framing and supports are not specified in other Sections.
3. Elevator hoist beams.
4. Support angles for elevator door sills.
5. Steel pipe columns for supporting wood frame construction.
6. Shelf angles.
7. Loose bearing and leveling plates.
8. Steel weld plates and angles for casting into concrete not specified in other Sections.
9. Structural-steel window frames.
10. Metal ladders and pit ladders.
11. Metal bollards.
12. Pipe guards.
13. Metal floor plate and supports.
14. Security gates.
15. Custom wood framing metal hangers.

- B. Products furnished, but not installed, under this Section include the following:

1. Loose steel lintels.
2. Anchor bolts, steel pipe sleeves, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.

- C. Related Sections include the following:

1. Division 3 Section "Cast-in-Place Concrete" for installing anchor bolts, steel pipe sleeves, wedge-type inserts and other items indicated to be cast into concrete.
2. Division 4 Section "Unit Masonry Assemblies" for installing loose lintels, anchor bolts, and other items indicated to be built into unit masonry.
3. Division 5 Section "Structural Steel."
4. Division 5 Section "Metal Stairs."
5. Division 5 Section "Pipe and Tube Railings."
6. Division 5 Section "Gratings."
7. Division 6 Section "Rough Carpentry" for metal framing anchors.

1.3 PERFORMANCE REQUIREMENTS

- A. 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.
- B. 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, ambient; 180 deg F, material surfaces.

1.4 SUBMITTALS

- A. Product Data: For the following:
 - 1. Paint products.
 - 2. 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. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Mill Certificates: Signed by manufacturers of stainless-steel sheet certifying that products furnished comply with requirements.
- D. Welding certificates.
- E. Qualification Data: For professional engineer.

1.5 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1, "Structural Welding Code--Steel."
 - 2. AWS D1.2, "Structural Welding Code--Aluminum."
 - 3. AWS D1.3, "Structural Welding Code--Sheet Steel."
 - 4. AWS D1.6, "Structural Welding Code--Stainless Steel."

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 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
 2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 METALS, GENERAL

- A. 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.

2.3 FERROUS METALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304.
- C. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304.
- D. 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.

- E. Rolled-Stainless-Steel Floor Plate: ASTM A 793.
- F. Steel Tubing: ASTM A 500, cold-formed steel tubing.
- G. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.
- H. Slotted Channel Framing: Cold-formed metal channels with continuous slot complying with MFMA-3.
 - 1. Size of Channels: 1-5/8 by 1-5/8 inches .
 - 2. Material: Galvanized steel complying with ASTM A 653/A 653M, structural steel, Grade 33, with G90 coating; 0.108-inch nominal thickness.
- I. Cast Iron: ASTM A 48/A 48M, Class 30, unless another class is indicated or required by structural loads.

2.4 NONFERROUS METALS

- A. Aluminum Plate and Sheet: ASTM B 209, Alloy 6061-T6.
- B. Aluminum Extrusions: ASTM B 221, Alloy 6063-T6.
- C. Aluminum-Alloy Rolled Tread Plate: ASTM B 632/B 632M, Alloy 6061-T6.
- D. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F.
- E. Bronze Plate, Sheet, Strip, and Bars: ASTM B 36/B 36M, Alloy UNS No. C28000 (muntz metal, 60 percent copper).
- F. Bronze Extrusions: ASTM B 455, Alloy UNS No. C38500 (extruded architectural bronze).
- G. Bronze Castings: ASTM B 584, Alloy UNS No. C83600 (leaded red brass) or No. C84400 (leaded semired brass).
- H. Nickel Silver Extrusions: ASTM B 151/B 151M, Alloy UNS No. C74500.
- I. Nickel Silver Castings: ASTM B 584, Alloy UNS No. C97600 (20 percent leaded nickel bronze).

2.5 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. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.

- C. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, nuts and, where indicated, flat washers; **ASTM F 593** for bolts and **ASTM F 594** for nuts, Alloy Group 1.
- D. Anchor Bolts: ASTM F 1554, Grade 36.
 - 1. Provide hot-dip or mechanically deposited, zinc-coated anchor bolts where item being fastened is indicated to be galvanized.
- E. Eyebolts: ASTM A 489.
- F. Machine Screws: **ASME B18.6.3**.
- G. Lag Bolts: **ASME B18.2.1**.
- H. Wood Screws: Flat head, ASME B18.6.1.
- I. Plain Washers: Round, **ASME B18.22.1**.
- J. Lock Washers: Helical, spring type, **ASME B18.21.1**.
- K. 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.
- L. 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. Material for Anchors in Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.
 - 2. Material for Anchors in Exterior Locations: Alloy Group 1 stainless-steel bolts complying with **ASTM F 593** and nuts complying with **ASTM F 594**.

2.6 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.
 - 1. Use primer with a VOC content of 420 g/L (3.5 lb/gal.) or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 2. 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.
 - 1. Use primer with a VOC content of 420 g/L (3.5 lb/gal.) or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 2. Available Products:
 - a. Benjamin Moore & Co.; Epoxy Zinc-Rich Primer CM18/19.
 - b. Carboline Company; Carbozinc 621.
 - c. ICI Devoe Coatings; Catha-Coat 313.
 - d. International Coatings Limited; Interzinc 315 Epoxy Zinc-Rich Primer.
 - e. PPG Architectural Finishes, Inc.; Aquapon Zinc-Rich Primer 97-670.
 - f. Sherwin-Williams Company (The); Corothane I GalvaPac Zinc Primer.
 - g. Tnemec Company, Inc.; Tneme-Zinc 90-97.
- 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, Metallic Grout: Factory-packaged, ferrous-aggregate grout complying with ASTM C 1107, specifically recommended by manufacturer for heavy-duty loading applications.
- G. 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.
- H. Concrete Materials and Properties: Comply with requirements in Division 3 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi, unless otherwise indicated.

2.7 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.
 - 1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, **1/8 by 1-1/2 inches**, with a minimum **6-inch** embedment and **2-inch** hook, not less than **8 inches** from ends and corners of units and **24 inches** o.c., unless otherwise indicated.

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.
- C. Fabricate supports for operable partitions from continuous steel beams of sizes indicated with attached bearing plates, anchors, and braces as indicated. Drill bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on operable partition Shop Drawings.

- D. Fabricate steel girders for wood frame construction from continuous steel shapes of sizes indicated.
 - 1. Provide bearing plates welded to beams where indicated.
 - 2. Drill girders and plates for field-bolted connections where indicated.
 - 3. Where wood nailers are attached to girders with bolts or lag screws, drill holes at **24 inches** o.c.
- E. Fabricate steel pipe columns for supporting wood frame construction from steel pipe with steel baseplates and top plates as indicated. Drill baseplates and top plates for anchor and connection bolts and weld to pipe with fillet welds all around. Make welds the same size as pipe wall thickness, unless otherwise indicated.
 - 1. Unless otherwise indicated, fabricate from Schedule 40 steel pipe.
 - 2. Unless otherwise indicated, provide **1/2-inch** baseplates with four **5/8-inch** anchor bolts and **1/4-inch** top plates.
- F. Galvanize miscellaneous framing and supports where indicated.
- G. Prime miscellaneous framing and supports with zinc-rich primer where indicated.

2.9 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.
- C. Galvanize loose steel lintels located in exterior walls.
- D. Prime loose steel lintels located in exterior walls with zinc-rich primer.

2.10 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-inch** bolts, 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. Galvanize shelf angles located in exterior walls.
- D. Prime shelf angles located in exterior walls with zinc-rich primer.

- E. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

2.11 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.
- B. Galvanize plates after fabrication.
- C. Prime plates with zinc-rich primer.

2.12 STEEL WELD PLATES AND ANGLES

- A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with not less than two integrally welded steel strap anchors for embedding in concrete.

2.13 STRUCTURAL-STEEL WINDOW FRAMES

- A. Fabricate structural-steel window frames from steel shapes, plates, and bars of size and to dimensions indicated, fully welded together, with **5/8-by-1-1/2-inch** steel channel stops, unless otherwise indicated. Plug-weld built-up members and continuously weld exposed joints. Secure removable stops to frame with countersunk machine screws, uniformly spaced at not more than **10 inches** o.c. Reinforce frames and drill and tap as necessary to accept finish hardware.
 - 1. Provide with integrally welded steel strap anchors for securing door frames into adjoining concrete or masonry.
- B. Extend bottom of frames to floor elevation indicated with steel angle clips welded to frames for anchoring frame to floor with expansion shields and bolts.
- C. Galvanize exterior steel frames.

2.14 METAL LADDERS

- A. General:
 - 1. Comply with ANSI A14.3, unless otherwise indicated.
 - 2. For elevator pit ladders, comply with ASME A17.1.
 - 3. Space siderails **18 inches** apart, unless otherwise indicated.
 - 4. Support each ladder at top and bottom and not more than **48 inches** with welded or bolted brackets, made from same metal as ladder.
- B. Steel Ladders:

1. Siderails: Continuous, 3/8-by-2-1/2-inch steel flat bars, with eased edges.
2. Rungs: 3/4-inch- diameter steel bars.
3. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
4. Provide nonslip surfaces on top of each rung, either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive or by using a type of manufactured rung filled with aluminum-oxide grout.
5. Galvanize ladders, including brackets and fasteners.

2.15 METAL BOLLARDS

- A. Fabricate metal bollards from Schedule 40 steel pipe.
- B. Fill bollard solid with 3000 psi concrete. Cap bollards with concrete mounded for drainage.
- C. Fabricate sleeves for bollard anchorage from steel pipe. Make sleeves not less than 48 inches deep and 3/4 inch larger than OD of bollard.

2.16 METAL FLOOR PLATE

- A. Fabricate from rolled-steel floor plate w/ diamond pattern of thickness indicated below:
 1. Thickness: 1/4 inch
- B. Provide steel angle supports as indicated.
- C. Include steel angle stiffeners, and fixed and removable sections as indicated.
- D. Provide flush steel bar drop handles for lifting removable sections, one at each end of each section.
- E. Galvanize plates, including support angles, stiffeners, handles and fasteners.

2.17 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.

2.18 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:
 1. ASTM A 123/A 123M, for galvanizing steel and iron products.
 2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.

- B. 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 Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 2. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."
- C. Shop Priming: Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
 - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

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 aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

3.2 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. Anchor supports for operable partitions securely to and rigidly brace from building structure.
- C. 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 "Installing Bearing and Leveling Plates" Article.
- D. Install pipe columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified in "Installing Bearing and Leveling Plates" Article.
 - 1. Grout baseplates of columns supporting steel girders after girders are installed and leveled.

3.3 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.

3.4 INSTALLING PIPE BOLLARDS

- A. Anchor bollards in concrete with pipe sleeves preset and anchored into concrete. Fill annular space around bollard solidly with nonshrink, nonmetallic grout; mixed and placed to comply with grout manufacturer's written instructions. Slope grout up approximately **1/8 inch** toward bollard.
- B. Fill bollards solidly with concrete, mounding top surface to shed water.

3.5 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. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 9 painting Sections.
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 05500

SECTION 05511 - METAL STAIRS

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.

1.2 SUMMARY

- A. This Section includes but is not limited to the following:
 - 1. Preassembled steel stairs with with grating treads.
 - 2. Handrails and railings attached to metal stairs.
 - 3. Handrails attached to walls adjacent to metal stairs.
 - 4. Guardrails at stair landings and platforms.
- B. Related Sections include the following:
 - 1. Division 3 Section "Cast-in-Place Concrete" for concrete fill for stair treads and platforms.
 - 2. Division 5 Section "Pipe and Tube Railings" for pipe and tube handrails and railings.

1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide metal stairs capable of withstanding the following structural loads without exceeding the allowable design working stress of the materials involved, including anchors and connections. Apply each load to produce the maximum stress in each component of metal stairs.
 - 1. Treads and Platforms of Metal Stairs: Capable of withstanding a uniform load of **100 lbf/sq. ft.** or a concentrated load of **300 lbf** on an area of **4 sq. in.**, whichever produces the greater stress.
 - 2. Stair Framing: Capable of withstanding stresses resulting from loads specified above in addition to stresses resulting from railing system loads.
 - 3. Limit deflection of treads, platforms, and framing members to L/360 or **1/4 inch**, whichever is less.
- B. Structural Performance of Handrails and Railings: Provide handrails and railings complying with requirements in ASTM E 985 for structural performance, based on testing performed according to ASTM E 894 and ASTM E 935.
- C. Structural Performance of Handrails and Railings: Provide handrails and railings capable of withstanding structural loads required by ASCE 7 without exceeding the allowable design working stress of materials for handrails, railings, anchors, and connections.

- D. Structural Performance of Handrails and Railings: Provide handrails and railings capable of withstanding the following structural loads without exceeding the allowable design working stress of materials for handrails, railings, anchors, and connections:
1. Top Rail of Guards: Capable of withstanding the following loads applied as indicated:
 - a. Concentrated load of **200 lbf** applied at any point and in any direction.
 - b. Uniform load of **50 lbf/ft.** applied horizontally and concurrently with uniform load of **100 lbf/ft.** applied vertically downward.
 - c. Concentrated and uniform loads above need not be assumed to act concurrently.
 2. Handrails Not Serving as Top Rails: Capable of withstanding the following loads applied as indicated:
 - a. Concentrated load of **200 lbf** applied at any point and in any direction.
 - b. Uniform load of **50 lbf/ft.** applied in any direction.
 - c. Concentrated and uniform loads above need not be assumed to act concurrently.
 3. Infill Area of Guards: Capable of withstanding a horizontal concentrated load of **200 lbf** applied to **1 sq. ft.** at any point in system, including panels, intermediate rails, balusters, or other elements composing infill area.
 - a. Load above need not be assumed to act concurrently with loads on top rails in determining stress on guards.

1.4 SUBMITTALS

- A. Product Data: For metal stairs and the following:
1. Metal-grating stair treads.
 2. Steel floor plate.
 3. Paint products.
 4. Grout.
- B. Shop Drawings: Show fabrication and installation details for metal stairs. Include plans, elevations, sections, and details of metal stairs and their connections. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other Sections.
1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Samples for Initial Selection: Manufacturer's color charts or sections of units showing the full range of colors and patterns for the following products:
- D. Welding Certificates: Copies of certificates for welding procedures and personnel.

- E. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Arrange for metal stairs specified in this Section to be fabricated and installed by the same firm.
- B. Fabricator Qualifications: A firm experienced in producing metal stairs 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.
- C. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."

1.6 COORDINATION

- A. Coordinate installation of anchorages for metal stairs. 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.

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. Metal Bar Gratings:
 - a. McNichols Co.

2.2 FERROUS METALS

- A. Metal Surfaces, General: Provide metal free from pitting, seam marks, roller marks, and other imperfections where exposed to view on finished units. Do not use steel sheet with variations in flatness exceeding those permitted by referenced standards for stretcher-leveled sheet.
- B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- C. Steel Tubing: Cold-formed steel tubing complying with ASTM A 500.
- D. Steel Pipe: ASTM A 53, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.

- E. 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.
- F. Uncoated, Cold-Rolled Steel Sheet: Commercial quality, complying with ASTM A 366/A 366M; or structural quality, complying with ASTM A 611, Grade A, unless another grade is required by design loads.
- G. Galvanized Steel Sheet: ASTM A 653/A 653M, G90 coating, either commercial quality or structural quality, Grade 33, unless another grade is required for design loads.
- H. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

2.3 FASTENERS

- A. General: Provide zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 25 for exterior use, and Class Fe/Zn 5 where built into exterior walls. Select fasteners for type, grade, and class required.
- B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.
- C. Machine Screws: ASME B18.6.3.
- D. Lag Bolts: ASME B18.2.1.
- E. Plain Washers: Round, carbon steel, ASME B18.22.1.
- F. Lock Washers: Helical, spring type, carbon steel, ASME B18.21.1.
- G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
 - 1. Material: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.

2.4 PAINT

- A. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements in FS TT-P-664, selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.
- B. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.
- C. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers or cold-applied asphalt emulsion complying with ASTM D 1187.

2.5 GROUT

- A. 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.

2.6 FABRICATION, GENERAL

- A. Provide complete stair assemblies, including metal framing, hangers, struts, handrails, railings, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.
- B. Provide complete stair assemblies, including metal framing, hangers, struts, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.
 - 1. Join components by welding, unless otherwise indicated.
 - 2. Use connections that maintain structural value of joined pieces.
- C. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," for class of stair designated, unless more stringent requirements are indicated.
 - 1. Service class, unless otherwise indicated.
- D. Shop Assembly: Preassemble stairs in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- E. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges. Shear and punch metals cleanly and accurately. Remove sharp or rough areas on exposed surfaces.
- F. Ease exposed edges to a radius of approximately **1/32 inch**, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- G. Weld connections 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. Weld exposed corners and seams continuously, unless otherwise indicated.
 - 5. 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.
- H. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.

- I. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

2.7 STEEL-FRAMED STAIRS

- A. Stair Framing: Fabricate stringers of structural-steel channels, plates, or a combination of both, as indicated. Provide closures for exposed ends of stringers. Construct platforms of structural-steel channel headers and miscellaneous framing members as indicated. Bolt or weld headers to stringers; bolt or weld framing members to stringers and headers. If using bolts, fabricate and join so bolts are not exposed on finished surfaces.
 1. Where masonry walls support metal stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.
- B. Metal Bar-Grating Stairs and Platform: Form treads and platforms to configurations shown from metal bar grating; fabricate to comply with NAAMM MBG 531, "Metal Bar Grating Manual." Form risers to configurations shown from rolled steel sheet of thickness needed to comply with performance requirements but not less than **0.0677 inch**.
 1. Fabricate treads and platforms from pressure-locked steel grating with **1-by-3/16-inch** bearing bars at **11/16 inch** o.c. and crossbars at **4 inches** o.c., NAAMM designation: P-11-4 (1 x 3/16) STEEL.
 2. Surface: Serrated.
 3. Finish: Shop primed.
 4. Fabricate grating treads with cast abrasive nosing and with steel angle or steel plate carrier at each end for stringer connections. Secure treads to stringers with bolts.
 5. Fabricate grating platforms with nosing matching that on grating treads. Provide toeplates at open-sided edges of grating platforms. Weld grating to platform framing.
 6. Attach risers and treads to stringers with brackets made of steel angles or bars. Weld brackets to stringers and attach metal pans to brackets by welding, riveting, or bolting.

2.8 STEEL TUBE HANDRAILS AND RAILINGS

- A. General: Fabricate handrails and railings to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of tube, post spacings, and anchorage, but not less than that needed to withstand indicated loads.
 1. Configuration: **1-1/2-inch-** square top and bottom rails, **1-1/2-inch-** square posts, and **1/2-inch-** square pickets spaced not more than **4 inches** clear.
 2. Gates: Form gates from steel tube of same size and shape as top rails. Provide with hinges for fastening to wall and overlapping stop with rubber bumper to restrict gate to opening in the direction of egress.
- B. Interconnect members by butt-welding or welding with internal connectors, at fabricator's option, unless otherwise indicated.
 1. At tee and cross intersections, cope ends of intersecting members to fit contour of tube to which end is joined, and weld all around.

- C. Form changes in direction of handrails and rails as follows:
 - 1. As detailed.
 - 2. By radius bends of radius indicated.
 - 3. By inserting prefabricated flush-elbow fittings.
 - 4. By any method indicated above, applicable to change of direction involved.
- D. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- E. Close exposed ends of handrail and railing members with prefabricated end fittings.
- F. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated. Close ends of returns, unless clearance between end of rail and wall is **1/4 inch** or less.
- G. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnecting railings and for attaching to other work. Furnish inserts and other anchorage devices for connecting to concrete or masonry work.
 - 1. Connect railing posts to stair framing by direct welding, unless otherwise indicated.
- H. For galvanized handrails and railings, provide galvanized fittings, brackets, fasteners, sleeves, and other ferrous-metal components.
- I. For nongalvanized handrails and railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors embedded in exterior masonry and concrete construction.

2.9 STAIR HANDRAILS AND RAILINGS

- 1. Fabricate newels of steel tubing and provide newel caps of pressed steel, as shown.
- 2. Railings may be bent at corners, rail returns, and wall returns, instead of using prefabricated fittings.
- 3. Connect railing posts to stair framing by direct welding, unless otherwise indicated.

2.10 FINISHES

- A. Comply with NAAMM'S "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal stairs after assembly.

- C. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:
 - 1. ASTM A 123, for galvanizing both fabricated and unfabricated iron and steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strips **0.0299 inch** thick and heavier.
 - 2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.
 - 3. Fill vent and drain holes that will be exposed in finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

- D. 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 products:
 - 1. Exteriors (SSPC Zone 1B): SSPC SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 2. Interiors (SSPC Zone 1A): SSPC SP 3, "Power Tool Cleaning."

- E. Apply shop primer to prepared surfaces of metal stair components, unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.
 - 1. Do not apply primer to galvanized surfaces.
 - 2. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.

- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free from rack.

- C. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete, unless otherwise indicated.

- D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

- E. 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.

- F. 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.

3.2 INSTALLING METAL STAIRS WITH GROUTED BASEPLATES

- A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of baseplates.
- B. Set steel stair baseplates on wedges, shims, or leveling nuts. After stairs have been positioned and aligned, 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 nonmetallic, nonshrink grout, unless otherwise indicated.
 2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.3 INSTALLING STEEL TUBE RAILINGS AND HANDRAILS

- A. Adjust handrails and railing systems before anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated or, if not indicated, as required by design loads. Plumb posts in each direction. Secure posts and railing ends to building construction as follows:
1. Anchor posts to steel by welding directly to steel supporting members.
 2. Anchor handrail ends to concrete and masonry with steel round flanges welded to rail ends and anchored with postinstalled anchors and bolts.
- B. Attach handrails to wall with wall brackets. Provide bracket with **1-1/2-inch** clearance from inside face of handrail and finished wall surface. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads. Secure wall brackets to building construction as follows:
1. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.
 2. Use type of bracket with predrilled hole for exposed bolt anchorage.
 3. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
 4. For hollow masonry anchorage, use toggle bolts.
 5. For wood stud partitions, use hanger or lag bolts set into wood backing between studs. Coordinate with carpentry work to locate backing members.
 6. For steel-framed gypsum board assemblies, use hanger or lag bolts set into wood backing between studs. Coordinate with stud installation to locate backing members.
 7. For steel-framed gypsum board assemblies, fasten brackets directly to steel framing or concealed reinforcements using self-tapping screws of size and type required to support structural loads.

3.4 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed 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. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 9 Section "Painting."
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 05511

SECTION 05521 - PIPE AND TUBE RAILINGS

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.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Steel pipe railings.
- B. Related Sections include the following:
 - 1. Division 5 Section "Metal Stairs" for steel tube railings associated with metal stairs.
 - 2. Division 6 Section "Rough Carpentry" for wood blocking for anchoring railings.

1.3 PERFORMANCE REQUIREMENTS

- A. General: In engineering railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:
 - 1. Steel: 72 percent of minimum yield strength.
- B. Structural Performance: Provide railings capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Handrails:
 - a. Uniform load of 50 lbf/ ft. applied in any direction.
 - b. Concentrated load of 200 lbf applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 - 2. Top Rails of Guards:
 - a. Uniform load of 50 lbf/ ft. applied in any direction] 50 lbf/ ft. applied horizontally and concurrently with 100 lbf/ ft. applied vertically downward].
 - b. Concentrated load of 200 lbf applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.

3. Infill of Guards:
 - a. Concentrated load of 200 lbf applied horizontally on an area of 1 sq. ft..
 - b. Uniform load of 25 lbf/ ft. applied horizontally.
 - c. Infill load and other loads need not be assumed to act concurrently.

C. Thermal Movements: Provide exterior railings 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.

D. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Manufacturer's product lines of mechanically connected railings.
2. Grout, anchoring cement, and paint products.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Samples for Initial Selection: For products involving selection of color, texture, or design.

D. Samples for Verification: For each type of exposed finish required.

1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.
2. Fittings and brackets.
3. Assembled Sample of railing system, made from full-size components, including top rail, post, handrail, and infill. Sample need not be full height.
 - a. Show method of finishing and connecting members at intersections.

E. Welding certificates.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of railing through one source from a single manufacturer.
- B. Welding: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1, "Structural Welding Code--Steel."

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings 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 railings 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 AND SCHEDULING

- A. Coordinate installation of anchorages for railings. 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. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

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. Steel Pipe and Tube Railings:
 - a. Pisor Industries, Inc.
 - b. Sharpe Products.
 - c. Wagner, R & B, Inc.; a division of the Wagner Companies.
 - d. Metal fabricator of G.C.'s choice

2.2 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails, unless otherwise indicated.

2.3 STEEL AND IRON

- A. Pipe: ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight Schedule 40, unless another grade and weight are required by structural loads.
 - 1. Provide galvanized finish for exterior installations and where indicated.
- B. Plates, Shapes, and Bars: ASTM A 36/A 36M.
- C. Castings: Either gray or malleable iron, unless otherwise indicated.
 - 1. Gray Iron: ASTM A 48/A 48M, Class 30, unless another class is indicated or required by structural loads.
 - 2. Malleable Iron: ASTM A 47/A 47M.

2.4 FASTENERS

- A. General: Provide the following:
 - 1. Steel Railings: Plated steel fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating.
- B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicate and capable of withstanding design loads.
- C. Anchors: Provide cast-in-place, chemical or torque-controlled expansion anchors, fabricated from corrosion-resistant materials with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

2.5 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Shop Primer for Galvanized Steel: Zinc-dust, zinc-oxide primer formulated for priming zinc-coated steel and for compatibility with finish paint systems indicated, and complying with SSPC-Paint 5.

- C. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.
- D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.
- E. 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.
- F. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.
 - 1. Water-Resistant Product: At exterior locations provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.6 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
- B. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- C. 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.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- G. Connections: Fabricate railings with welded connections, unless otherwise indicated.
- H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
 - 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 flux immediately.
 - 4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

- I. Form changes in direction as follows:
 - 1. By radius bends.
- J. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- K. Close exposed ends of railing members with prefabricated end fittings.
- L. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is **1/4 inch** or less.
- M. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work, unless otherwise indicated.
 - 1. At brackets and fittings fastened to plaster or gypsum board partitions, provide fillers made from crush-resistant material, or other means to transfer wall loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.
- N. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.
- O. For railing posts set in concrete, provide steel sleeves not less than **6 inches** long with inside dimensions not less than **1/2 inch** greater than outside dimensions of post, with steel plate forming bottom closure.

2.7 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. 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.
- D. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

2.8 STEEL AND IRON FINISHES

A. Galvanized Railings:

1. Hot-dip galvanize steel and iron railings, including hardware, after fabrication.
2. Comply with ASTM A 123/A 123M for hot-dip galvanized railings.
3. Comply with ASTM A 153/A 153M for hot-dip galvanized hardware.

B. Fill vent and drain holes that will be exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

C. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements have been clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

A. Fit exposed connections together to form tight, hairline joints.

B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
2. Set posts plumb within a tolerance of **1/16 inch in 3 feet**.
3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed **1/4 inch in 12 feet**.

C. Adjust railings before anchoring to ensure matching alignment at abutting joints.

D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in Part 2 "Fabrication" Article whether welding is performed in the shop or in the field.

- B. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending **2 inches** beyond joint on either side, fasten internal sleeve securely to 1 side, and locate joint within **6 inches** of post.

3.4 ANCHORING POSTS

- A. Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.
- B. Leave anchorage joint exposed; wipe off surplus anchoring material; and leave **1/8-inch** buildup, sloped away from post.
- C. Anchor posts to metal surfaces with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:
 - 1. For steel pipe railings, weld flanges to post and bolt to metal supporting surfaces.

3.5 ANCHORING RAILING ENDS

- A. Anchor railing ends to concrete and masonry with round flanges connected to railing ends and anchored to wall construction with anchors and bolts.

3.6 ATTACHING HANDRAILS TO WALLS

- A. Attach handrails to wall with wall brackets. Provide brackets with **1-1/2-inch** clearance from inside face of handrail and finished wall surface.
 - 1. Use type of bracket with predrilled hole for exposed bolt anchorage.
- B. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
- C. Secure wall brackets to building construction as follows:
 - 1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
 - 2. For hollow masonry anchorage, use toggle bolts.
 - 3. For wood stud partitions, use hanger or lag bolts set into wood backing between studs. Coordinate with carpentry work to locate backing members.

3.7 ADJUSTING AND CLEANING

- A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

3.8 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.
- B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION 05521

SECTION 06100 - ROUGH CARPENTRY

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.

1.2 SUMMARY

- A. This Section includes the following:

1. Framing with dimension lumber.
2. Framing with engineered wood products.
3. Wood blocking and nailers.
4. Utility shelving.
5. Wood furring.
6. Sheathing.
7. Subflooring and underlayment.
8. Plywood backing panels.
9. Building wrap.

- B. Related Sections include the following:

1. Division 6 Section "Finish Carpentry" for nonstructural carpentry items exposed to view and not specified in another Section.

1.3 DEFINITIONS

- A. Rough Carpentry: Carpentry work not specified in other Sections and not exposed, unless otherwise indicated.
- B. Exposed Framing: Dimension lumber not concealed by other construction.
- C. Lumber grading agencies, and the abbreviations used to reference them, include the following:
 1. NELMA - Northeastern Lumber Manufacturers Association.
 2. NLGA - National Lumber Grades Authority.
 3. RIS - Redwood Inspection Service.
 4. SPIB - Southern Pine Inspection Bureau.
 5. WCLIB - West Coast Lumber Inspection Bureau.
 6. WWPA - Western Wood Products Association.

1.4 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.

- B. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the American Lumber Standards Committee Board of Review.

- C. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:
 - 1. Preservative-treated wood.
 - 2. Fire-retardant-treated wood.
 - 3. Engineered wood products.
 - 4. Power-driven fasteners.
 - 5. Powder-actuated fasteners.
 - 6. Expansion anchors.
 - 7. Metal framing anchors.
 - 8. Building wrap.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.

- B. Source Limitations for Engineered Wood Products: Obtain each type of engineered wood product through one source from a single manufacturer.

- C. Source Limitations for Fire-Retardant-Treated Wood: Obtain each type of fire-retardant-treated wood product through one source from a single producer.

1.6 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 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Laminated-Veneer Lumber:
 - a. Boise Cascade Corporation.
 - b. Georgia-Pacific Corporation.
 - c. Louisiana-Pacific Corporation.
 - d. Trus Joist MacMillan.
 2. Parallel-Strand Lumber:
 - a. Trus Joist MacMillan.
 3. Prefabricated Wood I-Joists:
 - a. Boise Cascade Corporation.
 - b. Georgia-Pacific Corporation.
 - c. Louisiana-Pacific Corporation.
 - d. Trus Joist MacMillan.
 4. OSB Subfloor:
 - a. Huber Engineered Woods.
AdvanTech Flooring.
 5. Gypsum Sheathing Board:
 - a. G-P Gypsum Corporation.
 6. Building Wrap:
 - a. Celotex Corporation (The); Building Products Division.
 - b. DuPont (E. I. du Pont de Nemours and Company).
 7. Metal Framing Anchors:
 - a. Simpson Strong-Tie Company, Inc.

2.2 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. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
 3. 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.
 4. Provide dressed lumber, S4S, unless otherwise indicated.
 5. Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominal thickness or less, unless otherwise indicated.
- B. Engineered Wood Products: Provide engineered wood products acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.
1. Allowable Design Stresses: Provide engineered wood products with allowable design stresses, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.
- C. Wood Structural Panels:
1. Plywood: DOC PS 1.
 2. Oriented Strand Board: DOC PS 2.
 3. Thickness: As needed to comply with requirements specified but not less than thickness indicated.
 4. Comply with "Code Plus" provisions in APA Form No. E30K, "APA Design/Construction Guide: Residential & Commercial."
 5. Factory mark panels according to indicated standard.
- D. Reusable and Sustainable Material use:
1. Use locally available building materials whenever possible.
 - a. Recycled lumber or locally milled timber or Forest Stewardship Council (FSC) certified lumber or other recycled materials.

2.3 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment by Pressure Process: AWWA C2 lumber and AWWA C9 plywood, except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWWA C31 with inorganic boron (SBX).
1. Preservative Chemicals: Acceptable to authorities having jurisdiction and one of the following:
 - a. Ammoniacal copper zinc arsenate (ACZA).

- b. Ammoniacal, or amine, copper quat (ACQ).
 - c. Copper bis (dimethyldithiocarbamate) (CDDC).
 - d. Ammoniacal copper citrate (CC).
 - e. Copper azole, Type A (CBA-A).
 - f. Oxine copper (copper-8-quinolinolate) in a light petroleum solvent.
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.
1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.
- 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.
 3. Wood framing members less than **18 inches** above grade.
 4. Wood floor plates that are installed over concrete slabs directly in contact with earth.

2.4 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Where fire-retardant-treated materials are indicated, provide materials that 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.
 3. Use Exterior type for exterior locations and where indicated.
 4. Use Interior Type A High Temperature (HT), unless otherwise indicated.
- B. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not bleed through, contain colorants, or otherwise adversely affect finishes.

2.5 DIMENSION LUMBER

- A. General: Provide dimension lumber of grades indicated according to the American Lumber Standards Committee National Grading Rule provisions of the grading agency indicated.
- B. Non-Load-Bearing Interior Partitions: Construction, Stud, or No. 2 grade and any of the following species:
 - 1. Hem-fir or Hem-fir (north); NLGA, WCLIB, or WWPA.
 - 2. Spruce-pine-fir (south) or Spruce-pine-fir; NELMA, NLGA, WCLIB, or WWPA.
- C. Exterior and Load-Bearing Walls Framing Other Than Non-Load-Bearing Partitions: Construction or No. 2 grade and any of the following species:
 - 1. Hem-fir; WCLIB or WWPA.
 - 2. Hem-fir (north); NLGA.
 - 3. Spruce-pine-fir (south); NELMA, WCLIB, or WWPA.
 - 4. Spruce-pine-fir; NLGA.
- D. Ceiling Joists (Non-Load-Bearing): Construction or No. 2 grade and any of the following species:
 - 1. Hem-fir; WCLIB or WWPA.
 - 2. Hem-fir (north); NLGA.
 - 3. Mixed southern pine; SPIB.
 - 4. Spruce-pine-fir (south); NELMA, WCLIB, or WWPA.
 - 5. Spruce-pine-fir; NLGA.
- E. Joists, Rafters, and Other Framing Not Listed Above: Select Structural, Construction or No. 1 grade and any of the following species:
 - 1. Hem-fir; WCLIB or WWPA.
 - 2. Hem-fir (north); NLGA.
 - 3. Southern pine; SPIB.
 - 4. Spruce-pine-fir (south); NELMA, WCLIB, or WWPA.
 - 5. Spruce-pine-fir; NLGA.

2.6 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 19 percent maximum moisture content and any of the following species:
 - 1. Mixed southern pine; SPIB.
 - 2. Hem-fir or Hem-fir (north); NLGA, WCLIB, or WWPA.

3. Spruce-pine-fir (south) or Spruce-pine-fir; NELMA, NLGA, WCLIB, or WWPA.

C. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.7 ENGINEERED WOOD PRODUCTS

A. Laminated-Veneer Lumber: A composite of wood veneers with grain primarily parallel to member lengths, manufactured with an exterior-type adhesive complying with ASTM D 2559. Product has the following allowable design values as determined according to ASTM D 5456:

1. Extreme Fiber Stress in Bending, Edgewise: 2600 psi for 12-inch nominal- depth members.
2. Modulus of Elasticity, Edgewise: 1,900,000 psi.

B. Parallel-Strand Lumber: A composite of wood strand elements with grain primarily parallel to member lengths, manufactured with an exterior-type adhesive complying with ASTM D 2559. Product has the following allowable design values as determined according to ASTM D 5456:

1. Extreme Fiber Stress in Bending, Edgewise: 2900 psi for 12-inch nominal- depth members.
2. Modulus of Elasticity, Edgewise: 2,000,000 psi.

C. Wood I-Joists: Prefabricated units complying with APA PRI-400; depths and performance ratings not less than those indicated.

1. Web Material: Either oriented strand board or plywood, Exposure 1.
2. Structural Capacities: Establish and monitor structural capacities according to ASTM D 5055.
3. Trademark: Factory mark I-joists with APA trademark indicating nominal joist depth, joist class, span ratings, mill identification, and I-joist compliance with APA standard.

D. Rim Boards: Performance-rated product complying with APA PRR-401.

1. Material: Oriented strand board
2. Thickness and Grade: 1-inch rim board.
3. Trademark: Factory mark with APA trademark indicating thickness, grade, and compliance with APA standard.

2.8 SHEATHING

A. Plywood Wall Sheathing: Exterior, Structural I sheathing.

1. Span Rating: Not less than 16/0.
2. Thickness: As indicated

B. Plywood Roof Sheathing: Exterior, Structural I sheathing.

1. Span Rating: Not less than 24/0.
2. Thickness: As indicated.

2.9 SUBFLOORING AND UNDERLAYMENT

- A. Oriented-Strand-Board, tongue and groove subflooring: Exposure 1, Structural I sheathing.
 - 1. Span Rating: Not less than 16.
 - 2. Thickness: Not less than **3/4 inch**.
- B. Underlayment, General: Provide underlayment in nominal thicknesses indicated or, if not indicated, not less than **1/4 inch** over smooth subfloors and not less than **3/8 inch** over board or uneven subfloors.
- C. Plywood Underlayment for Resilient Flooring: DOC PS 1, Exterior, C-C Plugged with fully sanded face.
- D. Plywood Underlayment for Ceramic Tile: DOC PS 1, Exterior, C-C Plugged, **5/8 inch** thick, for ceramic tile.
- E. Plywood Underlayment for Carpet: DOC PS 1, Exterior, C-C Plugged.

2.10 PLYWOOD BACKING PANELS

- A. 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 **5/8 inch** thick.

2.11 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
 - 1. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153.
- B. Nails, Brads, and Staples: ASTM F 1667.
- 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. Lag Bolts: **ASME B18.2.1**.
- G. Bolts: Steel bolts complying with **ASTM A 307, Grade A**; with **ASTM A 563** hex nuts and, where indicated, flat washers.

- H. 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.
 2. Material: Stainless steel with bolts and nuts complying with **ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.**

2.12 METAL FRAMING ANCHORS

- A. General: Provide framing anchors made from metal indicated, of structural capacity, type, and size indicated, and as follows:
1. Research/Evaluation Reports: Provide products acceptable to authorities having jurisdiction and for which model code research/evaluation reports exist that show compliance of metal framing anchors, for application indicated, with building code in effect for Project.
 2. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.
- B. Joist Hangers: U-shaped joist hangers with **2-inch-** long seat and **1-1/4-inch-** wide nailing flanges at least 85 percent of joist depth.
1. Thickness: **0.062 inch**
- C. I-Joist Hangers: U-shaped joist hangers with **2-inch-** long seat and **1-1/4-inch-** wide nailing flanges full depth of joist. Nailing flanges provide lateral support at joist top chord.
1. Thickness: **0.062 inch.**
- D. Top Flange Hangers: U-shaped joist hangers, full depth of joist, formed from metal strap with tabs bent to extend over and be fastened to supporting member.
1. Strap Width: **1-1/2 inches .**
 2. Thickness: **0.062 inch.**
- E. Post Bases: Adjustable-socket type for bolting in place with standoff plate to raise post **1 inch** above base and with **2-inch-** minimum side cover, socket **0.062 inch** thick, and standoff and adjustment plates **0.108 inch** thick.
- F. Rafter Tie-Downs (Hurricane or Seismic Ties): Bent strap tie for fastening rafters or roof trusses to wall studs below, **2-1/4 inches** wide by **0.062 inch** thick. Tie fits over top of rafter or truss and fastens to both sides of rafter or truss, face of top plates, and side of stud below.

- G. Floor-to-Floor Ties: Flat straps, with holes for fasteners, for tying upper floor wall studs to band joists and lower floor studs, 1-1/4 inches wide by 0.050 inch thick by 36 inches long.
- H. Hold-Downs: Brackets for bolting to wall studs and securing to foundation walls with anchor bolts or to other hold-downs with threaded rods and designed with first of two bolts placed seven bolt diameters from reinforced base.
 - 1. Bolt Diameter: 3/4 inch.
 - 2. Width: 3-3/16 inches.
 - 3. Body Thickness: 0.138 inch.
 - 4. Base Reinforcement Thickness: 0.239 inch.
- I. Wall Bracing: T-shaped bracing made for letting into studs in saw kerf, 1-1/8 inches wide by 9/16 inch deep by 0.034 inch thick with hemmed edges.
- J. Wall Bracing: Angle bracing made for letting into studs in saw kerf, 15/16 by 15/16 by 0.040 inch thick with hemmed edges.

2.13 MISCELLANEOUS MATERIALS

- A. Building Paper: Asphalt-saturated organic felt complying with ASTM D 226, Type I (No. 15 asphalt felt), unperforated.
- B. Building Wrap: Air-retarder sheeting made from polyolefins; cross-laminated films, woven strands, or spun-bonded fibers; coated or uncoated; with or without perforations; and complying with ASTM E 1677, Type I.
 - 1. Thickness: Not less than 3 mils.
 - 2. Permeance: Not less than 10 perms.
 - 3. Flame-Spread Index: 25 or less per ASTM E 84.
 - 4. Allowable Exposure Time: Not less than three months.
- C. Building Wrap Tape: Pressure-sensitive plastic tape recommended by building wrap manufacturer for sealing joints and penetrations in building wrap.
- D. Adhesives for Field Gluing Panels to Framing: Formulation complying with APA AFG-01 that is approved for use with type of construction panel indicated by both adhesive and panel manufacturers.
- E. Water-Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbamate, combined with an insecticide containing chlorpyrifos as its active ingredient.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough 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.
- B. Do not use materials with defects that impair quality of rough carpentry or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- C. Apply field treatment complying with AWP A M4 to cut surfaces of preservative-treated lumber and plywood.
- D. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. CABO NER-272 for power-driven fasteners.
 - 2. Published requirements of metal framing anchor manufacturer.
 - 3. Table 2305.2, "Fastening Schedule," in the BOCA National Building Code.
- E. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; predrill as required.
- F. Use finishing nails for exposed work, unless otherwise indicated. Countersink nail heads and fill holes with wood filler.

3.2 WOOD GROUND, SLEEPER, 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. Build anchor bolts into masonry during installation of masonry work. Where possible, secure anchor bolts to formwork before concrete placement.

3.3 WOOD FRAMING INSTALLATION, GENERAL

- A. Framing Standard: Comply with AFPA's "Manual for Wood Frame Construction," unless otherwise indicated.
- B. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.
- C. Do not splice structural members between supports.

- D. Where built-up beams or girders of **2-inch nominal**- dimension lumber on edge are required, fasten together with 2 rows of **20d** nails spaced not less than **32 inches** o.c. Locate one row near top edge and other near bottom edge.
1. For continuous members locate end joints over supports.

3.4 WALL AND PARTITION FRAMING INSTALLATION

- A. General: Arrange studs so wide face of stud is perpendicular to direction of wall or partition and narrow face is parallel. Provide single bottom plate and double top plates using members of **2-inch nominal** thickness whose widths equal that of studs, except single top plate may be used for non-load-bearing partitions. Anchor plates to supporting construction, unless otherwise indicated.
1. For exterior walls, provide **2-by-6-inch nominal**- size wood studs spaced **16 inches** o.c., unless otherwise indicated.
 2. For interior partitions and walls, provide **2-by-4-inch nominal**-size wood studs spaced **16 inches** o.c., unless otherwise indicated.
- B. Construct corners and intersections with three or more studs. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
1. Provide continuous horizontal blocking at midheight of partitions more than **96 inches** high and bearing partitions, using members of **2-inch nominal** thickness and of same width as wall or partitions.
- C. Fire block concealed spaces of wood-framed walls and partitions at each floor level and at ceiling line of top story. Where fire blocking is not inherent in framing system used, provide closely fitted wood blocks of **2-inch nominal**- thick lumber of same width as framing members.
- D. Frame openings with multiple studs and headers. Provide nailed header members of thickness equal to width of studs. Set headers on edge and support on jamb studs.
1. For non-load-bearing partitions, provide double-jamb studs with headers not less than **4-inch nominal** depth for openings **48 inches** and less in width, **6-inch nominal** depth for openings **48 to 72 inches** in width, **8-inch nominal** depth for openings **72 to 120 inches** in width, and not less than **10-inch nominal** depth for openings **10 to 12 feet** in width.
 2. For load-bearing walls, provide double-jamb studs for openings **72 inches** and less in width, and triple-jamb studs for wider openings. Provide headers of depth indicated.
- E. Provide bracing in exterior walls, at both walls of each external corner, full-story height, unless otherwise indicated. Provide one of the following:
- F. Provide bracing in walls, at locations indicated, full-story height, unless otherwise indicated. Provide one of the following:
1. Diagonal bracing at 45-degree angle using let-in **1-by-4-inch nominal**- size boards.
 2. Diagonal bracing at 45-degree angle using metal bracing.
 3. Plywood panels not less than **48 by 96 inches** applied vertically.

3.5 FLOOR JOIST FRAMING INSTALLATION

- A. General: Install floor joists with crown edge up and support ends of each member with not less than **1-1/2 inches** of bearing on wood or metal, or **3 inches** on masonry. Attach floor joists as follows:
 - 1. Where supported on wood members, by using metal framing anchors.
 - 2. Where framed into wood supporting members by using metal joist hangers.
- B. Fire Cuts: At joists built into masonry, bevel cut ends **3 inches** and do not embed more than **4 inches**.
- C. Frame openings with headers and trimmers supported by metal joist hangers; double headers and trimmers where span of header exceeds **48 inches** .
- D. Do not notch in middle third of joists; limit notches to one-sixth depth of joist, one-third at ends. Do not bore holes larger than 1/3 depth of joist; do not locate closer than **2 inches** from top or bottom.
- E. Provide solid blocking of **2-inch nominal** thickness by depth of joist at ends of joists unless nailed to header or band.
- F. Lap members framing from opposite sides of beams, girders, or partitions not less than **4 inches** or securely tie opposing members together. Provide solid blocking of **2-inch nominal** thickness by depth of joist over supports.
- G. Anchor members paralleling masonry as indicated.
- H. Provide solid blocking between joists under jamb studs for openings.
- I. Under non-load-bearing partitions, provide double joists separated by solid blocking equal to depth of studs above.
 - 1. Provide triple joists separated as above, under partitions receiving ceramic tile and similar heavy finishes or fixtures.
 - 2. Provide bridging as indicated.

3.6 CEILING JOIST AND RAFTER FRAMING INSTALLATION

- A. Ceiling Joists: Install ceiling joists with crown edge up and complying with requirements specified above for floor joists. Face nail to ends of parallel rafters.
 - 1. Where ceiling joists are at right angles to rafters, provide additional short joists parallel to rafters from wall plate to first joist; nail to ends of rafters and to top plate and nail to first joist or anchor with framing anchors or metal straps. Provide **1-by-8-inch nominal-** size or **2-by-4-inch nominal-** size stringers spaced **48 inches** o.c. crosswise over main ceiling joists.

- B. Rafters: Notch to fit exterior wall plates and use metal framing anchors. Double rafters to form headers and trimmers at openings in roof framing, if any, and support with metal hangers. Where rafters abut at ridge, place directly opposite each other and nail to ridge member or use metal ridge hangers.
 - 1. At valleys, provide double-valley rafters of size indicated or, if not indicated, of same thickness as regular rafters and **2 inches** deeper. Bevel ends of jack rafters for full bearing against valley rafters.
 - 2. At hips, provide hip rafter of size indicated or, if not indicated, of same thickness as regular rafters and **2 inches** deeper. Bevel ends of jack rafters for full bearing against hip rafter.
- C. Provide collar beams (ties) as indicated or, if not indicated, provide **1-by-6-inch nominal-** size boards between every third pair of rafters, but not more than **48 inches** o.c. Locate below ridge member, at third point of rafter span. Cut ends to fit roof slope and nail to rafters.
- D. Provide special framing as indicated for eaves, overhangs, dormers, and similar conditions, if any.

3.7 STAIR FRAMING INSTALLATION

- A. Provide stair framing members of size, space, and configuration indicated or, if not indicated, to comply with the following requirements:
 - 1. Stringer Size: **2-by-12-inch nominal-** size, minimum.
 - 2. Notching: Notch stringers to receive treads, risers, and supports; leave at least **3-1/2 inches** of effective depth.
 - 3. Stringer Spacing: At least 3 stringers for each **36-inch** clear width of stair.
- B. Provide stair framing with no more than **3/16-inch** variation between adjacent treads and risers and no more than **3/8-inch** variation between largest and smallest treads and risers within each flight.

3.8 WOOD STRUCTURAL PANEL INSTALLATION

- A. General: Comply with applicable recommendations contained in APA Form No. E30K, "APA Design/Construction Guide: Residential & Commercial," for types of structural-use panels and applications indicated.
 - 1. Comply with "Code Plus" provisions in above-referenced guide.
- B. Fastening Methods: Fasten panels as indicated below:
 - 1. Combination Subfloor-Underlayment:
 - a. Glue and nail to wood framing.
 - 2. Subflooring:
 - a. Glue and nail to wood framing.

3. Sheathing:
 - a. Nail to wood framing.
4. Underlayment:
 - a. Nail or staple to subflooring.
 - b. Space panels **1/32 inch** apart at edges and ends.
 - c. Fill and sand edge joints of underlayment receiving resilient flooring just before installing flooring.
5. Plywood Backing Panels: Nail or screw to supports.

3.9 BUILDING PAPER APPLICATION

- A. Apply building paper horizontally with **2-inch** overlap and **6-inch** end lap; fasten to sheathing with galvanized staples or roofing nails. Cover upstanding flashing with **4-inch** overlap.

3.10 BUILDING WRAP APPLICATION

- A. Cover wall sheathing with building wrap as indicated.
 1. Comply with manufacturer's written instructions.
 2. Cover upstanding flashing with **4-inch** overlap.
 3. Seal seams, edges, and penetrations with tape.
 4. Extend into jambs of openings and seal corners with tape.

END OF SECTION 06100

SECTION 06200 - FINISH CARPENTRY

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.

1.2 SUMMARY

- A. This Section includes the following:

1. Exterior 'synthetic' (expanded rigid PVC) boards and trim for field application and field painted finish.
2. Interior standing and running trim for natural or field-painted finish.
3. Interior plywood, hardboard & board paneling.
4. Closet poles w/ shelves.

- B. Related Sections include the following:

1. Division 6 Section "Rough Carpentry" for furring, blocking, and other carpentry work not exposed to view.
2. Division 9 Section "Painting" for priming and back-priming of finish carpentry.

1.3 SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Include construction details, material descriptions, dimensions of individual components and profiles, textures, and colors.

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. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
3. For moulded millwork, 'Synthetic' Azek or equal (expanded rigid PVC) boards, mouldings & trim include statements regarding fire characteristics (self-extinguishing), impact resistance & environmental temperature stress, before shipment to Project site.

- B. Samples for Initial Selection: Style charts consisting of actual materials in small sections for boards, sheets, panels, mouldings, trim & brackets for each application of material indicated or required.

C. Samples for Verification:

1. For each element, style, cut and panel products with factory-applied finish.
2. For each composite application of products with factory-applied finish.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer with a minimum of 5 years experience.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect materials against weather and contact with damp or wet surfaces. Stack lumber, plywood, and other panels. Provide for air circulation within and around stacks and under temporary coverings.
- B. Protect materials against denting, gouges and scratches with protective covers until installation.
- C. Deliver interior finish carpentry only when environmental conditions meet requirements specified for installation areas. If finish carpentry must be stored in other than installation areas, store only where environmental conditions meet requirements specified for installation areas.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install interior finish carpentry until building is enclosed and weatherproof, wet work in space is completed and nominally dry, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit work to be performed according to manufacturer's written instructions and warranty requirements and at least one coat of specified finish to be applied without exposure to rain, snow, or dampness.

1.7 WARRANTY

- A. Warranties for products: Manufacturer's standard form, signed by manufacturer, Installer, and Contractor, in which manufacturer agrees to repair or replace materials that fail or workmanship within specified warranty period. Failures include, but are not limited to deformation or deterioration.
1. Warranty Period: 'Azek' Twenty-Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Synthetic Standing, Premoulded millwork, trim & sheet goods

Azek by Vycom
801 Corey Street
Moosic, PA 18507

AZEK TABLES/SPECIFICATIONS:

Table 6A: AZEK Foam PVC Sheet Typical Physical Properties

ASTM Designation	Property	Typical Value
D 792	Density	0.55g/cm ³
D 570	Water Absorption	0.15%
D 638	Tensile Strength	2256 psi
D 638	Tensile Modulus	144,000 psi
D790	Flexural Strength	3329 psi
D790	Flexural Modulus	144,219 psi
D1761	Nail Hold	35lbf/in. of pen.
D1761	Screw Hold	680 lbf/in. of pen.
D1761	Staple Hold	180lbf/in. of pen.
D 4228	Gardner Impact Strength	103 in/lbs
D 256	Charpy Impact	4.5 ft/lbs
D 696	Coefficient of Linear Expansion	3.2 x 10 ⁻⁶ in/in/°F
E84	Flame Spread index	25
D 648	Heat Deflection Temp 264psi	150°F
D3679	Oil Canning(@140°F)	None

Window Sills: 1" thick cultured marble or solid surface sills with bull nosing.

Closet And Utility Shelving:

Quality Standard: Comply with AWI Section 600.

Shelving for Opaque Finish: Comply with the following requirements:

Grade: Economy.

Shelving Material: Birch faced veneer core plywood w/ eased edge oak nosing, sanded.

Miscellaneous Materials:

Fasteners and Anchorages: Provide nails, screws and other anchoring devices of the type, size, material and finish required for application indicated to provide secure attachment, concealed where possible, and complying with applicable Federal Specifications.

Where finish carpentry is exposed on exterior or in areas of high relative humidity, provide fasteners and anchorages with a hot-dipped zinc coating (ASTM A 153).

Closet And Utility Shelving Hardware:

Adjustable Shelf Standards and Related Supports: Provide standards and supports of type indicated which comply with ANSI/BHMA A156.9.

Horizontal Slotted Type: Surface or mortise mounted, 5/8" wide x 3/16" high x length indicated, BHMA No B84071, zinc-plated steel.

Support Type: Closed shelf rest, BHMA No. B84081, zinc-plated steel.

Vertical Slotted Type: Vertical slots spaced 2" on center, 7/8" wide x 11/16" high x length indicated, BHMA No. B84102, zinc-plated steel.

Shelf Brackets: Size required to support shelving widths indicated, BHMA No. B84112, zinc-plated steel.

Clothes Poles and Supports: Provide steel pipe or tubing or 1 5/8" Fir closet pole w/ 3 coat poly finish cut to lengths required, with standard wrought steel flanges (one with open top).

Size: 1.660" O.D., 0.14" wall thickness (1-1/2").

Finish: Satin chrome plated, BHMA 652.

Center Brackets: Combination shelf and closet pole support wrought steel with manufacturer's standard enamel finish; complying with ANSI A156.16, Type B84051.

SUBMITTALS

- A. Product data: Submit manufacturer's descriptive literature, specifications, installation instructions and limited warranty.
- B. Shop drawings: Submit full-size details and method of installation.
- C. Samples: Provide samples of standard design or profile of custom design.

DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle according to instructions of manufacture.
- B. Installation stickers contain storage and handling instructions.

PROTECT/SITE CONDITIONS

- A. Furnish and install in cooperation with other trades.
- B. Coordinate field measurements and shop drawings with fabrication and shop assembly.

WARRANTY

- A. Manufacturer one year limited warranty against defects in materials and workmanship as stated in literature.

PART 2: PRODUCTS

MANUFACTURED UNITS

- A. General:
 - 1. Ultra violet: If properly coated, not affected.
 - 2. Solvent Resistance: Resistant
 - 3. Odor/Gas: Normal conditions release no gases, odor free.
 - 4. Vermin and Fungus Resistance: Resistant
 - 5. Insulation: Greater Insulating value than comparable wood products

FINISHES

- A. Factory coated with a high quality exterior grade acrylic emulsion paint.

PART 3 - EXECUTION

- 1. Installation
 - A. Follow manufacturer's instruction sheets.
 - B. Fill holes with wood putty and sand for finishing material.
 - C. Finish with high quality exterior paint.

2.2 LUMBER MATERIALS, GENERAL

- A. Lumber: DOC PS 20 and applicable grading rules of inspection agencies certified by the American Lumber Standards' Committee Board of Review.
 - 1. Factory mark each piece of lumber with grade stamp of inspection agency indicating grade, species, moisture content at time of surfacing, and mill.
 - 2. For exposed lumber, mark grade stamp on end or back of each piece, or omit grade stamp and provide certificates of grade compliance issued by inspection agency.

- B. Softwood Plywood: DOC PS 1.
- C. Hardwood Plywood: HPVA HP-1.
- D. Hardboard: AHA A135.4
- E. Medium-Density Fiberboard: ANSI A208.2, Grade MD-Exterior Glue.
- F. Particleboard: ANSI A208.1, Grade M-2-Exterior Glue.

2.3 EXTERIOR STANDING AND RUNNING TRIM

- A. Synthetic, Premoulded millwork, trim & sheet goods
Azek by Vycom
801 Corey Street Moosic, PA 18507

2.4 INTERIOR STANDING AND RUNNING TRIM

- A. Softwood Lumber Trim for Transparent Finish (Stain or Clear Finish): Kiln-dried finished lumber (S4S) of the following species and grades:
 - 1. Grade Finish or 1 Common eastern white pine; NELMA or NLGA.
- B. Hardwood Lumber Trim for Transparent Finish (Stain or Clear Finish): [Grade A finish], kiln-dried, [red oak]
- C. Lumber Trim for Opaque Finish (Painted): Finished lumber (S4S), either finger-jointed or solid lumber, of one of the following species and grades:
 - 1. Grade Finish or 1 Common eastern white pine; NELMA or NLGA.
 - 2. Grade 1 Common Idaho white, lodgepole, ponderosa, or sugar pine; NLGA or WWPA.
 - 3. Grade 1 Common white woods; WWPA.
 - 4. Grade Superior or C & Btr finish Douglas fir-larch or Douglas fir south; NLGA, WCLIB, or WWPA.
 - 5. Grade 1 Common spruce-pine-fir; NELMA, NLGA, WCLIB, or WWPA.
 - 6. Grade A Finish alder, aspen, basswood, cottonwood, gum, magnolia, soft maple, sycamore, tupelo, or yellow poplar; NHLA.
- D. Moldings: Made to patterns included in WMMPA WM 7. Wood moldings made from kiln-dried stock and graded under WMMPA WM 4.
 - 1. Moldings for Transparent Finish (Stain or Clear Finish): N-grade [red oak]
Provide material selected for compatible grain and color.
 - 2. Moldings for Opaque Finish (Painted): P-grade [eastern white, Idaho white, lodgepole, ponderosa, or sugar pine]
 - 3. Base Pattern: Brosco B688
 - 4. Shoe-Mold Pattern: WM 105, 3/4-by-3/4-inch quarter-round shoe mold.
 - 5. Casing Pattern: WM 412, 11/16-by-3-1/2-inch flat casing for doors.
 - 6. Casing Pattern: WM 472, 9/16-by-2-1/2-inch flat casing for windows.
 - 7. Casing Pattern: LWM 412, 11/16-by-3-1/2-inch flat casing for under window sills.
 - 8. Chair-Rail Pattern: 11/16-by-3-1/2-inch oak chair rail.
 - 9. Rosette: B160A 1-1/16 x 3-1/2-inch rosette.

10. Corridor handrail: Brosco B-959 or SpecTrim Handrail System.

2.5 MISCELLANEOUS MATERIALS

- A. Fasteners for Exterior Finish Carpentry: Provide nails or screws of the following materials, in sufficient length to penetrate minimum of **1-1/2 inches** into substrate, unless otherwise recommended by manufacturer:
 1. Stainless steel only
- B. Fasteners for Interior Finish Carpentry: Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.
 1. Where finish carpentry materials are exposed in areas of high humidity, provide fasteners and anchorages with hot-dip galvanized coating complying with ASTM A 153/A 153M.
- C. Adhesives: Comply with paneling or synthetic moulded millwork manufacturer's written recommendations for adhesives.
- D. Glue: Lumber Products: Aliphatic- or phenolic-resin wood glue recommended by manufacturer for general carpentry use.
- E. Flashing: Comply with requirements in Division 7 Section "Sheet Metal Flashing and Trim" for flashing materials installed in finish carpentry.
- F. Sealants: Comply with requirements in Division 7 Section "Joint Sealants" for materials required for sealing siding work.

2.6 FABRICATION

- A. Wood Moisture Content: Comply with requirements of specified inspection agencies and with manufacturer's written recommendations for moisture content of finish carpentry at relative humidity conditions existing during time of fabrication and in installation areas.
- B. Back out or kerf backs of the following members, except members with ends exposed in finished work:
 1. Exterior standing and running trim wider than **5 inches**.
 2. Interior standing and running trim, except shoe and crown molds.
 3. Wood board paneling.
- C. Ease edges of lumber less than **1 inch** in nominal thickness to **1/16-inch** radius and edges of lumber **1 inch** or more in nominal thickness to **1/8-inch** radius.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.
- B. Before installing finish carpentry, condition materials to average prevailing humidity in installation areas for a minimum of 24 hours, unless longer conditioning is recommended by manufacturer.
- C. Prime lumber for exterior applications to be painted, including both faces and edges. Cut to required lengths and prime ends. Comply with requirements in Division 9 Section "Painting."

3.3 INSTALLATION, GENERAL

- A. Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, or too small to fabricate with proper jointing arrangements.
 - 1. Do not use manufactured units with defective surfaces, sizes, or patterns.
- B. Install finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.
 - 1. Scribe and cut finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
 - 2. Countersink fasteners, fill surface flush, and sand where face fastening is unavoidable.
 - 3. Install to tolerance of **1/8 inch in 96 inches** for level and plumb. Install adjoining finish carpentry with **1/32-inch** maximum offset for flush installation and **1/16-inch** maximum offset for reveal installation.
 - 4. Coordinate finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate finish carpentry.

3.4 STANDING AND RUNNING TRIM INSTALLATION

- A. Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than **24 inches** long, except where necessary. Stagger joints in adjacent and related standing and running trim. Cope at returns and miter at corners to produce tight-fitting joints with full-surface contact throughout length of joint. Use scarf joints for end-to-end joints. Plane backs of casings to provide uniform thickness across joints, where necessary for alignment.
 - 1. Match color and grain pattern across joints.
 - 2. Install trim after gypsum board joint finishing operations are completed.
 - 3. Drill pilot holes in hardwood before fastening to prevent splitting. Fasten to prevent movement or warping. Countersink fastener heads on exposed carpentry work and fill holes.
 - 4. Fit exterior joints to exclude water. Apply flat grain lumber with bark side exposed to weather.

3.5 ADJUSTING

- A. Replace finish carpentry that is damaged or does not comply with requirements. Finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing. Adjust joinery for uniform appearance.

3.6 CLEANING

- A. Clean finish carpentry on exposed and semiexposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

END OF SECTION 06200

SECTION 07218
SPRAYED INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including Contractual Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes: Light density, open celled, flexible, 100 percent water blown polyurethane foam insulation.
- B. Related Sections:
 - 1. Section 01575 – Construction Waste Management.
 - 2. Section 03300 – Cast-in-Place Concrete.
 - 3. Section 04200 – Unit Masonry.
 - 4. Section 06100 – Rough Carpentry.
 - 5. Section 07210 – Building Insulation.
 - 6. Section 09260 – Gypsum Board Assemblies.
- C. Coordinate mechanical ventilation and fresh air supply with Mechanical sections and ASHRAE Guidelines for optimum indoor air quality.

1.3 REFERENCES

- A. American Society for Testing and Materials International (ASTM)
 - 1. ASTM C 518: Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
 - 2. ASTM D 2863: Standard Test Method for Measuring the Minimum Oxygen Concentration to Support Candle-Like Combustion of Plastics (Oxygen Index)
 - 3. ASTM E 84: Test Method for Surface Burning Characteristics of Building Materials
 - 4. ASTM E 96: Standard Test Methods for Water Vapor Transmission of Materials
 - 5. ASTM E 2178: Standard Test Method for Air Permeance of Building Materials
 - 6. ASTM E 283: Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen

1.4 SUBMITTALS

- A. Product Data for each type of insulation product specified.
- B. Product test reports performed by a qualified independent testing agency evidencing compliance of insulation products with specified requirements including those for thermal resistance, fire-test-response characteristics, water-vapor transmission, water absorption, and other properties, based on comprehensive testing of current products.
- C. Evaluation Report: Evidence of compliance of foam-plastic insulations with International Building Code (IBC), International Residential Code (IRC), International Energy Conservation Code (IECC), International Association of Plumbing and Mechanical Officials (IAPMO)

- D. Manufacturer's certificate certifying insulation provided meets or exceeds specified requirements.
- E. Installer's certificate showing the Icynene installation certification.
- F. NAHB National Green Building Standard (ANSI ICC-700-08) Submittals:
 - 1. Credit 608.1, Indigenous Materials: Product Data indicating location of material manufacturer for regionally manufactured materials.
 - 2. Credit 703 Prescriptive Path: Product Data confirming the sprayed insulation is Grade 1.
 - 3. Credit 901.11: Insulation – Emissions: Product Data confirming sprayed insulation contains formaldehyde emission levels that comply with the requirements of CA/DHS 01350.
- G. Sample warranty

1.5 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Product produced in an ISO9001 registered factory.
- B. Single Source Responsibility: Single source product from one manufacturer.
- C. Installer Qualifications: Engage an Icynene Licensed Dealer (applicator) who has been trained and certified by Icynene.
- D. Fire-Test-Response Characteristics: Provide materials specified as determined by testing identical products per test method indicated below by a testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
 - 1. Surface-Burning Characteristics: ASTM E 84
- E. Toxicity/Hazardous Materials
 - 1. Provide products that contain no urea-formaldehyde
 - 2. Products and equipment requiring or using CFCs, HCFCs, or HFCs during the manufacturing or application process will not be permitted
 - 3. Provide products that contain no PBDEs
 - 4. Provide products that are "Low-emitting"

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Comply with manufacturers written instructions for handling and protection prior to and during installation.
- B. Store both components in a temperature controlled area between 50 deg F (15 deg C) and 100 deg F (32 deg C). Do not allow product to freeze.
- C. Use only those components that are supplied by the Manufacturer.

1.7 PROJECT CONDITIONS

- A. Do not expose to sunlight, except to extent necessary for period of installation and concealment.

1.8 WARRANTY

- A. Manufacturer's standard limited lifetime warranty.
- B. Refer to www.Icynene.com for full warranty terms.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Polyurethane Spray Foam Insulation: ICYNENE LD-C-50™ by Icynene Inc.

2.2 MATERIALS

- A. General: Provide insulating materials that comply with requirements and with referenced standards.

- B. ICYNENE LD-C-50™ Spray Foam Insulation: Low-density, water-blown, conforming to the following:

1. Thermal Resistance (R-Value/inch @75 deg F): ASTM C 518; 3.7 hr/sq ft/degree F/BTU

a. Heat Flow Reduction:

- | | | |
|----|---------------------|------------|
| 1) | Through 1 inch: | 75 percent |
| 2) | Through 3.5 inches | 93 percent |
| 3) | Through 5.5 inches | 95 percent |
| 4) | Through 10.5 inches | 98 percent |

2. Air Permeance (for 2 inches of material): ASTM E 283; <0.02 L/S.m² @75 Pa

3. Air Permeance (for 5.5 inches of material): ASTM E 2178; < 0.02 L/s.m² @ 75 Pa

4. Water Vapor Transmission (for 5.5 inches of material): ASTM E 96; 11 perms [627 ng/(Pa.s.m²)]

5. Flame Spread and Smoke Developed Rating: ASTM E 84

- | | | |
|----|--------------------|---------------|
| a. | Flame Spread: | Less than 20 |
| b. | Smoke Development: | Less than 400 |
| c. | Oxygen Index | 23 percent |

6. Bacterial and Fungal Growth and Food Value: Texas Tech. University; not a source of food for mold (no growth)

C. Product Description:

1. ICC/ES Evaluation Report No. ESR 1826
2. IAPMO-ES Report No. 0165
3. Collaborative for High-Performance Schools (CHPS) “Low-emitting material” per CA 01350 Criteria
4. Effective “breathing,” (Vapor Permeable), air barrier material that can move with the building to maintain the air barrier characteristic for the life of the building.

2.3 SOURCE QUALITY CONTROL

- A. Product produced in an ISO 9001 registered factory.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, under which work is to be performed. Do not proceed until unsatisfactory conditions have been corrected.
 - 1. Review placement area to determine final location will not be within 3 inches of any heat source where the temperature will exceed 200 deg F per ASTM C 411 or in accordance with authorities having jurisdiction.

3.2 PREPARATION

- A. Clean substrates and cavities of loose materials capable of interfering with insulation placement.

3.3 APPLICATION

- A. Site mix liquid components manufactured by Icynene and supplied by Independent Icynene Licensed Dealer.
- B. Apply insulation to substrates in compliance with manufacturer's written instructions.
- C. Apply insulation to produce thickness required for indicated R Value.
 - 1. R-13 is achieved at 3 1/2 inches
 - 2. R-20 is achieved at 5 1/2 inches
- D. Extend insulation in thickness indicated to envelop entire area to be insulated.
- E. Water-Piping Coordination: If water piping is located within insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.

3.4 REPAIRS

- A. Any repairs must be effected by an Icynene Licensed Dealer.

3.5 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where insulation is subject to abuse.

END OF SECTION 07218

SECTION 07311 - ASPHALT SHINGLES

GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general conditions of the Contract, including General and Supplementary General Conditions and all Division 1 Sections, apply to the work of this section.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.3 SUMMARY

This Section includes asphalt shingles for steep roofs.

- A. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 6 Section "Rough Carpentry" for wood sheathing and framing.
 - 2. Division 7 Section "Flashing and Sheet Metal" for metal valley flashing, step flashing, drip edges, and other sheet metal work.
 - 3. Division 7 Section "Roof Accessories" for ridge vents, hatches, and roof penetrations.

1.4 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product data for each type of product specified, including details of construction relative to materials, dimensions of individual components, profiles, textures, and colors.
- C. Samples for initial selection in the form of manufacturer's sample finishes showing the full range of colors and profiles available for each type of asphalt shingle indicated.
- D. Samples for verification in the form of 2 full-size units of each type of asphalt shingle indicated showing the full range of variations expected in these characteristics.

1.5 QUALITY ASSURANCE

- A. Fire-Test-Response Classification: Where products with a fire-test-response classification are specified, provide asphalt shingles identical to those tested according to ASTM E 108 or UL 790 and listed by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify each bundle of asphalt shingles with appropriate markings indicating fire-test-response classification of applicable testing and inspecting agency.
- B. Wind-Resistance-Test Characteristics: Where wind-resistant asphalt shingles are indicated, provide products identical to those tested according to ASTM D 3161 or UL 997 and passed. Identify each bundle of asphalt shingles with appropriate markings of applicable testing and inspecting agency.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in manufacturer's unopened bundles or containers with labels intact.
- B. Handle and store materials at Project site to prevent water damage, staining, or other physical damage. Store roll goods on end. Comply with manufacturer's recommendations for job-site storage, handling, and protection.

1.7 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installing asphalt shingles only when existing and forecasted weather conditions will permit work to be performed according to manufacturers' recommendations and warranty requirements, and when substrate is completely dry.

1.8 WARRANTY

- A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
 - 1. Warranty Period: Manufacturer's standard but not less than 25 years after date of Substantial Completion.

1.9 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels clearly describing contents.
 - 1. Furnish 1 square coverage of asphalt shingles, identical to those to be installed, in unbroken bundles.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering asphalt shingles that may be incorporated in the Work include, but are not limited to, the following:
 - 1. GAF Building Materials Corporation. - 'Slateline' or equal
- B. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
 - 1. Waterproof Underlayment:
 - a. Bituthene Ice and Water Shield; Grace: W.R. Grace & Co.
 - b. Nordshield Ice and WaterGard; Nord Bitumi US, Inc.
 - c. Moisture Guard; Tamko Asphalt Products, Inc.
 - d. Weather Watch; GAF Building Materials Corporation.
 - e. Ice Guard Membrane No. 108-AG; Royston Laboratories, Inc.

2.2 ASPHALT SHINGLES

- A. Colors, Blends, and Patterns: Where manufacturer's standard products are indicated, provide asphalt shingles with the following requirements:
 - 1. Provide Architect's selections from manufacturer's full range of colors, textures, and patterns for asphalt shingles of type indicated.
- B. Square-Tab, Fiberglass Strip Shingles: Super Heavyweight, Mineral-surfaced, self-sealing, 5-tab, fiberglass-based, strip asphalt shingles, complying with both ASTM D 3018, Type I, and ASTM D 3161, Type I ASTM D 3462. Provide shingles with a Class A fire-test-response classification that pass the wind-resistance-test requirements of ASTM D 3161,

40 year warranty, GAF Building Materials Corporation. - 'Slateline' or equal

 - 1. Fungus Resistant: Provide shingles that have been surface treated to remain free of fungus and algae growth, which adversely affects the appearance of the roof, for at least 5 years.
- C. Hip and Ridge Shingles: Manufacturer's standard, factory-precut units to match asphalt shingles.
- D. Hip and Ridge Shingles: Job-fabricated units cut from actual asphalt shingles used.\

2.3 METAL FLASHING AND TRIM

- A. Sheet Metal Flashing and Trim: Comply with requirements in Division 7 Section "Sheet Metal Flashing and Trim."
 - 1. Sheet Metal: 16 oz. Copper.
- B. 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.
 - 1. Apron Flashings: Fabricate with lower flange a minimum of 4 inches over and 4 inches beyond each side of downslope asphalt shingles and 6 inches up the vertical surface.
 - 2. Step Flashings: Fabricate with a headlap of 2 inches and a minimum extension of 4 inches over the underlying asphalt shingle and up the vertical surface.
 - 3. Cricket Flashings: Fabricate with concealed flange extending a minimum of 24 inches beneath upslope asphalt shingles and 6 inches beyond each side of element and 6 inches above the roof plane.
 - 4. Drip Edges: Fabricate in lengths not exceeding 10 feet 2-inch roof deck flange and 1-1/2-inch fascia flange with 3/8-inch drip at lower edge.
- C. Vent Pipe Flashings: ASTM B 749, Type L51121, at least 1/16 inch thick. Provide lead sleeve sized to slip over and turn down into pipe, soldered to skirt at slope of roof and extending at least 4 inches from pipe onto roof.

2.4 ACCESSORIES

- A. Felt Underlayment: Type I, 36-inch wide, asphalt-saturated organic felt, complying with ASTM D 226 (No. 15) or ASTM D 4869.
- B. Asphalt Plastic Cement: Nonasbestos fibrated asphalt cement, complying with ASTM D 4586.
- C. Nails: Stainless steel, 0.120-inch diameter barbed shank, sharp-pointed, conventional roofing nails with a minimum 3/8-inch diameter head and of sufficient length to penetrate 3/4 inch into solid decking or at least 1/8 inch through plywood sheathing.
 - 1. Where nails are in contact with flashing, prevent galvanic action by providing nails made from the same metal as that of the flashing.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrate for compliance with requirements for substrates, installation tolerances, and other conditions affecting performance of asphalt shingles. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application. Cover knotholes or other minor voids in substrate with sheet metal flashing secured with noncorrosive roofing nails.
- B. Coordinate installation with flashings and other adjoining work to ensure proper sequencing. Do not install roofing materials until all vent stacks and other penetrations through roof sheathing have been installed and are securely fastened against movement.

3.3 INSTALLATION

- A. General: Comply with manufacturer's instructions and recommendations but not less than those recommended by ARMA's "Residential Asphalt Roofing Manual" or "The NRCA Steep Roofing Manual."
 - 1. Fasten asphalt shingles to roof sheathing with nails.
- B. Felt Underlayment: Apply 1 layer of felt underlayment horizontally over entire surface to receive asphalt shingles, lapping succeeding courses a minimum of 2 inches, end laps a minimum of 4 inches, and hips and valleys a minimum of 6 inches. Fasten felt with sufficient number of roofing nails or noncorrosive staples to hold underlayment in place until asphalt shingle installation.
 - 1. Apply felt underlayment at areas of waterproof underlayment. Lap felt underlayment over waterproof underlayment as recommended by manufacturer but not less than 2 inches on roof decks with a slope of 2 to 4 inches per foot (1:6 to 1:3).
 - 2. Omit felt underlayment at areas of waterproof underlayment. Lap felt underlayment over waterproof underlayment as recommended by manufacturer but not less than 2 inches.
- C. Waterproof Underlayment: Apply waterproof underlayment at eaves. Cover deck from eaves to at least 24 inches inside exterior wall line.
 - 1. In addition to eaves, apply waterproof underlayment in place of felt underlayment at valleys.
- D. Flashing: Install metal flashing and trim as indicated and according to details and recommendations of the "Asphalt Roofing" section of "The NRCA Steep Roofing Manual" and ARMA's "Residential Asphalt Roofing Manual."
- E. Install asphalt shingles, beginning at roof's lower edge, with a starter strip of roll roofing or inverted asphalt shingles with tabs removed. Fasten asphalt shingles in the desired weather exposure pattern; use number of fasteners per shingle as recommended by manufacturer. Use vertical and horizontal chalk lines to ensure straight coursing.
 - 1. Cut and fit asphalt shingles at valleys, ridges, and edges to provide maximum weather protection. Provide same weather exposure at ridges as specified for roof. Lap asphalt shingles at ridges to shed water away from direction of prevailing wind.
 - 2. Use fasteners at ridges of sufficient length to penetrate sheathing as specified.
 - 3. Pattern: 1/2 shingle spacing offset at succeeding courses or 1/3 shingle spacing offset at succeeding courses as per shingle requirement.

3.4 ADJUSTING

- A. Replace any damaged materials installed under this Section with new materials that meet specified requirements.

END OF SECTION 07311

SECTION 07460 - SIDING

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.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Fiber-cement siding and trim.
- B. Related Sections include the following:
 - 1. Division 6 Section "Rough Carpentry" for building wrap.
 - 2. Division 6 Section "Finish Carpentry" for wood and wood-based sidings and for exterior trim.
 - 3. Division 7 Section "Sheet Metal Flashing and Trim" for flashing, gutters, and other sheet metal work.
 - 4. Division 7 Section "Joint Sealants."

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
 - 1. Manufacturer's data sheets on each product to be used, including:
 - a) Preparation instructions and recommendations.
 - b) Storage and handling requirements and recommendations.
 - c) Installation methods.
- B. Samples for Initial Selection: For siding, soffit, and decorative accessories.
- C. Samples for Verification:
 - 1. ~~12-inch~~ long-by-actual-width Sample of siding.
 - 2. ~~24-inch~~ wide-by-~~36-inch~~ high Sample panel of siding assembled on plywood backing.

1.4 QUALITY ASSURANCE

- A. Source Limitations for Siding: Obtain each type, color, texture, and pattern of siding, including related accessories, through one source from a single manufacturer.

- B. Mockup: Build mockup to verify selections made under sample submittals and to demonstrate aesthetic effects.
 - 1. Build mockup approximately 48 inches long by 60 inches high. Include outside corner on one end of mockup and inside corner on other end.
- C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials in a dry, well-ventilated, weathertight place.

1.6 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with siding installation only if substrate is completely dry and if existing and forecasted weather conditions permit siding to be installed according to manufacturer's written instructions.

1.7 SEQUENCING

- A. Coordinate installation with flashings and other adjoining construction to ensure proper sequencing.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace siding that does not comply with requirements or that fails within specified warranty period. Failures include, but are not limited to, cracking, deforming, fading, or otherwise deteriorating beyond normal weathering.
 - 1. Warranty Period: 30 years from date of Substantial Completion.

1.9 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Furnish full lengths of siding and trim in a quantity equal to 2 percent of amount installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 SIDING

- A. Fiber-Cement Siding: Siding made from fiber-cement board that does not contain asbestos fibers; complies with ASTM C 1186, Type A, Grade II; is classified as noncombustible when tested according to ASTM E 136; and has a flame-spread index of 25 or less when tested according to ASTM E 84.
1. Manufacturers:
 - a. James Hardie Inc.
 - b. CertainTeed Corp.
 2. Vertical Pattern: Sheets
 - a. Sizes: 5/16 inch thick, 4 ft by 8 ft, 4 ft by 9 ft and 4 ft by 10 ft.
 - b. Texture: Smooth.
 3. Factory Priming: Manufacturer's standard acrylic primer.

2.3 ACCESSORIES

- A. Siding Accessories: Provide starter strips, edge trim, corner cap, and other items as recommended by siding manufacturer for building configuration.
1. Provide accessories made from same material as adjacent siding, unless otherwise indicated.
 2. Provide accessories matching color and texture of adjacent siding, unless otherwise indicated.
- B. Decorative Accessories: Provide the following types of decorative accessories as indicated:
1. Moldings and trim: Fiber Cement Trim Boards.
 - a. Sizes: 5/4 inch x 4 inches, 5/4 inch x 5 inches, 5/4 inch x 6 inches, 5/4 inch x 8 inches, 5/4 inch x 12 inches.
- C. Colors for Decorative Accessories: As selected by Architect from manufacturer's full range.
- D. Flashing: Provide aluminum flashing complying with Division 7 Section "Sheet Metal Flashing and Trim" at window and door heads and where indicated.

- E. Elastomeric Joint Sealant Single-component neutral-curing silicone joint sealant complying with requirements in Division 7 Section "Joint Sealants" for Use NT (nontraffic) and for Uses M, G, A, and, as applicable to joint substrates indicated, O joint substrates.
- F. Fasteners:
 - 1. For fastening fiber-cement siding and pvc trim, use hot-dip galvanized or stainless-steel fasteners.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of siding. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Install a water-resistive barrier is required in accordance with local building code requirements.
- D. The water-resistive barrier must be appropriately installed with penetration and junction flashing in accordance with local building code requirements.
- E. Install siding manufactures weather barrier in accordance with local building code requirements.
- F. Use siding manufactures seam tape and joint and laps.
- G. Install siding manufactures flashing materials.

3.3 INSTALLATION

- A. General: Comply with siding and trim manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply. Center nails in elongated nailing slots without binding siding to allow for thermal movement. Overlap joints to shed water away from direction of prevailing wind.
- B. Isolate dissimilar metals by separating with rubber gaskets or elastomeric sealant. Use rubber washers where fasteners made from dissimilar metal penetrate siding. Isolate dissimilar metals behind siding by covering with polyethylene film.

C. Vertical Siding:

1. Block framing between studs where panel siding horizontal joints occur.
2. Install metal Z flashing and provide a 1/4 inch gap at horizontal panel joints.
3. Place fasteners no closer than 3/8 inch from panel edges and 2 inches from panel corners.
4. Allow minimum vertical clearance between the edge of siding and any other material in strict accordance with the manufacturer's installation instructions.
5. Maintain clearance between siding and adjacent finished grade.
6. Specific framing and fastener requirements refer to Tables 2 and 3 in National Evaluation Service Report No. NER-405.

D. Trim boards:

1. Install flashing around all wall openings.
2. Fasten through trim into structural framing or code complying sheathing. Fasteners must penetrate minimum 3/4 inch or full thickness of sheathing. Additional fasteners may be required to ensure adequate security.
3. Place fasteners no closer than 3/4 inch and no further than 2 inches from side edge of trim board and no closer than 1 inch from end. Fasten maximum 16 inches on center.
4. Maintain clearance between trim and adjacent finished grade.
5. Trim inside corner with a single board trim both side of corner.
6. Outside Corner Board Attach Trim on both sides of corner with 16 gage corrosion resistant finish nail 1/2 inch from edge spaced 16 inches apart, weather cut each end spaced minimum 12 inches apart.
7. Allow 1/8 inch gap between trim and siding.
8. Seal gap with high quality, paint-able caulk.
9. Shim frieze board as required to align with corner trim..
10. Fasten through overlapping boards. Do not nail between lap joints.
11. Overlay siding with single board of outside corner board then align second corner board to outside edge of first corner board. Do not fasten trim boards to trim boards.
12. Shim frieze board as required to align with corner trim.
13. Install trim fascia boards to rafter tails or to sub fascia.

3.4 FINISHING

1. Finish unprimed siding with a minimum one coat high quality, alkali resistant primer and one coat of either, 100 percent acrylic or latex or oil based, exterior grade topcoats or two coats high quality alkali resistant 100 percent acrylic or latex, exterior grade topcoat within 90 days of installation. Follow paint manufacturer's written product recommendation and written application instructions.
2. Finish factory primed siding with a minimum of one coat of high quality 100 percent acrylic or latex or oil based exterior grade paint within 180 days of installation. Follow paint manufacturer's written product recommendation and written application instructions.

3.5 ADJUSTING AND CLEANING

- A. Remove damaged, improperly installed, or otherwise defective siding materials and replace with new materials complying with specified requirements.
- B. Clean finished surfaces according to siding manufacturer's written instructions and maintain in a clean condition during construction.

END OF SECTION 07460

SECTION 07620 - SHEET METAL FLASHING AND TRIM

GENERAL

1.01 DESCRIPTION OF WORK

- A. Furnish and install metal gutter system, flashing, trim specialty items and accessories in accordance with manufacturers Specifications and details.

1.02 RELATED WORK

- C. Flashing and Trim.
- D. Accessories.

1.03 SUBMITTALS

- A. Submit manufacturers current specifications and details.
- B. Provide samples in accordance with section.

1.04 DELIVERY

- A. Suitable facilities for storage and protection of materials shall be provided by the contractor on site. Upon receipt of materials, installer shall inspect the shipment for damage and to insure shipment is complete.

1.1 METALS

- A. Factory-Painted Aluminum Sheet: **ASTM B 209**, 3003-H14, with a minimum thickness of **0.040 inch**, unless otherwise indicated.
- B. Copper: ASTM B 370; temper H00, cold rolled except where temper 060 is required for forming; not less than **16 oz./sq. ft.**, unless otherwise indicated.
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
 - a) Berger Bros. Co.
805 Pennsylvania Blvd.
Feasterville, PA 19053

1.2 CONCEALED THROUGH-WALL SHEET METAL FLASHING

- A. Material: Fabricate from the following metal:
 - 1. Copper: **10 oz.** for fully concealed flashing; **16 oz.** elsewhere.
 - 2. Fabricate through-wall metal flashings embedded in masonry as follows:
 - a. With ribs formed in sawtooth pattern at **3-inch** intervals along length of flashing to provide a 3-way integral mortar bond and weep-hole drainage.

- B. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
1. Cheney Flashing (Dovetail); Cheney Flashing Company, Inc.
 2. Cheney Flashing (Sawtooth); Cheney Flashing Company, Inc.
 3. Keystone Three-Way Interlocking Thruwall Flashing; Keystone Flashing Co.

1.3 REGLETS

- A. General: Units of type, material, and profile indicated, formed to provide secure interlocking of separate reglet and counterflashing pieces and compatible with flashing indicated.
- B. Masonry Type: Provide with offset top flange for embedment in masonry mortar joint.
- C. Flexible Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where Drawings show reglet without metal counterflashing.
- D. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of the counterflashing lower edge.
1. Material: Copper, 16 oz./sq. ft.
- E. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
1. Fry Reglet Corporation.
 2. Hickman: W.P. Hickman Co.
 3. Keystone Flashing Company.

2.0 EXECUTION

A. INSPECTION

All surfaces to which sheet metal is to be applied shall be smooth, sound, clean, dry and free from defects.

B. INSTALLATION

All sheet metal work shall conform to standards set forth in the following publications:

1. C.D.A. Copper Brass Bronze Design Handbook- Sheet Copper Applications.
2. Revere Copper Products, Inc. Copper and Common Sense.
3. Sheet Metal and Air Conditioning Contractors National Association, Inc. Manual (SMACNA)

2.1 MISCELLANEOUS MATERIALS AND ACCESSORIES

- A. Solder: ASTM B 32, Grade Sn50, used with rosin flux.
- B. Fasteners: Same metal as sheet metal flashing or other noncorrosive metal as recommended by sheet metal manufacturer. Match finish of exposed heads with material being fastened.
- C. Asphalt Mastic: SSPC-Paint 12, solvent-type asphalt mastic, nominally free of sulfur and containing no asbestos fibers, compounded for 15-mil dry film thickness per coat.
- D. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.
- E. Elastomeric Sealant: Generic type recommended by sheet metal manufacturer and fabricator of components being sealed and complying with requirements for joint sealants as specified in Division 7 Section "Joint Sealants."
- F. Epoxy Seam Sealer: 2-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior and interior nonmoving joints, including riveted joints.
- G. Adhesives: Type recommended by flashing sheet metal manufacturer for waterproof and weather-resistant seaming and adhesive application of flashing sheet metal.
- H. Paper Slip Sheet: 5-lb/square red rosin, sized building paper conforming to FS UU-B-790, Type I, Style 1b.
- I. Polyethylene Underlayment: ASTM D 4397, minimum 6-mil- thick black polyethylene film, resistant to decay when tested according to ASTM E 154.
- J. Metal Accessories: Provide sheet metal clips, straps, anchoring devices, and similar accessory units as required for installation of Work, matching or compatible with material being installed; noncorrosive; size and thickness required for performance.
- K. Roofing Cement: ASTM D 4586, Type I, asbestos free, asphalt based.

2.2 FABRICATION, GENERAL

- A. Sheet Metal Fabrication Standard: Fabricate sheet metal flashing and trim to comply with recommendations of SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of the item indicated.
- B. Comply with details shown to fabricate sheet metal flashing and trim that fit substrates and result in waterproof and weather-resistant performance once installed. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
- C. Form exposed sheet metal Work that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems.
- D. Seams: Fabricate nonmoving seams in aluminum with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.

- E. Expansion Provisions: Space movement joints at maximum of **10 feet** with no joints allowed within **24 inches** of corner or intersection. Where lapped or bayonet-type expansion provisions in Work cannot be used or would not be sufficiently weatherproof and waterproof, form expansion joints of intermeshing hooked flanges, not less than **1 inch** deep, filled with mastic sealant (concealed within joints).
- F. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.
- G. Separate metal from noncompatible metal or corrosive substrates by coating concealed surfaces at locations of contact with asphalt mastic or other permanent separation as recommended by manufacturer.
- H. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of sheet metal exposed to public view.
- I. Fabricate cleats and attachment devices from same material as sheet metal component being anchored or from compatible, noncorrosive metal recommended by sheet metal manufacturer.

Size: As recommended by SMACNA manual or sheet metal manufacturer for application but never less than thickness of metal being secured.

2.3 SHEET METAL FABRICATIONS

General: Fabricate sheet metal items in thickness or weight needed to comply with performance requirements but not less than that listed below for each application and metal.

Exposed Trim, Gravel Stops, and Fasciae: Fabricate from the following material:
Aluminum: **0.050 inch** thick.

Copings: Fabricate from the following material:
Aluminum: **0.050 inch** thick.

Drip Edges: Fabricate from the following material:
Copper: **16 oz./sq. ft.**

Eave Flashing: Fabricate from the following material:
Copper: **16 oz./sq. ft.**

Equipment Support Flashing: Fabricate from the following material:
Aluminum-Zinc Alloy-Coated Steel: **0.0276 inch** thick.

Overhead-Piping Safety Pans: Fabricate from the following material:
Copper: **24 oz./sq. ft.**

Base Flashing: Fabricate from the following material:
Copper: **20 oz./sq. ft.**

Counterflashing: Fabricate from the following material:
Copper: **16 oz./sq. ft.**

Flashing Receivers: Fabricate from the following material:

Copper: 16 oz./sq. ft..

Valley Flashing: Fabricate from the following material:

Copper: 16 oz./sq. ft..

Cricket: Fabricate from the following material:

Copper: 16 oz./sq. ft.

Hip/Ridge Cap: Fabricate from the following material:

Copper: 16 oz./sq. ft.

Box Gutter: Fabricate from the following material:

Copper: 16 oz./sq. ft..

Plain Square Downspouts: Fabricate from the following material:

Copper: 16 oz./sq. ft..

2.4 ALUMINUM FINISHES

- A. General: Comply with Aluminum Association's (AA) "Designation System for Aluminum Finishes" for finish designations and application recommendations.
- 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 manufacturer's instructions.
 - 1. Fluoropolymer 2-Coat Coating System: Manufacturer's standard 2-coat, thermocured system composed of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 605.2.
 - a. Color and Gloss: As selected by Architect from manufacturer's full range of choices for color and gloss.

PART3- EXECUTION

3.1 EXAMINATION

- C. Examine substrates and conditions under which sheet metal flashing and trim are to be installed and verify that Work may properly commence. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Unless otherwise indicated, install sheet metal flashing and trim to comply with performance requirements, manufacturer's installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Anchor units of Work securely in place by methods indicated, providing for thermal expansion of metal units; conceal fasteners where possible, and set units true to line and level as indicated. Install Work with laps, joints, and seams that will be permanently watertight and weatherproof.
- B. Install exposed sheet metal Work that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
- C. Roof-Edge Flashings: Secure metal flashings at roof edges according to FM Loss Prevention Data Sheet 1-49 for specified wind zone.
- D. Expansion Provisions: Provide for thermal expansion of exposed sheet metal Work. Space movement joints at maximum of **10 feet** with no joints allowed within **24 inches** of corner or intersection. Where lapped or bayonet-type expansion provisions in Work cannot be used or would not be sufficiently weatherproof and waterproof, form expansion joints of intermeshing hooked flanges, not less than **1 inch** deep, filled with mastic sealant (concealed within joints).
- E. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of **1-1/2 inches**, except where pre-tinned surface would show in finished Work.
 - 1. Do not solder the following metals:
 - a. Aluminum.
 - b. Coil-coated galvanized steel sheet.
 - 2. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
- F. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate elastomeric sealant to comply with SMACNA standards. Fill joint with sealant and form metal to completely conceal sealant.
 - 1. Use joint adhesive for nonmoving joints specified not to be soldered.
- G. Seams: Fabricate nonmoving seams in sheet metal with flat-lock seams. Tin edges to be seamed, form seams, and solder.
- H. Seams: Fabricate nonmoving seams in aluminum with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.

- I. Separations: Separate metal from noncompatible metal or corrosive substrates by coating concealed surfaces, at locations of contact, with asphalt mastic or other permanent separation as recommended by manufacturer.
 - 1. Underlayment: Where installing stainless steel or aluminum directly on cementitious or wood substrates, install a slip sheet of red-rosin paper and a course of polyethylene underlayment.
 - 2. Bed flanges of Work in a thick coat of roofing cement where required for waterproof performance.
- J. Install reglets to receive counterflashing according to the following requirements:
 - 1. Where reglets are shown in concrete, furnish reglets for installation under Division 3 Section "Cast-in-Place Concrete."
 - 2. Where reglets are shown in masonry, furnish reglets for installation under Division 4 Section "Unit Masonry."
- K. Counterflashings: Coordinate installation of counterflashings with installation of assemblies to be protected by counterflashing. Install counterflashings in reglets or receivers. Secure in a waterproof manner by means of snap-in installation and sealant, lead wedges and sealant, interlocking folded seam, or blind rivets and sealant. Lap counterflashing joints a minimum of **2 inches** and bed with sealant.
- L. Roof-Drainage System: Install drainage items fabricated from sheet metal, with straps, adhesives, and anchors recommended by SMACNA's Manual or the item manufacturer, to drain roof in the most efficient manner. Coordinate roof-drain flashing installation with roof-drainage system installation. Coordinate flashing and sheet metal items for steep-sloped roofs with roofing installation.
- M. Equipment Support Flashing: Coordinate equipment support flashing installation with roofing and equipment installation. Weld or seal flashing to equipment support member.
- N. Roof-Penetration Flashing: Coordinate roof-penetration flashing installation with roofing and installation of items penetrating roof. Install flashing as follows:
 - 1. Turn lead flashing down inside vent piping, being careful not to block vent piping with flashing.
 - 2. Seal and clamp flashing to pipes penetrating roof, other than lead flashing on vent piping.

CLEANING AND PROTECTION

- A. Clean exposed metal surfaces, removing substances that might cause corrosion of metal or deterioration of finishes.
- B. Provide final protection and maintain conditions that ensure sheet metal flashing and trim Work during construction is without damage or deterioration other than natural weathering at the time of Substantial Completion.

END OF SECTION 07620

SECTION 07841 - THROUGH-PENETRATION FIRESTOP SYSTEMS

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.

1.2 SUMMARY

- A. This Section includes through-penetration firestop systems for penetrations through the following fire-resistance-rated assemblies, including both empty openings and openings containing penetrating items:
 - 1. Floors.
 - 2. Roofs.
 - 3. Walls and partitions.
- B. Related Sections include the following:
 - 1. Division 3 Section "Cast-in-Place Concrete" for construction of openings in concrete slabs and walls.
 - 2. Division 7 Section "Building Insulation" for safining insulation and accessories.
 - 3. Division 15 Sections specifying duct and piping penetrations.
 - 4. Division 16 Sections specifying cable and conduit penetrations.

1.3 PERFORMANCE REQUIREMENTS

- A. General: For the following constructions, 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 assembly penetrated.
 - 1. Fire-resistance-rated load-bearing walls, including partitions, with fire-protection-rated openings.
 - 2. Fire-resistance-rated non-load-bearing walls, including partitions, with fire-protection-rated openings.
 - 3. Fire-resistance-rated floor assemblies.
 - 4. Fire-resistance-rated roof assemblies.
- B. T-Rated Systems: For the following conditions, provide through-penetration firestop systems with T-ratings indicated, as well as F-ratings, as determined per ASTM E 814, where systems protect penetrating items exposed to potential contact with adjacent materials in occupiable floor areas:
 - 1. Penetrations located outside wall cavities.
 - 2. Penetrations located outside fire-resistive shaft enclosures.

3. Penetrations located in construction containing fire-protection-rated openings.
 4. Penetrating items larger than 4-inch- diameter nominal pipe or 16 sq. in. in overall cross-sectional area.
- 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 through-penetration firestop system product indicated.
- B. Shop Drawings: For each through-penetration firestop system, show each kind of construction condition penetrated, relationships to adjoining construction, and kind of penetrating item. Include firestop design designation of testing and inspecting agency acceptable to authorities having jurisdiction 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. Product Certificates: Signed by manufacturers of through-penetration firestop system products certifying that products furnished comply with requirements.
- D. Product Test Reports: From a qualified testing agency indicating through-penetration firestop system complies with requirements, based on comprehensive testing of current products.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed through-penetration firestop systems similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Source Limitations: Obtain through-penetration firestop systems, for each kind of penetration and construction condition indicated, from a single manufacturer.
- C. Fire-Test-Response Characteristics: Provide through-penetration firestop systems that comply with the following requirements and those specified in "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.
 - a. Through-penetration firestop systems correspond to those indicated by reference to through-penetration firestop system designations listed by the following:
 - 1) UL in "Fire Resistance Directory."

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.

PART 2 - PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. A/D Fire Protection Systems Inc.
 2. DAP Inc.
 3. Firestop Systems Inc.

4. Hilti Construction Chemicals, Inc.
5. Instant Firestop Mfg. Inc.
6. International Protective Coatings Corp.
7. Isolatek International.
8. Nelson Firestop Products.
9. NUCO Industries.
10. RectorSeal Corporation (The).
11. Specified Technologies Inc.
12. 3M Fire Protection Products.
13. Tremco.
14. United States Gypsum Company.

2.2 FIRESTOPPING, GENERAL

- 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. **Accessories:** Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with "Performance Requirements" Article. Use only components specified by through-penetration firestop system manufacturer and approved by the qualified testing and inspecting agency for firestop systems indicated. Accessories include, but are not limited to, the following items:

2.3 FILL MATERIALS

- A. **General:** Provide through-penetration firestop systems containing the types of fill materials indicated in the Through-Penetration Firestop System Schedule at the end of Part 3 by reference to the types of materials described in this Article. Fill materials are those referred to in directories of the referenced testing and inspecting agencies as fill, void, or cavity materials.
- B. **Cast-in-Place Firestop Devices:** Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.
- C. **Latex Sealants:** Single-component latex formulations that after cure do not re-emulsify during exposure to moisture.
- D. **Firestop Devices:** Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
- E. **Intumescent Composite Sheets:** Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized steel sheet.
- F. **Intumescent Putties:** Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.

- G. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
- H. Mortars: Prepackaged, dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.
- I. Pillows/Bags: Reusable, heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents and fire-retardant additives.
- J. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.
- K. Silicone Sealants: Moisture-curing, single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:
 - 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces and nonsag formulation for openings in vertical and other surfaces requiring a nonslumping, gunnable sealant, unless indicated firestop system limits use to nonsag grade for both opening conditions.
 - 2. Grade for Horizontal Surfaces: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces.
 - 3. Grade for Vertical Surfaces: Nonsag formulation for openings in vertical and other surfaces.

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.
- B. 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 written recommendations of firestop system manufacturer and 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 "Performance Requirements" Article and 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 CLEANING AND PROTECTION

- 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 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 through-penetration firestop systems complying with specified requirements.

3.5 THROUGH-PENETRATION FIRESTOP SYSTEM SCHEDULE

- A. Where UL-classified systems are indicated, they refer to the alpha-alpha-numeric designations listed in UL's "Fire Resistance Directory" under product Category XHEZ.

- B. Where ITS-listed systems are indicated, they refer to the design numbers listed in ITS's "Directory of Listed Products," "Firestop Systems" Section.
- C. Firestop Systems with No Penetrating Items: Comply with the following:
 - 1. Available UL-Classified Systems
 - 2. Type of Fill Materials: One or more of the following:
 - a. Latex sealant.
 - b. Silicone sealant.
 - c. Intumescent putty.
 - d. Mortar.
- D. Firestop Systems for Metallic Pipes, Conduit, or Tubing: Comply with the following:
 - 1. Available UL-Classified Systems:
- E. Firestop Systems for Nonmetallic Pipe, Conduit, or Tubing: Comply with the following:
 - 1. Available UL-Classified Systems
 - 2. Type of Fill Materials: One or more of the following:
 - a. Latex sealant.
 - b. Silicone sealant.
 - c. Intumescent putty.
 - d. Intumescent wrap strips.
 - e. Firestop device.
- F. Firestop Systems for Electrical Cables: Comply with the following:
 - 1. Available UL-Classified Systems:
 - 2. Type of Fill Materials: One or more of the following:
 - a. Latex sealant.
 - b. Silicone sealant.
 - c. Intumescent putty.
 - d. Silicone foam.
- G. Firestop Systems for Cable Trays: Comply with the following:
 - 1. [Available] UL-Classified Systems:
 - 2. Type of Fill Materials: One or more of the following:
 - a. Latex sealant.
 - b. Intumescent putty.
 - c. Silicone foam.
 - d. Pillows/bags.
- H. Firestop Systems for Insulated Pipes: Comply with the following:
 - 1. Available UL-Classified Systems:
 - 2. Type of Fill Materials: One or more of the following:

- a. Latex sealant.
- b. Intumescent putty.
- c. Silicone foam.
- d. Intumescent wrap strips.

I. Firestop Systems for Miscellaneous Electrical Penetrants: Comply with the following:

1. Available UL-Classified Systems:
2. Type of Fill Materials: One or more of the following:
 - a. Latex sealant.
 - b. Intumescent putty.
 - c. Mortar.

J. Firestop Systems for Miscellaneous Mechanical Penetrations Comply with the following:

1. Available UL-Classified Systems:
2. Type of Fill Materials: One or both of the following:
 - a. Latex sealant.
 - b. Mortar.

END OF SECTION 07841

SECTION 07920 - JOINT SEALANTS

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.

1.2 SUMMARY

- A. This Section includes sealants for the following applications, including those specified by reference to this Section:
- B. This Section includes sealants for the following applications:
 - 1. Exterior joints in the following vertical surfaces and nontraffic horizontal surfaces:
 - a. Control and expansion joints in cast-in-place concrete.
 - b. Control and expansion joints in unit masonry.
 - c. Joints between different materials listed above.
 - d. Perimeter joints between materials listed above and frames of doors and windows.
 - e. Joint sealants to replace existing asbestos containing materials removed.
 - f. Other joints as indicated.
 - 2. Exterior joints in the following horizontal traffic surfaces:
 - a. Control, expansion, and isolation joints in cast-in-place concrete slabs.
 - b. Tile control and expansion joints.
 - c. Joints between different materials listed above.
 - d. Joint sealants to replace existing asbestos containing materials removed.
 - e. Other joints as indicated.
 - 3. Interior joints in the following vertical surfaces and horizontal nontraffic surfaces:
 - a. Control and expansion joints on exposed interior surfaces of exterior walls.
 - b. Perimeter joints of exterior openings where indicated.
 - c. Vertical control joints on exposed surfaces of interior unit masonry and concrete walls and partitions.
 - d. Perimeter joints between interior wall surfaces and frames of interior doors, windows, and storefront entrances.
 - e. Joints between countertops, backsplashes, plumbing fixtures and adjoining walls, floors, and counters.
 - f. Joint sealants to replace existing asbestos containing materials removed.
 - g. Other joints as indicated.

4. Interior joints in the following horizontal traffic surfaces:
 - a. Control and expansion joints in cast-in-place concrete slabs.
 - b. Control and expansion joints in tile flooring.
 - c. Joint sealants to replace existing asbestos containing materials removed.
 - d. Other joints as indicated.

C. Related Sections include the following:

1. Division 2 Section "Pavement Joint Sealants" for sealing joints in pavements, walkways, and curbing.
2. Division 4 Section "Unit Masonry" for masonry control and expansion joint fillers and gaskets.
3. Division 7 Section "Firestopping" for fire-resistant building joint-sealant systems.
4. Division 8 Section "Glazing" for glazing sealants.
5. Division 9 Section "Gypsum Board Assemblies" for sealing perimeter joints of gypsum board partitions to reduce sound transmission.

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 Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- C. Samples for Verification: For each type and color of joint sealant required. Install 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.
- D. Product Certificates: Signed by manufacturers of joint sealants certifying that products furnished comply with requirements and are suitable for the use indicated.
- E. SWRI Validation Certificate: For each elastomeric sealant specified to be validated by SWRI's Sealant Validation Program.
- F. 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.

- G. Product Test Reports: From a qualified testing agency indicating sealants comply with requirements, based on comprehensive testing of current product formulations.
- H. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this Project and whose work has resulted in joint-sealant installations with a record of successful in-service performance.
- 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 manufacturers standard test methods to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
 - 2. Submit not fewer than nine 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 joint sealant manufacturer's written instructions for corrective measures, including the use of specially formulated primers.
- D. Product Testing: Obtain test results for "Product Test Reports" Paragraph in "Submittals" Article from a qualified testing agency based on testing current sealant formulations within a 36-month period.
 - 1. 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.
- E. Preconstruction Field-Adhesion Testing: Before installing elastomeric sealants, field test their adhesion to joint substrates as follows:
 - 1. Locate test joints where indicated 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.
- F. Mockups: Before installing joint sealants, apply elastomeric sealants as follows to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution:

1. Joints in mockups of assemblies specified in other Sections that are indicated to receive elastomeric joint sealants, which are specified by reference to this Section.

G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials in compliance with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: 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.

B. Joint-Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.

C. Joint-Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

1.8 WARRANTY

A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

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. Tremco Sealant/Weatherproofing Division of RPM International, Inc.

2.2 URETHANE SEALANTS

- A. Multi-Component Urethane: ASTM C920, Type M, Grade NS, Class 50; Uses T, NT, M, A, and O; two component, chemical curing, nonstaining, nonbleeding, color as selected.
 - 1. Dymeric 240/240FC.
- B. Single Component Urethane: ASTM C 920, Type S, Grade NS, Class 100/50, Uses T, NT, M, A, O; single component, moisture curing, nonstaining, non-bleeding, color as selected.
 - 1. Dymonic FC.
 - 2. Vulkem 45.

2.3 SILICONE SEALANTS

- C. Multi-Component Silicone: ASTM C920, Type M, Grade NS, Class 50; Uses NT, M, G, A and O: multi-component, neutral curing, nonstaining, nonbleeding, color as selected.
 - 1. Spectrem 4-TS.
- D. Single Component Silicone: ASTM C920, Type S, Grade NS, Class 50; Uses NT, M, G, A and O: single component, neutral curing, nonstaining, nonbleeding, color as selected.
 - 1. Spectrem 2.
 - 2. Spectrem 3.
- E. Single Component Traffic Silicone: Low modulus, high performance, single component, gun grade sealant.
 - 1. Spectrem 800.

1.2 OTHER SEALANTS

- A. Latex Sealant: ASTM C 834; single component, solvent curing, nonstaining, nonbleeding, nonsagging; color as selected.
 - 1. Tremflex 834.
- B. Synthetic Rubber Sealant:
 - 1. Acoustical Sealant.
- C. Butyl Sealant: ASTM C 1311, butyl or polyisobutylene, single component, nondrying, non-skinning, non-curing.
 - 1. Butyl Sealant.

1.3 ACCESSORIES

- A. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.
- B. Primer: Non-staining type, recommended by sealant manufacturer to suit application.
- C. Joint Backing: Round foam rod compatible with sealant; oversized 25 to 50 percent larger than joint width; recommended by sealant manufacturer to suit application

- D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.
- E. Masking tape: Non-staining, non-absorbent tape product compatible with joint sealants and adjacent joint surfaces.

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 from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air. Porous joint surfaces include the following:
 - a. Concrete.
 - b. Masonry.
 - 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.
 - a. Metal.
- 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 of 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 sealants by proven techniques to 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 provided for each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- E. 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 sealants from surfaces adjacent to joint.
 - 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.
 - a. Use masking tape to protect adjacent surfaces of recessed tooled joints.
- F. Installation of Preformed Silicone-Sealant System: Comply with the following requirements:
 - 1. Apply masking tape to each side of joint, outside of area to be covered by sealant system.
 - 2. Apply a bead of silicone sealant to each side of joint to produce a bead of size complying with preformed silicone-sealant system manufacturer's printed schedule and covering a bonded area of not less than a **3/8 inch**. Hold edge of sealant bead inside of masking tape by **1/4 inch**.
 - 3. Within 10 minutes of sealant application, press silicone extrusion into sealant to wet extrusion and substrate. Use a roller to apply consistent pressure and ensure uniform contact between sealant and both extrusion and substrate.
 - 4. Complete installation of horizontal joints before installing vertical joints. Lap vertical joints over horizontal joints. At end of joints, cut silicone extrusion with a razor knife.

- G. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping, taking care not to pull or stretch material, to produce seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures where expansion of sealant requires acceleration to produce seal, apply heat to sealant to comply with sealant manufacturer's written instructions.

3.4 CLEANING

- A. Clean off excess sealants 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 the original work.

3.6 SCHEDULE – SEALANT JOINTS

Based on Tremco Incorporated Products.

- F. Exterior Sealant Joint:
 - 1. Applications:
 - a. Control and expansion joints in cast-in-place concrete.
 - b. Control and expansion joints in unit masonry.
 - c. Control and expansion joints in stone masonry.
 - d. Joints between different materials listed above.
 - e. Perimeter joints between materials listed above and frames of doors, windows, storefronts, louvers and similar openings.
 - f. Control and expansion joints in soffits and overhead surfaces.
 - g. Other exterior joints in vertical surfaces and non-traffic horizontal surfaces for which no other sealant is specified.
 - 2. Multi-Component Urethane Sealants:
 - a. Dymeric 240/240FC.
 - 3. Single Component Urethane Sealants:
 - a. Dymonic FC.
 - 4. Multi-Component Silicone Sealants:
 - a. Spectrem 4-TS.
 - 5. Single Component Silicone Sealants:
 - a. Spectrem 2.
 - b. Spectrem 3.

- G. Interior Sealant Joint:
 - 1. Applications:
 - a. Control and expansion joints on exposed interior surfaces of exterior walls.
 - b. Perimeter joints on exposed interior surfaces of exterior openings.
 - c. Perimeter joints between interior wall surfaces and frames of interior doors, windows, storefronts, louvers, elevator entrances and similar openings.
 - d. Other interior joints in vertical surfaces and non-traffic horizontal surfaces subject to movement for which no other sealant is specified.
 - 2. Multi Component Urethane Sealants:
 - a. Dymeric 240/240FC.
 - 3. Single Component Urethane Sealants:
 - a. Dymonic FC.
 - 4. Single Component Silicone Sealants:
 - a. Spectrem 2.
 - b. Spectrem 3.
 - 5. Other Sealants:
 - a. Tremflex 834.

- H. Traffic Sealant Joint:
 - 1. Applications:
 - a. Control, expansion and isolation joints in cast-in-place concrete.
 - b. Tile control and expansion joints.
 - c. Joints between different materials listed above.
 - d. Other interior and exterior traffic bearing joints in horizontal and sloped traffic surfaces
 - 2. Single Component Urethane Sealants:
 - a. Vulkem 45, self leveling.
 - 3. Single Component Silicone Sealants:
 - a. Spectrem 800.

- I. Interior Food Contact Sealant Joint:
 - 1. Applications:
 - a. Joints in kitchen counter tops and work surfaces.
 - b. Joints between food service equipment and surrounding construction.
 - c. Other interior joints where incidental food contact may occur.
 - 2. Single Component Urethane Sealants:
 - a. Dymonic FC.
 - 3. Single Component Silicone Sealants:
 - a. Spectrem 2.
 - b. Spectrem 3.

- J. Interior Sanitary Sealant Joint:
 - 1. Applications:
 - a. Joints in toilet room and bathroom counter tops.
 - b. Joints between plumbing fixtures and adjacent materials.
 - c. Joints between food service equipment and surrounding construction.
 - d. Other interior joints in wet areas where needed to limit mold and mildew growth.

2. Single Component Silicone Sealants:
 - a. Tremsil 200.

- K. Concealed Metal Lap Sealant Joint:
 1. Applications:
 - a. Concealed lap and hook joints in sheet metal flashing and trim.
 2. Single Component Non-Curing Sealants:
 - a. Tremco Butyl Sealant.
 - b. Tremco Acoustical Sealant.

- L. Concealed Bedding Sealant Joint :
 1. Applications:
 - a. Bedding joints under metal thresholds and saddles.
 - b. Bedding joints between sheet metal flashing and other materials.
 2. Single Component Urethane Sealants:
 - a. Dymonic FC.
 3. Single Component Silicone Sealants:
 - a. Spectrem 2.
 - b. Spectrem 3.
 4. Single Component Non-Curing Sealants:
 - a. Tremco Butyl Sealant.
 - b. Tremco Acoustical Sealant.

END OF SECTION 07920

Supplementary Conditions of the Contract for Construction

U.S. Department of Housing
and Urban Development
Office of Housing
Federal Housing Commissioner

OMB Approval No. 2502-0470
(Expires 5/31/2010)

Public reporting burden for this collection of information is estimated to average 30 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. This information is required to obtain benefits and voluntary. HUD may not collect this information, and you are not required to complete this form, unless it displays a currently valid OMB control number.

This information collection is necessary to ensure that viable projects are developed. It is important to obtain information from applicants to assist HUD in determining if nonprofit organizations initially funded continue to have the financial and administrative capacity needed to develop a project and that the project design meets the needs of the residents. The Department will use this information to set forth the obligations of the contractor or subcontractor performing under the covered contract. This information is required in order to obtain benefits. This information is considered non-sensitive and no assurance of confidentiality is provided.

Article 1 – Labor Standards

Instructions

Whenever only FHA mortgage insurance is involved, use paragraph (A) and (C) of Article 1 – Labor Standards. Whenever any direct form of assistance (Section 8, Section 202/811 Capital Advance, grants etc.) is involved, use paragraphs (A) and (B) and (C) of Article 1 – Labor Standards.

Applicability

The Project or Program to which the construction work covered by this contract pertains is being assisted or insured by the United States of America and the following Federal Labor Standards Provisions are included in this Contract or related instrument pursuant to the provisions applicable to such Federal assistance or insurance.

A. 1. (i) Minimum Wages. All laborers and mechanics employed or working upon the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR Part 3), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics. Contributions made or costs reasonably anticipated for bona fide fringe benefits under Section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of 29 CFR 5.5(a)(1)(iv); also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs, which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period.

Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR Part 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under 29 CFR Part 5.5(a)(1)(ii) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

(ii) (a) Any class of laborers or mechanics which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. HUD shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(1) The work to be performed by the classification

requested is not performed by a classification in the wage determination; and

(2) The classification is utilized in the area by the construction industry; and

(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(b) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and HUD or its designee agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by HUD or its designee to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, D.C. 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within the 30-day period that additional time is necessary. (Approved by the Office of Management and Budget under OMB control number 1215-0140.)

(c) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and HUD or its designee do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), HUD or its designee shall refer the questions, including the views of all interested parties and the recommendation of HUD or its designee, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within the 30-day period that additional time is necessary. (Approved by the Office of Management and Budget under OMB Control Number 1215-0140.)

(d) The wage rate (including fringe benefits where appropriate) determined pursuant to subparagraphs A.1.(ii)(b) or (c) of this paragraph, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program. (Approved by the Office of Management and Budget under OMB Control Number 1215-0140.)

2. Withholding. HUD or its designee shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the

same prime contractor, or any other Federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee or helper, employed or working on the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), all or part of the wages required by the contract, HUD or its designee may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased. HUD or its designee may, after written notice to the contractor, disburse such amounts withheld for and on account of the contractor or subcontractor to the respective employees to whom they are due. The Comptroller General shall make such disbursements in the case of direct Davis-Bacon Act contracts.

3. (i) Payrolls and basic records. Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work (or under the United States Housing Act of 1937, or under the Housing Act of 1949, in the construction or development of the project). Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in Section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in Section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs. (Approved by the Office of Management and budget under OMB Control Numbers 1215-0140 and 1215-0017.)

(ii) (a) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to HUD or its designee if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit the payrolls to the applicant, sponsor, or owner, as the case may be, for transmission to HUD or its designee. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR Part 5.5(a)(3)(i). This information may be submitted in any form desired. Optional Form WH-347 is available for this purpose and may be purchased from the Superintendent of Documents (Federal Stock Number 029-005-00014-1), U.S. Government Printing Office, Washington, D.C. 20402. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. (Approved by the Office of Management and Budget under OMB Control Number 1215-0149.)

(b) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

- (1)** That the payroll for the payroll period contains the information required to be maintained under 29 CFR Part 5.5(a)(3)(i) and that such information is correct and complete;
- (2)** That each laborer or mechanic (including each

helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in 29 CFR Part 3;

(3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(c) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph A.3.(ii)(b) of this section.

(d) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under Section 1001 of Title 18 and Section 231 of Title 31 of the United States Code.

(iii) The contractor or subcontractor shall make the records required under paragraph A.3.(i) of this section available for inspection, copying, or transcription by authorized representatives of HUD or its designee or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, HUD or its designee may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR Part 5.12.

4. (i) Apprentices and Trainees. Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Bureau of Apprenticeship and Training, or with a State Apprenticeship Agency recognized by the Bureau, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Bureau of Apprenticeship and Training or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Bureau

of Apprenticeship and Training, or a State Apprenticeship Agency recognized by the Bureau, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman's hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR Part 30.

5. Compliance with Copeland Act Requirements. The contractor shall comply with the requirements of 29 CFR Part 3 which are incorporated by reference in this contract.

6. Subcontracts. The contractor or subcontractor will insert in any subcontracts the clauses contained in 29 CFR 5.5(a)(1) through (10) and such other clauses as HUD or its designee may be appropriate instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR Part 5.5.

7. Contract termination; debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

8. Compliance with Davis-Bacon and Related Act Requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR Parts 1, 3, and 5 are herein incorporated by reference in this contract.

9. Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR Parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and HUD or its designee, the U.S. Department of Labor, or the employees or their representatives.

10. (i) Certification of Eligibility. By entering into this contract the contractor certifies neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm

ineligible to be awarded Government contracts by virtue of Section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1) or to be awarded HUD contracts or participate in HUD programs pursuant to 24 CFR Part 24.

(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of Section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1) or to be awarded HUD contracts or participate in HUD programs pursuant to 24 CFR Part 24.

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001. Additionally, U.S. Criminal Code, Section 1010, Title 18, U.S.C., "Federal Housing Administration transactions", provides in part: "Whoever, for the purpose of . . . influencing in any way the action of such Administration . . . makes, utters or publishes any statement, knowing the same to be false . . . shall be fined not more than \$5,000 or imprisoned not more than two years, or both."

B. Contract Work Hours and Safety Standards Act. As used in this paragraph, the terms "laborers" and "mechanics" include watchmen and guards.

1. Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

2. Violation; liability for unpaid wages, liquidated damages. In the event of any violation of the clause set forth in subparagraph (1) of this paragraph, the contractor and any subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in subparagraph (1) of this paragraph, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in subparagraph (1) of this paragraph.

3. Withholding for unpaid wages and liquidated damages. HUD or its designee shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in subparagraph (2) of this paragraph.

4. Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in subparagraph (1) through (4) of this paragraph and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in subparagraphs (1) through (4) of this paragraph.

C. The Contractor will be required to execute FHA Form No. 2403-A, Contractor's Prevailing Wage Certificate, as a condition precedent to insurance by the Federal Housing Administration of that certain mortgage loan, or an advance thereof, made or to be made by the mortgagee in connection with the construction of the project.

Article 2 – Equal Employment Opportunity

The applicant hereby agrees that it will incorporate or cause to be

incorporated into any contract for construction work, or modification thereof, as defined in the regulations of the Secretary of Labor at 41 CFR Chapter 60, which is paid for in whole or in part with funds obtained from the Federal Government or borrowed on the credit of the Federal Government pursuant to a grant, contract, loan insurance, or guarantee, or undertaken pursuant to any Federal program involving such grant, contract, loan, insurance, or guarantee, the following equal opportunity clause:

During the performance of this contract, the Contractor agrees as follows:

A. The Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex or national origin. Such action shall include, but not be limited to the following: Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training including apprenticeship. The Contractor agrees to post in conspicuous places available to employees and applicants for employment notices to be provided setting forth the provisions of this nondiscrimination clause.

B. The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin.

C. The Contractor will send to each labor union or representative of workers with which it has a collective bargaining agreement or other contract or understanding a notice to be provided advising the said labor union or workers representatives of the Contractor's commitments hereunder, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

D. The Contractor will comply with all provisions of Executive Order 11246 of September 24, 1965 and of the rules, regulations, and relevant orders of the Secretary of Labor.

E. The Contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to its books, records, and accounts by the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

F. In the event of the Contractor's noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or orders, this contract may be canceled, terminated, or suspended in whole or in part and the Contractor may be declared ineligible for further government contracts or federally assisted construction contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulations or order of the Secretary of Labor, or as otherwise provided by law.

G. The Contractor will include the portion of the sentence immediately preceding paragraph A and the provisions of paragraphs A through G in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to Section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The Contractor will take such action with respect to any subcontract or purchase order as the Secretary of Housing and Urban Development or the Secretary of Labor may direct as a means of enforcing such provisions, including sanctions for noncompliance. *Provided, however,* that in the event the Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the Secretary of Housing and Urban Development or the Secretary of Labor, the Contractor may request the United States to enter into such litigation to protect the interests of the United States.

H. The applicant further agrees that it will be bound by the above equal opportunity clause with respect to its own employment practices when it participates in federally assisted construction work:

Provided, That if the applicant so participating is a State or local government, the above equal opportunity clause is not applicable to any agency, instrumentality or subdivision of such government which does not participate in work on or under the contract.

I. The applicant agrees that it will assist and cooperate actively with the administering agency and the Secretary of Labor in obtaining the compliance of contractors and subcontractors with the equal opportunity clause and the rules, regulations, and relevant orders of the Secretary of Labor, that it will furnish the administering agency and the Secretary of Labor such information as they may require for the supervision of such compliance, and that it will otherwise assist the administering agency in the discharge of the agency's primary responsibility for securing compliance.

J. The applicant further agrees that it will refrain from entering into any contract or contract modification subject to Executive Order 11246 of September 24, 1965, with a contractor debarred from, or who has not demonstrated eligibility for, Government contracts and federally assisted construction contracts pursuant to the Executive order and will carry out such sanctions and penalties for violation of the equal opportunity clause as may be imposed upon contractors and subcontractors by the administering agency or the Secretary of Labor pursuant to Part II, Subpart D of the Executive order. In addition, the applicant agrees that if it fails or refuses to comply with these undertakings, the administering agency may take any or all of the following actions: Cancel, terminate, or suspend in whole or in part this grant (contract, loan, insurance, guarantee); refrain from extending any further assistance to the applicant under the program with respect to which the failure or refund occurred until satisfactory assurance of future compliance has been received from such applicant; and refer the case to the Department of Justice for appropriate legal proceedings.

Article 3 – Equal Opportunity for Businesses and Lower Income Persons Located Within the Project Area

(Applicable to Section 236 projects, where the estimated replacement cost of the project as determined by the Secretary of Housing and Urban Development exceeds \$500,000, and to all projects, including Section 236 regardless of estimated replacement cost, receiving rent supplement assistance under Title I, Section 101 of the Housing and Urban Development Act of 1965.)

A. The work to be performed under this contract is on a project assisted under a program providing direct Federal financial assistance from the Department of Housing and Urban Development and is subject to the requirements of Section 3 of the Housing and Urban Development Act of 1968, as amended, 12 U.S.C. 1701u. Section 3 requires that to the greatest extent feasible opportunities for training and employment be given lower income residents of the unit of local government or the metropolitan area (or nonmetropolitan county) as determined by the Secretary of Housing and Urban Development in which the projects located and contracts for work in connection with the project be awarded to business concerns which are located in, or owned in substantial part by persons residing in the same metropolitan area (or nonmetropolitan county) as the project.

Article 4 – Health and Safety

A. No laborer or mechanic shall be required to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to his health and safety as determined under construction safety and health standards promulgated by the Secretary of Labor by regulation.

B. The Contractor shall comply with all regulations issued by the Secretary of Labor pursuant to Title 29 Part 1926 (formerly part 1518) and failure to comply may result in imposition of sanctions pursuant to the Contract Work Hours and Safety Standards Act (Public Law 91-54, 83 Stat. 96).

C. The Contractor shall include the provisions of this Article in every subcontract so that such provisions will be binding on each subcontractor. The Contractor shall take such action with respect to any subcontract as the Secretary of Housing and Urban Development of the Secretary of Labor shall direct as a means of enforcing such provisions.

SECTION 08211 - FLUSH WOOD DOORS

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.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Solid-core doors with wood-veneer, faces.
 - 2. Factory fitting flush wood doors to frames and factory machining for hardware.
 - 3. Vision Panels for flush wood doors.
- B. Related Sections include the following:
 - 1. Division 6 Section "Finish Carpentry" for wood door frames.
 - 2. Division 8 Section "Glazing" for glass view panels in flush wood doors.

1.3 SUBMITTALS

- A. Product Data: For each type of door. Include details of core and edge construction and trim for openings. Include recommended finishing specifications.
- B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.
 - 1. Indicate dimensions and locations of mortises and holes for hardware.
 - 2. Indicate dimensions and locations of cutouts.
 - 3. Indicate fire ratings for fire doors.
- C. Samples for Verification:
 - 1. Corner sections of doors, approximately **8 by 10 inches**, with door faces and edgings representing typical range of color and grain for each species of veneer and solid lumber required.
 - 2. Frames for light openings, **6 inches** long, for each material, type, and finish required.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain flush wood doors through one source from a single manufacturer.
- B. Quality Standard: Comply with AWI's "Architectural Woodwork Quality Standards Illustrated."
 - 1. Provide AWI Quality Certification Labels or an AWI letter of licensing for Project indicating that doors comply with requirements of grades specified.
- C. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Package doors individually in cardboard cartons
- C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until building is enclosed, wet work is complete, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form, signed by manufacturer, Installer, and Contractor, in which manufacturer agrees to repair or replace doors that are defective in materials or workmanship, have warped (bow, cup, or twist) more than **1/4 inch** in a **42-by-84-inch** section, or show telegraphing of core construction in face veneers exceeding **0.01 inch in a 3-inch** span.
 - 1. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
 - 2. Warranty shall be in effect during the following period of time from date of Substantial Completion:
 - a. Solid-Core Interior Doors: Life of 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. Flush Wood Doors:
 - a. Algoma Hardwoods Inc.
 - b. Eggers Industries; Architectural Door Division.
 - c. Weyerhaeuser Company.
 2. Metal Louvers for Doors:
 - a. Air Louvers, Inc.
 - b. Anemostat Door Products.
 - c. Leslie-Locke, Inc.

2.2 DOOR CONSTRUCTION, GENERAL

- A. Doors for Transparent Finish:
1. Grade: Premium, with Grade A faces
 2. Species and Cut: Red oak, plain sliced
 3. Match between Veneer Leaves: Pleasing match.
 4. Assembly of Veneer Leaves on Door Faces Running match.
 5. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
 6. Room Match: Match door faces within each separate room or area of building. Corridor door faces do not need to match.
 7. Room Match: Provide door faces of compatible color and grain within each separate room or area of building.
- B. Doors for Opaque Finish:
1. Grade: Custom
 2. Faces for Interior Doors: Any closed-grain hardwood of mill option

2.3 SOLID-CORE DOORS

- A. Interior Veneer-Faced Doors:
1. Core: Either glued block or structural composite lumber
 2. Construction: Five or seven plies with stiles and rails bonded to core, then entire unit abrasive planed before veneering.

B. Fire-Rated Doors:

1. Construction: Construction and core specified above for type of face indicated or manufacturer's standard mineral-core construction as needed to provide fire rating indicated.
2. Blocking: For mineral-core doors, provide composite blocking with improved screw-holding capability approved for use in doors of fire ratings indicated [as needed to eliminate through-bolting hardware.]
3. Edge Construction: At hinge stiles, provide manufacturer's standard laminated-edge construction with improved screw-holding capability and split resistance and with outer stile matching face veneer.

2.4 LOUVERS AND LIGHT FRAMES

A. Metal Louvers:

1. Blade Type: [Vision-proof, inverted V]
2. Metal and Finish: Galvanized steel, 0.0396 inch thick, hot-dip zinc coated and factory primed for paint finish.

B. Metal Frames for Light Openings in Fire Doors: Manufacturer's standard frame formed of 0.0478-inch- thick, cold-rolled steel sheet; factory primed and approved for use in doors of fire rating indicated.

2.5 FABRICATION

A. Fabricate doors in sizes indicated for Project-site fitting.

B. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances and bevels, unless otherwise indicated:

1. Comply with clearance requirements of referenced quality standard for fitting. Comply with requirements in NFPA 80 for fire-rated doors.

C. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.

1. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining.

D. Transom and Side Panels: Fabricate matching panels with same construction, exposed surfaces, and finish as specified for associated doors. Finish bottom edges of transoms and top edges of rabbeted doors same as door stiles.

1. Fabricate door and transom panels with full-width, solid-lumber, rabbeted, meeting rails. Provide factory-installed spring bolts for concealed attachment into jambs of metal door frames.

- E. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of door(s) required.
 - 1. Light Openings: Trim openings with moldings of material and profile indicated.
 - 2. Louvers: Factory install louvers in prepared openings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and installed door frames before hanging doors.
 - 1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
 - 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Hardware: For installation, see Division 8 Section "Door Hardware."
- B. Manufacturer's Written Instructions: Install doors to comply with manufacturer's written instructions, referenced quality standard, and as indicated.
 - 1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.
- C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal cut surfaces after fitting and machining.
 - 1. Clearances: Provide **1/8 inch** at heads, jambs, and between pairs of doors. Provide **1/8 inch** from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide **1/4 inch** from bottom of door to top of threshold.
 - a. Comply with NFPA 80 for fire-rated doors.
 - 2. Bevel non-fire-rated doors **1/8 inch in 2 inches** at lock and hinge edges.
- D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- E. Field-Finished Doors: Refer to the following for finishing requirements:
 - 1. Division 9 Section "Painting."

3.3 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Replace doors that are damaged or do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 08211

SECTION 08212 - PANEL WOOD DOORS

PART 1 - GENERAL

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

SUMMARY:

Extent and location of each type of panel wood doors is indicated on drawings and in schedules.

Types of panel wood doors required include the following:

Interior stile and rail doors with raised panels.

Factory-prefitting to frames and factory-premachining for hardware of panel wood doors is included in this section.

Wood door frames and other woodwork in juxtaposition to panel wood doors is specified in Division-6 section "Architectural Woodwork".

SUBMITTALS:

Product Data: Door manufacturer's technical data for each type of door required, including details of construction relative to materials, dimensions of individual components, profiles and finishes.

Shop Drawings: Indicate location and size of each door; elevation of each door; construction details not covered in product data including those for stiles, rails, panels, and moldings (sticking); location and extent of hardware cutouts; fire ratings; and factory finishing requirements.

Samples: Corner section, 1'-0" square, showing edges, faces, joinery and material qualities of typical stile, rail, molding and panel for each exposed material, door type and finish required; and as follows:

Doors for Transparent Finish: Door faces representing typical range of color and grain for each veneer and lumber species required.

Certificate of Product Compliance: Manufacturer's certificate evidencing compliance of panel wood doors with requirements.

QUALITY ASSURANCE:

Single Source Responsibility: Obtain panel wood doors from a single manufacturer.

Product Certification: Require door manufacturer to certify that doors comply with specified requirements including those of referenced door standard.

Mark, label or otherwise identify panel wood doors as complying with NWWDA I.S.6.

Safety Glazing Standard: Provide safety glass of type indicated or required by authorities having jurisdiction for doors and sidelights; comply with ANSI Z97.1 and testing requirements of 16 CFR Part 1201 for Category II materials except where those of Category I are expressly indicated and permitted.

PRODUCT DELIVERY, STORAGE, AND HANDLING:

Protect doors during transit, storage and handling to prevent damage, soiling and deterioration. Comply with NWWDA pamphlet "How to Store, Handle, Finish, Install and Maintain Wood Doors" and with manufacturer's instructions and with applicable requirements of referenced door standard.

Identify each door with individual opening numbers which correlate with shop drawing designation system for doors, frames and hardware, using temporary, removable or concealed markings.

PROJECT CONDITIONS:

Conditioning: Do not deliver or install doors until conditions for temperature and relative humidity have been stabilized and will be maintained in storage and installation areas during remainder of construction period to comply with requirements of the following quality standard applicable to project's geographical location.

"Architectural Woodwork Quality Standards" including Section 100-S-3 "Moisture Content" of Architectural Woodwork Institute (AWI) And Comply With ANSI/AHA 135.4-1982, & NWWDAAL.S.1.1-86, SEC 3.7.(B)

PART 2 - PRODUCTS

MANUFACTURERS:

Available Manufacturers: Subject to compliance with requirements, manufacturers offering panel wood doors which may be incorporated in the work include, but are not limited to, the following:

Mohawk Molded 6 Panel Wood Doors MMP.
Jeld Wen Molded 6 Panel Wood Doors Bristol.
Simpson Infinity # 8316-F.

PANEL WOOD DOORS OF STOCK DESIGN AND CONSTRUCTION:

NWWDA Quality Standard: Comply with NWWDA I.S.6 "Industry Standard for Wood Stile and Rail Doors" of National Wood Window and Door Association (NWWDA).

Interior Doors: Comply with the following requirements:

NWWDA Grade of Doors for Transparent Finish: Premium or select.

Wood Species for Transparent Finish: Manufacturer's standard softwood species and cut.

Wood Species of Doors for Opaque Finish: Medium-density fiberboard for stiles and rails and panels over base construction materials, as standard with manufacturer.

Panel Configuration: Raised.

Raised Panel Thickness: Manufacturer's standard but not less than 7/16" required by referenced NWWDA standard for design group indicated.

Design and Layout: Panel design as described below under NWWDA design group, with minimum dimensions for stiles, rails, panels and other elements complying with referenced NWWDA standard.

NWWDA Design Group: "1-3/8 Interior Panel Doors".

Panel Design: As indicated.

FABRICATION:

Fabricate panel wood doors to produce doors complying with following requirements:

In sizes indicated for job-site fittings.

Factory-prefit doors to fit frame opening sizes indicated with uniform clearances and bevels as indicated below:

Fitting Clearances for Non-rated Doors: Provide 1/8" at jambs and heads; 1/16" per leaf at meeting stiles for pairs of doors; and 1/8" from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide 1/4" clearance from bottom of door to top of threshold.

Bevel non-rated doors 1/8" in 2" at lock and hinge edges.

Factory-premachine panel wood doors for hardware; comply with final hardware schedule, door frame shop drawings and hardware templates.

Glazed Openings: Factory-preglaze doors for applications indicated. Comply with requirements of Division-8 section "Glass and Glazing".

Glazed Openings: Trim glazed openings with solid wood moldings of profile indicated, removable one side.

Transom and Side Panels: Fabricate panels to match adjoining doors in materials, finish and quality of construction.

PART 3 - EXECUTION

EXAMINATION:

Examine installed door frames prior to hanging doors:

Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with plumb jambs and level heads.

Reject doors with defects.

Do not proceed with installation until unsatisfactory conditions have been corrected.

INSTALLATION:

Hardware: For installation see Division-8 "Builder's Hardware" section of these specifications.

Manufacturer's Instructions: Install panel wood doors to comply with manufacturer's instructions, applicable requirements of referenced quality standard, and as indicated.

Job-Fit Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted with fire-rated doors. Machine doors for hardware. Seal cut surfaces after fitting and machining.

Fitting Clearances for Non-rated Doors: Provide 1/8" at jambs and heads; 1/16" per leaf at meeting stiles for pairs of doors; and 1/8" from bottom of door to top of decorative floor finish and covering. Where threshold is shown or scheduled, provide 1/4" clearance from bottom of door to top of threshold.

Fitting Clearances for Fire-rated Doors: Comply with NFPA 80.

Bevel non-rated doors 1/8" in 2" at lock and hinge edges.

Bevel fire-rated doors 1/8" in 2" at lock edge.

Prefit Doors: Fit to frames for uniform clearance at each edge.

Factory-Finished Doors: Restore finish before installation, if fitting or machining is required at job site.

Field-Finished Doors: Refer to the following for finishing requirements:

Division-9 section "Painting".

ADJUSTING AND PROTECTION:

Operation: Rehang or replace doors which do not swing or operate freely.

Finished Doors: Refinish or replace doors damaged during installation.

Protect doors as recommended by door manufacturer to ensure that doors are without damage at time of Substantial Completion.

END OF SECTION 08212

SECTION 08311 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawing and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following access doors required for access to all shut-offs, valves, dampers and mechanical devices which cannot be accessed by removable acoustical ceiling panels:
 - 1. Wall access doors and frames.
 - 2. Fire-rated wall access doors and frames.
 - 3. Ceiling access doors and frames.
 - 4. Fire-rated ceiling access doors and frames.
 - 5. Floor doors and frames.
- B. Related Sections include the following:
 - 1. Division 4 Section "Unit Masonry Assemblies" for anchoring and grouting access door frames set in masonry construction.
 - 2. Division 9 Section "Acoustical Tile Ceilings" for access tile in suspended acoustical tile ceilings.
 - 3. Division 15 Section "Duct Accessories" for heating and air-conditioning duct access doors.

1.3 SUBMITTALS

- A. Product Data: For each type of door and frame indicated. Include construction details relative to materials, individual components and profiles, finishes, and fire ratings (if required) for access doors and frames.
- B. Shop Drawings: Show fabrication and installation details of customized doors and frames. Include plans, elevations, sections, details, and attachments to other Work.
- C. Samples: For each door face material, at least **3 by 5 inches** in size, in specified finish.
- D. Schedule: Provide complete door and frame schedule, including types, general locations, sizes, construction details, latching or locking provisions, and other data pertinent to installation.
- E. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items with concealed framing, suspension systems, piping, ductwork, and other construction. Show the following:

1. Method of attaching door frames to surrounding construction.
2. Ceiling-mounted items including access doors and frames, lighting fixtures, diffusers, grilles, speakers, sprinklers, and special trim.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain doors and frames through one source from a single manufacturer.
- B. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to access door and frame assemblies tested for fire-test-response characteristics per the following test method and that are labeled and listed by UL, ITS, or another testing and inspecting agency acceptable to authorities having jurisdiction:
 1. NFPA 252 or UL 10B for vertical access doors.
 2. ASTM E 119 or UL 263 for horizontal access doors and frames.
- C. Size Variations: Obtain Architect's acceptance of manufacturer's standard-size units, which may vary slightly from sizes indicated.

1.5 COORDINATION

- A. Verification: Determine specific locations and sizes for access doors needed to gain access to concealed equipment, and indicate on schedule specified in "Submittals" Article.

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:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Wall and Ceiling Access Doors:
 - a. Acudor Products Inc.
 - b. Babcock-Davis.
 - c. Bar-co
 - d. J. L. Industries, Inc.
 - e. Karp Associates, Inc.
 - f. Milcor Limited Partnership.
 - g. Williams Brothers Corp.
 2. Floor Doors:
 - a. Acudor Products Inc. (aluminum only).
 - b. Babcock-Davis Hatchways, Inc.
 - c. Bilco Company (The).
 - d. Dur-Red Products, Inc.

2.2 MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Aluminum Sheet: **ASTM B 209**, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than strength and durability properties of alloy 5005-H15; with minimum thickness indicated representing specified thickness according to **ANSI H35.2**.
- C. Aluminum Extrusions: **ASTM B 221**, alloy 6063-T6.
- D. Drywall Beads: Edge trim formed from **0.0299-inch** zinc-coated steel sheet formed to receive joint compound and in size to suit thickness of gypsum board
- E. Plaster Bead: Casing bead formed from **0.0299-inch** zinc-coated steel sheet with flange formed out of expanded metal lath and in size to suit thickness of plaster.

2.3 PAINT

- A. Shop Primers: Provide primers that comply with Division 9 Section "Painting."
- B. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements in FS TT-P-664; selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.
- C. Shop Primer for Metallic-Coated Steel: Organic zinc-rich primer complying with SSPC-Paint 20 and compatible with topcoat.

2.4 ACCESS DOORS AND FRAMES

- A. Flush, Uninsulated, Fire-Rated Access Doors and Frames with Exposed Trim: Fabricated from steel sheet.
 - 1. Locations: Masonry wall surfaces, gypsum wallboard surfaces, and plaster and gypsum wallboard ceilings.
 - 2. Fire-Resistance Rating: One hour.
 - 3. Door: Minimum **0.060-inch**- thick sheet metal, flush construction.
 - 4. Frame: Minimum **0.060-inch**- thick sheet metal with **1-1/4-inch**- wide, surface-mounted trim.
 - 5. Hinges: Continuous piano hinge.
 - 6. Automatic Closer: Spring type.
 - 7. Latch: Self-latching bolt operated by flush key with interior release.

2.5 FLOOR DOORS

- A. Floor Doors, General: Equip each door with adjustable counterbalancing springs, heavy-duty hold-open arm that automatically locks door open at 90 degrees, release handle with red vinyl grip that allows for one-handed closure, and recessed lift handle.

- B. Aluminum Floor Door: Extruded-aluminum angle frame with **1/4-inch-** thick, aluminum tread plate door with recess to receive floor finish; nonwatertight; loading capacity to support **300-lbf/sq. ft.** load. Aluminum mill finish.
- C. Options: If available from specified manufacturers, include the following options:
 - 1. Hinges: Heavy-duty, stainless-steel continuous piano hinge with stainless-steel pins.
 - 2. Latch: Stainless-steel slam latch.
 - 3. Lock: Stainless-steel snap lock with removable outside handle.
 - 4. Hardware Material: Stainless steel, including latch and lifting mechanism assemblies, hold-open arms, and all brackets, hinges, pins, and fasteners.

2.6 FABRICATION

- A. General: Provide access door assemblies manufactured as integral units ready for installation.
- B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- C. Steel Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.
 - 1. Exposed Flanges: Nominal **1 to 1-1/2 inches** wide around perimeter of frame.
 - 2. For trimless frames with drywall bead for installation in gypsum board assembly provide edge trim for gypsum board securely attached to perimeter of frames.
 - 3. For trimless frames with plaster bead for full-bed plaster applications, provide zinc-coated expanded metal lath and exposed casing bead welded to perimeter of frames.
 - 4. Provide mounting holes in frames to attach frames to metal or wood framing in plaster and drywall construction and to attach masonry anchors in masonry construction. [Furnish adjustable metal masonry anchors.]
- D. Recessed Access Doors: Form face of panel to provide recess for application of applied finish. Reinforce panel as required to prevent buckling.
- E. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.
 - 1. For doors with latches released by and locks operated by mortise cylinders, prepare access doors for cylinders specified in Division 8 Section "Door Hardware."
- F. Extruded Aluminum: After fabrication, apply manufacturer's standard protective coating on aluminum that will come in contact with concrete.

2.7 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.

2.8 STEEL FINISHES

- A. Surface Preparation: 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): SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 2. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."
- B. Apply shop primer to uncoated surfaces of metal fabrications. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for shop painting.

2.9 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. As-Fabricated Finish: AA-M10 (Mechanical Finish: as fabricated, unspecified).
- C. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Advise installers of other work about specific requirements relating to access door and floor door installation, including sizes of openings to receive access door and frame, as well as locations of supports, inserts, and anchoring devices.

3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing [access doors and frames] [and] [floor doors and frames].
- B. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finish surfaces.

- C. Install access doors with trimless frames flush with adjacent finish surfaces or recessed to receive finish material.

3.3 ADJUSTING AND CLEANING

- A. Adjust doors and hardware after installation for proper operation.
- B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION 08311

SECTION 08460 - AUTOMATIC SWINGING ENTRANCE SYSTEMS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Furnish and install automatic entrance equipment as indicated on drawings and as specified.
- B. Related work specified elsewhere.
 - 1. Division 16 Section "Electrical."
 - a. **ELECTRICAL INSTALLER** shall furnish and install all conduit and electrical wiring for activating devices and door operators. A minimum of 5 amperes, 115-volt, A/C. 1-phase circuit shall be furnished for each door operator, terminate and connect to operator control panel in operator housing.

1.02 QUALITY ASSURANCE

- A. **Manufacturer's Qualifications:**
Products specified shall be represented by a factory authorized and trained distributor. Distributor shall maintain a parts inventory and trained personnel capable of providing service.
- B. **Requirements of Regulatory Agencies:**
 - 1. Underwriters Laboratory, Inc. (UL): Automatic entrance and/or exit doors shall be a UL listed system in guide FDDR and/or guide FUXV.
 - 2. Meets requirements of disabled in accordance with Federal Regulation ANSI 117
- C. All automatic equipment to comply with ANSI A156.19.
- D. Gyro Tech equipment as manufactured by NABCO ENTRANCES, INC. has been specified and shall be quoted as the base bid. Other systems can be quoted along with information specifically detailing the differences from the following specification.

1.03 SUBMITTALS

- A. Shop drawings showing complete elevations, details and method of anchorage to location; installation of hardware; size, shape, joints and connections; and details of joining with other construction.
- B. Templates and diagrams and/or shop drawings as needed shall be furnished to fabricators and installers of related work for coordination of operators with doors, frames, hardware, concrete work and other work.
- C. A copy of appropriate manual shall be provided to owner's engineer upon completion of installation.

1.04 WARRANTY

- A. Warranty of power operators, controls and labor provided by automatic door equipment installer against defects in material and workmanship at no cost to owner, for a period of one year from date of substantial completion. Provide warranty to owner after completion of installation.

PART 2-PRODUCTS

2.01 APPROVED MANUFACTURER

- A. Automatic entrance equipment and controls shall be manufactured by:
NABCO ENTRANCES INC.
S82 W18717 Gemini Drive
P.O. Box 906
Muskego, Wisconsin 53150
Phone: (877) 622-2694
Fax: (888) 679-3319

2.02 AUTOMATIC SWING DOOR SYSTEM

- A. GYRO TECH GT System 500 (surface applied): Automatic Swing door system for physically challenged as indicated on door schedule and details.
- B. Mode of Operation: Spring Close. Gyro-Swing operator shall open door by energizing motor and shall stop door by stalling motor against mechanical stop. Door shall close slowly by means of spring energy, closing force shall be controlled by gear system and motor being used as dynamic brake without power. Complete automatic door cycle 18 to 20 seconds. Manual door operation requires less than 12 lbs. of force applied to door stile. System shall also operate as a manual door in event of power failure. Hold open time shall be adjustable. Door operation shall not require any fluids or gases under pressure to be used in opening and closing of door.
- C. Components:
1. Operator Housing
 - la) GYRO TECH Housing shall be 5-1/2" (139.7 mm) wide by 5" (127.0 mm) high aluminum extrusions with finished end caps and shall be prepared for mounting to new or existing door frames. All structural sections shall have a minimum thickness of 0.146" (3.7 mm) and shall be fabricated of 6063-T5 aluminum alloy.
 - 1b) Finish: Aluminum shall have a standard finish of AA-M 12-C22-A41 (204 RI) or AA-M12-C22-A42 (dark bronze). Black and special finishes available upon request.
 2. Gyro-Swing Power Operator
Completely assembled and sealed unit which shall include helical gear-driven transmission, overriding clutch (to provide easy manual operation, spring-close), mechanical spring and bearings all located in cast aluminum housing and filled with special lubricant for extreme temperature conditions. Attached to transmission system shall be a DC shunt-wound permanent magnet motor with sealed ball bearings. Motor shall operate from 115-volt supply and require less than 5 amps at full power stall. Complete unit shall be resilient mounted with provisions for easy replacement, without removing door from pivots or frame.
 3. Electronic Control
Self-contained unit including necessary transformer, relays, rectifiers, and other electronic components for proper operation and switching of Gyro-Swing power operator. Relays shall be plug-in type for individual replacement. All connecting harnesses shall have interlocking plugs. Controls shall also include time delay for normal cycle. Control shall also include adjustable (0 to 60 seconds) time delay module

4. Connecting Hardware
Connect conversion unit (CU) drive arm to inswing door with a urethane covered roller which shall ride in a track fabricated of 6061 -T6 aluminum alloy attached to the top door rail where required for pull-type operation. Outswing doors shall be connected to operator by a two-piece drive arm with self-aligning rod ends and connecting door bracket for push-type operation.

2.03 ACTIVATING DEVICES

- A. Wall Switches: 6" (152.4 mm) diameter stainless steel, surface or flush mounted, engraved or plain, as manufactured by NABCO ENTRANCES, INC.

PART 3-EXECUTION

3.01 INSTALLATION

- A. Automatic door equipment shall be installed by factory-trained installers in compliance with manufacturer's recommendations and approved shop drawings

3.02 CLEANING AND PROTECTION

- A. After installation, clean framing members as recommended by manufacturer. Aluminum surfaces in contact with masonry, concrete, and steel shall be protected from contact by use of neoprene gaskets where indicated, or a coat of bituminous paint to prevent galvanic or corrosive action. Advise general contractor to protect unit from damage during subsequent construction activities.

SECTION 08520 - ALUMINUM WINDOWS

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.

1.2 SUMMARY

- A. This Section includes the following types of aluminum-framed windows:
 - 1. Awning windows.
 - 2. Double-hung windows.
 - 3. Fixed windows.
- B. Related Sections include the following:
 - 1. Division 8 Section "Aluminum Entrances and Storefronts."
 - 2. Division 8 Section "Glazing" for glazing requirements for aluminum windows, including those specified to be factory glazed.

1.3 DEFINITIONS

- A. AW: Architectural.
- B. Performance grade number, included as part of the AAMA/NWWDA product designation code, is actual design pressure in pounds force per square foot used to determine structural test pressure and water test pressure.
- C. Structural test pressure, for uniform load structural test, is equivalent to 150 percent of design pressure.
- D. Minimum test size is smallest size permitted for performance class (gateway test size). Products must be tested at minimum test size or at a size larger than minimum test size to comply with requirements for performance class.

1.4 PERFORMANCE REQUIREMENTS

- A. General: Provide aluminum windows capable of complying with performance requirements indicated, based on testing manufacturer's windows that are representative of those specified and that are of test size indicated below:
 - 1. Minimum size required by gateway performance requirements for determining compliance with AAMA/NWWDA 101/I.S.2 for both gateway performance requirements and optional performance grades.

- B. AAMA/NWWDA Performance Requirements: Provide aluminum windows of the performance class and grade indicated that comply with AAMA/NWWDA 101/I.S.2.
 - 1. Performance Class: AW.
 - 2. Performance Grade: 45.
- C. Structural Performance: Provide aluminum windows capable of withstanding the following, including wind loads based on passing AAMA/NWWDA 101/I.S.2, Uniform Load Structural Test, at basic wind speed indicated:
 - 1. Deflection: Based on passing AAMA/NWWDA 101/I.S.2, Uniform Load Deflection Test.
- D. Air Infiltration: Maximum rate not more than indicated when tested according to AAMA/NWWDA 101/I.S.2, Air Infiltration Test.
 - 1. Maximum Rate: 0.1 cfm/sq. ft of area at an inward test pressure of 6.24 lbf/sq. ft.
- E. Water Resistance: No water leakage as defined in AAMA/NWWDA referenced test methods at a water test pressure equaling that indicated, when tested according to AAMA/NWWDA 101/I.S.2, Water Resistance Test.
 - 1. Test Pressure: 20 percent of positive design pressure, but not more than 12 lbf/sq. ft..
- F. Forced-Entry Resistance: Comply with Performance Level 10 requirements when tested according to ASTM F 588.
- G. Thermal Transmittance: Provide aluminum windows with a whole-window U-value maximum indicated at 15-mph exterior wind velocity and winter condition temperatures when tested according to ASTM E 1423.
 - 1. U-Value: .30 Btu/sq. ft. x h x deg F.
- H. Sound Transmission Class: Provide glazed windows rated for not less than 26 -35 STC when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 413.
- I. Thermal Movements: Provide aluminum windows, including anchorage, that accommodate thermal movements of units resulting from the following maximum change (range) in ambient and surface temperatures without buckling, distortion, opening of joints, failure of joint sealants, damaging loads and stresses on glazing and connections, and other detrimental effects. Base engineering calculation on actual surface temperatures of materials due to solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F , ambient; 180 deg F material surfaces.

1.5 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, fabrication methods, dimensions of individual components and profiles, hardware, finishes, and operating instructions for each type of aluminum window indicated.

- B. Shop Drawings: Include plans, elevations, sections, details, hardware, attachments to other Work, operational clearances, and the following:
 - 1. Mullion details, including reinforcement and stiffeners.
 - 2. Joinery details.
 - 3. Expansion provisions.
 - 4. Flashing and drainage details.
 - 5. Weather-stripping details.
 - 6. Thermal-break details.
 - 7. Glazing details.
 - 8. Window cleaning provisions.
 - 9. Window System Operators: Show locations, mounting, and details for installing operator components and controls.

- C. Samples for Verification: For aluminum window components required, prepared on Samples of size indicated below.
 - 1. Main Framing Member: 12-inch- long, full-size sections of extrusions with factory-applied color finish.
 - 2. Hardware: Full-size units with factory-applied finish.
 - 3. Weather Stripping: 12-inch- long sections.
 - 4. Architect reserves the right to require additional samples that show fabrication techniques, workmanship, and design of hardware and accessories.

- D. Qualification Data: For Installer.

- E. Product Test Reports: Based on evaluation of comprehensive tests performed within the last four years by a qualified testing agency, for each type, grade, and size of aluminum window. Test results based on use of down-sized test units will not be accepted.

- F. Maintenance Data: For operable window sash, operating hardware, weather stripping and finishes to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An installer acceptable to aluminum window manufacturer for installation of units required for this Project.

- B. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.

- C. Source Limitations: Obtain aluminum windows through one source from a single manufacturer.

- D. Product Options: Information on Drawings and in Specifications establishes requirements for aluminum windows' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.
- E. Fenestration Standard: Comply with AAMA/NWWDA 101/I.S.2, "Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors," for minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.
 1. Provide AAMA-certified aluminum windows with an attached label.
- F. Glazing Publications: Comply with published recommendations of glass manufacturers and GANA's "Glazing Manual" unless more stringent requirements are indicated.
- G. Mockups: Build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution.
 1. Build mockup in building envelope wall in location[s] shown on Drawings.
 2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to aluminum windows including, but not limited to, the following:
 1. Inspect and discuss condition of substrate and other preparatory work performed by other trades.
 2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify aluminum window openings by field measurements before fabrication and indicate measurements on Shop Drawings.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace aluminum windows that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:
 1. Failure to meet performance requirements.
 2. Structural failures including excessive deflection.
 3. Water leakage, air infiltration, or condensation.
 4. Faulty operation of movable sash and hardware.
 5. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 6. Insulating glass failure.

- B. Warranty Period: One year from date of Substantial Completion.
- C. Warranty Period for Metal Finishes: 10 years from date of Substantial Completion.
- D. Warranty Period for Glass: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Windows:
 - a. EFCO Corporation.
 - b. Peerless Products, Inc.

2.2 MATERIALS, GENERAL

- A. Aluminum Extrusions: Alloy and temper recommended by aluminum window manufacturer for strength, corrosion resistance, and application of required finish, but not less than 22,000-psi ultimate tensile strength, not less than 16,000-psi minimum yield strength, and not less than 0.062-inch thickness at any location for the main frame and sash members.
- B. Fasteners: Aluminum, nonmagnetic stainless steel, epoxy adhesive, or other materials warranted by manufacturer to be noncorrosive and compatible with aluminum window members, trim, hardware, anchors, and other components. Cadmium-plated steel fasteners are not permitted.
 - 1. Reinforcement: Where fasteners screw-anchor into aluminum less than 0.125 inch thick, reinforce interior with aluminum or nonmagnetic stainless steel to receive screw threads, or provide standard, noncorrosive, pressed-in, splined grommet nuts.
 - 2. Exposed Fasteners: Unless unavoidable for applying hardware, do not use exposed fasteners. For application of hardware, use fasteners that match finish of member or hardware being fastened, as appropriate.
- C. Anchors, Clips, and Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated. Cadmium-plated steel anchors, clips, and accessories are not permitted.
- D. Reinforcing Members: Aluminum, nonmagnetic stainless steel, nickel/chrome-plated steel complying with ASTM B 456 for Type SC 3 severe service conditions, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated. Cadmium-plated steel reinforcing members are not permitted.

- E. Compression-Type Weather Stripping: Provide compressible weather stripping designed for permanently resilient sealing under bumper or wiper action, and completely concealed when aluminum window is closed.
 - 1. Weather-Stripping Material: Manufacturer's standard system and materials complying with AAMA/NWWDA 101/I.S.2.
- F. Sliding-Type Weather Stripping: Provide woven-pile weather stripping of wool, polypropylene, or nylon pile and resin-impregnated backing fabric. Comply with AAMA 701/702.
 - 1. Weather Seals: Provide weather stripping with integral barrier fin or fins of semirigid, polypropylene sheet or polypropylene-coated material.
- G. Replaceable Weather Seals: Comply with AAMA 701/702.
- H. Sealant: For sealants required within fabricated windows, provide window manufacturer's standard, permanently elastic, nonshrinking, and nonmigrating type recommended by sealant manufacturer for joint size and movement.

2.3 GLAZING

- A. Glass and Glazing Materials: Manufactures standard glazing materials installed with 5/8 inch Insulated Glazing comprised of 3/16 inch Clear and 3/16 inch Low-E Argon AFG Comfort E-PS.
- B. Glazing System: Manufacturer's standard factory-glazing system that produces weathertight seal.

2.4 HARDWARE

- A. General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with aluminum; designed to smoothly operate, tightly close, and securely lock aluminum windows and sized to accommodate sash or ventilator weight and dimensions. Cadmium-plated hardware is not permitted. Do not use aluminum in frictional contact with other metals.
- B. Counterbalancing Mechanism: Comply with AAMA 902.
 - 1. Sash Balance: Concealed ultra-lift spring type capable of lifting 70 percent of sash weight of size and capacity to hold sash stationary at any open position.
- C. Gear-Type Rotary Operators: Comply with AAMA 901 when tested according to ASTM E 405, Method A.
 - 1. Operation Function: All ventilators move simultaneously and securely close at both jambs without using additional manually controlled locking devices.
- D. Four- or Six-Bar Friction Hinges: Comply with AAMA 904.
 - 1. Locking mechanism and handles for manual operation.

2. Friction Shoes: Provide friction shoes of nylon or other nonabrasive, nonstaining, noncorrosive, durable material.

E. Awning Windows: Provide the following operating hardware:

1. Operator: Gear-type rotary operator located on jamb at sill.
2. Hinges: Concealed four- or six-bar friction hinges located on each jamb near top rail; two per ventilator.
3. Lock: Lift-type throw, cam-action lock with keeper; two per ventilator.

F. Single-Hung Windows: Provide the following operating hardware:

1. Sash Balances: Two per sash.
2. Handle: Continuous, integral, sash lift bar on bottom rail of forward placed operating sash.
3. Sash Lock: Spring-loaded, snap-type lock on bottom rail of lower sash; two per sash.
4. Tilt Lock: Design windows and provide with tilt latch and pivot bar hardware to permit tilting of sash inward for cleaning both sides of sash from interior.

2.5 INSECT SCREENS

A. General: Design windows and hardware to accommodate screens in a tight-fitting, removable arrangement, with a minimum of exposed fasteners and latches. Locate screens on inside of window and provide for each operable exterior sash or ventilator.

1. Aluminum Tubular Frame Screens: Comply with SMA 1004, "Specifications for Aluminum Tubular Frame Screens for Windows," Architectural C-24 class.

B. Aluminum Insect Screen Frames: Manufacturer's standard aluminum alloy complying with SMA 1004. Fabricate frames with mitered or coped joints, concealed fasteners and removable PVC spline/anchor concealing edge of frame.

1. Aluminum Tubular Framing Sections and Cross Braces: Roll formed from aluminum sheet with minimum wall thickness as required for class indicated.
2. Finish: Match aluminum window members.

C. Aluminum Wire Fabric: 18-by-16 mesh of 0.011-inch- diameter, coated aluminum wire.

1. Wire-Fabric Finish: Natural bright.

D. Wickets: Provide sliding or hinged wickets, framed and trimmed for a tight fit and durability during handling.

2.6 ACCESSORIES

A. Historic Options: Provide the following Historic Options:

1. 3/8 inch Historic Trim (Putty Glazing).
2. 7/8 inch Applied Muntins
3. 5/8 inch In Between Glass Muntins.
4. Exterior Aluminum Snap Trim to Match Existing.

2.7 FABRICATION

- A. General: Fabricate aluminum windows, in sizes indicated, that comply with AAMA/NWWDA 101/I.S.2 for performance class and performance grade indicated. Include a complete system for assembling components and anchoring windows.
- B. Fabricate aluminum windows that are reglazable without dismantling sash or ventilator framing.
- C. Thermally Improved Construction: Fabricate aluminum windows with an integral, concealed, low-conductance thermal barrier; located between exterior materials and window members exposed on interior side; in a manner that eliminates direct metal-to-metal contact.
 - 1. Provide thermal-break construction that has been in use for not less than three years and has been tested to demonstrate resistance to thermal conductance and condensation and to show adequate strength and security of glass retention.
 - 2. Provide hardware with low conductivity or nonmetallic material for hardware bridging thermal breaks at frame or vent sash.
- D. Weather Stripping: Provide full-perimeter weather stripping for each operable sash and ventilator.
- E. Weep Holes: Provide weep holes and internal passages to conduct infiltrating water to exterior.
- F. Mullions: Provide mullions and cover plates as shown, matching window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections, as indicated. Provide mullions and cover plates capable of withstanding design loads of window units.
- G. Factory-Glazed Fabrication: Glaze aluminum windows in the factory where practical and possible for applications indicated. Comply with requirements in Division 8 Section "Glazing" and with AAMA/NWWDA 101/I.S.2.

2.8 FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- C. High-Performance Organic Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 1. Fluoropolymer Two-Coat System: Manufacturer's standard two-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color 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.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances; rough opening dimensions; levelness of sill plate; coordination with wall flashings, vapor retarders, and other built-in components; operational clearances and other conditions affecting performance of work.
 1. Masonry Surfaces: Visibly dry and free of excess mortar, sand, and other construction debris.
 2. Wood Frame Walls: Dry, clean, sound, well nailed, free of voids, and without offsets at joints. Ensure that nail heads are driven flush with surfaces in opening and within 3 inches of opening.
 3. Metal Surfaces: Dry; clean; free of grease, oil, dirt, rust, corrosion, and welding slag; without sharp edges or offsets at joints.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components; Drawings; and Shop Drawings.
- B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction.
- C. Set sill members in bed of sealant or with gaskets, as indicated, for weathertight construction.
- D. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.
- E. Metal Protection: Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials by complying with requirements specified in "Dissimilar Materials" Paragraph in Appendix B in AAMA/NWWDA 101/I.S.2.

3.3 ADJUSTING

- A. Adjust operating sashes and ventilators, screens, hardware and accessories for a tight fit at contact points and weather stripping for smooth operation and weathertight closure. Lubricate hardware and moving parts.

3.4 PROTECTION AND CLEANING

- A. Protect window surfaces from contact with contaminating substances resulting from construction operations. In addition, monitor window surfaces adjacent to and below exterior concrete and masonry surfaces during construction for presence of dirt, scum, alkaline deposits, stains, or other contaminants. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written recommendations.
- B. Clean aluminum surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.
- C. Clean factory-glazed glass immediately after installing windows. Comply with manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels and clean surfaces.
- D. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

END OF SECTION 08520

SECTION 08710 - FINISH HARDWARE

PART 1 - GENERAL

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to the work of this section.

DESCRIPTION OF WORK:

Definition: "Builders' Hardware" includes items known commercially as builders hardware which are required for swing, sliding and folding doors, except special types of unique and non-matching hardware specified in the same section as the door and door frame.

Extent of finish hardware required is indicated on drawings and in schedules.

Types of finish hardware required include the following:

Hinges	Pivots	Spring hinges
Lock cylinders and keys	Lock and latch sets	Bolts
Exit devices	Push/pull units	Sliding door equipment
Bi-pass door hardware	Closers	Overhead holders
Protection plates	Door trim units	Miscellaneous door control devices
Security products	Thresholds	Weatherstripping for exterior doors
Sound stripping for interior doors.		Automatic drop seals (door bottoms).
Astragals or meeting seals on pairs of doors		
Electric strike.		
Door Stops		

Silencers included integral with hollow metal frames are specified with door frames elsewhere in Division-8.

Weatherstripping included integral with hollow metal frames are specified with door frames elsewhere in Division-8.

Thresholds for aluminum entrance doors are specified with entrance doors elsewhere in Division-8.

Expansion joints acting as thresholds are specified in Division-5.

QUALITY ASSURANCE:

Manufacturer: Obtain each type of hardware (latch and lock sets, hinges, closers, etc.) from only one manufacturer, although several may be indicated as offering products complying with requirements.

Supplier: A recognized architectural finish hardware supplier, with warehousing facilities, who has been furnishing hardware in the project's vicinity for a period of not less than 2 years, and who is, or who employs an experienced architectural consultant who is available, at reasonable times during the course of the work, for consultation about project's hardware requirements, to Owner, Architect and Contractor.

Fire-Rated Openings: Provide hardware for fire-rated openings in compliance with NFPA Standard No. 80 and local building code requirements. Provide only hardware which has been tested and listed by UL or FM for types and sizes of doors required and complies with requirements of door and door frame labels.

Where emergency exit devices are required on fire-rated doors (with supplementary marking on doors' UL or FM labels indicating "Fire Door to be Equipped with Fire Exit Hardware") provide UL or FM label on exit devices indicating "Fire Exit Hardware".

SUBMITTALS:

Product Data: Submit manufacturers technical product data for each item of hardware in accordance with Division-1 section "Submittals". Include whatever information may be necessary to show compliance with requirements, and include instructions for installation and for maintenance of operating parts and finish.

Hardware Schedule: Submit final hardware schedule in manner indicated below. Coordinate hardware with doors, frames and related work to ensure proper size, thickness, hand, function and finish of hardware.

Final Hardware Schedule Content: Based on finish hardware indicated, organize hardware schedule into "hardware sets" indicating complete designations of every item required for each door or opening. Include the following information:

Type, style, function, size and finish of each hardware item.

Name and manufacturer of each item.

Fastenings and other pertinent information.

Location of hardware set cross-referenced to indications on Drawings both on floor plans and in door and frame schedule.

Explanation of all abbreviations, symbols, codes, etc. contained in schedule.

Mounting locations for hardware.

Door and frame sizes and materials.

Keying information.

Submittal Sequence: Submit schedule at earliest possible date particularly where acceptance of hardware schedule must precede fabrication of other work (e.g., hollow metal frames) which is critical in the project construction schedule. Include with schedule the product data, samples, shop drawings of other work affected by finish hardware, and other information essential to the coordinated review of hardware schedule.

Submittal Sequence: Submit initial draft of schedule along with essential product data in order to facilitate the fabrication of other work (e.g., hollow metal frame) which is critical in the project construction schedule. Submit final draft of schedule after samples, product data, coordination with shop drawings of other work, delivery schedules, and similar information has been completed and accepted.

Keying Schedule: Submit separate detailed schedule indicating clearly how the Owner's final instructions on keying of locks has been fulfilled.

Samples: Prior to submittal of the final hardware schedule and prior to final ordering of finish hardware, submit one sample of each type of exposed hardware unit, finished as required, and tagged with full description for coordination with schedule.

Samples will be returned to the supplier. Units which are acceptable and remain undamaged through submittal, review and field comparison procedures may, after final check of operation, be used in the work, within limitations of keying coordination requirements.

Templates: Furnish hardware templates to each fabricator of doors, frames and other work to be factory-prepared for the installation of hardware. Upon request, check shop drawings of such other work, to confirm that adequate provisions are made for proper location and installation of hardware.

PRODUCT HANDLING:

Tag each item or package separately, with identification related to final hardware schedule, and include basic installation instructions with each item or package.

Packaging of hardware, is responsibility of supplier. As material is received by hardware supplier from various manufacturers, sort and repackage in containers clearly marked with appropriate hardware set number to match set numbers of approved hardware schedule. Two or more identical sets may be packed in same container.

Inventory hardware jointly with representatives of the hardware supplier and the hardware installer until each is satisfied that the count is correct.

Deliver individually packaged hardware items at the proper times to the proper locations (shop or project site) for installation.

Provide secure lock-up for hardware delivered to the project, but not yet installed. Control handling and installation of hardware items which are not immediately replaceable, so that completion of the work will not be delayed by hardware losses, both before and after installation.

PART 2 - PRODUCTS

Responsibilities of Finish Hardware Supplier:

Submittals: Provide through Contractor required Product Data, Final Hardware Schedule, Separate Keying Schedule (if required), and samples as specified in Part 1 - General of this section, unless otherwise indicated.

Construction Schedule: Inform Contractor at earliest possible date of estimated times and dates to process submittals, to furnish templates, to deliver hardware, and to perform other work associated with furnishing Finish Hardware for purposes of including in construction progress schedule and then comply with this schedule.

Coordination and Templates: Assist Contractor as required to coordinate hardware with other work in respect to both fabrication and installation. Furnish Contractor with templates and deliver hardware to proper locations.

Product Handling: Package, identify, deliver, and inventory hardware as specified in Part 1 - General of this section.

Discrepancies: Based on requirements indicated in Contract Documents in effect at time of hardware selection: furnish proper types, finishes, and quantities of finish hardware, including fasteners, and Owner's

maintenance tools; and furnish or replace any items of finish hardware resulting from shortages and incorrect items, at no cost to the Owner or Contractor. Obtain signed receipts from Contractor for all delivered materials.

Responsibilities of Contractor:

Submittals: Coordinate and process submittals for Builders Hardware in same manner as submittals for other work.

Construction Schedule: Cooperate with Finish Hardware supplier in establishing scheduled dates for submittals and delivery of templates and finish hardware.

Coordination: Coordinate finish hardware with other work. Furnish hardware supplier or manufacturer with shop drawings of other work where required or requested. Verify completeness and suitability of hardware with supplier.

Product Handling: Provide secure lock-up for hardware delivered to the site. Inventory hardware jointly with representative of hardware supplier and issue signed receipts for all delivered materials. Any hardware items lost, damaged or stolen after being accepted by Contractor shall be replaced at Contractor's expense.

Installation Information: The general types and approximate quantities of hardware required for this project are indicated at the end of this section in order to establish Contractors costs for installation and other work not included in allowance.

No adjustments in Contract sum will be made for costs other than those covered by the allowances for subsequent increases or decreases in quantity of one or more hardware types which do not exceed 5 percent.

SCHEDULED HARDWARE:

Requirements for design, grade, function, finish, size and other distinctive qualities of each type of finish hardware is indicated in the Finish Hardware Data Sheet and Hardware Schedule at the end of this section. Products are identified by using hardware designation numbers of the following.

Manufacturer's product designations: One or more manufacturers are listed for each hardware type required. An asterisk (*) after a manufacturer's name indicates whose product designation is used in the Hardware Schedule for purposes of establishing minimum requirements. Provide either the product designated, or, where more than one manufacturer is listed, the comparable product of one of the other manufacturers which comply with requirements including those specified elsewhere in this section.

ANSI/BHMA designations used elsewhere in this section or in schedules to describe hardware items or to define quality or function are derived from the following standards. Provide products complying with these standards and requirements specified elsewhere in this section.

Butts and Hinges: ANSI A156.1 (BHMA 101)

Locks & Lock Trim: ANSI A156.2 (BHMA 601)

Exit Devices: ANSI A156.3 (BHMA 701)

Door Controls - Closers: ANSI A156.4 (BHMA 301)

Auxiliary Locks: ANSI A 156.5 (BHMA 501).

Architectural Door Trim: ANSI A156.6 (BHMA 1001)

Template Hinge Dimensions: ANSI A156.7.

Door Controls - Overhead Holders: ANSI A156.8 (BHMA 311)

Interconnected Locks & Latches: ANSI A 156.12 (BHMA 611)

Mortise Locks & Latches: ANSI A156.13 (BHMA 621)

Sliding & Folding Door Hardware: ANSI A156.14 (BHMA 401)

Closer Holder Release Devices: ANSI A156.15 (BHMA 321)

Auxiliary Hardware: ANSI A156.16 (BHMA 1201)

Self Closing Hinges & Pivots: ANSI A156.17 (BHMA 1101)

Materials & Finishes: ANSI A156.18 (BHMA 1301)

MATERIALS AND FABRICATION:

General:

Hand of door: Drawings show direction of slide, swing or hand of each door leaf. Furnish each item of hardware for proper installation and operation of door movement as shown.

Manufacturer's Name Plate: Do not use manufacturer's products which have manufacturer's name or trade name displayed in a visible location (omit removable nameplates), except in conjunction with required UL labels and as otherwise acceptable to Architect.

Manufacturer's identification will be permitted on rim of lock cylinders only.

Base Metals: Produce hardware units of basic metal and forming method indicated, using manufacturer's standard metal alloy, composition, temper and hardness, but in no case of lesser (commercially recognized) quality than specified for the applicable hardware units by applicable ANSI A156 series standard for each type hardware item and with ANSI A156.18 for finish designations indicated. Do not furnish "optional" materials or forming methods for those indicated, except as otherwise specified.

Fasteners: Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation. Do not provide hardware which has been prepared for self-tapping sheet metal screws, except as specifically indicated.

Furnish screws for installation, with each hardware item. Provide Phillips flat-head screws except as otherwise indicated. Finish exposed (exposed under any condition) screws to match hardware finish or, if

exposed in surfaces of other work, to match finish of such other work as closely as possible, including "prepared for paint" in surfaces to receive painted finish.

Provide concealed fasteners for hardware units which are exposed when door is closed, except to extent no standard units of the type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on the opposite face is exposed in other work, except where it is not feasible to adequately reinforce the work. In such cases, provide sleeves for each thru-bolt or use sex screw fasteners.

Tools and Maintenance Instructions for Maintenance: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of finish hardware.

HINGES, BUTTS AND PIVOTS:

Templates: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.

Screws: Furnish Phillips flat-head or machine screws for installation of units, except furnish Phillips flat-head or wood screws for installation of units into wood. Finish screw heads to match surface of hinges or pivots.

Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:

Steel Hinges: Steel pins.

Non-ferrous Hinges: Stainless steel pins.

Exterior Doors: Non-removable pins.

Out-swing Corridor Doors: Non-removable pins.

Interior Doors: Non-rising pins.

Tips: Flat button and matching plug, finished to match leaves, except where hospital tip (HT) indicated.

Number of hinges: Provide number of hinges indicated but not less than 3 hinges for door leaf for doors 90" or less in height and one additional hinge for each 30" of additional height.

LOCK CYLINDERS AND KEYING:

General: Supplier will meet with Owner to finalize keying requirements and obtain final instructions in writing.

Standard System: Except as otherwise indicated, provide new masterkey system for project.

Review the keying system with the Owner and provide the type required (master, grandmaster or great-grandmaster), either new or integrated with Owner's existing system.

Equip locks with cylinders for interchangeable-core pin tumbler inserts. Furnish only temporary inserts for the construction period, and remove these when directed.

Metals: Construct lock cylinder parts from brass/bronze, stainless steel or nickel silver.

Comply with Owner's instructions for masterkeying and, except as otherwise indicated, provide individual change key for each lock which is not designated to be keyed alike with a group of related locks.

Permanently inscribe each key with number or lock that identifies cylinder manufacturer key symbol, and notation "DO NOT DUPLICATE".

Key Material: Provide keys of nickel silver only.

Key Quantity: Furnish 3 change keys for each lock; 5 master keys for each master system; and 5 grandmaster keys for each grandmaster system & 2 control keys for each building.

Deliver keys to Owner's representative.

Provide a key control system including envelopes, labels, tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet, all as recommended by system manufacturer, with capacity for 150% of the number of locks required for the project.

Provide complete cross index system set up by key control manufacturer and place keys on marker and hooks in the cabinet as determined by the final key schedule.

Provide hinged-panel type cabinet, for wall mounting.

LOCKS, LATCHES AND BOLTS

Strikes: Provide manufacturer's standard wrought box strike for each latch or lock bolt, with curved lip extended to protect frame, finished to match hardware set.

Provide standard (open) strike plates for interior doors of residential units where wood door frames are used.

Provide roller type strikes where recommended by manufacturer of the latch and lock units.

Lock Throw: Provide 5/8" minimum throw of latch and deadbolt used on pairs of doors. Comply with UL requirements for throw of bolts and latch bolts on rated fire openings.

Provide 1/2" minimum throw on other latch and deadlock bolts.

Flush Bolt Heads: Minimum of 1/2" diameter rods of brass, bronze or stainless steel, with minimum 12" long rod for doors up to 7'-0" in height. Provide longer rods as necessary for doors exceeding 7'-0" in height.

Exit Device Dogging: Except on fire-rated doors, wherever closers are provided on doors equipped with exit devices, equip the units with keyed dogging device to hold the push bar down and the latch bolt in the open position.

PUSH/PULL UNITS:

Exposed Fasteners: Provide manufacturer's standard exposed fasteners for installation; through-bolted for matched pairs, but not for single units.

Concealed Fasteners: Provide manufacturer's special concealed fastener system for installation; through-bolted for matched pairs, but not for single units.

CLOSERS AND DOOR CONTROL DEVICES:

Size of Units: Except as otherwise specifically indicated, comply with the manufacturer's recommendations for size of door control unit, depending upon size of door, exposure to weather and anticipated frequency of use.

Provide parallel arms for all overhead closers, except as otherwise indicated.

Access-Free Manual Closers: Where manual closers are indicated for doors required to be accessible to the physically handicapped, provide adjustable units complying with ANSI A 117.1 provisions for door opening force and delayed action closing.

Combination Door Closers and Holders: Provide units designed to hold door in open position under normal usage and to release and automatically close door under fire conditions. Incorporate an integral electromagnetic holder mechanism designed for use with UL listed fire detectors, provided with normally closed switching contacts.

Provide grey resilient parts for exposed bumpers.

Automatic Swinging Entrance Systems:

Mode of Operation: Operator shall open door by energizing motor and shall stop door by stalling motor against mechanical stop. Door shall close slowly by means of spring energy, closing force shall be controlled by gear system and motor being used as dynamic brake without power. Complete automatic door cycle 18 to 20 seconds. Manual door operation requires less than 12 lbs. of force applied to door stile. System shall also operate as a manual door in the event of a power failure. Hold open time shall be adjustable. Door operation shall not require any fluids or gases under pressure.

Components: Aluminum operator housing.
Assembled and sealed Gyro-swing power operator. 5 amp, 115-volt. A/C, 1-phase power.
Self-contained electrical controls.
Connecting Hardware

Electro-Magnetic Door Release:

Mode of Operation: Electromagnet holds door open until released by fire alarm system. Complete assembly consists of an armature contact plate with adjustable pivot mounting for installation on the door and heavy-duty electromagnet mounted on the wall behind door.

DOOR TRIM UNITS:

Fasteners: Provide manufacturer's standard exposed fasteners for door trim units (kick plates, edge trim, viewers, knockers, mail drops and similar units); either machine screws or self-tapping screw.

Fabricate edge trim of stainless steel, not more than 1/2" nor less than 1/16" smaller in length than door dimension.

Fabricate protection plates (armor, kick or mop) not more than 1- 1/2" less than door width on stop side and not more than 1/2" less than door width on pull side, x the height indicated.

Metal Plates: Stainless steel, .050" (U.S. 18 ga.).

WEATHERSTRIPPING:

General: Except as otherwise indicated, provide continuous weatherstripping at each edge of every exterior door leaf. Provide type, sizes and profiles shown or scheduled. Provide non-corrosive fasteners as recommended by manufacturer for application indicated.

Replaceable Seal Strips: Provide only those units where resilient or flexible seal strip is easily replaceable and readily available from stocks maintained by manufacturer.

Weatherstripping at Jambs and Heads:

Provide bumper-type resilient insert and metal retainer strips, surface-applied unless shown as mortised or semi-mortised, of following metal, finish and resilient bumper material:

Extruded aluminum with natural anodized finish; 0.062" minimum thickness of main walls and flanges.

Closed-cell extruded, hollow sponge neoprene insert, conforming to MIL R 6130 A Type II, Grade C, with ribbed face of 5/8" contact width; designed as a combination door stop and seal.

Weatherstripping at Door Bottoms:

Provide threshold consisting of contact type resilient insert and metal housing of design and size shown; of following metal, finish, and resilient seal strip:

Extruded aluminum with natural anodized finish; 0.062" minimum thickness of main walls and flanges.

Solid neoprene wiper or sweep seal complying with MIL R 6055, Class II, Grade 40.

THRESHOLDS:

General: Except as otherwise indicated provide standard metal threshold unit of type, size and profile as shown or scheduled.

Exterior Hinged/Pivoted Doors: Provide units not less than 4" wide, formed to accommodate change in floor elevation where indicated, fabricated to accommodate door hardware and to fit door frames, and as follows:

For in-swinging doors provide units with interlocking lip and interior drain channel; include hook on bottom edge of door and drain pan.

For outswinging doors provide units with interlocking lip and with hook on bottom edge of door to act as weather bar.

HOLDERS, STOPS, BUMPERS:

Provide grey rubber exposed resilient parts and metal housing.
Provide stops, bumpers on all doors.

HARDWARE FINISHES:

Provide matching finishes for hardware units at each door or opening, to the greatest extent possible, and except as otherwise indicated. Reduce differences in color and textures as much as commercially possible where the base metal or metal forming process is different for individual units of hardware exposed at the same door or opening. In general, match items to the manufacturer's standard finish for the latch and lock set (or push-pull units if no latch-lock sets) for color and texture.

Provide finishes which match those established by BHMA or, if none established, match the Architect's sample.

Provide quality of finish, including thickness of plating or coating (if any), composition, hardness and other qualities complying with manufacturer's standards, but in no case less than specified for the applicable units of hardware by referenced standards.

Provide protective lacquer coating on all exposed hardware finishes of brass, bronze and aluminum, except as otherwise indicated. The suffix "-NL" is used with standard finish designations to indicate "no lacquer". The designations used in schedules and elsewhere to indicate hardware finishes are the industry-recognized standard commercial finishes, except as otherwise noted.

Rust-Resistant Finish:For iron and steel base metal, required for exterior work and in areas shown as "High Humidity" areas (and also when designed with the suffix -RR), provide 0.2 mil thick copper coating on base metal before applying brass, bronze, nickel or chromium plated finishes.

PART 3 - EXECUTION

INSTALLATION:

Mount hardware units at heights indicated in "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute, except as specifically indicated or required to comply with governing regulations, and except as may be otherwise directed by Architect.

Install each hardware item in compliance with the manufacturer's instructions and recommendations. Wherever cutting and fitting is required to install hardware onto or into surfaces which are later to be painted or finished in another way, coordinate removal, storage and reinstallation or application of surface protections with finishing work specified in the Division-9 sections. Do not install surface-mounted items until finishes have been completed on the substrate.

Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

Drill and countersink units which are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

Set thresholds for exterior doors in full bed of butyl-rubber or polyisobutylene mastic sealant.

ADJUST AND CLEAN:

Adjust and check each operating item of hardware and each door, to ensure proper operation or function of every unit. Replace units which cannot be adjusted to operate freely and smoothly as intended for the application made.

Clean adjacent surfaces soiled by hardware installation.

Final Adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy of a space or area, return to the work during the week prior to acceptance or occupancy, and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

Instruct Owner's Personnel in proper adjustment and maintenance of hardware and hardware finishes, during the final adjustment of hardware.

Continued Maintenance Service: Approximately six months after the acceptance of hardware in each area, the Installer, accompanied by the representative of the latch and lock manufacturer, shall return to the project and re-adjust every item of hardware to restore proper function of doors and hardware. Consult with and instruct Owner's personnel in recommended additions to the maintenance procedures. Replace hardware items which have deteriorated or failed due to faulty design, materials or installation of hardware units. Prepare a written report of current and predictable problems (of substantial nature) in the performance of the hardware.

HARDWARE MANUFACTURE SCHEDULE:

Number Designations: Numbers indicating hardware items are ANSI standard number designations.

Acceptable Manufacturers/Products: Acceptable manufacturers for various types of products are listed below. Except as otherwise indicated, products of equivalent quality, design and function by other listed manufacturers may be used, subject to approval of Architect. An asterisk (*) following a manufacturers name designates manufacturer whose products have priority.

Submit final hardware schedule organized by "hardware sets", to indicate specifically the product to be furnished for each item required on each door.

Furnish templates to each fabricator of doors and frames, as required for preparation to receive hardware.

For fire-rated openings provide hardware tested and listed by UL or FM (NFPA Standard 80). On panic exit devices, provide UL or FM label indicating "Fire Exit Hardware".

Submit samples of hardware items, showing each required finish from each manufacturer (for acceptance of color and texture only).

Finish and base material designations are indicated in accordance with ANSI A156.18 or the nearest traditional U.S. commercial finish.

Where base material and quality of finish are not otherwise indicated, provide at least the commercially recognized quality specified in ANSI A156 series standards applicable to each particular type of hardware.

Hinges and Pivots:

Mfrs. of Butts: Stanley F-179 & FBB179.

Mfrs. of Spring Hinges: Stanley 2060

Provide 1-1/2 pairs full-mortise type hinges on each door, except as otherwise indicated, and except as otherwise needed for proper support and operation of doors. Provide stainless steel pins, except steel pins with steel hinges; non-removable for exterior and public interior exposure, non-rising for non-security exposure, flat button with matching plugs.

Ball-bearing Function: Swaged, inner leaf beveled, square corners.

Locks, Latches and Bolts:

Mfrs. of Lock/Latch Sets, Including Cylinders for Apartment entry Doors: Schlage AL-Series.

Mfrs. of Lock/Latch Sets, Including Cylinders for Common Doors: Schlage AL-Series.

Mfrs. of Exit Devices: Adams-Rite*, Corbin/Russwin, Jackson Exit Device, Monarch, Reed Exit Device/Scovill, Sargent, Von Duprin, or Yale.

Mfrs. of Door Deadlock: Schlage B-Series.

Strikes: Wrought box strikes, with extended lip for latch bolts, except open strike plates may be used in wood frames. Provide dust-proof strikes for foot bolts.

Equip exit devices with dogging devices where door has closer, except when door is fire-rated.

Locks: Equip lock sets with 6-pin tumbler type lock cylinders, in a masterkey system.
Individual key per Apartment
Individual key per Office
1 Key for Utility, Storage, Janitor, Electrical, CATV, Tele. Closets, etc.
1 Key for Trash Rooms
1 Key for Laundry Rooms.
1 Key for Elevator Mach. Rm.
1 Key for Community Room
1 Key for Warming Kitchen
1 Key for Private Dining Room
1 Key for Bathrooms
1 Key for Exterior Doors of Apartment Bldg.
1 Master key for Building

Verify final keying with Owner prior to final cylinder installation.

Construction Locks: Either temporary cylinders for construction period, or temporary construction keying which is automatically voided through use of Owners' keys.

Provide 3 change keys for each lock, plus 5 masterkeys for each master key system. Stamp keys "DO NOT DUPLICATE".

Provide key control system, including metal cabinet with 150% capacity, envelopes, labels, tags, clips, forms, card index and markers; standard system with keys installed and index prepared by key control manufacturer.

Push/Pull Units:

Mfrs. of Push/Pull Units: Rockwood.

Door Control Devices:

Mfrs. of Overhead Parallel Arm Closers: Corbin/Russwin*, Dorma, LCN, Norton, S. Parker, Rixson-Firemark, Russwin, Sargent Yale.

Size and mount units indicated or, if not indicated, to comply with mfrs.'s recommendations for the exposure condition. Reinforce the substrate as recommended.

Where parallel-arm closers are indicated, provide units one size larger than recommended for standard-arm units.

Silencers: Provide silencers in metal door frames, unless not permitted for fire rating, or unless bumper-type weatherstripping is provided; 3 per single-door frame, 4 per double-door frame.

Mfrs. of Holders, Stops, Bumpers: Ives.

Provide stops, bumpers on all doors.

Coordinators: Provide coordinator device for pairs of doors with closers, wherever there is the possibility of leaves closing in wrong sequence.

Electric Strike: As manuf. by Adams Rite Manuf. Co. ,7800 Series or equal w/ transformer, rectifier & current limiter if required and is compatible with latch set.

Automatic Entrance Systems: as manufactured by NABCO ENTRANCES INC.

SECTION 08450 – Automatic Sliding Entrance System

SECTION 08460 – Automatic Swinging Entrance System

Electro-magnetic Door Release: Rixson-Firemark 900 Series, wall mounted, concealed wiring, total projection as required for condition.

Miscellaneous Door Hardware:

Mfrs. of Miscellaneous Hardware: Provide plates, trim, one-way viewers, magnetic latches, and similar units as indicated, produced by Ives.

Fabricate plates and edge trim units 1/16" to 1/2" smaller than actual door dimension. Install with self-tapping screws.

Provide .050" thick (18 ga.) stainless steel with beveled edges and No. 4 polish for kick plates, armor plates, and edge protection stripping (regardless of finish or other hardware).

"Door Defender" wrap-around plates: Taymor Industries.

Weatherstripping:

Mfrs. of Weatherstripping: Combo Alum. Products, K.N. Crowder, Liberty, A.J. May, National Guard, Pemko, Reese*, Zero.

Provide manufacturer's standard weatherstripping of type, size and profile indicated, continuous at head and jamb edges of each exterior door opening. Provide non-corrosive fasteners.

Thresholds:

Mfrs. of Thresholds: Combo Alum. Products, K.N. Crowder, A.J. May, National Guard, Pemko, Reese*, Zero.

Provide extruded aluminum threshold of type, design and profile indicated, complete with replaceable resilient vinyl wiper-type insert. Provide non-corrosive fasteners.

END OF SECTION 08710

SECTION 08800 - GLAZING

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.

1.2 SUMMARY

- A. This Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
 - 1. Window units, not indicated as "preglazed".
 - 2. Entrances and other doors, not indicated as "preglazed".
 - 3. Skylights and smoke vents.
 - 4. Interior Storefronts.
- B. Related Sections include the following:
 - 1. Division 8 Section "Clad Wood Windows and Doors" for glass panels installed in pre manufactured clad wood window and door units.

1.3 DEFINITIONS

- A. Manufacturer: A firm that produces primary glass or fabricated glass as defined in referenced glazing publications.
- B. Interspace: Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.
- C. Deterioration of Coated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in metallic coating.
- D. Deterioration of Laminated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.
- E. Deterioration of Insulating Glass: Failure of the 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.

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 thicknesses indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites for various size openings in nominal thicknesses indicated, 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: Determine design wind loads applicable to Project from basic wind speed indicated in **miles per hour** at **33 feet** above grade, according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 6.4.2, "Analytic Procedure," based on mean roof heights above grade indicated on Drawings.
 - 1) Load Duration: 60 seconds or less.
 - b. Maximum Lateral Deflection: For the following types of glass supported on all four 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.
 - c. Minimum Glass Thickness for Exterior Lites: Not less than 6 mm.
 - d. Thickness of Tinted and Heat-Absorbing Glass: Provide the same thickness for each tint color indicated throughout Project.
 - 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 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 mm thick and a nominal 1/2-inch- wide interspace.
4. Center-of-Glass U-Values: NFRC 100 methodology using LBL-35298 WINDOW 4.1 computer program, expressed as $Btu/sq. ft. \times h \times deg F$.
5. Center-of-Glass Solar Heat Gain Coefficient: NFRC 200 methodology using LBL-35298 WINDOW 4.1 computer program.
6. 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 and of 12-inch- long Samples for sealants. Install sealant Samples between two strips of material representative in color of the adjoining framing system.
- C. 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. Wired glass.
 4. Fire-resistive glazing products.
 5. Insulating glass for each designation indicated.
- D. 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.
- E. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.
- F. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Source Limitations for Clear Glass: Obtain clear float glass from one primary-glass manufacturer.
- C. Source Limitations for Tinted Glass: Obtain tinted, heat-absorbing, and light-reducing float glass from one primary-glass manufacturer for each tint color indicated.

- D. Source Limitations for Coated Glass: Obtain coated glass from one manufacturer for each type of coating and each type and class of float glass indicated.
- E. Source Limitations for Insulating Glass: Obtain insulating-glass units from one manufacturer using the same type of glass and other components for each type of unit indicated.
- F. Source Limitations for Laminated Glass: Obtain laminated-glass units from one manufacturer using the same type of glass lites and interlayers for each type of unit indicated.
- G. Source Limitations for Glazing Accessories: Obtain glazing accessories from one source for each product and installation method indicated.
- H. Glass Product Testing: Obtain glass test results for product test reports in "Submittals" Article from a qualified testing agency based on testing glass products.
 - 1. Glass Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.
- I. 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.
- J. 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 ratings indicated, based on testing according to NFPA 252.
- K. Fire-Rated Window Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 257.
- L. Safety Glass: Category II materials complying with testing requirements in 16 CFR 1201 and ANSI Z97.1.
 - 1. Subject to compliance with requirements, permanently mark safety glass with certification label of Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction.
- M. 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'S "Glazing Manual" and "Laminated Glass Design Guide."
 - 2. SIGMA Publications: SIGMA TM-3000, "Vertical Glazing Guidelines,"

- N. 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 inspecting and testing agency:
1. Insulating Glass Certification Council.
 2. Associated Laboratories, Inc.
 3. National Accreditation and Management Institute.

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. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Manufacturer's Special Warranty on Coated-Glass Products: Written warranty, made out to Owner and signed by coated-glass manufacturer agreeing to furnish replacements for those 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: 10 years from date of Substantial Completion.
- C. Manufacturer's Special Warranty on Laminated Glass: Written warranty, made out to Owner and signed by laminated-glass manufacturer agreeing to furnish replacements for 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.

PART 2 - PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products indicated in schedules at the end of Part 3.

2.2 PRIMARY FLOAT GLASS

- A. Float Glass: ASTM C 1036, Type I (transparent glass, flat), Quality q3 (glazing select); class as indicated in schedules at the end of Part 3.

2.3 HEAT-TREATED FLOAT GLASS

- A. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed, unless otherwise indicated.
- B. Fabrication Process: By vertical (tong-held) or horizontal (roller-hearth) process, at manufacturer's option, except provide horizontal process where indicated as tongless or free of tong marks.

2.4 COATED FLOAT GLASS

- A. General: Provide coated glass complying with requirements indicated in this Article and in schedules at the end of Part 3.
 - 1. Provide Kind HS (heat-strengthened) coated float glass in place of coated 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 "Performance Requirements" Article. Provide Kind FT (fully tempered) where safety glass is indicated.
 - 2. Provide Kind HS (heat-strengthened) coated float glass, except provide Kind FT (fully tempered) products where coated safety glass is indicated.
- B. Pyrolytic-Coated Float Glass: Float glass with solar-reflective metallic-oxide coating applied by pyrolytic deposition process during initial manufacture, complying with requirements specified in schedules at the end of Part 3.

2.5 WIRED GLASS

- A. Wired Glass: ASTM C 1036, Type II (patterned and wired glass, flat), Class 1 (clear), Quality q8 (glazing); 6.4 mm thick; of form and mesh pattern indicated below:
 - 1. Polished Wired Glass: Form 1 (wired, polished both sides), and as follows:
 - a. Mesh m1 (diamond).

2. Patterned Wired Glass: Form 2 (patterned and wired), Mesh m1 (diamond).

B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Polished Wired Glass:
 - a. Central Glass Co., Ltd.
 - b. Nippon Sheet Glass Co., Ltd.
 - c. Pilkington Glass Ltd.

2.6 LAMINATED GLASS

A. Laminated Glass: Comply with ASTM C 1172 for kinds of laminated glass indicated and other requirements specified, including those in the Laminated-Glass Schedule at the end of Part 3.

B. Interlayer: Interlayer material as indicated below, clear or in colors, and of thickness indicated with a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after laminating glass lites and installation.

1. Interlayer Material: Polyvinyl butyral sheets.
2. Interlayer Material: Cured resin.
3. Interlayer Material: Polyvinyl butyral sheets or cured resin.

C. Laminating Process: Fabricate laminated glass to produce glass free of foreign substances and air or glass pockets as follows:

1. Laminate lites with laminated glass manufacturer's standard cast-in-place and cured transparent resin interlayer.

2.7 INSULATING GLASS

A. Insulating-Glass Units: Preassembled units consisting of sealed lites of glass separated by a dehydrated interspace, and complying with ASTM E 774 for Class CBA units and with requirements specified in this Article and in the Insulating-Glass Schedule at the end of Part 3.

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 "Performance Requirements" Article. Provide Kind FT (fully tempered) where safety glass is indicated.

B. Overall Unit Thickness and Thickness of Each Lite: Dimensions indicated in the Insulating-Glass Schedule at the end of Part 3 are nominal and the overall thicknesses of units are measured perpendicularly from outer surfaces of glass lites at unit's edge.

C. In all exterior applications provide Low E Argon filled units.

D. Sealing System: Dual seal, with primary and secondary sealants as follows:

1. Manufacturer's standard sealants.

E. Spacer Specifications: Manufacturer's standard spacer material and construction.

2.8 FIRE-RATED GLAZING PRODUCTS

- A. Monolithic Ceramic Glazing Material: Proprietary product in the form of clear flat sheets of **3/16-inch** nominal thickness weighing **2.5 lb/sq. ft.**, and as follows:
1. Fire-Protection Rating: As indicated for the fire window in which the glazing material is installed, and permanently labeled by a testing and inspecting agency acceptable to authorities having jurisdiction.
 2. Unpolished on both surfaces, transparent.
 3. Product: Subject to compliance with requirements, provide the following product manufactured by Nippon Electric Glass Co., Ltd. and distributed by Technical Glass Products:
 - a. "Standard FireLite" (unpolished on both surfaces).
- B. Laminated Ceramic Glazing Material: Proprietary product in the form of two lites of clear ceramic glazing material laminated together to produce a laminated lite of **5/16-inch** nominal thickness; polished on both surfaces; weighing **4 lb/sq. ft.**; and as follows:
1. Fire-Protection Rating: As indicated for the assembly in which the glazing material is installed, and permanently labeled by a testing and inspecting agency acceptable to authorities having jurisdiction.
 2. Polished on both surfaces, transparent.
 3. Product: Subject to compliance with requirements, provide "FireLite Plus" manufactured by Nippon Electric Glass Co., Ltd. and distributed by Technical Glass Products.

2.9 ELASTOMERIC GLAZING SEALANTS

- A. General: Provide products of type indicated, complying with the following requirements:
1. Compatibility: Select glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, 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 for this characteristic.
- B. Elastomeric Glazing Sealant Standard: Comply with ASTM C 920 and other requirements indicated for each liquid-applied, chemically curing sealant in the Glazing Sealant Schedule at the end of Part 3, including those referencing ASTM C 920 classifications for type, grade, class, and uses.
1. Additional Movement Capability: Where additional movement capability is specified in the Glazing Sealant Schedule, provide products with the capability, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, to withstand the specified percentage change in the joint width existing at time of installation and remain in compliance with other requirements in ASTM C 920 for uses indicated.

- C. Glazing Sealant for Fire-Resistive Glazing Products: Identical to product used in test assembly to obtain fire-protection rating.

2.10 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tape: 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 products indicated below:

- 1. AAMA 804.3 tape, where indicated.

2.11 GLAZING GASKETS

- A. Lock-Strip Gaskets: Neoprene extrusions in size and shape indicated, fabricated into frames with molded corner units and zipper lock strips, complying with ASTM C 542, black.

2.12 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 A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions with a Shore 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. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.
- G. Perimeter Insulation for Fire-Resistive Glazing: Identical to product used in test assembly to obtain fire-resistance rating.

2.13 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS

- A. Fabricate glass and other glazing products 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 standard, to comply with system performance requirements.

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 the 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. Where framing joints are vertical, cover these joints by applying tapes to heads and sills first and then to jambs. Where framing joints are horizontal, cover these 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 GASKET GLAZING (DRY)

- A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with stretch allowance during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Center glass lites in openings on setting blocks and press firmly against soft compression gasket 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. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Install gaskets so they protrude past face of glazing stops.

3.6 LOCK-STRIP GASKET GLAZING

- A. Comply with ASTM C 716 and gasket manufacturer's written instructions. Provide supplementary wet seal and weep system, unless otherwise indicated.

3.7 PROTECTION AND CLEANING

- 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 them 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 build-up of dirt, scum, alkaline deposits, or stains; remove as recommended by glass manufacturer.
- D. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents, and vandalism, during construction period.
- E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

END OF SECTION 08800

SECTION 08814 - MIRRORED GLASS

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.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Silvered mirrored frameless fixed glass for all Bathrooms.
- B. Related Sections include the following:
 - 1. Division 8 Section "Glazing" for glass with reflective coatings used for vision and spandrel lites.
 - 2. Division 10 Section "Toilet and Bath Accessories" for metal-framed mirrors and 'tilt' mirrors.

1.3 DEFINITIONS

- A. Deterioration of Silvered Mirrored Glass: Defects developed from normal use that are attributable to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning silvered mirrored glass contrary to mirrored glass manufacturer's written instructions. Defects include discoloration, black spots, and clouding of the silver film.

1.4 PERFORMANCE REQUIREMENTS

- A. Provide mirrored glass that will not fail under normal usage. Failure includes glass breakage and deterioration attributable to defective manufacture, fabrication, and installation.

1.5 SUBMITTALS

- A. Product Data: For the following:
 - 1. Silvered mirrored glass. Include description of materials and process used to produce mirrored glass that indicates source of glass, glass coating components, edge sealer, and quality-control provisions.
 - 2. Mirror mastic.
 - 3. Mirror hardware.

- B. Shop Drawings: Include elevations, sections, details, and attachments to other Work.
- C. Samples for Verification: For the following products, in sizes indicated below:
 - 1. Mirror trim, 12 inches long.
- D. Product Certificates: Signed by manufacturers of mirrored glass and mirror mastic certifying that products furnished comply with requirements.
- E. Mirror Mastic Glass Coating Compatibility Test Reports: From an organic protective coating manufacturer indicating that mirror mastic has been tested for compatibility and adhesion with organic protective coating applied to silvered mirrored glass. Include organic coating manufacturers' interpretation of test results relative to performance and recommendations for use of mastics with organic protective coating.
- F. 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 mirrored glass installations with a record of successful in-service performance; and who employs glass installers for this Project who are certified under the National Glass Association's Glazier Certification Program as Level 2 (Senior Glaziers) or Level 3 (Master Glaziers).
- B. Installer Qualifications: An experienced installer who has completed mirrored glass installations similar in material, design, and extent to that indicated for Project and whose work has resulted in construction with a record of successful in-service performance.
- C. Source Limitations for Mirrored Glass: Obtain mirrored glass from one source for each type of mirrored glass indicated.
- D. Source Limitations for Glazing Accessories: Obtain glazing accessories from one source for each type of accessory indicated.
- E. Glazing Publications: Comply with published recommendations in GANA's "Glazing Manual," unless more stringent requirements are indicated. Refer to this publication for definitions of glass and glazing terms not otherwise defined in this Section or in referenced standards.
- F. NAAMM's Publication: For silvered mirrored glass, comply with recommendations in NAAMM's "Mirrors, Handle with Extreme Care, Tips for the Professional on the Care and Handling of Mirrors."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to mirrored glass 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 silvered mirrored glass, comply with mirrored glass manufacturer's written instructions for shipping, storing, and handling mirrored glass as needed to prevent deterioration of silvering,

damage to edges, and abrasion of glass surfaces and applied coatings. Store indoors, protected from moisture including condensation.

1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install mirrored glass until ambient temperature and humidity conditions are maintained at levels indicated for final occupancy.

1.9 WARRANTY

- A. General Warranty: Special [warranty] specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Manufacturer's Special Warranty for Silvered Mirrored Glass: Written warranty, made out to Owner and signed by mirrored glass manufacturer agreeing to replace silvered mirrored 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.

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. American Mirror Company, Inc.
 - 2. Carolina Mirror Company.
 - 3. Sunshine Mirror.

2.2 FLOAT GLASS

- A. Annealed Float Glass: ASTM C 1036, Type I (transparent glass, flat), class, quality, and other properties as indicated below:
 - 1. Clear Annealed Float Glass: Class 1 (clear), Quality q2 (mirror).
 - a. Thickness: [5 mm]

2.3 MIRRORED GLASS

- A. Silvered Mirrored Glass: [Annealed] [clear] float glass with successive layers of chemically deposited silver, electrically or chemically deposited copper, and manufacturer's standard organic protective coating applied to second glass surface to produce a coating system complying with FS DD-M-411.

2.4 FABRICATION

- A. Mirrored Glass Sizes: Cut mirrored glass to final sizes and shapes to suit Project conditions.
- B. Cutouts: Fabricate cutouts for notches and holes in mirrored glass without marring visible surfaces. Locate and size cutouts so they fit closely around penetrations in mirrored glass.
- C. Mirrored Glass Edge Treatment: Treat edges as indicated below.
 - 1. Flat polished edge.
 - 2. Seal edges of silvered mirrored glass after edge treatment to prevent chemical or atmospheric penetration of glass coating.

2.5 MISCELLANEOUS MATERIALS

- A. Setting Blocks: Neoprene, 70 to 90 Shore A hardness.
- B. Edge Sealer: Coating compatible with glass coating and approved by mirrored glass manufacturer for use in protecting against silver deterioration at mirrored glass edges.
- C. Mirror Mastic: An adhesive setting compound, produced specifically for setting mirrored glass by spot application, certified by both mirrored glass manufacturer and mastic manufacturer as compatible with glass coating and substrates on which mirrored glass will be installed.
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Gunther Mirror Mastics.
 - b. Palmer Products Corporation.
- D. Extruded-Aluminum Top and Bottom Trim: J-channels formed with a return deep enough to produce a glazing channel to accommodate mirrored glass units of thickness indicated and in lengths required to cover bottom edge of each mirrored glass unit in a single piece.
 - 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. Bottom Trim:
 - 1) CRL Standard "J" Channel; C. R. Laurence Co., Inc.
 - 2) Heavy Gauge Aluminum Shallow Nose "J" Moulding Lower Bar; Sommer & Maca Industries, Inc.

- b. Top Trim:
 - 1) Medium Gauge Aluminum Deep Nose "J" Moulding Upper Bar; Sommer & Maca Industries, Inc.
- E. Fasteners: Fabricated of same basic metal and alloy as fastened metal and matching it in finished color and texture where fasteners are exposed.
- F. Anchors and Inserts: Provide devices as required for mirror hardware installation. Provide toothed or lead-shield expansion-bolt devices for drilled-in-place anchors. Provide galvanized anchors and inserts for applications on inside face of exterior walls and where indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, over which mirrored glass units are to be mounted, with Installer present, for compliance with installation tolerances, substrate preparation, and other conditions affecting performance.
 - 1. Verify compatibility with and suitability of substrates, including compatibility of mirror mastic with existing finishes or primers.
 - 2. Proceed with mirrored glass installation only after unsatisfactory conditions have been corrected and surfaces are dry.

3.2 GLAZING

- A. General: Install mirrored glass units to comply with written instructions of mirrored glass manufacturer and with referenced GANA and NAAMM publications. Mount mirrored glass accurately in place in a manner that avoids distorting reflected images.
- B. Provide space for air circulation between back of mirrored glass units and face of mounting surface.
- C. Mastic Spot Installation System: Install mirrored glass units with mastic as follows:
 - 1. Apply barrier coat to mirrored glass backing where approved in writing by manufacturers of mirrored glass and backing material.
 - 2. Apply mastic in spots to comply with mastic manufacturer's written instructions for coverage and to allow air circulation between back of mirrored glass units and face of mounting surface.
- D. For wall-mounted mirrored glass units, install permanent means of support at bottom and top edges with bottom support designed to withstand mirrored glass weight and top support designed to prevent mirrored glass from coming away from wall along top edges.
 - 1. Attach mirror hardware securely to mounting surfaces with mechanical fasteners installed with anchors or inserts as applicable. Install fasteners so heads do not impose point loads on backs of mirrored glass units.

2. For continuous bottom supports, provide setting blocks **1/8 inch** thick by **4 inches** long at quarter points. For channels or other continuous supports in which water could be trapped, provide, between setting blocks, two slotted weeps not less than **1/4 inch** wide by **3/8 inch** long.

3.3 PROTECTION AND CLEANING

- A. Protect mirrored glass from breakage and contaminating substances resulting from construction operations.
 1. Do not permit edges of silvered mirrored glass to be exposed to standing water.
 2. Maintain environmental conditions that will prevent silvered mirrored glass from being exposed to moisture from condensation or other sources for continuous periods of time.
- B. Wash mirrored glass not more than four days before date scheduled for inspections intended to establish date for Substantial Completion. Wash mirrored glass by methods recommended in NAAMM publication and in writing by mirrored glass manufacturer. Use water and glass cleaners free from substances capable of damaging mirrored glass edges or coatings.

END OF SECTION 08814

SECTION 09220 - PORTLAND CEMENT PLASTER

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.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Interior portland cement plasterwork on metal lath and solid plaster bases.
- B. Related Sections include the following:
 - 1. Division 7 Section "Building Insulation" for thermal insulations and vapor retarders included in portland cement plaster assemblies.
 - 2. Division 7 Section "Joint Sealants" for sealants.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.

1.4 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: For portland cement plaster assemblies with fire-resistance ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.
- B. Mockups: Before plastering, install mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Install mockups for each type of finish indicated.
 - 2. For interior plasterwork, simulate finished lighting conditions for review of mockups.
 - 3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes.

1.6 PROJECT CONDITIONS

- A. Comply with ASTM C 926 requirements.
- B. Interior Plasterwork: Maintain room temperatures at greater than 40 deg F for at least 48 hours before plaster application, and continuously during and after application.
 - 1. Avoid conditions that result in plaster drying out during curing period. Distribute heat evenly; prevent concentrated or uneven heat on plaster.
 - 2. Ventilate building spaces as required to remove water in excess of that required for hydrating plaster in a manner that prevents drafts of air from contacting surfaces during plaster application and until plaster is dry.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
 - 2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 METAL LATH

- A. Expanded-Metal Lath: ASTM C 847 with ASTM A 653/A 653M, G60, hot-dip galvanized zinc coating.
 - 1. Available Manufacturers:
 - a. Alabama Metal Industries Corporation (AMICO).
 - b. California Expanded Metal Products Company (CEMCO).
 - c. Dale/Incor.
 - d. Marino/Ware; Division of Ware Industries, Inc.
 - e. Phillips Manufacturing Co.
 - f. Unimast, Inc.
 - g. Western Metal Lath & Steel Framing Systems.

2. Diamond-Mesh Lath: Flat.
 - a. Weight: 3.4 lb/sq. yd. .
3. Flat Rib Lath: Rib depth of not more than 1/8 inch .
 - a. Weight: 3.4 lb/sq. yd..
4. 3/8-Inch Rib Lath:
 - a. Weight: 3.4 lb/sq. yd.

B. Wire-Fabric Lath:

1. Available Manufacturers:
 - a. Davis Wire Corporation.
 - b. Jaenson Wire Company.
 - c. Keystone Steel & Wire.
 - d. K-Lath; Division of Georgetown Wire.
2. Welded-Wire Lath: ASTM C 933; self-furring.
 - a. Weight: 1.95 lb/sq. yd..
3. Woven-Wire Lath: ASTM C 1032; self-furring, with stiffener wire backing.
 - a. Weight: 1.4 lb/sq. yd. .

2.3 ACCESSORIES

- A. General: Comply with ASTM C 1063 and coordinate depth of trim and accessories with thicknesses and number of plaster coats required.
- B. Zinc and Zinc-Coated (Galvanized) Accessories:
 1. Available Manufacturers:
 - a. Alabama Metal Industries Corporation (AMICO).
 - b. California Expanded Metal Products Company (CEMCO).
 - c. Dale/Incor.
 - d. Dietrich Industries, Inc.
 - e. Phillips Manufacturing Co.
 - f. Unimast, Inc.
 - g. Western Metal Lath & Steel Framing Systems.
 2. Cornerite: Fabricated from metal lath with ASTM A 653/A 653M, G60, hot-dip galvanized zinc coating.
 3. External-Corner Reinforcement: Fabricated from metal lath with ASTM A 653/A 653M, G60, hot-dip galvanized zinc coating.
 4. Cornerbeads: Fabricated from zinc-coated galvanized steel.

- a. Small nose cornerbead with expanded flanges; use unless otherwise indicated.
 - b. Small nose cornerbead with perforated flanges; use on curved corners.
 - c. Small nose cornerbead with expanded flanges reinforced by perforated stiffening rib; use on columns and for finishing masonry corners.
 - d. Bull nose cornerbead, radius **3/4 inch** minimum, with expanded flanges.
5. Casing Beads: Fabricated from zinc-coated galvanized steel; square-edged style; with expanded flanges.
 6. Control Joints: Fabricated from zinc-coated galvanized steel; one-piece-type, folded pair of unperforated screeds in M-shaped configuration; with perforated flanges and removable protective tape on plaster face of control joint.
 7. Expansion Joints: Fabricated from zinc-coated galvanized steel; folded pair of unperforated screeds in M-shaped configuration; with expanded flanges.
 8. Two-Piece Expansion Joints: Fabricated from zinc-coated galvanized steel; formed to produce slip-joint and square-edged reveal that is adjustable from **1/4-to-5/8-inch** wide; with perforated flanges.

2.4 MISCELLANEOUS MATERIALS

- A. Water for Mixing: Potable and free of substances capable of affecting plaster set or of damaging plaster, lath, or accessories.
- B. Fiber for Base Coat: Alkaline-resistant glass or polypropylene fibers, **1/2 inch** long, free of contaminants, manufactured for use in portland cement plaster.
- C. Bonding Compound: ASTM C 932.
- D. Steel Drill Screws: For metal-to-metal fastening, ASTM C 1002 or ASTM C 954, as required by thickness of metal being fastened; with pan head that is suitable for application; in lengths required to achieve penetration through joined materials of not fewer than three exposed threads.
- E. Fasteners for Attaching Metal Lath to Substrates: Complying with ASTM C 1063.
- F. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing), produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
 1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
- G. Isolation Strip at Exterior Walls:
 1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), unperforated.
 2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, **1/8 inch** thick, in width to suit steel stud size.

- H. Acoustical Sealant for Exposed and Concealed Joints: Nonsag, paintable, nonstaining, latex sealant complying with ASTM C 834 that effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

1. Available Products:

- a. OSI Sealants, Inc.; Pro-Series, SC 175 Acoustical Sound Sealant Non-Flammable - Latex.
- b. Pecora Corporation; AC-20 + Silicone.
- c. Tremco Incorporated; Tremflex 834.
- d. United States Gypsum Co.; SHEETROCK Acoustical Sealant.

2.5 PLASTER MATERIALS

- A. Portland Cement: ASTM C 150, Type I.

1. Color for Finish Coats: White or Gray.

- B. Masonry Cement: ASTM C 91, Type N.

1. Color for Finish Coats: White or Gray.

- C. Plastic Cement: ASTM C 1328.

- D. Lime: ASTM C 206, Type S; or ASTM C 207, Type S.

- E. Sand Aggregate: ASTM C 897.

1. Color for Job-Mixed Finish Coats: White.

2.6 PLASTER MIXES

- A. General: Comply with ASTM C 926 for applications indicated.

1. Fiber Content: Add fiber to base-coat mixes after ingredients have mixed at least two minutes. Comply with fiber manufacturer's written instructions for fiber quantities in mixes, but do not exceed **1 lb of fiber/cu. ft.** of cementitious materials. Reduce aggregate quantities accordingly to maintain workability.

- B. Base-Coat Mixes for Use over Metal Lath: Scratch and brown coats for three-coat plasterwork as follows:

1. Portland Cement Mixes:

- a. Scratch Coat: For cementitious material, mix 1 part portland cement and 0 to 3/4 parts lime. Use 2-1/2 to 4 parts aggregate per part of cementitious material (sum of separate volumes of each component material).

- b. Brown Coat: For cementitious material, mix 1 part portland cement and 0 to 3/4 parts lime. Use 3 to 5 parts aggregate per part of cementitious material (sum of separate volumes of each component material).
 2. Masonry Cement Mixes:
 - a. Scratch Coat: 1 part masonry cement and 2-1/2 to 4 parts aggregate.
 - b. Brown Coat: 1 part masonry cement and 3 to 5 parts aggregate.
 3. Portland and Masonry Cement Mixes:
 - a. Scratch Coat: For cementitious material, mix 1 part portland cement and 1 part masonry cement. Use 2-1/2 to 4 parts aggregate per part of cementitious material (sum of separate volumes of each component material).
 - b. Brown Coat: For cementitious material, mix 1 part portland cement and 1 part masonry cement. Use 3 to 5 parts aggregate per part of cementitious material (sum of separate volumes of each component material).
 4. Plastic Cement Mixes:
 - a. Scratch Coat: 1 part plastic cement and 2-1/2 to 4 parts aggregate.
 - b. Brown Coat: 1 part plastic cement and 3 to 5 parts aggregate.
 5. Portland and Plastic Cement Mixes:
 - a. Scratch Coat: For cementitious material, mix 1 part plastic cement and 1 part portland cement. Use 2-1/2 to 4 parts aggregate per part of cementitious material (sum of separate volumes of each component material).
 - b. Brown Coat: For cementitious material, mix 1 part plastic cement and 1 part portland cement. Use 3 to 5 parts aggregate per part of cementitious material (sum of separate volumes of each component material).
- C. Base-Coat Mixes for Use over Concrete Unit Masonry: Single base coats for two-coat plasterwork as follows:
 1. Portland Cement Mix: For cementitious material, mix 1 part portland cement and 3/4 to 1-1/2 parts lime. Use 2-1/2 to 4 parts aggregate per part of cementitious material (sum of separate volumes of each component material).
 2. Masonry Cement Mix: Use 1 part masonry cement and 2-1/2 to 4 parts aggregate.
 3. Plastic Cement Mix: Use 1 part plastic cement and 2-1/2 to 4 parts aggregate.
- D. Job-Mixed Finish-Coat Mixes:
 1. Portland Cement Mix: For cementitious materials, mix 1 part portland cement and 3/4 to 1-1/2 parts lime. Use 1-1/2 to 3 parts aggregate per part of cementitious material (sum of separate volumes of each component material).
 2. Masonry Cement Mix: 1 part masonry cement and 1-1/2 to 3 parts aggregate.
 3. Portland and Masonry Cement Mix: For cementitious materials, mix 1 part portland cement and 1 part masonry cement. Use 1-1/2 to 3 parts aggregate per part of cementitious material (sum of separate volumes of each component material).
 4. Plastic Cement Mix: 1 part plastic cement and 1-1/2 to 3 parts aggregate.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Protect adjacent work from soiling, spattering, moisture deterioration, and other harmful effects caused by plastering.
- B. Prepare solid-plaster bases that are smooth or that do not have the suction capability required to bond with plaster according to ASTM C 926.

3.3 INSTALLATION, GENERAL

- A. Fire-Resistance-Rated Assemblies: Install components according to requirements for design designations from listing organization and publication indicated on Drawings.
- B. Sound Attenuation Blankets: Where required, install blankets before installing lath unless blankets are readily installed after lath has been installed on one side.
- C. Acoustical Sealant: Where required, seal joints between edges of plasterwork and abutting construction with acoustical sealant.

3.4 INSTALLING METAL LATH

- A. Expanded-Metal Lath: Install according to ASTM C 1063.
 - 1. Partition Framing and Vertical Furring: Install flat diamond-mesh or flat rib or welded-wire or woven-wire lath.
 - 2. On Solid Surfaces, Not Otherwise Furred: Install self-furring diamond-mesh or welded-wire or woven-wire lath.

3.5 INSTALLING ACCESSORIES

- A. Install according to ASTM C 1063 and at locations indicated on Drawings.
- B. Reinforcement for External Corners:
 - 1. Install cornerbead at interior locations.

3.6 PLASTER APPLICATION

- A. General: Comply with ASTM C 926.
 - 1. Do not deviate more than plus or minus **1/4 inch in 10 feet** from a true plane in finished plaster surfaces, as measured by a **10-foot** straightedge placed on surface.
 - 2. Grout hollow-metal frames, bases, and similar work occurring in plastered areas, with base-coat plaster material, before lathing where necessary. Except where full grouting is indicated or required for fire-resistance rating, grout at least **6 inches** at each jamb anchor.
 - 3. Finish plaster flush with metal frames and other built-in metal items or accessories that act as a plaster ground, unless otherwise indicated. Where casing bead does not terminate plaster at metal frame, cut base coat free from metal frame before plaster sets and groove finish coat at junctures with metal.
 - 4. Provide plaster surfaces that are ready to receive field-applied finishes indicated.
- B. Bonding Compound: Apply on unit masonry plaster bases.
- C. Plaster Finish Coats: Apply to provide float finish to match existing.
- D. Concealed Interior Plasterwork:
 - 1. Where plaster application will be concealed behind built-in cabinets, similar furnishings, and equipment, apply finish coat.
 - 2. Where plaster application will be concealed above suspended ceilings and in similar locations, finish coat may be omitted.
 - 3. Where plaster application will be used as a base for adhesive application of tile and similar finishes, finish coat may be omitted.

3.7 CUTTING AND PATCHING

- A. Cut, patch, replace, and repair plaster as necessary to accommodate other work and to restore cracks, dents, and imperfections. Repair or replace work to eliminate blisters, buckles, crazing and check cracking, dry outs, efflorescence, sweat outs, and similar defects and where bond to substrate has failed.

3.8 CLEANING AND PROTECTION

- A. Remove temporary protection and enclosure of other work. Promptly remove plaster from doorframes, windows, and other surfaces not indicated to be plastered. Repair floors, walls, and other surfaces stained, marred, or otherwise damaged during plastering.

END OF SECTION 09220

SECTION 09260 - GYPSUM BOARD ASSEMBLIES

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.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Interior gypsum wallboard.
 - 2. Non-load-bearing steel framing.
- B. Related Sections include the following:
 - 1. Division 6 Section "Rough Carpentry" for wood framing.
 - 2. Division 7 Section "Building Insulation" for insulation and vapor retarders installed in gypsum board assemblies.

1.3 DEFINITIONS

- A. Gypsum Board Terminology: Refer to ASTM C 11 for definitions of terms for gypsum board assemblies not defined in this Section or in other referenced standards.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For the following products:
 - 1. Trim Accessories: Full-size sample in 12-inch- long length for each trim accessory indicated.

1.5 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: For gypsum board assemblies with fire-resistance ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

1. Fire-Resistance-Rated Assemblies: Indicated by design designations from UL's "Fire Resistance Directory" and GA-600, "Fire Resistance Design Manual."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.
- B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Stack gypsum panels flat to prevent sagging.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

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. Steel Framing and Furring:
 - a. Consolidated Systems, Inc.
 - b. Dietrich Industries, Inc.
 - c. National Gypsum Company.
 - d. Scafco Corporation.
 - e. Western Metal Lath & Steel Framing Systems.
 2. Gypsum Board and Related Products:
 - a. G-P Gypsum Corp.
 - b. National Gypsum Company.
 - c. United States Gypsum Co.

2.2 STEEL SUSPENDED CEILING AND SOFFIT FRAMING

- A. Components, General: Comply with ASTM C 754 for conditions indicated.
- B. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch- diameter wire, or double strand of 0.0475-inch- diameter wire.
- C. Hanger Attachments to Concrete: As follows:
 - a. Type: Postinstalled, chemical anchor

2. Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E 1190 by a qualified independent testing agency.

D. Hangers: As follows:

1. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.162-inch diameter.
2. Rod Hangers: ASTM A 510, mild carbon steel.
 - a. Diameter: 7/32-inch
 - b. Protective Coating: ASTM A 153/A 153M, hot-dip galvanized
3. Flat Hangers: Commercial-steel sheet, ASTM A 366/A 366M, with corrosion-resistant paint finish].
 - a. Size: 1 by 3/16 inch by length indicated

E. Carrying Channels: Cold-rolled, commercial-steel sheet with a base metal thickness of 0.0538 inch, a minimum 1/2-inch- wide flange, with ASTM A 653/A 653M, G40, hot-dip galvanized

1. Depth: 2-1/2 inches

F. Furring Channels Furring Members: Commercial-steel sheet with ASTM A 653/A 653M, G40, hot-dip galvanized

1. Cold Rolled Channels: 0.0538-inch bare steel thickness, with minimum 1/2-inch- wide flange, 3/4 inch and 1-1/2 inch deep.

G. Grid Suspension System for Interior Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide [one of] the following:
 - a. Armstrong World Industries, Inc.; Furring Systems/Drywall.
 - b. Chicago Metallic Corporation; [Fire Front 630] System.
 - c. USG Interiors, Inc.; Drywall Suspension System.

2.3 STEEL FRAMING

A. Components, General: As follows:

1. Comply with ASTM C 754 for conditions indicated.
2. Steel Sheet Components: Complying with ASTM C 645 requirements for metal and with manufacturer's standard corrosion-resistant zinc coating.

- B. Cold-Rolled Furring Channels: 0.0538-inch bare steel thickness, with minimum 1/2-inch- wide flange.
 - 1. Depth: 3/4 inch.
 - 2. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum bare steel thickness of 0.0312 inch .
 - 3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch-diameter wire, or double strand of 0.0475-inch- diameter wire.
- C. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches , wall attachment flange of 7/8 inch, minimum bare metal thickness of 0.0179 inch, and depth required to fit insulation thickness indicated.
- D. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

2.4 INTERIOR GYPSUM WALLBOARD

- A. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and correspond with support system indicated.
- B. Gypsum Wallboard: ASTM C 36.
 - 1. Regular Type:
 - a. Thickness: 5/8 inch.
 - b. Long Edges: Tapered
 - c. Location: As indicated.
 - 2. Type X:
 - a. Thickness: 5/8 inch.
 - b. Long Edges: Tapered.
 - c. Location: Where required for fire-resistance-rated assembly.

2.5 TILE BACKING PANELS

- A. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and correspond with support system indicated.
- B. Water-Resistant Gypsum Backing Board: ASTM C 630/C 630M.
 - 1. Core: 5/8 inch. (Type X Where required for fire-resistance-rated assembly).

- C. Cementitious Backer Units: ANSI A118.9.
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Custom Building Products; Wonderboard.
 - b. FinPan, Inc.; Util-A-Crete Concrete Backer Board.
 - c. United States Gypsum Co.; DUROCK Cement Board.
 - 3. Thickness: **5/8 inch**.

2.6 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
 - 1. Material: [Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized steel sheet]
 - 2. Shapes:
 - a. Cornerbead: Use at outside corners[, unless otherwise indicated].
 - b. Bullnose Bead: [Use at outside corners]
 - c. LC-Bead (J-Bead): Use at exposed panel edges.
 - d. L-Bead: [Use where indicated]
 - e. U-Bead: [Use where indicated]
 - f. Expansion (Control) Joint: [Use where indicated]
 - g. Curved-Edge Cornerbead: With notched or flexible flanges; use at curved openings.
 - 3. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Fry Reglet Corp.
 - b. Gordon, Inc.
 - c. MM Systems Corporation.
 - d. Pittcon Industries.

2.7 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475.
- B. Joint Tape:
 - 1. Interior Gypsum Wallboard: Paper.
 - 2. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
 - 3. Tile Backing Panels: As recommended by panel manufacturer.

- C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
 - 1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
 - 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
 - 3. Fill Coat: For second coat, use setting-type, sandable topping compound
 - 4. Finish Coat: For third coat, use setting-type, sandable topping compound
 - 5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound
- D. Joint Compound for Tile Backing Panels:
 - 1. Water-Resistant Gypsum Backing Board: Use setting-type taping and setting-type, sandable topping compounds.
 - 2. Glass-Mat, Water-Resistant Backing Panel: As recommended by manufacturer.
 - 3. Cementitious Backer Units: As recommended by manufacturer.

2.8 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
- C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
 - 1. Use screws complying with ASTM C 954 for fastening panels to steel members from **0.033 to 0.112 inch** thick.
 - 2. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
- D. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
 - 1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
- E. Thermal Insulation: As specified in Division 7 Section "Building Insulation."
- F. Polyethylene Vapor Retarder: As specified in Division 7 Section "Building Insulation."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Suspended Ceilings: Coordinate installation of ceiling suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive ceiling hangers at spacing required to support ceilings and that hangers will develop their full strength.
 - 1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

3.3 INSTALLING STEEL FRAMING, GENERAL

- A. Installation Standards: ASTM C 754, and ASTM C 840 requirements that apply to framing installation.
- B. Install supplementary framing, blocking, and bracing at terminations in gypsum board assemblies to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction. Comply with details indicated and with gypsum board manufacturer's written recommendations or, if none available, with United States Gypsum's "Gypsum Construction Handbook."
- C. Isolate steel framing from building structure at locations indicated to prevent transfer of loading imposed by structural movement.
 - 1. Isolate ceiling assemblies where they abut or are penetrated by building structure.
 - 2. Isolate partition framing and wall furring where it abuts structure, except at floor. Install slip-type joints at head of assemblies that avoid axial loading of assembly and laterally support assembly.
 - a. Use deep-leg deflection track where indicated.
- D. Do not bridge building control and expansion joints with steel framing or furring members. Frame both sides of joints independently.

3.4 INSTALLING STEEL SUSPENDED CEILING AND SOFFIT FRAMING

- A. Suspend ceiling hangers from building structure as follows:
1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with the location of hangers required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
 3. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eyescrews, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause them to deteriorate or otherwise fail.
 4. Secure rod, flat, angle hangers to structure, including intermediate framing members, by attaching to inserts, eyescrews, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 5. Do not support ceilings directly from permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
 6. Do not attach hangers to steel deck tabs.
 7. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 8. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- B. Sway-brace suspended steel framing [with hangers used for support]
- C. Wire-tie [or clip] furring channels to supports[, as required to comply with requirements for assemblies indicated].
- D. Install suspended steel framing components in sizes and spacings indicated, but not less than that required by the referenced steel framing and installation standards.
1. Hangers: **48 inches** o.c.
 2. Carrying Channels (Main Runners): **48 inches** o.c.
 3. Furring Channels (Furring Members): **16 inches** o.c.
- E. Grid Suspension System: Attach perimeter wall track or angle where grid suspension system meets vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

3.5 APPLYING AND FINISHING PANELS, GENERAL

- A. Gypsum Board Application and Finishing Standards: ASTM C 840 and GA-216.
- B. Install sound attenuation blankets before installing gypsum panels, unless blankets are readily installed after panels have been installed on one side.

- C. Install ceiling board panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in the central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- D. Install gypsum panels with face side out. Butt panels together for a light contact at edges and ends with not more than **1/16 inch** of open space between panels. Do not force into place.
- E. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- F. Attach gypsum panels to studs so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- G. Attach gypsum panels to framing provided at openings and cutouts.
- H. Form control and expansion joints with space between edges of adjoining gypsum panels.
- I. Cover both faces of stud partition framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than **8 sq. ft.** in area.
 - 2. Fit gypsum panels around ducts, pipes, and conduits.
 - 3. Where partitions intersect open concrete coffers, concrete joists, and other structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by coffers, joists, and other structural members; allow **1/4- to 3/8-inch-**wide joints to install sealant.
- J. STC-Rated Assemblies: Seal construction at perimeters, behind control and expansion joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through gypsum board assemblies, including sealing partitions above acoustical ceilings.
- K. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's written recommendations.
 - 1. Space screws a maximum of **12 inches** o.c. for vertical applications.
- L. Space fasteners in panels that are tile substrates a maximum of **8 inches** o.c.

3.6 PANEL APPLICATION METHODS

- A. Single-Layer Application:
 - 1. On ceilings, apply gypsum panels before wall/partition board application to the greatest extent possible and at right angles to framing, unless otherwise indicated.

2. On partitions/walls, apply gypsum panels [vertically (parallel to framing)] [horizontally (perpendicular to framing)], unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of board.
 - b. At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.
 3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
- B. Multilayer Application on Ceilings: Apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints 1 framing member, **16 inches** minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
- C. Single-Layer Fastening Methods: Apply gypsum panels to supports with steel drill screws.
- D. Multilayer Fastening Methods: Fasten base layers and face layers separately to supports with screws
- E. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate other than studs, joists, furring members, or base layer of gypsum board, comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.

3.7 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints at locations indicated on Drawings

3.8 FINISHING GYPSUM BOARD ASSEMBLIES

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.

- D. Gypsum Board Finish Levels: Finish panels to levels indicated below, according to ASTM C 840, for locations indicated:
1. Level 1: Embed tape at joints in ceiling plenum areas, concealed areas, and where indicated, unless a higher level of finish is required for fire-resistance-rated assemblies
 2. Level 4: Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges at panel surfaces that will be exposed to view, unless otherwise indicated

END OF SECTION 09260

SECTION 09310 - CERAMIC TILE

PART 1 - GENERAL

GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general conditions of the Contract, including General and Supplementary General Conditions and all Division 1 Sections, apply to the work of this section.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.3 SUMMARY

- A. This Section includes the following:

- 1. Ceramic mosaic tile.
- 2. Glazed wall tile.
- 3. Stone thresholds installed as part of tile installations.
- 4. Waterproof membrane for thin-set tile installations.

- B. Related Sections include the following:

- 1. Division 2 Section "Selective Demolition" for removing existing tile.
- 2. Division 3 Section "Cast-in-Place Concrete" for monolithic slab finishes specified for tile substrates.
- 3. Division 7 Section "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.

1.4 DEFINITIONS

- A. Module Size: Actual tile size (minor facial dimension as measured per ASTM C 499) plus joint width indicated.
- B. Facial Dimension: Actual tile size (minor facial dimension as measured per ASTM C 499).

1.5 PERFORMANCE REQUIREMENTS

- A. Static Coefficient of Friction: For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per ASTM C 1028:
 - 1. Level Surfaces: Minimum 0.6.
 - 2. Step Treads: Minimum 0.6.
 - 3. Ramp Surfaces: Minimum 0.8.
- B. Load-Bearing Performance: For ceramic tile installed on walkway surfaces, provide installations rated for the following load-bearing performance level based on testing assemblies according to ASTM C 627 that are representative of those indicated for this Project:
 - 1. Heavy: Passes cycles 1 through 12.

1.6 SUBMITTALS

- A. Product Data: For each type of tile, mortar, grout, and other products specified.
- B. Shop Drawings: For the following:
 - 1. Tile patterns and locations.
 - 2. Widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.
- C. Tile Samples for Initial Selection: Manufacturer's color charts consisting of actual tiles or sections of tiles showing the full range of colors, textures, and patterns available for each type and composition of tile indicated. Include Samples of accessories involving color selection.
- D. Grout Samples for Initial Selection: Manufacturer's color charts consisting of actual sections of grout showing the full range of colors available for each type of grout indicated.
- E. Samples for Verification: Of each item listed below, prepared on Samples of size and construction indicated. Where products involve normal color and texture variations, include Sample sets showing the full range of variations expected.
 - 1. Each type and composition of tile and for each color and texture required, at least **12 inches** square, mounted on braced cementitious backer units, and with grouted joints using product complying with specified requirements and approved for completed work in color or colors selected by Architect.
 - 2. Full-size units of each type of trim and accessory for each color required.
 - 3. Stone thresholds in **6-inch** lengths.
 - 4. Metal edge strips in **6-inch** lengths.
- F. Product Certificates: Signed by manufacturers certifying that the products furnished comply with requirements.
- G. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names of architects and owners, and other information specified.

- H. Tile Test Reports: Indicate and interpret test results for compliance of special-purpose tile with specified requirements.
- I. Setting Material Test Reports: Indicate and interpret test results for compliance of tile-setting and -grouting products with specified requirements.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer who has completed tile installations similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- B. Source Limitations for Tile: Obtain each color, grade, finish, type, composition, and variety of tile from one source with resources to provide products from the same production run for each contiguous area of consistent quality in appearance and physical properties without delaying the Work.
- C. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from a single manufacturer and each aggregate from one source or producer.
- D. Source Limitations for Other Products: Obtain each of the following products specified in this Section from one source and by a single manufacturer for each product:
 - 1. Stone thresholds.
 - 2. Joint sealants.
 - 3. Waterproof membrane
- E. Mockups: Before installing tile, construct mockups for each form of construction and finish required to verify selections made under Sample submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for completed Work.
 - 1. Locate mockups in the location and of the size indicated or, if not indicated, as directed by Architect.
 - 2. Notify Architect 7 days in advance of the dates and times when mockups will be constructed.
 - 3. Demonstrate the proposed range of aesthetic effects and workmanship.
 - 4. Obtain Architect's approval of mockups before proceeding with final unit of Work.
 - 5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 - a. When directed, demolish and remove mockups from Project site.
- F. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings."

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirement of ANSI A137.1 for labeling sealed tile packages.
- B. Prevent damage or contamination to materials by water, freezing, foreign matter, and other causes.
- C. Handle tile with temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.9 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install tile until construction in spaces is completed and ambient temperature and humidity conditions are being maintained to comply with referenced standards and manufacturer's written instructions.

1.10 EXTRA MATERIALS

- A. Deliver extra materials to Owner. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.
 - 1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed, for each type, composition, color, pattern, and size indicated.

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. Tile Products:
 - a. American Marrazzi Tile, Inc.
 - b. American Olean Tile Company.
 - c. Dal-Tile Corporation.
 - d. Florida Tile Industries, Inc.
 - e. Mannington Ceramic Tile.
 - f. Metropolitan Ceramics.
 - g. Monarch Tile, Inc.
 - h. United States Ceramic Tile Company.

2. Tile-Setting and -Grouting Materials:
 - a. American Olean Tile Company.
 - b. Atlas Minerals & Chemicals, Inc.
 - c. Boiardi Products Corporation.
 - d. Bonsal: W.R. Bonsal Company.
 - e. Bostik.
 - f. C-Cure Corporation.
 - g. Custom Building Products.
 - h. Dal-Tile Corporation.
 - i. DAP, Inc.
 - j. Laticrete International, Inc.
 - k. Mapei Corporation.
 - l. Southern Grouts & Mortars, Inc.
 - m. Summitville Tiles, Inc.
 - n. TEC Incorporated.

2.2 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1, "Specifications for Ceramic Tile," for types, compositions, and other characteristics indicated.
 1. Provide tile complying with Standard Grade requirements, unless otherwise indicated.
 2. For facial dimensions of tile, comply with requirements relating to tile sizes specified in Part 1 "Definitions" Article.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI standards referenced in "Setting Materials" and "Grouting Materials" articles.
- C. Colors, Textures, and Patterns: Where manufacturer's standard products are indicated for tile, grout, and other products requiring selection of colors, surface textures, patterns, and other appearance characteristics, provide specific products or materials complying with the following requirements:
 1. Provide Architect's selections from manufacturer's full range of colors, textures, and patterns for products of type indicated.
- D. Factory Blending: For tile exhibiting color variations within the ranges selected during Sample submittals, blend tile in the factory and package so tile units taken from one package show the same range in colors as those taken from other packages and match approved Samples.
- E. Mounting: Where factory-mounted tile is required, provide back- or edge-mounted tile assemblies as standard with manufacturer, unless another mounting method is indicated.
- F. Factory-Applied Temporary Protective Coating: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating them with a continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.

2.3 TILE PRODUCTS

- A. Unglazed Ceramic Mosaic Tile for floors: Provide factory-mounted flat tile complying with the following requirements:
1. Composition: Porcelain with abrasive admixture.
 2. Module Size: **2 by 2 inches.**
 3. Nominal Thickness: **1/4 inch.**
 4. Face: Plain with cushion edges.
- B. Glazed Wall Tile: Flat tile as follows:
1. Module Size: **4-1/4 by 4-1/4 inches.**
 2. Thickness: **5/16 inch.**
 3. Face: Plain with cushion edges.
 4. Finish: Bright, clear glaze.
 5. Mounting: Factory back-mounted.
- C. Glazed Wall Tile Trim Units: Matching characteristics of adjoining flat tile and coordinated with sizes and coursing of adjoining flat tile where applicable. Provide shapes as follows, selected from manufacturer's standard shapes:
1. Base for Thin-Set Mortar Installations: Straight, module size **4-1/4 by 4-1/4 inches .**
 2. Wainscot Cap for Thin-Set Mortar Installations: Surface bullnose, module size **4-1/4 by 4-1/4 inches.**
 3. External Corners for Thin-Set Mortar Installations: Surface bullnose.
 4. Internal Corners: Field-buttet square corners except with coved base and cap angle pieces designed to fit with stretcher shapes.

2.4 STONE THRESHOLDS

- A. General: Provide stone thresholds that are uniform in color and finish, fabricated to sizes and profiles indicated to provide transition between tile surfaces and adjoining finished floor surfaces.
1. Fabricate thresholds to heights indicated, but not more than **1/2 inch (12.7 mm)** above adjoining finished floor surfaces, with transition edges beveled on a slope of no greater than 1:2.
- B. Marble Thresholds: Provide marble thresholds complying with ASTM C 503 requirements for exterior use and with a minimum abrasive-hardness value of 10 per ASTM C 241.
1. Match Architect's sample for color and finish.

2.5 WATERPROOFING FOR THIN-SET TILE INSTALLATIONS

- A. General: Provide products that comply with ANSI A118.10 and the descriptions in this Article.

- B. Chlorinated Polyethylene-Sheet Waterproofing: Manufacturer's standard proprietary product consisting of composite sheets, **60 inches** wide by a nominal thickness of **0.040 inches**, composed of an inner layer of nonplasticized, chlorinated polyethylene sheet faced on both sides with laminated, high-strength, nonwoven polyester material, designed for embedding in latex-portland cement mortar and as the substrate for latex-portland cement mortar setting bed.
- C. Urethane Waterproofing and Tile-Setting Adhesive: Manufacturer's standard proprietary product consisting of 1-part liquid-applied urethane in a consistency suitable for trowel application and intended for use as both waterproofing and tile-setting adhesive in a 2-step process.
- D. Available Products: Subject to compliance with requirements, products which may be incorporated into the Work include, but are not limited to, the following:
- E. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Chlorinated Polyethylene-Sheet Waterproofing:
 - a. Nobleseal TS; Noble Company (The).
 - 2. Urethane Waterproofing and Tile-Setting Adhesive:
 - a. Hydroment Ultra-Set; Bostik.
 - b. Deck-Seal 1000; Southern Grouts & Mortars, Inc.

2.6 SETTING AND GROUTING MATERIALS

- A. Available Manufacturers:
 - 1. Atlas Minerals & Chemicals, Inc.
 - 2. Boiardi Products Corporation.
 - 3. Bonsal, W. R., Company.
 - 4. Bostik.
 - 5. C-Cure.
 - 6. Custom Building Products.
 - 7. DAP, Inc.
 - 8. Jamo Inc.
 - 9. LATICRETE International Inc.
 - 10. MAPEI Corporation.
 - 11. Southern Grouts & Mortars, Inc.
 - 12. Summitville Tiles, Inc.
 - 13. TEC Specialty Products Inc.
- B. Dry-Set Portland Cement Mortar (Thin Set): ANSI A118.1.
 - 1. For wall applications, provide nonsagging mortar that complies with Paragraph C-4.6.1 in addition to the other requirements in ANSI A118.1.

- C. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4, consisting of the following:
 - 1. Prepackaged dry-mortar mix containing dry, redispersible, ethylene vinyl acetate additive to which only water must be added at Project site.
 - 2. Prepackaged dry-mortar mix combined with acrylic resin or styrene-butadiene-rubber liquid-latex additive.
 - a. For wall applications, provide nonsagging mortar that complies with Paragraph F-4.6.1 in addition to the other requirements in ANSI A118.4.
 - D. Chemical-Resistant, Water-Cleanable, Tile-Setting and -Grouting Epoxy: ANSI A118.3.
 - 1. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to **140 deg F** and **212 deg F**, respectively, and certified by manufacturer for intended use.
 - E. Water-Cleanable, Tile-Setting Epoxy Adhesive: ANSI A118.3.
 - F. Organic Adhesive: ANSI A136.1, Type I.
 - G. Sand-Portland Cement Grout: ANSI A108.10, composed of white or gray cement and white or colored aggregate as required to produce color indicated.
 - H. Standard Sanded Cement Grout: ANSI A118.6, color as indicated.
 - I. Standard Unsanded Cement Grout: ANSI A118.6, color as indicated.
 - J. Polymer-Modified Tile Grout: ANSI A118.7, color as indicated.
 - 1. Polymer Type: Acrylic resin or styrene-butadiene rubber in liquid-latex form for addition to prepackaged dry-grout mix.
 - 2. Polymer Type: Either ethylene vinyl acetate, in dry, redispersible form, prepackaged with other dry ingredients, or acrylic resin or styrene-butadiene rubber in liquid-latex form for addition to prepackaged dry-grout mix.
 - a. Unsanded grout mixture for joints **1/8 inch** and narrower.
 - b. Sanded grout mixture for joints **1/8 inch** and wider.
 - K. Grout for PregROUTED Tile Sheets: Same silicone rubber used in factory to pregrout tile sheets.
- 2.7 ELASTOMERIC SEALANTS
- A. General: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer and characteristics indicated that comply with applicable requirements of Division 7 Section "Joint Sealants."
 - B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints, unless otherwise indicated.
 - C. Multipart, Pourable Urethane Sealant for Use T: ASTM C 920; Type M; Grade P; Class 25; Uses T, M, A, and, as applicable to joint substrates indicated, O.

- D. Chemical-Resistant Sealants: For chemical-resistant floors, provide sealants compatible with chemical-resistant mortars and grouts, approved for use indicated by manufacturers of both mortar/grout and sealant and with chemical-resistance properties equivalent to mortar/grout.
- E. Available Products: Subject to compliance with requirements, products which may be incorporated into the Work include, but are not limited to, the following:
- F. Products: Subject to compliance with requirements, provide one of the following:
 - 1. One-Part, Mildew-Resistant Silicone Sealants:
 - a. Dow Corning 786; Dow Corning Corporation.
 - b. Sanitary 1700; GE Silicones.
 - c. Pecora 898 Sanitary Silicone Sealant; Pecora Corp.
 - d. Rhodorsil 6B White; Rhone-Poulenc, Inc.
 - e. Tremsil 600 White; Tremco, Inc.

2.8 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
- B. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

2.9 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.

1. Verify that substrates for setting tile are firm; dry; clean; free from oil, waxy films, and curing compounds; and within flatness tolerances required by referenced ANSI A108 series of tile installation standards for installations indicated.
2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed before installing tile.
3. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust latter in consultation with Architect.

B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove coatings, including curing compounds, and other substances that contain soap, wax, oil, or silicone and are incompatible with tile-setting materials by using a terrazzo or concrete grinder, a drum sander, or a polishing machine equipped with a heavy-duty wire brush.
- B. Provide concrete substrates for tile floors installed with dry-set or latex-portland cement mortars that comply with flatness tolerances specified in referenced ANSI A108 series of tile installation standards for installations indicated.
 1. Use trowelable leveling and patching compounds per tile-setting material manufacturer's written instructions to fill cracks, holes, and depressions.
 2. Remove protrusions, bumps, and ridges by sanding or grinding.
- C. Blending: For tile exhibiting color variations within the ranges selected during Sample submittals, verify that tile has been blended in the factory and packaged so tile units taken from one package show the same range in colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 INSTALLATION, GENERAL

- A. ANSI Tile Installation Standards: Comply with parts of ANSI A108 series of tile installation standards in "Specifications for Installation of Ceramic Tile" that apply to types of setting and grouting materials and to methods indicated in ceramic tile installation schedules.
- B. TCA Installation Guidelines: TCA's "Handbook for Ceramic Tile Installation." Comply with TCA installation methods indicated in ceramic tile installation schedules.
- C. Extend tile work into recesses and under or behind equipment and fixtures to form a complete covering without interruptions, unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- D. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

- E. Jointing Pattern: Lay tile in grid pattern, unless otherwise indicated. Align joints when adjoining tiles on floor, base, walls, and trim are the same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise indicated.
 - 1. For tile mounted in sheets, make joints between tile sheets the same width as joints within tile sheets so joints between sheets are not apparent in finished work.
- F. Expansion Joints: Locate expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
 - 1. Locate joints in tile surfaces directly above joints in concrete substrates.
 - 2. Prepare joints and apply sealants to comply with requirements of Division 7 Section "Joint Sealants."
- G. Grout tile to comply with the requirements of the following tile installation standards:
 - 1. For ceramic tile grouts (sand-portland cement, dry-set, commercial portland cement, and latex-portland cement grouts), comply with ANSI A108.10.
 - 2. For chemical-resistant epoxy grouts, comply with ANSI A108.6.
 - 3. For chemical-resistant furan grouts, comply with ANSI A108.8.

3.4 WATERPROOFING INSTALLATION

- A. Install waterproofing to comply with waterproofing manufacturer's written instructions to produce a waterproof membrane of uniform thickness bonded securely to substrate.
- B. Do not install tile over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

3.5 FLOOR TILE INSTALLATION

- A. General: Install tile to comply with requirements in the Floor Tile Installation Schedule, including those referencing TCA installation methods and ANSI A108 Series of tile installation standards.
 - 1. For installations indicated below, follow procedures in ANSI A108 Series tile installation standards for providing 95 percent mortar coverage.
 - a. Tile floors in wet areas.
 - b. Tile floors in laundries.
- B. Joint Widths: Install tile on floors with the following joint widths:
 - 1. Ceramic Mosaic Tile: **1/16 inch.**
- C. Stone Thresholds: Install stone thresholds at locations indicated; set in same type of setting bed as abutting field tile, unless otherwise indicated.

1. Set thresholds in latex-portland cement mortar for locations where mortar bed would otherwise be exposed above adjacent nontile floor finish.
- D. Metal Edge Strips: Install at locations indicated or where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile.
- E. Grout Sealer: Apply grout sealer to cementitious grout joints according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer that has gotten on tile faces by wiping with soft cloth.

3.6 WALL TILE INSTALLATION

- A. Install types of tile designated for wall installations to comply with requirements in the Wall Tile Installation Schedule, including those referencing TCA installation methods and ANSI setting-bed standards.
- B. Install metal lath and scratch coat for walls to comply with ANSI A108.1A, Section 4.1.
- C. Joint Widths: Install tile on walls with the following joint widths:
 1. Glazed Wall Tile: **1/16 inch**.

3.7 CLEANING AND PROTECTING

- A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
 1. Remove latex-portland cement grout residue from tile as soon as possible.
 2. Unglazed tile may be cleaned with acid solutions only when permitted by tile and grout manufacturer's written instructions, but no sooner than 10 days after installation. Protect metal surfaces, cast iron, and vitreous plumbing fixtures from effects of acid cleaning. Flush surface with clean water before and after cleaning.
 3. Remove temporary protective coating by method recommended by coating manufacturer that is acceptable to brick and grout manufacturer. Trap and remove coating to prevent it from clogging drains.
- B. Finished Tile Work: Leave finished installation clean and free of cracked, chipped, broken, unbonded, and otherwise defective tile work.
- C. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure tile is without damage or deterioration at the time of Substantial Completion.
 1. When recommended by tile manufacturer, apply a protective coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear.
 2. Prohibit foot and wheel traffic from tiled floors for at least 7 days after grouting is completed.
- D. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

SECTION 09320 - CAST IN PLACE TACTILE/DETECTABLE WARNING SURFACE TILE

PART 1 - GENERAL

1. RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Special Conditions and Division 1 Specifications Section, apply to this Section.
- B. Division 2 Section "Portland Cement Concrete Paving"

2. DESCRIPTION

- A. This Section specifies furnishing and installing cast-in-place tactile tile modules where indicated.

3. SUBMITTALS

- A. Product Data: Submit manufacturer's literature describing products, installation procedures and routine maintenance.
- B. Samples for Verification Purposes: Submit two (2) tile samples minimum 6"x8" of the kind proposed for use.
- C. Shop drawings are required for products specified showing fabrication details; composite structural system; plans of tile placement including joints, and material to be used as well as outlining installation materials and procedure.
- D. Material Test Reports: Submit test reports from qualified independent testing laboratory indicating that materials proposed for use are in compliance with requirements and meet the properties indicated. All test reports shall be conducted on a cast-in-place tactile tile system as certified by a qualified independent testing laboratory.
- E. Maintenance Instructions: Submit copies of manufacturer's specified maintenance practices for each type of tactile tile and accessory as required.

4. QUALITY ASSURANCE

- A. Provide cast-in-place tactile tiles and accessories as produced by a single manufacturer.
- B. Installer's Qualifications: Engage an experienced Installer certified in writing by tactile manufacturer as qualified for installation, who has successfully completed tile installations similar in material, design, and extent to that indicated for Project.
- C. Americans with Disabilities Act (ADA): Provide tactile warning surfaces which comply with the detectable warnings on walking surfaces section of the Americans with Disabilities Act (Title 49 CFR TRANSPORTATION, Part 37.9 STANDARDS FOR ACCESSIBLE TRANSPORTATION FACILITIES, Appendix A, Section 4.29.2 DETECTABLE WARNINGS ON WALKING SURFACES.

D. Vitrified Polymer Composite (VPC) cast-in-place tiles shall be an epoxy polymer composition with an ultra violet stabilized coating employing aluminum oxide particles in the truncated domes. The tile shall incorporate an in-line dome pattern of truncated domes 0.2" in height, 0.9" diameter at the base, and 0.4" diameter at top of dome spaced 2.35" nominal as measured on a diagonal and 1.70" nominal as measured side by side. For wheelchair safety the field area shall consist of a non-slip surface with a minimum of 40 - 90° raised points 0.045" high, per square inch; "Armor-Tile" as manufactured by Engineered Plastics Inc., Tel: 800-682-2525, or approved equal.

1. Dimensions: Tiles shall be held within the following dimensions and tolerances:

Nominal Tile Size							
Length and Width:	12"x12"	24"x24"	24"x36"	24"x48"	24"x60"	36"x48"	36"x60"
Depth	1.400" ± 5% max.						
Face Thickness	0.1875 ± 5% max.						
Warpage of Edge	± 0.5% max.						

2. Water Absorption of Tile when tested by ASTM-D 570 not to exceed 0.35%.
3. Slip Resistance of Tile when tested by ASTM-C 1028 the combined wet/dry static co-efficient of friction not to be less than 0.80 on top of domes and field area.
4. Compressive Strength of tile when tested by ASTM-D 695-91 not to be less than 18,000 psi.
5. Tensile Strength of Tile when tested by ASTM-D 638-91 not to be less than 10,000 psi.
6. Flexural Strength of Tile when tested by ASTM - C293-94 not to be less than 24,000 psi.
7. Chemical Stain Resistance of Tile when tested by ASTM-D 543-87 to withstand without discoloration or staining - 1% hydrochloric acid, urine, calcium chloride, stamp pad ink, gum and red aerosol paint.
8. Abrasive Wear of Tile when tested by BYK - Gardner Tester ASTM-D 2486* with reciprocating linear motion of 37± cycles per minute over a 10" travel. The abrasive medium, a 40 grit Norton Metallite sand paper, to be fixed and leveled to a holder. The combined mass of the sled, weight and wood block to be 3.2 lb. Average wear depth shall not exceed 0.030 after 1000 abrasion cycles measured on the top surface of the dome representing the average of three measurement locations per sample.
9. Fire Resistance: When tested to ASTM E84 flame spread be less than 25.
10. Gardner Impact to geometry "GE" of the standard when tested by ASTM-D 5420-93 to have a mean failure energy expressed as a function of specimen thickness of not less than 450 in. lbf/in. A failure is noted if a hairline fracture is visible in the specimen.
11. Accelerated Weathering of Tile when tested by ASTM-G26-95 for 2000 hours shall exhibit the following result - no deterioration, fading or chalking of surface of tile.

- E. Vitrified Polymer Composite (VPC) Cast-In-Place Tiles embedded in concrete shall meet or exceed the following test criteria:
 - 1. Accelerated Aging and Freeze Thaw Test of Tile when tested to ASTM-D 1037 shall show no evidence of cracking, delamination, warpage, checking, blistering, color change, loosening of tiles or other defects.
 - 2. Salt and Spray Performance of Tile and Adhesive System when tested to ASTM-B 117 not to show any deterioration or other defects after 100 hours of exposure.
- F. Embedment flange spacing shall be 3.0" minimum to 3.1" maximum center to center spacing as illustrated on product drawing.

5. DELIVERY, STORAGE AND HANDLING

- A. Tiles shall be suitably packaged or crated to prevent damage in shipment or handling. Finished surfaces shall be protected by sturdy wrappings and tile type shall be identified by part number.
- B. Tiles shall be delivered to location at building site for storage prior to installation.

6. SITE CONDITIONS

- A. Environmental Conditions and Protection: Maintain minimum temperature of 40°F in spaces to receive tactile tiles for at least 48 hours prior to installations, during installation, and for not less than 48 hours after installation. Store tactile tile material in spaces where they will be installed for at least 48 hours before beginning installation. Subsequently, maintain minimum temperature of 40°F in areas where work is completed.
- B. The use of water for work, cleaning or dust control, etc. shall be contained and controlled and shall not be allowed to come into contact with the passengers or public. Provide barricades or screens to protect passengers or public.
- C. Disposal of any liquids or other materials of possible contamination shall be made in accordance with federal state and local laws and ordinances.
- D. Cleaning materials shall have code acceptable low VOC solvent content and low flammability if used on the site.

7. EXTRA STOCK

- A. Deliver extra stock to storage area designated by engineer. Furnish new materials from same manufactured lot as materials installed and enclose in protective packaging with appropriate identification for cast-in-place tactile tiles. Furnish not less than two (2) % of the supplied materials for each type, color and pattern installed.

8. GUARANTEE

- A. Cast-in-place tactile tiles shall be guaranteed in writing for a period of five years from date of final completion. The guarantee includes defective work, breakage, deformation, and loosening of tiles.

Part 2 - PRODUCTS

1. MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
- B. The Vitrified Polymer Composite (VPC) Cast-In-Place Tactile Tile specified is based on Armor-Tile manufactured by Engineered Plastics Inc. (800-682-2525). Existing engineered and field tested products which are subject to compliance with requirements, may be incorporated in the work and shall meet or exceed the specified test criteria and characteristics.
- C. Color: Yellow conforming to Federal Color No. 33538. Color shall be homogeneous throughout the tile.

PART 3 - EXECUTION

1. INSTALLATION

- A. During tile installation procedures, ensure adequate safety guidelines are in place and that they are in accordance with the applicable industry and government standards.
- B. The specifications of the structural adhesives, fasteners, and related materials shall be in strict accordance with the contract documents and the guidelines set by their respective manufacturers.
- C. The physical characteristics of the concrete shall be consistent with the contract specifications while maintaining a slump range of 4 7 to permit solid placement of the Cast-In-Place Tile System. An overly wet mix will cause the Cast-In-Place System to float. Under these conditions, suitable weights such as 2 concrete blocks or sandbags (25 lb) shall be placed on each tile.
- D. Prior to placement of the Cast-In-Place System, the contract drawings shall be reviewed.
- E. The concrete pouring and finishing operations require typical mason's tools, however, a 4' long level with electronic slope readout, 25 lb. weights, and a large non-marring rubber mallet are specific to the installation of the Cast-In-Place System. A vibrating mechanism such as that manufactured by Vibco can be employed, if desired. The vibrating unit should be fixed to a soft base such as wood, at least 1 foot square.
- F. The factory-installed plastic sheeting must remain in place during the entire installation process, to prevent the splashing of concrete onto the finished surface of the tile.
- G. When preparing to set the tile, it is important that NO concrete be removed in the area to accept the tile. It is imperative that the installation technique eliminates any air voids under the tile. Holes around the tile perimeter allow air to escape during the installation process. Concrete will flow through the large holes in each vane on the underside of the tile. This will lock the tile solidly into the cured concrete.

- H. The concrete shall be poured and finished true and smooth to the required dimensions and slope prior to the tile placement. Immediately after finishing concrete, the electronic level should be used to check that the required slope is achieved. The tile shall be placed true and square to the curb edge in accordance with the contract drawings. The Cast-In-Place Tiles shall be tamped (or vibrated) into the fresh concrete to ensure that the field level of the tile is flush to the adjacent concrete surface. The contract drawings indicate that the tile field level (base of truncated dome) is flush to adjacent surfaces to permit proper water drainage and eliminate tripping hazards between adjacent finishes.
- I. Immediately after tile placement, the tile elevation is to be checked to adjacent concrete. The tile elevation and slope should be set consistent with contract drawings to permit water drainage to curb as the design dictates.
- J. While concrete is workable, a 3/8" radius edging tool shall be used to create a finished edge of concrete, then a steel trowel shall be used to float the concrete around the tile's perimeter, flush to the field level of tile.
- K. During and after the tile installation and the concrete curing stage, it is imperative that there is no walking, leaning or external forces placed on the tile to rock the tile, causing a void between the underside of tile and concrete.
- L. Following tile placement, review installation tolerances to contract drawings and adjust tile before the concrete sets. Two suitable weights of 25 lb each shall be placed on each tile as necessary to ensure solid contact of the underside of tile to concrete.
- M. Following the curing of the concrete, protective plastic wrap is to be removed from the tile face by cutting the plastic with a sharp knife, tight to the concrete/tile interface. If concrete bled under the plastic, a soft wire brush will clean the residue without damage to the tile surface.

If desired, individual tiles can be bolted together using 1/4 inch or equivalent hardware. This can help to ensure that adjacent tiles are flush to each other during the installation process. Tape or caulking can be placed on the underside of the bolted butt joint to ensure that concrete does not ooze up between the tiles during installation. Any protective plastic wrap which was peeled back to facilitate bolting or cutting, should be replaced and taped to ensure that the tile surface remains free of concrete during the installation process.

Tiles can be cut to custom sizes, or to make a radius, using a continuous rim diamond blade in a circular saw or mini-grinder. Use of a straightedge to guide the cut is advisable where appropriate.

Any sound-attenuating plates on the underside of the tile, which are dislodged during handling or cutting, should be replaced and secured with construction adhesive. The air gap created between these plates and the bottom of the tile is important, in preserving the detectability properties of the Armor-Tile System.

2. CLEANING AND PROTECTING

- A. Protect tiles against damage during construction period to comply with tactile tile manufacturer's specification.
- B. Protect tiles against damage from rolling loads following installation by covering with plywood or hardwood.
- C. Clean tactile tiles not more than four days prior to date scheduled for inspection intended to establish date of substantial completion in each area of project. Clean tactile tile by method specified by tactile tile manufacturer.

End of Section 09320

SECTION 09511 - ACOUSTICAL PANEL CEILINGS

GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general conditions of the Contract, including General and Supplementary General Conditions and all Division 1 Sections, apply to the work of this section.

PART 2 - GENERAL

2.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

2.2 SUMMARY

- A. This Section includes ceilings consisting of acoustical panels and exposed suspension systems.
- B. Related Sections include the following:
 - 1. Division 9 Section "Acoustical Tile Ceilings" for ceilings consisting of mineral-base acoustical tiles used with concealed suspension systems, stapling, or adhesive bonding.

2.3 SUBMITTALS

- A. Product Data: For each type of product specified.
- B. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items. Show the following:
 - 1. Ceiling suspension system members.
 - 2. Method of attaching suspension system hangers to building structure.
 - 3. Ceiling-mounted items including light fixtures; air outlets and inlets; speakers; sprinklers; and special moldings at walls, column penetrations, and other junctures of acoustical ceilings with adjoining construction.
 - 4. Minimum Drawing Scale: **1/4 inch = 1 foot.**
- C. Samples for Initial Selection: Manufacturer's color charts consisting of actual acoustical panels or sections of acoustical panels, suspension systems, and moldings showing the full range of colors, textures, and patterns available for each type of ceiling assembly indicated.

- D. Samples for Verification: Full-size units of each type of ceiling assembly indicated; in sets for each color, texture, and pattern specified, showing the full range of variations expected in these characteristics.
 - 1. 12-inch square samples of each acoustical panel type, pattern, and color.
 - 2. Set of 12-inch- long samples of exposed suspension system members, including moldings, for each color and system type required.
- E. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- F. Product Test Reports: Indicate compliance of acoustical panel ceilings and components with requirements based on comprehensive testing of current products.
- G. Research/Evaluation Reports: Evidence of acoustical panel ceiling's and components' compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.

2.4 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer who has completed acoustical panel ceilings similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- B. Source Limitations for Ceiling Units: Obtain each acoustical ceiling panel from one source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.
- C. Source Limitations for Suspension System: Obtain each suspension system from one source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.
- D. Fire-Test-Response Characteristics: Provide acoustical panel ceilings that comply with the following requirements:
 - 1. Fire-response tests were performed by UL, ITS/Warnock Hersey, or another independent testing and inspecting agency that is acceptable to authorities having jurisdiction and that performs testing and follow-up services.
 - 2. Surface-burning characteristics of acoustical panels comply with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84.
 - 3. Fire-resistance-rated assemblies, which are indicated by design designations from UL's "Fire Resistance Directory," from ITS/Warnock Hersey's "Directory of Listed Products," or from the listings of another testing and inspecting agency, are identical in materials and construction to those tested per ASTM E 119.
 - 4. Products are identified with appropriate markings of applicable testing and inspecting agency.

2.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels and suspension system components to Project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

2.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

2.7 COORDINATION

- A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

2.8 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.
 - 1. Acoustical Ceiling Units: Full-size units equal to 2.0 percent of amount installed.
 - 2. Suspension System Components: Quantity of each exposed component equal to 2.0 percent of amount installed.

PART 3 - PRODUCTS

3.1 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, those indicated for each designation in the Acoustical Panel Ceiling Schedule at the end of Part 4.

3.2 ACOUSTICAL PANELS, GENERAL

- A. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.
 - 1. Mounting Method for Measuring Noise Reduction Coefficient: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface per ASTM E 795.
- B. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.
 - 1. Where appearance characteristics of acoustical panels are indicated by referencing ASTM E 1264 pattern designations and not manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range of products that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.
- C. Antimicrobial Treatment: Provide acoustical panels treated with manufacturer's standard antimicrobial solution consisting of a synergistic blend of substituted ammonium salts of alkylated phosphoric acids admixed with free alkylated phosphoric acid that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria.
- D. Panel Characteristics: Comply with requirements indicated in the Acoustical Panel Ceiling Schedule at the end of Part 3, including those referencing ASTM E 1264 classifications.

3.3 METAL SUSPENSION SYSTEMS, GENERAL

- A. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable ASTM C 635 requirements.
- B. Metal Suspension System Characteristics: Comply with requirements indicated in the Acoustical Panel Ceiling Schedule at the end of Part 4.
- C. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.
- D. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung, unless otherwise indicated.
 - 1. Cast-in-Place and Postinstalled Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing per ASTM E 488, conducted by a qualified testing and inspecting agency.
 - a. Type: Postinstalled expansion anchors.
 - b. Type: Chemical anchors.

- c. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (0.005 mm) for Class SC service condition (mild).
- E. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
1. Zinc-Coated Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
 2. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635, Table 1, Direct Hung) will be less than yield stress of wire, but provide not less than **0.106-inch-** diameter wire.
- F. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.
- G. Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.
- H. Angle Hangers: Angles with legs not less than **7/8 inch** wide; formed with **0.04-inch-** thick, galvanized steel sheet complying with ASTM A 653/A 653M, **G90** coating designation; with bolted connections and **5/16-inch-**diameter bolts.
- I. Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that fit acoustical panel edge details and suspension systems indicated; formed from sheet metal of same material and finish as that used for exposed flanges of suspension system runners.
1. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.
 2. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.
 3. For narrow-face suspension systems, provide suspension system and manufacturer's standard edge moldings that match width and configuration of exposed runners.
- J. Extruded-Aluminum Edge Moldings and Trim: Where indicated, provide manufacturer's extruded-aluminum edge moldings and trim of profile indicated or referenced by manufacturer's product designations, including splice plates, corner pieces, and attachment and other clips, complying with the following requirements:
1. Baked-Enamel Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Comply with paint manufacturer's written instructions for applying and baking and for minimum dry film thickness.
 - a. Organic Coating: Manufacturer's standard thermosetting coating system with a minimum dry film thickness of **0.8 to 1.2 mils**.
 - b. Color: As selected by Architect from manufacturer's standard colors.
 2. Manufacturer: Subject to compliance with requirements, provide products by one of the following:
 - a. Armstrong World Industries, Inc.
 - b. Chicago Metallic Corporation.
 - c. USG Interiors, Inc.

- K. Hold-Down Clips for Fire-Resistance-Rated Ceilings: For interior ceilings consisting of acoustical panels weighing less than 1 lb/sq. ft. , provide hold-down clips spaced 24 inches o.c. on all cross tees.
- L. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.
- M. Seismic Clips: Manufacturer's standard seismic clips designed and spaced to secure acoustical panels in-place.

PART 4 - EXECUTION

4.1 EXAMINATION

- A. Examine substrates and structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage, and other conditions affecting performance of acoustical panel ceilings.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

4.2 PREPARATION

- A. Coordination: Furnish layouts for cast-in-place anchors, clips, and other ceiling anchors whose installation is specified in other Sections.
 - 1. Furnish cast-in-place anchors and similar devices to other trades for installation well in advance of time needed for coordinating other work.
- B. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

4.3 INSTALLATION

- A. General: Install acoustical panel ceilings to comply with publications referenced below per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
 - 1. Standard for Ceiling Suspension System Installations: Comply with ASTM C 636.
- B. Suspend ceiling hangers from building's structural members and as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 - 2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

3. Splay hangers only where required and, if permitted with fire-resistance-rated ceilings, to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 4. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
 5. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure; that are appropriate for substrate; and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, powder-actuated fasteners, or drilled-in anchors that extend through forms into concrete.
 7. Do not attach hangers to steel deck tabs.
 8. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 9. Space hangers not more than **48 inches** o.c. along each member supported directly from hangers, unless otherwise indicated; and provide hangers not more than **8 inches** from ends of each member.
- C. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
1. Screw attach moldings to substrate at intervals not more than **16 inches** o.c. and not more than **3 inches** from ends, leveling with ceiling suspension system to a tolerance of **1/8 inch in 12 feet**. Miter corners accurately and connect securely.
 2. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- D. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- E. Install acoustical panels with undamaged edges and fitted accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
1. Arrange directionally patterned acoustical panels as follows:
 - a. As indicated on reflected ceiling plans.
 2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and moldings.
 3. For reveal-edged panels on suspension system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
 4. Paint cut panel edges remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
 5. Install hold-down clips in areas indicated, in areas required by authorities having jurisdiction, and for fire-resistance ratings; space as recommended by panel manufacturer's written instructions, unless otherwise indicated or required.

6. Install clean-room gasket system in areas indicated, sealing each panel and fixture as recommended by panel manufacturer's written instructions.
7. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

4.4 CLEANING

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

4.5 ACOUSTICAL PANEL CEILING SCHEDULE

For Bathrooms and Toilet Rooms:

24" x 24" x 5/8" Ceramic faced mineral fiber panels.

Ceramaguard-Armstrong

Or Equal.

Typical Suspended Acoustical Tile Ceilings:

24" x 24" x 5/8" Fissured angled tegular edge panels.

Fissured Tegular-Armstrong

Or Equal

END OF SECTION 09511

SECTION 09775 - FIBERGLASS REINFORCED PLASTIC PANELS

PART 1 GENERAL

1.1 SECTION INCLUDES

Fiberglass reinforced polyester panel system for adhesive mounting.

Moldings, adhesive, and joint sealants.

1.2 REFERENCES

ANSI/AHA A135.5 - Prefinished Hardboard Paneling; 1995.

ASTM D 256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics; 1997.

ASTM D 523 - Standard Test Method for Specular Gloss; 1989 (Reapproved 1994).

ASTM D 570 - Standard Test Method for Water Absorption of Plastics; 1998.

ASTM D 638 - Standard Test Method for Tensile Properties of Plastics; 1997.

ASTM D 696 - Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30 degrees C and 30 degrees C With a Vitreous Silica Dilatometer; 1998.

ASTM D 790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials; 1997.

ASTM D 792 - Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement; 1998.

ASTM D 968 - Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive; 1993.

ASTM D 1037 - Standard Test Methods for Evaluating Properties of Wood-Base Fiber and Particle Panel Materials; 1996a.

ASTM D 1308 - Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes; 1987 (Reapproved 1998).

ASTM D 2197 - Standard Test Methods for Adhesion of Organic Coatings by Scrape Adhesion; 1998.

ASTM D 2486 - Standard Test Method for Scrub Resistance of Wall Paints; 1996.

ASTM D 2583 - Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor; 1995.

ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 1998.

1.3 SUBMITTALS

Submit under provisions of Section 01300.

Product Data: Manufacturer's data sheets on each product to be used, including:

1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.

Selection Samples: For each finish specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

Maintenance Instructions: Deliver to Owner.

1.4 DELIVERY, STORAGE, AND HANDLING

Store products in manufacturer's unopened packaging until ready for installation.

Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.5 PROJECT CONDITIONS

Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering Fiberglass Reinforced Plastic Panels which may be incorporated in the work include, but are not limited to, the following:

Marlite, Dover, OH 44622. Tel: (330) 343-6621.

Fax: (330) 343-7296. Email: info@marlite.com www.marlite.com

Citadel Architectural Products, Indianapolis, IN. 46226 Tel: (800) 446-8828.

Fax: (317) 894-6333. Email: info@citadelap.com www.citadelap.com.

Kemlite Company, Joliet, IL 60434 Tel: (800) 435-0080.

Fax: (815) 467-8666. Email: Kemlite@POP.wva.com www.kemlite.com

NUDO Products Inc., Springfield, IL 62703 Tel: (800) 826-4132.

Fax: (217) 528-8722. www.nudo.com

Sequentia Inc., Strongsville, OH. 44136 Tel: (888) 811-6194.

Fax: (440) 238-0820.

Glasteel Tennessee, Inc., Collierville, TN 38017 Tel: (800) 238-5546.

2.2 APPLICATIONS

Provide plastic paneling in Janitors Closet.

2.3 PANEL SYSTEM

Plastic Panel System: Factory finished panels, trim, sealant, and accessories.

Panels: FRP Panels; fiberglass reinforced polyester, USDA approved for incidental food contact.

1. Thickness: 3/32 inch (2.4 mm), nominal.
2. Width: 48 inches (1220 mm).
3. Height: 120 inches (3048 mm).
4. Surface Burning Characteristics: Flame spread index of 200 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E 84 (Class C/III).
5. Flexural Strength: 17,000 psi (117 MPa), when tested in accordance with ASTM D 790.
6. Flexural Modulus: 600,000 psi (4137 MPa), when tested in accordance with ASTM D 790.
7. Tensile Strength: 8,000 psi (55 MPa), when tested in accordance with ASTM D 638.
8. Tensile Modulus: 9,430 psi (65 MPa), when tested in accordance with ASTM D 638.
9. Barcol Hardness: 40, when tested in accordance with ASTM D 2583.
10. Impact Resistance: 7 ft-lb/in (1225 N/m), when tested in accordance with ASTM D 256, Izod method.
11. Coefficient of Thermal Expansion: 0.0000157 in/in/degree F (0.0000283 mm/mm/degree C), measured in accordance with ASTM D 696.
12. Water Absorption: 0.17 percent, when tested in accordance with ASTM D 570.
13. Specific Gravity: 1.53, when tested in accordance with ASTM D 792.
14. Surface Texture: Gently pebbled, high-gloss.
15. Surface Texture: High-gloss, smooth.
16. Color: As selected by Architect from manufacturer's standard selection.

Panel Trim: Extruded PVC, in manufacturer's standard colors.

1. Outside corners, inside corners, edge trim, and division molding.
2. Base Molding: Design that simplifies installation and helps seal wall panel system, with factory made corners and splices.
3. Borders: 4 inch (100 mm) wide decorative strips made of same material as panels.

Sealant: Silicone Sealant; gunnable silicone rubber.

1. Outside corners, inside corners, edge trim, and division molding.

PART 3 EXECUTION

3.1 EXAMINATION

Do not begin installation until substrates have been properly prepared.

If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

Take panels out of cartons and allow to acclimatize to room conditions for at least 48 hours prior to installation.

Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

Clean surfaces thoroughly prior to installation.

Protect existing surfaces from damage due to installation.

3.3 INSTALLATION

Install in accordance with manufacturer's instructions.

Use the adhesives recommended by the panel manufacturer unless prohibited by local regulations; obtain manufacturer's approval of alternative adhesives.

Install continuous bead of silicone sealant in each joint and trim groove and between trim and adjacent construction, maintaining 1/8 inch (3 mm) expansion space.

Avoid contamination of panel faces with adhesives, solvents, or cleaners; clean as necessary and replace if not possible to repair to original condition.

Protect installed products until completion of project.

Touch-up, repair or replace damaged products after Substantial Completion.

END OF SECTION

SECTION 09900 – PAINTING

GENERAL:

1.1 RELATED DOCUMENTS

- A. Drawings and general conditions of the Contract, including General and Supplementary General Conditions and all Division 1 Sections, apply to the work of this section.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.3 SUMMARY

- A. This Section includes surface preparation and field painting of the following:
 - 1. Exposed exterior items and surfaces, unless otherwise noted.
 - 2. Exposed interior items and surfaces, unless otherwise noted
 - 3. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.
- B. Paint exposed surfaces, except where the paint schedules indicate that a surface or material is not to be painted or is to remain natural. If the paint schedules do not specifically mention an item or a surface, paint the item or surface the same as similar adjacent materials or surfaces whether or not schedules indicate colors. If the schedules do not indicate color or finish, the 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 work, and primed metal surfaces of mechanical and electrical equipment.
- C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.
 - 1. Prefinished items include the following factory-finished components:
 - a. Architectural woodwork and casework.
 - b. Prefabricated toilet and shower enclosures.
 - c. Metal lockers.
 - d. Kitchen Cabinets.
 - e. Finished mechanical and electrical equipment.
 - f. 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.
 - 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 Underwriters Laboratories (UL), Factory Mutual (FM), or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

1.4 SUBMITTALS

- A. Product Data: For each paint system specified. Include block fillers and primers.
 1. Material List: Provide 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: Provide manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material proposed for use.
 3. Certification by the manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs).
Funding sources request the use of no VOC interior paints.
- B. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for each type of finish-coat material indicated.
 1. After color selection, the Architect will furnish color chips for surfaces to be coated.

- C. Samples for Verification: Of 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 Samples on the following substrates for the Architect's review of color and texture only:
 - a. Concrete: Provide two 4-inch- square samples for each color and finish.
 - b. Concrete Masonry: Provide two 4-by-8-inch samples of masonry, with mortar joint in the center, for each finish and color.
 - c. Painted Wood: Provide two 12-inch- square samples of each color and material on hardboard.
 - d. Stained or Natural Wood: Provide two 4-by-8-inch samples of natural- or stained-wood finish on actual wood surfaces.
 - e. Ferrous Metal: Provide two 4-inch- square samples of flat metal and two 8-inch-long samples of solid metal for each color and finish.
- D. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.5 QUALITY ASSURANCE

- A. Applicator Qualifications: Engage an experienced applicator who has completed painting system applications similar in material and extent to that indicated for this Project with a record of successful in-service performance.
- B. Source Limitations: Obtain block fillers, primers, and undercoat materials for each coating system from the same manufacturer as the finish coats.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to the 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 containers used in storage 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. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

1.7 PROJECT CONDITIONS

- A. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 and 90 deg F
- B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45 and 95 deg F
- C. Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85 percent; or at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.
 - 1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

1.8 EXTRA MATERIALS

- A. Furnish extra paint materials from the same production run as the materials applied in the quantities described below. Package paint materials in unopened, factory-sealed containers for storage and identify with labels describing contents. Deliver extra materials to the Owner.
 - 1. Quantity: Furnish the Owner with an additional 5 percent, but not less than 1 gal. or 1 case, as appropriate, of each material and color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the products in the paint schedules.
- B. Manufacturers Names: The following manufacturers are referred to in the paint schedules by use of shortened versions of their names, which are shown in parentheses:
 - 1. Benjamin Moore & Co. (Moore).

2.2 PAINT MATERIALS, GENERAL

- A. Material Compatibility: Provide block fillers, primers, undercoats, and finish-coat materials that are compatible with one another and 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. Paint-material containers not displaying manufacturer's product identification will not be acceptable.
- C. Colors: Match colors indicated by reference to manufacturer's color designations.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with the Applicator present, under which painting will be performed for compliance with paint application requirements.
 - 1. Do not begin to apply paint until unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
 - 2. Start of painting will be construed as the 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 the Architect about anticipated problems 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 the 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 the substrates of substances that could impair the 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 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 masonry block, 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 where moisture content exceeds that permitted in manufacturer's written instructions.
 - c. Clean concrete floors to be painted with a 5 percent solution of muriatic acid or other etching cleaner. Flush the floor with clean water to remove acid, neutralize with ammonia, rinse, allow to dry, and vacuum before painting.
 3. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.
 - a. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.
 - b. Prime, stain, or seal wood to be painted immediately on delivery. Prime edges, ends, faces, undersides, and backsides of wood, including cabinets, counters, cases, and paneling.
 - c. When transparent finish is required, backprime with spar varnish.
 - d. Backprime paneling on interior partitions where masonry, plaster, or other wet wall construction occurs on backside.
 - e. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately on delivery.
 4. Synthetic Moulded Millwork: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.
 - a. Scrape and clean before applying primer. After priming, fill holes, open joints and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.
 - b. Prime immediately all materials exposed to sunlight to be painted. Prime edges, ends and faces.
 5. 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 the Steel Structures Painting Council's (SSPC) recommendations.

- a. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with the same primer as the shop coat.
6. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.
- D. Materials 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 the 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 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, convactor covers, covers for finned-tube radiation, grilles, and similar components are in place. Extend coatings in these areas, as required, to maintain the system integrity and provide desired protection.
 5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before the final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 6. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
 7. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
 8. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
 9. Sand lightly between each succeeding enamel or varnish coat.

- B. **Scheduling Painting:** Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
1. The number of coats and the film thickness required are the same regardless of application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
 2. Omit primer on 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 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, does not deform or feel sticky under moderate thumb pressure, and where application of another coat of paint does not cause the 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 the type of material applied. Use brush of appropriate size for the surface or item being painted.
 2. **Rollers:** Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.
 3. **Spray Equipment:** Use airless spray equipment with orifice size as recommended by the manufacturer for the material and texture required.
- D. **Minimum Coating Thickness:** Apply paint materials no thinner than manufacturer's recommended spreading rate. Provide the total dry film thickness of the entire system as recommended by the manufacturer.
- E. **Block Fillers:** Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.
- F. **Prime Coats:** Before applying finish coats, apply a prime coat of material, as recommended by the 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.
- G. **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.
- H. **Transparent (Clear) Finishes:** Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections.
1. Provide satin finish for final coats.

- I. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.4 CLEANING

- A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from the site.
 1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping. Be careful not to scratch or damage adjacent finished surfaces.

3.5 PROTECTION

- A. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.
- B. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.
 1. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

3.6 EXTERIOR PAINT SCHEDULE

- A. **Concrete Masonry Units:** Provide the following finish systems over exterior concrete masonry units:
 1. Flat Acrylic Finish: 2 finish coats over a block filler.
 - a. Block Filler: High-performance, latex block filler applied at spreading rate recommended by the manufacturer to achieve a total dry mill thickness of not less than **4.0 mils**.
 - 1) Moore: Moorcraft Interior & Exterior Block Filler #173.
 - b. First and Second Coats: Flat, exterior, acrylic-emulsion paint applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than **2.4 mils**.
 - 1) Moore: MoorLife Latex House Paint #105.
- B. **Exterior Synthetic Moulded Millwork:** All Trim, Brackets, Panels, balusters, Post, Piers, Boards and other ornamental items: Provide the following finish systems.
 1. Full-Gloss, Acrylic-Enamel Finish: 2 finish coats over a primer.
 - a. Primer: Exterior, alkyd- or alkali-resistant, acrylic-latex primer, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than **1.5 mils**.
 - 1) Moore: Moore's Latex Exterior Primer #102.

- b. First and Second Coats: Full-gloss, exterior, acrylic-latex enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than **2.4 mils**.
 - 1) Moore: Impervex Enamel #309.
- C. **Ferrous Metal:** Provide the following finish systems over exterior ferrous metal. Primer is not required on shop-primed items.
 - 1. Full-Gloss, Alkyd-Enamel Finish: 2 finish coats over a rust-inhibitive primer.
 - a. Primer: Rust-inhibitive metal primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than **1.3 mils**.
 - 1) Moore: IronClad Retardo Rust-Inhibitive Paint #163.
 - b. First and Second Coats: Full-gloss, exterior, alkyd enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than **3.0 mils**.
 - 1) Moore: Impervo Enamel #133.
- D. **Zinc-Coated Metal:** Provide the following finish systems over exterior zinc-coated (galvanized) metal surfaces:
 - 1. Semigloss, Acrylic-Enamel Finish: 2 finish coats over a galvanized metal primer.
 - a. Primer: Galvanized metal primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than **1.2 mils** .
 - 1) Moore: IronClad Galvanized Metal Latex Primer #155.
 - b. First and Second Coats: Semigloss, exterior, acrylic-latex enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than **2.6 mils** .
 - 1) Moore: MoorGlo Latex House & Trim Paint #096.

3.7 INTERIOR PAINT SCHEDULE

- A. **Concrete and Masonry (Other than Concrete Masonry Units):** Provide the following paint systems over interior concrete and brick masonry surfaces:
 - 1. Semigloss, Acrylic Finish: 2 finish coats over a primer.
 - a. Primer: Alkali-resistant, acrylic-latex, interior primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than **1.0 mil**.
 - 1) Moore: Eco Spec WB Primer #372.
 - b. First and Second Coats: Semigloss, acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than **2.6 mils**.
 - 1) Moore: Eco Spec WB Semi-Gloss #376.

- B. **Gypsum Board Ceilings:** Provide the following finish systems over interior gypsum board surfaces:
1. Low Luster Finish: 2 finish coats over a primer.
 - a. Primer: Latex-based, interior primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than **1.2 mils**.
 - 1) Moore: Eco Spec WB Primer #372.
 - b. First and Second Coats: Flat, acrylic-latex-based, interior paint applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than **2.5 mils**.
 - 1) Moore: Eco Spec WB Flat #373.
- C. **Gypsum Board Walls:** Provide the following finish systems over interior gypsum board surfaces:
1. Eggshell Finish: 2 finish coats over a primer.
 - a. Primer: Latex-based, interior primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than **1.2 mils**.
 - 1) Moore: Eco Spec WB Primer #372.
 - b. First and Second Coats: Eggshell, acrylic-latex-based, interior paint applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than **2.5 mils**.
 - 1) Moore: Eco Spec WB Eggshell #374.
- D. **Woodwork and Hardboard:** Provide the following paint finish systems over new, interior wood surfaces:
1. Semigloss, Acrylic-Enamel Finish: 2 finish coats over a wood undercoater.
 - a. Undercoat: Alkyd- or acrylic-latex-based, interior wood undercoater, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than **1.2 mils**.
 - 1) Moore: Eco Spec WB Primer #372.
 - b. First and Second Coats: Semigloss, acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than **2.6 mils**.
 - 1) Moore: Eco Spec WB Semi-Gloss #376.
- E. **Stained Woodwork:** Provide the following stained finishes over new, interior woodwork:
1. Alkyd-Based, Satin-Varnish Finish: 2 finish coats of an alkyd-based, clear-satin varnish over a sealer coat and an alkyd-based, interior wood stain. Wipe wood filler before applying stain.

- a. Filler Coat: Paste-wood filler applied at spreading rate recommended by the manufacturer.
 - 1) Moore: Benwood Paste Wood Filler #238.
 - b. Stain Coat: Alkyd-based, interior wood stain applied at spreading rate recommended by the manufacturer.
 - 1) Moore: Benwood Penetrating Stain #234.
 - c. Sealer Coat: Clear sanding sealer applied at spreading rate recommended by the manufacturer.
 - 1) Moore: Moore's Interior Wood Finishes Quick-Dry Sanding Sealer #413.
 - d. First and Second Finish Coats: Alkyd-based or polyurethane varnish, as recommended by the manufacturer, applied at spreading rate recommended by the manufacturer.
 - 1) Moore: Benwood Satin Finish Varnish #404.
- F. **Natural-Finish Woodwork:** Provide the following natural finishes over new, interior woodwork:
1. Alkyd-Based, Satin-Varnish Finish: 2 finish coats of an alkyd-based, clear-satin varnish over a sanding sealer. Provide wood filler on open-grain wood before applying first varnish coat.
 - a. Filler Coat: Paste-wood filler applied at spreading rate recommended by the manufacturer.
 - 1) Moore: Benwood Paste Wood Filler #238.
 - b. Sealer Coat: Clear sanding sealer applied at spreading rate recommended by the manufacturer.
 - 1) Moore: Moore's Interior Wood Finishes Quick-Dry Sanding Sealer #413.
 - c. First and Second Finish Coats: Alkyd-based or polyurethane varnish, as recommended by the manufacturer, applied at spreading rate recommended by the manufacturer.
 - 1) Moore: Benwood Satin Finish Varnish #404.
- G. **Ferrous Metal:** Provide the following finish systems over ferrous metal:
1. Full-Gloss, Alkyd-Enamel Finish: 2 finish coats over a rust-inhibitive primer.
 - a. Primer: Quick-drying, rust-inhibitive, alkyd-based or epoxy-metal primer, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than **1.5 mils**.
 - 1) Moore: IronClad Retardo Rust-Inhibitive Paint #163.
 - b. First and Second Coats: Full-gloss, exterior, alkyd enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than **3.0 mils**.
 - 1) Moore: Impervo Enamel #133.

- H. **Zinc-Coated Metal:** Provide the following finish systems over zinc-coated metal:
1. Full-Gloss, Alkyd-Enamel Finish: 2 finish coats over a rust-inhibitive primer.
 - a. Primer: Galvanized metal primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than **1.2 mils** .
 - 1) Moore: IronClad Galvanized Metal Latex Primer #155.
 - b. First and Second Coats: Full-gloss, exterior, alkyd enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than **3.0 mils**.
 - 1) Moore: Impervo Enamel #133.

END OF SECTION 09900

SECTION 10100 - TACK BOARDS

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.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Plastic-impregnated cork tackboards.
- B. Related Sections include the following:
 - 1. Division 12 Section "Display Casework" for built-in trophy and display cases.

1.3 SUBMITTALS

- A. Product Data: For each type of visual display board indicated.
- B. Shop Drawings: For each type of visual display board required.
 - 1. Include dimensioned elevations. Show location of joints between individual panels where unit dimensions exceed maximum panel length.
 - 2. Include sections of typical trim members.
 - 3. Show anchors, grounds, reinforcement, accessories, layout, and installation details.
- C. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors and textures available for the following:
 - 1. Plastic-impregnated Cork Tackboards: Color samples for each type of plastic-impregnated cork tackboard indicated.
 - 2. Aluminum Trim and Accessories: Samples of each finish type and color, on **6-inch**- long sections of extrusions and not less than **4-inch** squares of sheet or plate. Include Sample sets showing the full range of color variations expected.
- D. Product Certificates: Signed by manufacturers of tackboards certifying that plastic-impregnated cork tackboard materials furnished comply with requirements specified for flame-spread ratings.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain markerboard & tackboard units through one source from a single manufacturer.

- B. Product Options: Drawings indicate size, profiles, and dimensional requirements of visual display boards and are based on the products indicated. Other manufacturers' products with equal performance characteristics may be considered. Refer to Division 1 Section "Substitutions."
- C. Fire-Test-Response Characteristics: Provide Plastic-impregnated tackboards with the following surface-burning characteristics as determined by testing assembled materials composed of facings and backings identical to those required in this Section per ASTM E 84 by a testing and inspecting agency acceptable to authorities having jurisdiction. Identify Plastic-impregnated tackboards with appropriate markings of applicable testing and inspecting agency.
 - 1. Flame Spread: 25 or less.
 - 2. Smoke Developed: 10 or less.

1.5 PROJECT CONDITIONS

- A. Field Measurements: Verify field measurements before preparation of Shop Drawings and before fabrication to ensure proper fitting. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Allow for trimming and fitting where taking field measurements before fabrication might delay the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Best-Rite Chalkboard Co.
 - b. Carolina Chalkboard Co.
 - c. Claridge Products and Equipment, Inc.
 - d. Ghent Manufacturing, Inc.
 - e. Greensteel, Inc.
 - f. Lemco, Inc.
 - g. Marsh Chalkboard Company.
 - h. Nelson Adams Company.

2.2 MATERIALS

- A. Plastic-Impregnated Cork Tackboards & Tack Strips: Seamless sheet, 1/4-inch thick, ground natural cork compressed with a resinous binder with washable vinyl finish and integral color throughout, laminated to burlap backing. Provide color and texture as scheduled or as selected from manufacturer's standards.

2.3 ACCESSORIES

- A. Metal Trim and Accessories: Fabricate frames and trim of not less than **0.062-inch** thick, extruded-aluminum alloy, size and shape as indicated, to suit type of installation. Provide straight, single-length units. Keep joints to a minimum. Miter corners to a neat, hairline closure.
 - 1. Field-Applied Trim: Manufacturer's standard snap-on trim with no visible screws or exposed joints.

2.4 FABRICATION

2.5 FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.
- B. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.
- C. Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 607.1.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine wall surfaces, with Installer present, for compliance with requirements and other conditions affecting installation of visual display boards.
 - 1. Surfaces to receive tackboards shall be dry and free of substances that would impair the bond between tackboards and substrate.
 - 2. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Deliver factory-built visual display boards completely assembled in one piece without joints, where possible. If dimensions exceed panel size, provide 2 or more pieces of equal length as acceptable to Architect. When overall dimensions require delivery in separate units, prefit components at the factory, disassemble for delivery, and make final joints at the site. Use splines at joints to maintain surface alignment.
- B. Install units in locations and at mounting heights indicated and according to manufacturer's written instructions. Keep perimeter lines straight, plumb, and level. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation. Secure with concealed screws & wall plugs or expansion bolts to suit wall conditions, maximum spacing of fasteners to be 20" o.c. for tackboards & tack strips. Use spotting adhesive in spots 12" o.c. horizontally & vertically to set units plumb and true.

3.3 ADJUSTING AND CLEANING

- A. Verify that accessories required for each unit have been properly installed and that operating units function properly.
- B. Clean units according to manufacturer's written instructions.

END OF SECTION 10100

SECTION 10200 - LOUVERS AND VENTS

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.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Fixed, extruded-aluminum louvers.
 - 2. Wall vents and caps.

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. Standard Free Area: Free area of a louver 48 inches wide by 48 inches high, identical to that provided.
- C. Drainable-Blade Louver: Louver designed to collect and drain water to exterior at sill by means of gutters in front edges of blades and channels in jambs and mullions.

1.4 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide exterior metal louvers capable of withstanding the effects of loads and stresses from wind and normal thermal movement without evidencing permanent deformation of louver components including blades, frames, and supports; noise or metal fatigue caused by louver blade rattle or flutter; or permanent damage to fasteners and anchors.
 - 1. Wind Load: Uniform pressure (velocity pressure) of 30 lbf/sq. ft., acting inward or outward.
 - 2. 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, and other detrimental effects:
 - a. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

1.5 SUBMITTALS

- A. Product Data: For each type of product specified.
- B. Shop Drawings: For louver units and accessories. Include plans; elevations; sections; and details showing profiles, angles, and spacing of louver blades. Show unit dimensions related to wall openings and construction; free area for each size indicated; profiles of frames at jambs, heads, and sills; and anchorage details and locations.
 - 1. For installed louvers and vents indicated to comply with design loadings, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for units with factory-applied color finishes.
- D. Samples for Verification: Of each type of metal finish required, prepared on Samples of same thickness and material indicated for final Work. Where finishes involve normal color and texture variations, include Sample sets showing the full range of variations expected.
- E. Product Test Reports: Indicate compliance of products with requirements based on comprehensive testing of current products.
- F. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.6 QUALITY ASSURANCE

- A. Source Limitations: Obtain louvers and vents through one source from a single manufacturer where alike in one or more respects regarding type, design, or factory-applied color finish.
- B. Welding Standards: As follows:
 - 1. Comply with AWS D1.2, "Structural Welding Code--Aluminum."
- C. SMACNA Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" recommendations for fabrication, construction details, and installation procedures.
- D. UL and NEMA Compliance: Provide motors and related components for motor-operated adjustable louvers that are listed and labeled by UL and comply with applicable NEMA standards.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify louver openings by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. AiroLite Co.
 2. American Warming and Ventilating, Inc.
 3. Construction Specialties, Inc.
 4. Greenheck Fan Corporation.
 5. Hart & Cooley, Inc.; Reliable Metal Products Division.

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.
 1. Use types and sizes to suit unit installation conditions.
 2. Use Phillips flat-head screws for exposed fasteners, unless otherwise indicated.
- D. Anchors and Inserts: Of type, size, and material required for loading and installation indicated. Use nonferrous metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as needed for corrosion resistance. Use toothed steel or expansion bolt devices for drilled-in-place anchors.
- E. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12 but containing no asbestos fibers, or 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. Maintain equal louver blade spacing to produce uniform appearance.

- D. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining materials' tolerances, and perimeter sealant joints.
 - 1. Frame Type: Channel type, with projected sill, unless otherwise indicated.
- E. Include supports, anchorages, and accessories required for complete assembly.
- F. Provide sill extensions and loose sills made of same material as louvers where indicated or required for drainage to exterior and to prevent water penetrating to interior.
- G. Join frame members to one another 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.
- H. Join frame members to one another and to fixed louver blades with fillet welds, threaded fasteners, or both, as standard with louver manufacturer, 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. Louver Construction: Provide fixed-blade louvers with extruded-aluminum frames and blades.
- B. Horizontal Louvers: Either drainable- or nondrainable-blade type complying with the following:
 - 1. Louver Depth: 4 inches , unless otherwise indicated. 1" when installed in window frames.
 - 2. Performance Requirements: Maximum standard airflow not less than 8500 cfm with not more than 0.20- inch wg static-pressure loss.
 - 3. AMCA Seal: Mark units with AMCA Certified Ratings Seal.
- C. Horizontal, Drainable-Blade Louvers: As follows:
 - 1. Louver Depth: 4 inches , unless otherwise indicated. 1" when installed in window frames.
 - 2. Blade Angle and Spacing: 35 degrees and 3-1/2 inches o.c. for 4-inch- deep louvers.
- D. Continuous, Horizontal, Drainable-Blade Louvers: Fabricated with close-fitting, field-made splice joints in blades designed to permit expansion and contraction without deforming blades or framework and with mullions recessed from front edges of blades so blades have continuous appearance.
 - 1. Blade Thickness: 0.081 inch.
 - 2. Blade Thickness: 0.125 inch.
 - 3. Blade Profile: Drainable blade.
 - 4. Blade Profile: Plain blade with no center baffle.
 - 5. Blade Profile: Blade with center baffle.

2.5 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish louvers after assembly.

2.6 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with system established by the Aluminum Association for designating aluminum finishes.
- B. Baked-Enamel Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Apply baked enamel complying with paint manufacturer's specifications for cleaning, conversion coating, and painting.
 - 1. Color: As selected by Architect from manufacturer's full range of colors.

PART 3 - EXECUTION

3.1 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.

3.2 INSTALLATION

- A. Locate and place louver units 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. 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.
- F. Install concealed gaskets, flashings, joint fillers, and insulation, as louver installation progresses, where weathertight louver joints are required. Comply with Division 7 Section "Joint Sealants" for sealants applied during louver installation.

3.3 ADJUSTING, CLEANING, AND PROTECTING

- A. Test operation of adjustable louvers and adjust as needed to produce fully functioning units that comply with requirements.
- B. Periodically 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.
- C. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.
- D. Protect louvers and vents from damage during construction. Use temporary protective coverings where needed and approved by louver manufacturer. Remove protective covering at the time of Substantial Completion.
- E. 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. Clean and touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

3.4 LOUVER SCHEDULE

- A. See HVAC drawings for locations and sizes

END OF SECTION 10200

SECTION 10265 - IMPACT-RESISTANT WALL PROTECTION

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.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Corner guards.
- B. Related Sections include the following:
 - 1. Division 8 Section "Door Hardware" for metal armor, kick, mop, and push plates.

1.3 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, impact strength, fire-test-response characteristics, dimensions of individual components and profiles, and finishes for each impact-resistant wall-protection unit.
- B. Shop Drawings: For each impact-resistant wall-protection unit showing locations and extent. Include sections, details, and attachments to other work.
 - 1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Samples for Initial Selection: For each type of impact-resistant wall-protection unit indicated.
 - 1. Include similar Samples of accent strips and accessories involving color selection.
- D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.
 - 1. Corner Guards: 12 inches long. Include examples of joinery, corners, end caps, top caps, and field splices.
- E. Material Test Reports: For each impact-resistant plastic material.
- F. Material Certificates: For each impact-resistant plastic material, signed by manufacturer.
- G. Maintenance Data: For each impact-resistant wall-protection unit to include in maintenance manuals.

1. Include recommended methods and frequency of maintenance for maintaining optimum condition of plastic covers under anticipated traffic and use conditions. Include precautions against using cleaning materials and methods that may be detrimental to plastic finishes and performance.

H. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Testing Agency Qualifications: An independent agency qualified according to ASTM E 329 for testing indicated, as documented according to ASTM E 548.
- C. Source Limitations: Obtain impact-resistant wall-protection units through one source from a single manufacturer.
- D. Product Options: Drawings indicate size, profiles, and dimensional requirements of impact-resistant wall-protection units and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."
 1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.
- E. Fire-Test-Response Characteristics: Provide impact-resistant, plastic wall-protection units with surface-burning characteristics as determined by testing identical products per ASTM E 84, NFPA 255, or UL 723 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
- F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store impact-resistant wall-protection units in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.
 1. Maintain room temperature within storage area at not less than 70 deg F during the period plastic materials are stored.
 2. Keep plastic sheet material out of direct sunlight.
 3. Store plastic wall-protection components for a minimum of 72 hours, or until plastic material attains a minimum room temperature of 70 deg F.
 - a. Store corner-guard covers in a vertical position.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install impact-resistant wall-protection units until building is enclosed and weatherproof, wet work is complete and dry, and HVAC system is operating and maintaining temperature at 70 deg F for not less than 72 hours before beginning installation and for the remainder of the construction period.
- B. Field Measurements: Verify actual locations of walls, columns, and other construction contiguous with impact-resistant wall-protection units by field measurements before fabrication and indicate measurements on Shop Drawings.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of impact-resistant wall-protection units that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures.
 - b. Deterioration of plastic and other materials beyond normal use.
 - 2. Warranty Period: Five years from date of Substantial Completion.

1.8 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Corner-Guard Covers: Full-size plastic covers of maximum length equal to 2 percent of each type, color, and texture of units installed, but no fewer than ten, 4-foot-long units.
- B. Include mounting and accessory components. Replacement materials shall be from same production run as installed units.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 MATERIALS

- A. Polycarbonate Plastic Sheet: ASTM D 6098, S-PC01, Class 1 or 2, abrasion resistant; with a minimum impact-resistance rating of **15 ft-lbf/in. (800 J/m)** of notch when tested according to ASTM D 256, Test Method A.
- B. Aluminum Extrusions: Alloy and temper recommended by manufacturer for type of use and
- C. Fasteners: Aluminum, nonmagnetic stainless-steel, or other noncorrosive metal screws, bolts, and other fasteners compatible with items being fastened. Use security-type fasteners where exposed to view.
- D. Adhesive: Type recommended by manufacturer for use with material being adhered to substrate indicated.

2.3 CORNER GUARDS

- A. Surface-Mounted, Transparent-Plastic Corner Guards: Fabricated from clear polycarbonate plastic sheet; with formed edges; fabricated with 90- or 135-degree turn to match wall condition.
 - 1. Available Manufacturers:
 - a. American Floor Products Co., Inc.
 - b. ARDEN Architectural Specialties, Inc.
 - c. Balco, Inc.
 - d. Construction Specialties, Inc.
 - e. IPC Door and Wall Protection Systems; Division of InPro Corporation.
 - f. Johnsonite
 - g. Pawling Corporation.
 - h. Tepromark International, Inc.
 - 2. Wing Size: Nominal **2-1/2 by 2-1/2 inches** .
 - 3. Thickness: Minimum **1/8 inch**.
 - 4. Mounting: Countersunk screws through factory-drilled mounting holes.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances, fire rating, and other conditions affecting performance of work.
 - 1. Examine walls to which impact-resistant wall protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.
 - 2. For impact-resistant wall-protection units attached with adhesive or foam tape, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Complete finishing operations, including painting, before installing impact-resistant wall-protection system components.
- B. Before installation, clean substrate to remove dust, debris, and loose particles.

3.3 INSTALLATION

- A. General: Install impact-resistant wall-protection units level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.
 1. Install impact-resistant wall-protection units in locations and at mounting heights indicated on Drawings or, if not indicated, at heights indicated below:
 - a. Corner Guards: From top of base to 48 inches above finished floor.

3.4 CLEANING

- A. Immediately after completion of installation, clean plastic covers and accessories using a standard, ammonia-based, household cleaning agent.
- B. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

END OF SECTION 10265

SECTION 10425 - SIGNS

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.

1.2 SUMMARY

- A. This Section includes the following types of signs:

B. SIGN SCHEDULE:

1. ADA Interior Signage:

- a. Raised, and embossed, two color, 'Plastic Laminate' signage in compliance with ADA & AAB requirements, as detailed on the drawings, for room identification.

2. ADA Compliant Signs:

- a. Four (4) 'handicap accessible' HP. Aluminum 'painted' signs
Height: 5'-0" to center of signs above finish grade.
Note: Use min. 2 1/2" sq. H.D. Aluminum tubing poles set 24" into 12" 'sonotube' concrete foundation 36" deep.
- b. Two (2) Aluminum 'painted' "Accessible Entrance" signs.
Wall Mounted. Height to be determined in field.

3. Pole Mounted Signs:

- a. Four (4) Aluminum 'painted' "No Parking Fire Lane" signs
Height: Per DPW Requirements.
Note: Use min. 2 1/2" sq. H.D. Aluminum tubing poles set 24" into 12" 'sonotube' concrete foundation 36" deep.
- b. Two (2) Aluminum 'painted' "One Way" signs
Height: Per DPW Requirements.
Note: Use min. 2 1/2" sq. H.D. Aluminum tubing poles set 24" into 12" 'sonotube' concrete foundation 36" deep.
- c. Two (2) Aluminum 'painted' "Do Not Enter" signs
Height: Per DPW Requirements.
Note: Use min. 2 1/2" sq. H.D. Aluminum tubing poles set 24" into 12" 'sonotube' concrete foundation 36" deep.

- d. One (1) Aluminum 'painted' "Stop" sign
Height: Per DPW Requirements.
Note: Use min. 2 1/2" sq. H.D. Aluminum tubing poles set 24" into 12" 'sonotube'
concrete foundation 36" deep.

1.3 SUBMITTALS

- A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product data for each type of sign specified, including details of construction relative to materials, dimensions of individual components, profiles, and finishes.
- C. Shop drawings showing fabrication and erection of signs. Include plans, elevations, and large-scale sections of typical members and other components. Show anchors, grounds, layout, reinforcement, accessories, and installation details.
 1. Provide message list for each sign required, including large-scale details of wording and lettering layout.
 2. For signs supported by or anchored to permanent construction, provide setting drawings, templates, and directions for installation of anchor bolts and other anchors to be installed as a unit of Work in other Sections.
 3. Templates: Furnish full-size spacing templates for individually mounted dimensional letters and numbers.
 4. Furnish full-size rubbings for metal plaques.
- D. Samples: Provide the following samples of each sign component for initial selection of color, pattern and surface texture as required and for verification of compliance with requirements indicated.
 1. Samples for initial selection of color, pattern, and texture:
 - a. Cast Acrylic Sheet and Plastic Laminate: Manufacturer's color charts consisting of actual sections of material including the full range of colors available for each material required.
 - b. Aluminum: Samples of each finish type and color, on 6-inch-long sections of extrusions and not less than 4-inch squares of sheet or plate, showing the full range of colors available.
 2. Samples for verification of color, pattern, and texture selected and compliance with requirements indicated:
 - a. Cast Acrylic Sheet and Plastic Laminate: Provide a sample panel not less than 8-1/2 inches by 11 inches for each material, color, texture, and pattern required. On each panel include a representative sample of the graphic image process required, showing graphic style, and colors and finishes of letters, numbers, and other graphic devices.

- b. Aluminum: Samples of each finish type and color, on 6-inch-long sections of extrusions and not less than 4-inch squares of sheet or plate. Where finishes involve normal color and texture variations, include sample sets showing the full range of variations expected.
- c. Dimensional Letters: Provide full-size representative samples of each dimensional letter type required, showing letter style, color, and material finish and method of attachment.

1.4 QUALITY ASSURANCE

- A. Sign Fabricator Qualifications: Firm experienced in producing signs similar to those indicated for this Project, with a record of successful in-service performance, and sufficient production capacity to produce sign units required without causing delay in the Work.
- B. Single-Source Responsibility: For each separate sign type required, obtain signs from one source of a single manufacturer.
- C. Design Concept: The Drawings indicate sizes, profiles, and dimensional requirements of signs and are based on the specific types and models indicated. Sign units by other manufacturers may be considered provided deviations in dimensions and profiles do not change the design concept as judged by the Architect. The burden of proof of equality is on the proposer.

1.5 PROJECT CONDITIONS

- A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication to ensure proper fitting. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Manufacturers of Panel Signs:
 - a. ASI Sign Systems, Inc.
 - b. Best Manufacturing Company.
 - c. Charleston Industries, Inc.
 - d. DGS Corp.
 - e. Diskey Sign Corp.
 - f. Environmental Graphic Systems, Inc.
 - g. Poblocki & Sons, Inc.
 - h. Spanjer Brothers, Inc.
 - i. Vomar Products, Inc.

2. Manufacturers of Dimensional Letters:
 - a. Andco Industries Corp.
 - b. A.R.K. Ramos Manufacturing Company, Inc.
 - c. ASI Sign Systems, Inc.
 - d. Gemini, Inc.
 - e. Spanjer Brothers, Inc.
 - f. Vomar Products, Inc.

2.2 MATERIALS

- A. Cast Acrylic Sheet: Provide cast (not extruded or continuous cast) methyl methacrylate monomer plastic sheet, in sizes and thicknesses indicated, with a minimum flexural strength of 16,000 psi when tested according to ASTM D 790, with a minimum allowable continuous service temperature of 176 deg F (80 deg C), and of the following general types:
 1. Transparent Sheet: Where sheet material is indicated as "clear," provide colorless sheet in matte finish, with light transmittance of 92 percent, when tested according to the requirements of ASTM D 1003.
 2. White Translucent Sheet: Where sheet material is indicated as "white," provide white translucent sheet of density required to produce uniform brightness and minimum halation effects.
 3. Opaque Sheet: Where sheet material is indicated as "opaque," provide colored opaque acrylic sheet in colors and finishes indicated.
 4. Opaque Sheet: Where sheet material is indicated as "opaque," provide colored opaque acrylic sheet in colors and finishes as selected from the manufacturer's standards.
- B. Plastic Laminate: Provide high-pressure plastic laminate engraving stock with face and core plies in contrasting colors, in finishes and color combinations indicated or, if not indicated, as selected from the manufacturer's standards.
- C. Aluminum Sheet: Provide aluminum sheet of alloy and temper recommended by the sign manufacturer for the type of use and finish indicated, and with not less than the strength and durability properties specified in ASTM B 209 for 5005-H15.
- D. Aluminum Extrusions: Provide aluminum extrusions of alloy and temper recommended by the sign manufacturer for the type of use and finish indicated, and with not less than the strength and durability properties specified in ASTM B 221 for 6063-T5.
- E. Aluminum Castings: Provide aluminum castings of alloy and temper recommended by the sign manufacturer for the casting process used and for the use and finish indicated.
- F. Vinyl Film: Provide opaque nonreflective vinyl film, 0.0035-inch minimum thickness, with pressure-sensitive adhesive backing, suitable for exterior as well as interior applications.
- G. Fasteners: Use concealed fasteners fabricated from metals that are not corrosive to the sign material and mounting surface.

- H. Anchors and Inserts: Use nonferrous metal or hot-dipped galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.
- I. Colored Coatings for Acrylic Plastic Sheet: Use colored coatings, including inks and paints for copy and background colors, that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and are nonfading for the application intended.

2.3 PANEL SIGNS

- A. Panel Signs: Comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction.
 - 1. Produce smooth, even, level sign panel surfaces, constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch measured diagonally.
- B. Framed Panel Signs: Fabricate frames to profile indicated; comply with the following requirements for materials and corner conditions:
 - 1. Material: Aluminum, extruded
 - 2. Corner Condition: Square corners.
- C. Laminated Sign Panels: Permanently laminate face panels to backing sheets of material and thickness indicated using the manufacturer's standard process.
- D. Brackets: Fabricate brackets and fittings for bracket-mounted signs from extruded aluminum to suit sign panel construction and mounting conditions indicated. Factory-paint brackets in a color matching the background color of the sign panel.
- E. Graphic Content and Style: Provide sign copy that complies with the requirements indicated for size, style, spacing, content, position, material, finishes, and colors of letters, numbers, and other graphic devices.
- F. Engraved Copy: Machine-engage letters, numbers, symbols, and other graphic devices into sign panel on the face indicated to produce precisely formed copy, incised to uniform depth. Use high-speed cutters mechanically linked to master templates in a pantographic system or equivalent process capable of producing characters of the style indicated with sharply formed edges.
 - 1. Engraved Plastic Laminate: Engrave through the exposed face ply of the plastic laminate sheet to expose the contrasting core ply.
 - a. Engrave the copy to produce a minimum indentation depth of 1/32 inch and a minimum stroke width of 1/4 inch.
 - 2. Use reverse silk-screen process to print copy; overspray the copy with an opaque background color coating.

3. Use Dupont Chromalin heat- and pressure-laminated photopolymer film system to form copy and background color.
 - a. The manufacturer has the option of selecting either process indicated above.
- G. Raised Copy: Machine-cut copy characters from matte-finished opaque acrylic sheet and chemically weld onto the acrylic sheet forming sign panel face. Produce precisely formed characters with square cut edges free from burrs and cut marks.
 1. Panel Material: Matte-finished opaque acrylic sheet.
 2. Panel Material: Matte-finished clear acrylic with opaque color coating subsurface applied.
- H. Applied Copy: Die-cut characters from vinyl film with pressure-sensitive adhesive backing. Apply copy to the exposed face of the sign panel.
 1. Panel Material: Matte-finished opaque acrylic sheet.
 2. Panel Material: Matte-finished clear acrylic sheet with opaque color coating subsurface applied.

2.4 FINISHES

- A. Colors and Surface Textures: For exposed sign material that requires selection of materials with integral or applied colors, surface textures or other characteristics related to appearance, provide color matches indicated, or if not indicated, as selected by the Architect from the manufacturer's standards.
- B. Metal Finishes: Comply with NAAMM "Metal Finishes Manual" for finish designations and applications recommendations.
- C. Aluminum Finishes: Finish designations prefixed by "AA" conform to the system established by the Aluminum Association for designating aluminum finishes.
 1. Baked-Enamel Finish: AA-M4xC12C42R1x (Mechanical Finish: Manufacturer's standard, other nondirectional textured; Chemical Finish: Chemical conversion coating, acid chromate-fluoride-phosphate pretreatment; Organic Coating: as specified below). Apply baked enamel in compliance with paint manufacturer's specifications for cleaning, conversion coating, and painting.
 - 1) Color: As selected by the Architect from the manufacturer's standard colors.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Locate sign units and accessories where indicated, using mounting methods of the type described and in compliance with the manufacturer's instructions.
 1. Install signs level, plumb, and at the height indicated, with sign surfaces free from distortion or other defects in appearance.

- B. Wall-Mounted Panel Signs: Attach panel signs to wall surfaces using the methods indicated below:
 - 1. Silicone-Adhesive Mounting: Use liquid silicone adhesive recommended by the sign manufacturer to attach sign units to irregular, porous, or vinyl-covered surfaces. Use double-sided vinyl tape where recommended by the sign manufacturer to hold the sign in place until the adhesive has fully cured.
 - 2. Shim Plate Mounting: Provide 1/8-inch-thick concealed aluminum shim plates with predrilled and countersunk holes, at locations indicated, and where other mounting methods are not practicable. Attach the plate with fasteners and anchors suitable for secure attachment to the substrate. Attach panel sign units to the plate using the method specified above.
- C. Bracket-Mounted Units: Provide the manufacturer's standard brackets, fittings, and hardware as appropriate for mounting signs that project at right angles from walls and ceilings. Attach brackets and fittings securely to walls or ceilings with concealed fasteners and anchoring devices to comply with manufacturer's directions.
- D. Dimensional Letters and Numbers: Mount letters and numbers using standard fastening methods recommended by the manufacturer for letter form, type of mounting, wall construction, and condition of exposure indicated. Provide heavy paper template to establish letter spacing and to locate holes for fasteners.
 - 1. Projected Mounting: Mount letters at the projection distance from the wall surface indicated.

3.2 CLEANING AND PROTECTION

- A. After installation, clean soiled sign surfaces according to the manufacturer's instructions. Protect units from damage until acceptance by the Owner.

END OF SECTION 10425

SECTION 10520 - FIRE-PROTECTION SPECIALTIES

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.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Portable fire extinguishers.
 - 2. Fire-protection cabinets for the following:
 - a. Portable fire extinguishers.
- B. Related Sections include the following:
 - 1. Division 9 Section "Painting" for field-painting fire-protection cabinets.
 - 2. Division 15 Section "Fire Protection" for fire suppression systems and fire hose valve cabinets and additional fire extinguishers.

1.3 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire-protection specialties.
 - 1. Fire Extinguishers: Include rating and classification.
 - 2. Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.
- B. Samples for Initial Selection: Manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available for each type of cabinet finish indicated.
- C. Samples for Verification: For each type of exposed cabinet finish required, prepared on Samples of size indicated below and of same thickness and material indicated for the Work. If finishes involve normal color and texture variations, include sample sets showing the full range of variations expected.
 - 1. Size: 6-by-6-inch square Samples.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain fire extinguishers and cabinets through one source from a single manufacturer.
- B. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Standard for Portable Fire Extinguishers."
- C. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
 - 1. Provide extinguishers listed and labeled by FM.

1.5 COORDINATION

- A. Coordinate size of cabinets to ensure that type and capacity of fire extinguishers indicated and provided by Owner under separate Contract are accommodated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Portable Fire Extinguishers:
 - a. Badger; Div. of Figgie Fire Protection Systems.
 - b. Kidde: Walter Kidde, The Fire Extinguisher Co.
 - c. Larsen's Manufacturing Company.
 - d. Modern Metal Products; Div. of Technico.
 - e. Moon/American, Inc.
 - f. Potter-Roemer; Div. of Smith Industries, Inc.
 - g. Samson Products, Inc.
 - h. Watrous; Div. of American Specialties, Inc.
 - 2. Fire-Protection Cabinets:
 - a. Larsen's Manufacturing Company.
 - b. Modern Metal Products; Div. of Technico.
 - c. Moon/American, Inc.
 - d. Potter-Roemer; Div. of Smith Industries, Inc.
 - e. Samson Products, Inc.
 - f. Watrous; Div. of American Specialties, Inc.

2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: Carbon steel, complying with ASTM A 366/A 366M, commercial quality, stretcher leveled, temper rolled.

- B. Aluminum: Alloy and temper recommended by aluminum producer and manufacturer for type of use and finish indicated, and as follows:
 - 1. Sheet: **ASTM B 209**.
 - 2. Extruded Shapes: **ASTM B 221**.
- C. Stainless-Steel Sheet: ASTM A 666/A 666M, Type 302 or Type 304 alloy.

2.3 PORTABLE FIRE EXTINGUISHERS

- A. General: Provide fire extinguishers of type, size, and capacity for each cabinet and other locations indicated.
- B. Multipurpose Dry Chemical Type: UL-rated 4-A:60-B:C, 10-lb. nominal capacity, in enameled steel container.
 - 1) Lower Level: Two required, locations shown on plans.
 - 2) First Floor: Two required, locations shown on plans.
 - 3) Second Floor: Two required, locations shown on plans.
 - 4) Third Floor: Three required, locations shown on plans.
- C. Wet Chemical Type: UL-rated 2A:1B:C:K in stainless steel container, for K Class fires.
 - Install in Warming Kitchen area.
 - To establish a standard of quality, fire extinguisher shall be equivalent to Larsen Model #WC-6L Wet Chemical.
- D. Additional fire extinguishers are required. See Division 15 Section "Fire Protection."
- E. Cabinet Construction: Provide manufacturer's standard box (tub), with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated. Weld joints and grind smooth. Miter and weld perimeter door frames.
- F. Cabinet Type: Suitable for the following:
 - 1. Fire extinguisher.
- G. Cabinet Mounting: Suitable for the following mounting conditions:
 - 1. Semirecessed: Cabinet box partially recessed in walls of shallow depth to suit style of trim indicated.
- H. Cabinet Trim Style: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.
 - 1. Trimless: Surface of surrounding wall finishes flush with exterior finished surface of cabinet frame and door, without overlapping trim attached to cabinet.
 - a. Provide recessed flange, of same material as box, attached to box to act as plaster stop.
 - b. Rolled-Edge Trim: **4-inch** backbend depth.

- I. Cabinet Trim Material: Manufacturer's standard, as follows:
 - 1. Aluminum sheet.
- J. Door Material: Manufacturer's standard, as follows:
 - 1. Aluminum sheet.
- K. Door Glazing: Manufacturer's standard, as follows:
 - 1. Clear Float Glass: ASTM C 1036, Type I, Class 1, Quality q3, as follows:
 - a. Thickness: 3 mm.
- L. Door Style: Manufacturer's standard design, as follows:
 - 1. Fully glazed panel with frame.
- M. Door Construction: Fabricate doors according to manufacturer's standards, of materials indicated, and coordinated with cabinet types and trim styles selected.
 - 1. Provide minimum **1/2-inch**- thick door frames, fabricated with tubular stiles and rails, and hollow-metal design.
 - 2. Provide inside latch and lock for break-glass panels.
- N. Door Hardware: Provide manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated. Provide either lever handle with cam-action latch, or exposed or concealed door pull and friction latch. Provide concealed or continuous-type hinge permitting door to open 180 degrees.

2.4 ACCESSORIES

- A. Mounting Brackets: Manufacturer's standard steel, designed to secure extinguisher, of sizes required for types and capacities of extinguishers indicated, with plated or baked-enamel finish.
 - 1. Provide brackets for extinguishers not located in cabinets.
 - 2. Provide brackets for extinguishers located in cabinets.
- B. Break-Glass Strike: Provide manufacturer's standard metal strike, complete with chain and mounting clip, secured to cabinet.
- C. Lettered Door Handle: Provide one-piece, cast-iron door handle with the word "FIRE" embossed into face.
- D. Door Locks: Provide cylinder lock, with all cabinets keyed alike.
- E. Identification: Provide lettering to comply with authorities having jurisdiction for letter style, color, size, spacing, and location. Locate as indicated by Architect.
 - 1. Identify bracket-mounted extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to wall surface.

2. Identify fire extinguisher in cabinet with the words "FIRE EXTINGUISHER" applied to door.
 - a. Application Process: Silk-screened.
 - b. Lettering Color: Red.
 - c. Orientation: Horizontal.

2.5 COLORS AND TEXTURES

- A. Colors and Textures: As selected by Architect from manufacturer's full range for these characteristics.

2.6 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. 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.
- D. Cabinet and Door Finishes: Provide manufacturer's standard baked-enamel paint for the following:
 1. Exterior of cabinets and doors, except for those surfaces indicated to receive another finish.
 2. Interior of cabinets and doors.

2.7 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. Baked-Enamel Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Apply baked enamel complying with paint manufacturer's specifications for cleaning, conversion coating, and painting.
 1. Color: As selected by Architect from manufacturer's full range.

2.8 STEEL FINISHES

- A. Surface Preparation: Clean surfaces of dirt, oil, grease, mill scale, rust, and other contaminants that could impair paint bond using manufacturer's standard methods.
- B. Factory Priming for Field-Painted Finish: Apply shop primer specified below immediately after surface preparation and pretreatment.
 - 1. Shop Primer: Manufacturer's or fabricator's standard, fast-curing, lead- and chromate-free, universal primer, selected for resistance to normal atmospheric corrosion, for compatibility with substrate and field-applied finish paint system indicated, and for capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.
- C. Baked-Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-enamel finish consisting of prime coat and thermosetting topcoat. Comply with paint manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of **2 mils**.
 - 1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in for hose valves, hose racks, and cabinets to verify actual locations of piping connections before cabinet installation.
- B. Examine walls and partitions for suitable framing depth and blocking where recessed and semirecessed cabinets are to be installed.
- C. Examine fire extinguishers for proper charging and tagging.
 - 1. Remove and replace damaged, defective, or undercharged units.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing fire-protection specialties.
- B. Install in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.
 - 1. Prepare recesses for cabinets as required by type and size of cabinet and trim style.
 - 2. Fasten mounting brackets to structure and cabinets, square and plumb.
- C. Fire extinguishers must be tested and tagged at time of Fire Department inspection.

3.3 ADJUSTING, CLEANING, AND PROTECTION

- A. Adjust cabinet doors that do not swing or operate freely.
- B. Refinish or replace cabinets and doors damaged during installation.
- C. Provide final protection and maintain conditions that ensure that cabinets and doors are without damage or deterioration at the time of Substantial Completion.

SECTION 10536-FABRIC AWNINGS

PART 1 - GENERAL

RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

SUMMARY

This Section includes awning/canopy fabric, framing system, installation and accessories.

SUBMITTALS

General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

Product data for each type of awning/canopy material and installation accessory required. Submit written data on physical characteristics, durability, resistance to fading, and flame resistance characteristics.

Shop drawings showing awning/canopy in elevation, plan & section. Drawings shall include the following details:

- a. All frame dimensions including overall dimensions, module dimensions, and fabric panel dimensions.
- b. Frame module labels.
- c. Frame module connection details.
- d. Connection and anchoring details.
- e. Material information.
- f. All other applicable information.

Samples for verification purposes in manufacturer's standard size, showing full range of color, texture, and pattern variations expected. Prepare samples from same material to be used for the Work. Submit the following:

Manufactures color & pattern selection sample book.

QUALITY ASSURANCE

Flame Resistance (FR) Characteristics: Provide fabric identical to that tested for the following fire performance characteristics, per test method indicated below, by UL or other testing and inspecting organizations acceptable to authorities having jurisdiction. Identify fabric with appropriate markings of applicable testing and inspecting organization.

Passes or exceeds: NFPA test #701; UL 214 certification (US), CAN/UL S109 (Canada);
Test Procedure #801, Title 19, California State fire Marshalstest (Registration #F-368.01);
and
ASTM E-84-84 (Flame spread and smoke density is Class A or Class 1).

WARRANTY

Awning/canopy system including installation shall be warranted for five years. Frames and fabric attachment shall be warranted against defective material and workmanship for a period of five years by awning manufacture. Fabrics shall be warranted by the fabric manufacture for a minimum of five years. Labor to replace defective fabric shall be guaranteed for one year.

MAINTENANCE

Upon installation, awning/canopies are to be clean and free of any substance that might discolor or damage surface. Written cleaning instructions are to be made available from the fabric manufacture. Damaged fabric panels must be replaced.

PART 2 - PRODUCTS

MATERIALS

Framework: 6063-T5 aluminum extrusions, framework profiles shall be sized to withstand all live loads, dead loads, superimposed loads and transportation loads, including local & state requirements.

Fasteners, anchors, bolts, shims, sleeves & accessories shall be non-corrosive & non-staining.

Fabric shall be Sunbrella Firesist, as manufactured by Glen Raven Mills, Inc., Solution-dyed Modacrylic fibers with fluorocarbon finish, woven fabric made of self-extinguishing 100% SEF-FR, mildew, chemical and UV resistant. Minimum fabric weight to be approx. 9.25 oz. per sq. yard. Colors as selected by Architect from manufacturer's standard color selections.

Graphics: Applied graphics on fabric:

STEVENS MEMORIAL SENIOR HOUSING (6 inches high)

Frame Finish: Surface of aluminum frame should be mill finish, clean and free of defects, scratches or discoloration.

PART 3 - EXECUTION

INSTALLATION

Awning Fabrication: Each framing member is to be cut to the appropriate length and burrs removed to provide a tight clean fit. Remove scale and foreign material, inside and outside before assembly. All framing member junctions can be welded or mechanically fastened with galvanized steel sleeves and joints.

Junctions are to receive no less than three welds per member. Welds are to be 1/4-inch fillet type, welded with 3/32-inch diameter 4043 aluminum welding rod. TIG (Tungsten Inert Gas) welding equipment is to be used to provide a cleaner, more penetrating weld.

Welds that interface with fabric panels are to be ground smooth and de-burred so that no sharp edges come in contact with the fabric.

Finished frame modules shall be sized so that they can be transported in accordance with all national & regional transportation regulations.

Fabric is to be applied tight and is to be free of wrinkles, sagging, puckers and punctures. All panels are to be equal in tension and quality.

Installations shall be structurally sound, level and leak free. Awnings are to have no blemishes and shall meet all local and state codes.

PROTECTION

Provide final protection and maintain conditions, in a manner acceptable to manufacturer and installer, to ensure awnings are not damaged or deteriorated at time of Substantial Completion.

END OF SECTION 10536

SECTION 10552 POSTAL SPECIALTIES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Front-loading interior mailboxes with parcel lockers and letter drops.
- B. Postal accessories.

1.2 RELATED SECTIONS

- A. Section 06100 - Rough Framing: Framed wall openings.
- B. Section 09250 - Gypsum Board.

1.3 REFERENCES

- A. USPS-STD-4C - United States Postal Service Standard 4C, Wall-Mounted Centralized Mail Receptacles.
- B. USPS Publication 16.
- C. ASTM A 591 - Specification for Steel Sheet, Electrolytic Zinc Coated, for Light Coating Mass Applications.
- D. ASTM A 653 - Specification For Steel Sheet, Zinc Coated (Galvanized), or Zinc-Iron Alloy Coated (Galvannealed) by the Hot Dip Process.
- E. ASTM A 666 - Specification for Austenitic Stainless Steel Sheet, Strip, Plate and Flat Bar.
- F. ASTM A 1008 - Specification for Steel, Sheet Cold-Rolled, Carbon, Structural High Strength Low-Alloy and High Strength Low-Alloy with Improved Formability.
- G. ASTM B 209 - Specification Aluminum and Aluminum Alloy Sheet and Plate.
- H. ASTM B 221 - Specification Aluminum and Aluminum Alloy Extruded Bar, Rods, Wire, Shapes, and Tubes.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. **Product Data** : Provide manufacturer's standard catalog data for specified products.
- C. Shop Drawings: Prepared specifically for this project; show dimensions of mail boxes, wall cuts, and interface with other products.

1.5 REGULATORY REQUIREMENTS

- A. Comply with USPS-STD-4C for wall-mounted centralized mailboxes.
- B. Comply with Americans with Disabilities Act Accessibility Guidelines (ADAAG).

1.6 QUALITY ASSURANCE

- A. **Manufacturer Qualifications:** Manufacturer shall have a Quality System in place to ensure and be able to substantiate that manufactured units conform to requirements and match the approved design.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Inspect the materials upon delivery to assure that specified products have been received.
- B. Store materials protected from exposure to harmful weather conditions.
- C. Handle materials to prevent damage or marring of finish.

1.8 WARRANTY

- A. Manufacturer's standard warranty to repair or replace components of postal specialties that fail in materials or workmanship within five years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering USPS STD 4C approved postal specialties which may be incorporated in the work include, but are not limited to, the following:
 - 1) Auth-Florence Manufacturing Company, 5935 Corporate Drive, Manhattan, KS 66503; ASD. Tel: (785)323-4400, Tel: (800)275-1747. Fax: (800)275-5081. Email: sales@auth-florence.com. Web: <http://www.auth-florence.com>.

2.2 WALL-MOUNTED CENTRALIZED MAIL RECEPTACLES (MAILBOXES)

- A. **USPS Approved Front-Loading Mail Boxes:** Horizontal style complying with USPS STD 4C and the following:
 - 1. **Model:** Series 4C by Auth-Florence.
 - a) **Module:** Two (2) Model No. 4CET8-13
 - b) **Module:** One (1) Model No. 4CET2-9
 - c) **Module:** One (1) Model No. 4CET1-1
 - 2. **Mounting:** Recessed mounted.
 - 3. **Locks:** 5-pin cylinder lock on each compartment, 3 keys each lock; 2,000 key changes.
 - 4. **Box Identification:** Top to bottom, left to right.
 - a. Engraved identifier with black fill.

5. Material and Finish: Aluminum with powder coat finish.
 - a. Finish: Selected from manufacturer's standard powder coat colors.

2.3 ACCESSORIES

- A. Key Keepers: Consisting of single compartment with.
 1. Model: Series KK (recessed or surface mounted) by Auth-Florence.
 2. Door Lock: Door prepared to receive lock furnished by local postmaster.
 3. Key Retractor: Provide retractable reel and 20 inch (508 mm) long chain.
- B. Key Cabinets: Wall-mounted, metallic-coated steel cabinet with pivoting, key-holding panels and side-hinged door equipped with five-pin tumbler, cylinder door lock and concealed, full-length flush hinge. Finish cabinet, panels, and door with baked-enamel finish in New Sand color. Provide key control system consisting of key-holding hooks, and labels. Provide key cabinet with capacity for 150 percent of the keys required.
 1. Capacity: Keys for thirty-nine (39) apartment mailbox locks.
- C. Letter Drops: Consisting of 12.625 inch (321 mm) wide by 5 inch (127 mm), top-hinged, flap that pivots inward, held in place by 1 inch (25 mm) wide face frame. Fabricated from 1/4 inch (6 mm) thick aluminum or steel, with exposed surfaces finished same as adjacent apartment mailboxes.
 1. Sleeve: Provide steel wall sleeve for 4 inch (102 mm) minimum wall depth to 8 inch (203 mm) maximum wall depth.
 2. Finished Frame: Provide finished face frame on back side of wall opening.
 3. Identification: Engrave face of swinging flap as follows:
 - a. OUTGOING MAIL

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that openings in wall are correctly located, aligned, and sized for mailboxes.
- B. Installer's Examination:
 1. Examine conditions under which construction activities of this section are to be performed; submit written notification if such conditions are unacceptable.
 2. Beginning installation indicates acceptance of conditions.

3.2 INSTALLATION

- A. Install mail boxes in accordance with shop drawings and manufacturer's printed installation instructions.
- B. Align, plumb, and level; anchor in accordance with manufacturer's requirements.

3.3 ADJUSTING

- A. Adjust doors and locks to operate correctly.

3.4 CLEANING

- A. Clean surfaces with mild dish detergent. Do not use harsh abrasive cleaners. Lubricate locks with graphite type lubricants only.

3.5 PROTECTION OF INSTALLED PRODUCTS

- A. Protect finishes from damage by construction activities.

END OF SECTION

SECTION 10801 - TOILET AND BATH ACCESSORIES

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.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Toilet and bath accessories.
- B. Related Sections include the following:
 - 1. Division 8 Section "Mirrored Glass" for frameless mirrors.

1.3 SUBMITTALS

- A. Product Data: Include construction details, material descriptions and thicknesses, dimensions, profiles, fastening and mounting methods, specified options, and finishes for each type of accessory specified.
- B. Samples: For each accessory item to verify design, operation, and finish requirements.
 - 1. Approved full-size Samples will be returned and may be used in the Work.
- C. Setting Drawings: For cutouts required in other work; include templates, substrate preparation instructions, and directions for preparing cutouts and installing anchoring devices.
- D. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required. Use designations indicated in the Toilet and Bath Accessory Schedule and room designations indicated on Drawings in product schedule.
- E. Maintenance Data: For accessories to include in maintenance manuals specified in Division 1. Provide lists of replacement parts and service recommendations.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Provide products of same manufacturer for each type of accessory unit and for units exposed to view in same areas, unless otherwise approved by Architect.

- B. Product Options: Accessory requirements, including those for materials, finishes, dimensions, capacities, and performance, are established by specific products indicated in the Toilet and Bath Accessory Schedule.
 - 1. Products of other manufacturers listed in Part 2 with equal characteristics, as judged solely by Architect, may be provided.

1.5 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by disabled persons, proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.6 WARRANTY

- A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Manufacturer's Mirror Warranty: Written warranty, executed by mirror manufacturer agreeing to replace mirrors that develop visible silver spoilage defects within minimum warranty period indicated.
 - 1. Minimum Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide accessories by one of the following:
 - 1. Toilet and Bath Accessories:
 - a. American Specialties, Inc.
 - b. Bobrick Washroom Equipment, Inc.
 - c. Bradley Corporation.
- B. Products: Subject to compliance with requirements, provide one of the products indicated for each designation in the Toilet and Bath Accessory Schedule at the end of Part 3.

2.2 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, with No. 4 finish (satin), in 0.0312-inch minimum nominal thickness, unless otherwise indicated.

- B. Brass: ASTM B 19, leaded and unleaded flat products; ASTM B 16, rods, shapes, forgings, and flat products with finished edges; ASTM B 30, castings.
- C. Sheet Steel: ASTM A 366/A 366M, cold rolled, commercial quality, 0.0359-inch minimum nominal thickness; surface preparation and metal pretreatment as required for applied finish.
- D. Galvanized Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.
- E. Fasteners: Screws, bolts, and other devices of same material as accessory unit, tamper and theft resistant when exposed, and of galvanized steel when concealed.

2.3 FABRICATION

- A. General: One, maximum 1-1/2-inch- diameter, unobtrusive stamped manufacturer logo, as approved by Architect, is permitted on exposed face of accessories. On interior surface not exposed to view or back surface of each accessory, provide printed, waterproof label or stamped nameplate indicating manufacturer's name and product model number.
- B. Surface-Mounted Toilet Accessories: Unless otherwise indicated, fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with continuous stainless-steel hinge. Provide concealed anchorage where possible.
- C. Framed Glass-Mirror Units: Fabricate frames for glass-mirror units to accommodate glass edge protection material including all 'tilt' mirror units. Provide mirror backing and support system that permits rigid, tamper-resistant glass installation and prevents moisture accumulation.
 - 1. Provide galvanized steel backing sheet, not less than 0.034 inch and full mirror size, with nonabsorptive filler material. Corrugated cardboard is not an acceptable filler material.
- D. Mirror-Unit Hangers: Provide mirror-unit mounting system that permits rigid, tamper- and theft-resistant installation, as follows:
 - 1. Heavy-duty wall brackets of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.
- E. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Secure mirrors to walls in concealed, tamper-resistant manner with special hangers, toggle bolts, or screws. Set units level, plumb, and square at locations indicated, according to manufacturer's written instructions for substrate indicated.

- C. Install grab bars to withstand a downward load of at least 250 lbf, when tested according to method in ASTM F 446.

3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation and verify that mechanisms function properly. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

3.3 TOILET AND BATH ACCESSORY SCHEDULE

- A. **Combination Towel Dispenser/Waste Receptacle:** Where this designation is indicated, provide stainless-steel combination unit complying with the following one for public bathrooms.
 - 1. Products: Bobrick #B-3961, Classic Series.
 - 2. Recessed Type with Projecting Receptacle: Designed for nominal 2 to 4-inch wall depth with continuous, seamless wall flange; towel dispenser in unit's upper compartment designed to dispense 8 inch wide by 800 feet paper towel roll; waste receptacle in unit's lower portion secured by tumbler lockset and with minimum 12-gal. capacity, reusable, vinyl liner; and upper compartment double-panel door with continuous hinge and tumbler lockset.
- B. **Toilet Tissue Dispenser:** Provide toilet tissue dispenser complying with the following for public bathrooms for each water closet:
 - 1. Products: Bobrick #B-52891 Matrix Series.
 - 2. Type: Jumbo Roll dispenser with hinged front secured with concealed locking device.
 - 3. Mounting: Surface mounted with concealed anchorage.
 - 4. Material: ABS Plastic.
 - 5. Operation: Noncontrol delivery.
 - 6. Capacity: Designed for 10-inch- diameter-core tissue rolls.
- C. **Soap Dispenser :** Provide soap dispenser complying with the following for public bathrooms and all janitors closets:
 - 1. Products: Bobrick #2112 Classic Series Soap Dispenser:
 - 2. Liquid Soap Dispenser, Horizontal-Tank Type: Surface-mounted type, minimum 40-oz. capacity tank with stainless-steel piston, springs, and internal parts designed to dispense soap in measured quantity by pump action; and stainless-steel cover with unbreakable window-type refill indicator.
 - a. Soap Valve: [Designed for dispensing soap in liquid form]

- D. **Paper Towel Dispenser** Provide stainless-steel paper towel dispenser complying with the following for all janitors closets:
1. Products: Bobrick #B-2860
 2. Surface-Mounted Type: 8 inch by 800 ft. roll paper towel. Delivers preset length 2-1/2 inch, 4 inch or 5 inch per stroke. Satin-finished stainless steel, tumbler lock on side of cabinet.
- E. **Toilet Tissue Dispenser:** Provide toilet tissue dispenser complying with the following for each apartment water closet:
1. Products:
 - a. HEWI ,Inc. #450
 - b. Taymor #02-D6648PB
 - c. or Equal.
 2. Type: U or J shaped single roll dispenser.
 3. Mounting: Surface mounted
 4. Material: Nylon or Satin Nickel Plated Solid Forged Brass
 5. Operation: Non controlled delivery.
 6. Capacity: Designed for up to 5-1/2- diameter-core tissue roll
- F. **Grab Bars:** Provide a pair of stainless-steel grab bars complying with the following for each accessible bathroom, see drawings:
1. Products: Bobrick units #B-6806 series in configurations shown on plans.
 2. Stainless-Steel Nominal Thickness: Minimum 0.05 inch .
 3. Mounting: Concealed with manufacturer's standard flanges and anchors
 4. Gripping Surfaces: Manufacturer's standard peened slip-resistant texture
 5. Outside Diameter: 1-1/2 inches for heavy-duty applications.
- G. **Grab Bars as Towel Bars:** Provide stainless-steel grab bars/towel bars complying with the following for each apartment bathroom, see drawings:
1. Products: Bobrick units #B-6806 series in configurations shown on plans.
 2. Stainless-Steel Nominal Thickness: Minimum 0.05 inch .
 3. Mounting: Concealed with manufacturer's standard flanges and anchors
 4. Gripping Surfaces: Manufacturer's standard peened slip-resistant texture
 5. Outside Diameter: 1-1/2 inches for heavy-duty applications.
- H. **Fixed Mirror Unit:** Provide mirror unit complying with the following where designated on the plans for each public bathroom.
1. Products: Bobrick #B-290 series
 2. Stainless-Steel, Channel-Framed Mirror: Fabricate frame from stainless-steel channels in manufacturer's standard satin or bright finish with square corners mitered to hairline joints and mechanically interlocked.

- I. **Medicine Cabinet:** Provide medicine cabinet complying with the following for each apartment bathroom:
1. Products: Ketcham # 105RSWT-HC
 2. Surface Mounted Unit: Nominal **16-by-28** unit designed for surface mounting; with hinged, rounded corner framed mirror door concealing storage cabinet; and minimum of three adjustable shelves. Door equipped with continuous hinge and spring-buffered, rod-type stop and magnetic door catch. Fabricate mirror frame, door, hinge, cabinet and shelves of stainless steel.
- J. **Soap Dish:** Provide stainless-steel soap dish complying with the following for each apartment bathroom:
1. Products: Bobrick #B-7680, Classic Series
 2. Mounting: Surface mounted, with rectangular wall bracket and backplate for concealed mounting.
- K. **Toothbrush Holder:** Provide toothbrush holder complying with the following for each apartment bathroom:
1. Products: Bobrick #B-7679, Classic Series.
 2. Stainless-Steel Unit: With approximately **2-1/4-inch** diameter hole in center to hold tumbler; two holes on each side to accommodate total of four toothbrushes; and rectangular wall bracket and backplate for concealed mounting.
- L. **Shower Curtain Rod:** Provide stainless-steel shower curtain rod with **3-inch** stainless-steel flanges designed for exposed fasteners, in length required for shower openings, and complying with the following, for each shower:
1. Products: Bobrick #B-6107, Heavy Duty Shower Rod
 2. Heavy-Duty Rod: **1-1/4-inch** OD; fabricated from nominal **0.05-inch-** thick stainless steel.
- M. **Shower Curtain:** Where this designation is indicated, provide shower curtain complying with the following, for each shower:
1. Products: Bobrick #204-3 Vinyl Shower Curtain with #204-1 hooks
 2. Vinyl Shower Curtain: Minimum **0.006-inch-** thick, opaque, matte vinyl with hemmed edges and corrosion-resistant grommets at minimum **6 inches** o.c. through top hem.
 - a. Size: Minimum **6 inches** wider than opening by **72 inches** high.
 - b. Color: [As selected by Architect from mfr's full range].
- N. **Robe Hook:** Where this designation is indicated, provide robe hook complying with the following for each public bathroom:
1. Products: Bobrick #B-982, Vandal resistant
Single-Prong Unit: Stainless-steel, robe hook with rectangular wall bracket and backplate for concealed mounting.

- O. **Double Robe Hook:** Where this designation is indicated, provide robe hook complying with the following for each unit bathroom:
1. Products: Bobrick #B-7672,
Stainless-steel, double robe hook with rectangular wall bracket and backplate for concealed mounting.
- P. **Mop and Broom Holder:** In all janitors closets, provide mop and broom holder complying with the following:
1. Products: Bobrick #B-239
 2. Mop and Broom Holder with Utility Shelf: 36-inch- long unit fabricated of minimum nominal 0.05-inch- thick stainless steel with shelf; support brackets for wall mounting; three hooks for wiping rags; four spring-loaded, rubber hat, cam-type, mop/broom holders mounted on front of shelf; and approximately 1/4-inch-diameter, stainless-steel rod suspended beneath shelf for drying rags.

END OF SECTION 10801

SECTION 01210 - ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements governing allowances.
 - 1. Certain materials and equipment are specified in the Contract Documents by allowances. In some cases, these allowances include installation. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when additional information is available for evaluation. If necessary, additional requirements will be issued by Change Order.
- B. Types of allowances include the following:
 - 1. Lump-sum allowances.
- C. Related Sections include the following:
 - 1. Division 1 Section "Unit Prices" for procedures for using unit prices.

1.3 SELECTION AND PURCHASE

- A. At the earliest practical date after award of the Contract, advise Architect of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.
- B. At Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.
- C. Purchase products and systems selected by Architect from the designated supplier.

1.4 SUBMITTALS

- A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.
- B. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.

1.5 UNUSED MATERIALS

- A. Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.
 - 1. If requested by Architect, prepare unused material for storage by Owner when it is not economically practical to return the material for credit. If directed by Architect, deliver unused material to Owner's storage space. Otherwise, disposal of unused material is Contractor's responsibility.

PART 2 - EXECUTION

2.1 EXAMINATION

- A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

2.2 PREPARATION

- A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

2.3 SCHEDULE OF ALLOWANCES

- A. Allowance No.'A'

The Plumbing Sub-Contractor Shall Carry An Allowance Of \$5,000 (Five Thousand Dollars) To Cover Fees For Services As Established By The Town of Ludlow Water Department Regarding The Domestic Water Service Entrance. All other cost (trenching, backfilling, materials, labor, installation, etc.) shall be included in the contract.

- B. Allowance No.'B'

The Fire Protection Sub-Contractor Shall Carry An Allowance Of \$5,000 (Five Thousand Dollars) To Cover Fees For Services As Established By The Town of Ludlow Water Department Regarding The Fire Water Service Entrance. All other cost (trenching, backfilling, materials, labor, installation, etc.) shall be included in the contract.

- C. Allowance No.'C'

The Electrical Sub-Contractor Shall Carry An Allowance Of \$10,000.00 (Ten Thousand Dollars) To Cover Fees For Services As Established By The CATV Provider For Service Entrance Fees Or Charges. All other cost (trenching, backfilling, materials, labor, installation, etc.) shall be included in the contract.

D. Allowance No.'D'

The Electrical Sub-Contractor Shall Carry An Allowance Of \$10,000.00 (Ten Thousand Dollars) To Cover Fees For Services As Established By The Service Provider For Telephone Service Entrance Fees Or Charges. All other cost (trenching, backfilling, materials, labor, installation, etc.) shall be included in the contract.

E. Allowance No.'E'

The Electrical Sub-Contractor Shall Carry An Allowance Of \$100,000.00 (One Hundred Thousand Dollars) To Cover Fees For Services As Established By The Service Provider For Any Electrical Service Entrance Fees Or Charges.

All other cost (trenching, backfilling, materials, labor, installation, etc.) shall be included in the contract.

F. Allowance No.'F'

The Plumbing Sub-Contractor Shall Carry An Allowance Of \$20,000.00 (Twenty Thousand Dollars) To Cover Fees For Services As Established By The Service Provider For Any Gas Service Entrance Fees Or Charges. All other cost (trenching, backfilling, materials, labor, installation, etc.) shall be included in the contract.

G Allowance No.'G'

The Landscaping Sub-Contractor Shall Include A Lump Sum Of \$ 20,000.00 (Ten Thousand Dollars) For The Purchase And Installation Of New Landscaping Materials Including Plants, Vegetation, Flowers, Trees, Shrubs & Bark Mulch Material Including Spreading And 4" Vinyl Perimeter Plant Bed Edging.

END OF SECTION 01210

SECTION 12491 - HORIZONTAL LOUVER BLINDS

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.

1.2 SUMMARY

- A. This Section includes the following types of venetian blinds and accessories:
 - 1. Miniblinds with aluminum louver slats.

1.3 DEFINITIONS

- A. Miniblind: Venetian blind with nominal **1-inch**- wide louver slat.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions.
- B. Shop Drawings: Show location and extent of horizontal louver blinds. Include elevations, sections, details, and dimensions not shown in Product Data. Show installation details, mountings, attachments to other Work, operational clearances, and relationship to adjoining work.
- C. Samples for Initial Selection: For each colored component of each type of horizontal louver blind indicated.
 - 1. Include similar Samples of accessories involving color selection.
- D. Samples for Verification: For the following products, prepared on Samples from the same material to be used for the Work.
 - 1. Louver Slat: Not less than **12 inches** long.
 - 2. Tapes: Full width, not less than **6 inches** long.
 - 3. Horizontal Louver Blind: Full-size unit, not less than **16 inches** wide by **24 inches** long.
 - 4. Valance: Full-size unit, not less than **12 inches** wide.
 - 5. Cornice: Full-size unit, not less than **12 inches** wide.

- E. Window Treatment Schedule: Include horizontal louver blinds in schedule using same room designations indicated on Drawings.
- F. Product Certificates: For each type of horizontal louver blind product, signed by product manufacturer.
- G. Product Test Reports: For each type of horizontal louver blind product.
- H. Maintenance Data: For horizontal louver blinds to include in maintenance manuals. Include the following:
 - 1. Methods for maintaining horizontal louver blinds and finishes.
 - 2. Precautions about cleaning materials and methods that could be detrimental to finishes and performance.
 - 3. Operating hardware.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain horizontal louver blinds through one source from a single manufacturer.
- B. Fire-Test-Response Characteristics: Provide horizontal louver blinds with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - 1. Flame-Resistance Ratings: Passes NFPA 701.
- C. Corded Window Covering Product Standard: Provide horizontal louver blinds complying with WCMA A 100.1.
- D. Mockups: Build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution.
 - 1. Build mockups in the location and of the size indicated or, if not indicated, as directed by Architect.
 - 2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver blinds in factory packages, marked with manufacturer and product name, and location of installation using same room designations indicated on Drawings and in a window treatment schedule.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install horizontal louver blinds until construction and wet and dirty finish work in spaces, including painting, is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Where horizontal louver blinds are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operable glazed units' operation hardware throughout the entire operating range. Notify Architect of discrepancies. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.8 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Horizontal Louver Blinds: Before installation begins, for each size, color, texture, pattern, and gloss indicated, full-size units equal to 5 percent of amount installed

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. Horizontal Louver Blinds, Aluminum Louver Slats:
 - a. Comfortex Window Fashions.
 - b. Hunter Douglas Window Fashions.
 - c. Levolor Contract; a Newell Company; Levolor.
 - d. Springs Window Fashions Division, Inc.; Bali.
 - e. Springs Window Fashions Division, Inc.; Graber.
 - f. Verosol USA, Inc.

2.2 HORIZONTAL LOUVER BLINDS, ALUMINUM LOUVER SLATS

- A. Louver Slats: Aluminum, alloy and temper recommended by producer for type of use and finish indicated; with crowned profile and radiused corners.
 - 1. Nominal Slat Width: **1 inch** for miniblinds.
 - 2. Nominal Slat Thickness: Not less than **0.006 inch**.
 - 3. Slat Finish: As selected by Owner from manufactures full range.

- B. Headrail/Valance: Decorative, integrated headrail/valance not requiring a separate valance or end brackets for finished appearance; formed steel or extruded aluminum; long edges returned or rolled; fully enclosing operating mechanisms on three sides and ends; capacity for one blind per headrail, unless otherwise indicated.
 - 1. Finish Color Characteristics: Match color, texture, pattern, and gloss of louver slats
- C. Bottom Rail: Formed-steel or extruded-aluminum tube, sealed with plastic or metal capped ends top contoured to match crowned shape of louver slat and bottom contoured for minimizing light gaps; with enclosed and protected ladders and tapes to prevent their contact with sill.
- D. Maximum Light Blocking Blinds: Designed for eliminating all visible light gaps if slats are tilted closed; with tight tape spacing indicated and slats with minimal-sized rout holes for ladders hidden and placed near back edge for maximum slat overlap; with headrail and bottom rail extended and formed for light-tight joints between rail and adjacent slats or construction.
- E. Tilt Control: Consisting of enclosed worm gear mechanism, slip clutch or detachable wand preventing overrotation, and linkage rod, for the following operation:
 - 1. Tilt Operation: Manual with clear plastic wand.
 - 2. Length of Tilt Control: Length required to make operation convenient from floor level.
 - 3. Tilt: Full.
- F. Lift Operation: Manual, cord lock; locks pull cord to stop blind at any position in ascending or descending travel.
- G. Tilt-Control and Cord-Lock Position: As selected by Owner.
- H. Ladders: Evenly spaced to prevent long-term louver sag.
 - 1. For Blinds with Nominal Slat Width **1 Inch** or Less: Braided string.
- I. Valance: Two louver slats.
 - 1. Finish Color Characteristics: Match color, texture, pattern, and gloss of louver slats
- J. Mounting: Mounting as required to permit easy removal and replacement without damaging blind or adjacent surfaces and finishes; with spacers and shims required for blind placement and alignment indicated.
 - 1. Provide intermediate support brackets if end support spacing exceeds spacing recommended by manufacturer for weight and size of blind.
- K. Hold-Down Brackets and Hooks or Pins: Manufacturer's standard, as indicated.
- L. Colors, Textures, Patterns, and Gloss: As selected by Owner from manufacturer's full range.

2.3 HORIZONTAL LOUVER BLINDS FABRICATION

- A. Product Standard and Description: Comply with AWCMA Document 1029, unless otherwise indicated, for each horizontal louver blind designed to be self-leveling and consisting of louver slats, rails, ladders, tapes, lifting and tilting mechanisms, cord, cord lock, tilt control, and installation hardware.
- B. Concealed Components: Noncorrodible or corrosion-resistant-coated materials.
 - 1. Lifting and Tilting Mechanisms: With permanently lubricated moving parts.
- C. Unit Sizes: Obtain units fabricated in sizes to fill window and other openings as follows, measured at 74 deg F:
 - 1. Blind Units Installed between (Inside) Jambs: Width equal to 1/4 inch per side or 1/2 inch total, plus or minus 1/8 inch , less than jamb-to-jamb dimension of opening in which each blind is installed. Length equal to 1/4 inch , plus or minus 1/8 inch , less than head-to-sill dimension of opening in which each blind is installed.
 - 2. Blind Units Installed Outside Jambs: Width and length as indicated, with terminations between blinds of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.
- D. Installation Brackets: Designed for easy removal and reinstallation of blind, for supporting headrail/valance and operating hardware, and for hardware position and blind mounting method indicated.
- E. Installation Fasteners: Not fewer than two fasteners per bracket, fabricated from metal noncorrosive to blind hardware and adjoining construction; type designed for securing to supporting substrate; and supporting blinds and accessories under conditions of normal use.
- F. Color-Coated Finish:
 - 1. Metal: For components exposed to view, apply manufacturer's standard baked finish complying with manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness.
- G. Component Color: Provide rails, cords, ladders, and exposed-to-view metal and plastic matching or coordinating with slat color, unless otherwise indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 HORIZONTAL LOUVER BLIND INSTALLATION

- A. Install blinds level and plumb and aligned with adjacent units according to manufacturer's written instructions, and located so exterior louver edges in any position are not closer than **1 inch** to interior face of glass. Install intermediate support as required to prevent deflection in headrail. Allow clearances between adjacent blinds and for operating glazed opening's operation hardware, if any.
- B. Flush Mounted: Install blinds with louver edges flush with finish face of opening if slats are tilted open.
- C. Jamb Mounted: Install headrail flush with face of opening jamb and head.
- D. Head Mounted: Install headrail on face of opening head.
- E. Recessed: Install headrail concealed within blind pocket.
- F. Connections: Connect motorized operators to building electrical system.

3.3 ADJUSTING

- A. Adjust horizontal louver blinds to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

- A. Clean blind surfaces after installation, according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that horizontal louver blinds are without damage or deterioration at time of Substantial Completion.
- C. Replace damaged blinds that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain systems. Refer to Division 1 Section "Closeout Procedures."

3.6 WINDOW TREATMENT SCHEDULE

- A. Provide and install horizontal louver mini blinds in all interior and exterior windows and fixed in-place doors in all thirty-six (28) Living Units, Offices, Laundry Rooms, Program Spaces, Tenant Storage, Community Room and Computer Room

- B. Living Units: 001-006, 101-107, 201-207, 301-308.
Reception 013, Managers Office 014, Community Room 007, Program Space 016 & 213,
Laundry Room 111, Computer Room 112, Tenant Storage 211,

END OF SECTION 12491

SECTION 01732 - SELECTIVE DECONSTRUCTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:

1. Deconstruction and removal of the boiler room building, foundation, utilities, equipment, breeching and flue.
2. Deconstruction and removal of asphalt paving.
3. Deconstruction and removal of selected site elements.
4. Deconstruction and removal of exterior steel stair construction.
5. Deconstruction and removal of windows, doors and roofing.
6. Deconstruction and removal of interior finishes.
7. Deconstruction and removal of interior partitions.
8. Deconstruction and removal of interior furnishings.
9. Deconstruction and removal of interior stair construction.
10. Deconstruction and removal of stage and equipment.
11. Deconstruction and removal of balcony construction.
12. Deconstruction and removal of interior stair construction.
13. Repair procedures for selective deconstruction operations.
14. Deconstruction and removal of electrical, plumbing, water supply and heating systems, fixtures and equipment not scheduled to remain.
15. Making inactive, disconnecting, capping and removing existing plumbing, mechanical and electrical services in areas where deconstruction, demolition and removal work is required.

- B. Related Sections include the following:

1. Division 1 Section "Summary" for use of the premises and phasing requirements.
2. Division 1 Section "Construction Progress Documentation" for preconstruction photographs taken before selective demolition.
3. Division 1 Section "Temporary Facilities and Controls" for temporary construction and environmental-protection measures for selective demolition operations.
4. Division 1 Section "Cutting and Patching" for cutting and patching procedures for selective demolition operations.
5. Division 2 Section "Site Clearing" for site clearing and removal of above- and below-grade improvements.
6. Division 1 Section "Construction Waste Management And Disposal" for Waste management and recycling.

7. Division 2 Section "Asbestos Abatement" for removal or encapsulation of asbestos containing items.
8. Division 2 Section "Lead-based Paint Handling Specification" for removal or encapsulation of asbestos containing items

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 Owner
- C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.
- 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. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, demolished materials shall become Contractor's property and shall be removed from Project site.
- B. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to Owner that may be encountered during selective demolition remain Owner's property. Carefully remove and salvage each item or object in a manner to prevent damage and deliver promptly to Owner.

1.5 SUBMITTALS

- A. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.6 QUALITY ASSURANCE

- A. Deconstruction Firm Qualifications: An experienced firm that has specialized in deconstruction work similar in material and extent to that indicated for this Project.
- B. Professional Engineer Qualifications: Comply with Division 1 Section "Quality Requirements."
- C. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- D. Standards: Comply with ANSI A10.6 and NFPA 241.

- E. Pre deconstruction Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to selective deconstruction including, but not limited to, the following:
 - 1. Inspect and discuss condition of construction to be selectively deconstructed.
 - 2. Review structural load limitations of existing structure.
 - 3. Review and finalize selective deconstruction schedule and verify availability of materials, deconstruction 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 deconstruction operations.

1.7 PROJECT CONDITIONS

- A. Owner assumes no responsibility for condition of areas to be selectively deconstructed.
 - 1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- B. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work. Hazardous materials have been identified and are to be removed prior to commencing deconstruction work.
 - 1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner.
- C. Storage or sale of removed items or materials on-site will not be permitted.
- D. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
 - 1. Maintain fire-protection facilities in service during selective deconstruction operations.

1.8 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.
 - 1. If possible, retain original Installer or fabricator to patch the exposed Work listed below that is damaged during selective demolition. If it is impossible to engage original Installer or fabricator, engage another recognized experienced and specialized firm.
 - a. Processed concrete finishes.
 - b. Stonework and stone masonry.
 - c. Ornamental metal.
 - d. Matched-veneer woodwork.
 - e. Preformed metal panels.
 - f. Roofing.
 - g. Firestopping.

- h. Stucco and ornamental plaster.
- i. Terrazzo.
- j. Finished wood flooring.
- k. Fluid-applied flooring.
- l. Aggregate wall coating.
- m. Wall covering.
- n. HVAC enclosures, cabinets, or covers.

PART 2 - PRODUCTS

2.1 REPAIR MATERIALS

- A. Use repair materials identical to existing materials.
 - 1. If identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
 - 2. Use materials whose installed performance equals or surpasses that of existing materials.
- B. Comply with material and installation requirements specified in individual Specification Sections.

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 deconstruction 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 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 deconstruction operations.
- F. Perform surveys as the Work progresses to detect hazards resulting from selective deconstruction activities.

3.2 UTILITY SERVICES

- A. Existing Utilities: Maintain services indicated to remain and protect them against damage during selective deconstruction operations.
- B. Do not interrupt existing utilities serving occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and to authorities having jurisdiction.
 - 1. Provide at least **72** hours' notice to Owner if shutdown of service is required during changeover.
- C. Utility Requirements: Locate, identify, disconnect, and seal or cap off indicated utilities serving areas to be selectively deconstruction.
 - 1. Arrange to shut off indicated utilities with utility companies.
 - 2. If utility services are required to be removed, relocated, or abandoned, before proceeding with selective deconstruction provide temporary utilities that bypass area of selective deconstruction and that maintain continuity of service 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.
 - 4. Do not start selective deconstruction work until utility disconnecting and sealing have been completed and verified in writing. Tradesmen will inactivate, disconnect and label existing utilities to be removed.

3.3 PREPARATION

- A. Dangerous Materials: Drain, purge, or otherwise remove, collect, and dispose of chemicals, gases, explosives, acids, flammables, or other dangerous materials before proceeding with selective deconstruction operations.
- B. Pest Control: Employ a certified, licensed exterminator to treat building and to control rodents and vermin before and during selective deconstruction operations.
- C. Site Access and Temporary Controls: Conduct selective deconstruction and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.
 - 2. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction.
 - 3. Protect existing site improvements, appurtenances, and landscaping to remain.
 - 4. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.

- D. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 - 1. Provide protection to ensure safe passage of people around selective deconstruction area and to and from occupied portions of building.
 - 2. Provide temporary weather protection, during interval between selective deconstruction of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
 - 3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective deconstruction operations.
 - 4. Cover and protect furniture, furnishings, and equipment that have not been removed.
- E. Temporary Enclosures: Provide temporary enclosures for protection of existing building and construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
 - 1. Where heating or cooling is needed and permanent enclosure is not complete, provide insulated temporary enclosures. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.
- F. Temporary Partitions: Erect and maintain dustproof partitions and temporary enclosures to limit dust and dirt migration and to separate areas from fumes and noise.
- G. Temporary Shoring: Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent movement, settlement, or collapse of construction to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being deconstructed.
 - 1. Strengthen or add new supports when required during progress of selective deconstruction.

3.4 POLLUTION CONTROLS

- A. Dust Control: Use water mist, temporary enclosures, and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations.
 - 1. Do not use water when it may damage existing construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.
- B. Disposal: Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 - 1. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
- C. Cleaning: Clean adjacent structures and improvements of dust, dirt, and debris caused by selective deconstruction operations. Return adjacent areas to condition existing before selective deconstruction operations began.

3.5 SELECTIVE DECONSTRUCTION

- A. General: Deconstruct 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 deconstruction systematically, from higher to lower level. Complete selective deconstruction 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 deconstruction equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 9. Dispose of deconstructed items and materials promptly. Comply with requirements in Section 01741 - Construction Waste Management And Disposal.
 10. Return elements of construction and surfaces that are to remain to condition existing before selective deconstruction operations began.
- B. Existing Facilities: Comply with building manager's requirements for using and protecting elevators, stairs, walkways, loading docks, building entries, and other building facilities during selective demolition operations.
- C. Removed and Salvaged Items: Comply with the following:
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.
- D. Removed and Reinstalled Items: Comply with the following:
1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
 2. Pack or crate items after cleaning and repairing. Identify contents of containers.
 3. Protect items from damage during transport and storage.

4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
 - E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective deconstruction. When permitted by Architect, items may be removed to a suitable, protected storage location during selective deconstruction and cleaned and reinstalled in their original locations after selective deconstruction operations are complete.
 - F. Concrete: Deconstruct in small sections. Cut concrete to a depth of at least **3/4 inch** at junctures with construction to remain, using power-driven saw. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete indicated for selective deconstruction. Neatly trim openings to dimensions indicated.
 - G. Masonry: Deconstruct in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.
 - H. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be deconstructed, then break up and remove.
 - I. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI-WP and its Addendum.
 1. Remove residual adhesive and prepare substrate for new floor coverings by one of the methods recommended by RFCI.
 - J. Roofing: Remove no more existing roofing than can be covered in one day by new roofing. Refer to applicable Division 7 Section for new roofing requirements.
 - K. Air-Conditioning Equipment: Evacuate refrigerants in compliance with Federal and State regulations prior to removing equipment
- 3.6 PATCHING AND REPAIRS
- A. General: Promptly repair damage to adjacent construction caused by selective deconstruction operations.
 - B. Patching: Comply with Division 1 Section "Cutting and Patching."
 - C. Repairs: Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials.
 1. Completely fill holes and depressions in existing masonry walls that are to remain with an approved masonry patching material applied according to manufacturer's written recommendations.
 - D. Finishes: Restore exposed finishes of patched areas and extend restoration into adjoining construction in a manner that eliminates evidence of patching and refinishing.

- E. Floors and Walls: Where walls or partitions that are deconstructed 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 existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - 1. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections of these Specifications.
 - 2. Where patching occurs in a painted surface, apply primer and intermediate paint coats over patch and apply final paint coat over entire unbroken surface containing patch. Provide additional coats until patch blends with adjacent surfaces.
 - 3. Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.

- F. Ceilings: Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.

3.7 DISPOSAL OF DECONSTRUCTED MATERIALS

- A. General: Comply with requirements of Section 017419 - Construction Waste Management And Disposal and the following.
 - 1. Do not allow deconstructed 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 deconstruction materials.

3.8 CLEANING

Clean adjacent structures and improvements of dust, dirt, and debris caused by selective deconstruction operations. Premises shall be left in a clean condition and ready to accept alteration work and new construction

END OF SECTION 01732

SECTION 07210 - BUILDING INSULATION

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.

1.2 SUMMARY

- A. This Section includes the following:

1. Insulation under slabs.
2. Concealed building insulation.
3. Loose-fill building insulation.
4. Vapor retarders.

- B. Related Sections include the following:

1. Division 4 Section "Unit Masonry Assemblies" for insulation installed in cavity walls and masonry cells.
2. Division 7 Section "Sprayed Insulation" for spray foam insulation installation.
3. Division 9 Section "Gypsum Board Assemblies" for installation in metal-framed assemblies of insulation specified by reference to this Section.
4. Division 15 Sections "Duct Insulation," "Equipment Insulation," and "Pipe Insulation."

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Verification: Full-size units for each type of exposed insulation indicated.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for insulation products.
- D. Research/Evaluation Reports: For foam-plastic insulation.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of building insulation through one source.

- B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
 - 1. Surface-Burning Characteristics: ASTM E 84.
 - 2. Fire-Resistance Ratings: ASTM E 119.
 - 3. Combustion Characteristics: ASTM E 136.

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.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Extruded-Polystyrene Board Insulation:
 - a. DiversiFoam Products.
 - b. Dow Chemical Company.
 - c. Owens Corning.
 - d. Tenneco Building Products.
 - 2. Cellulose Insulation:
 - a. Nu-Wool Company Inc.
 - 3. Perimeter Fire-Containment Systems:
 - a. United States Gypsum Co.
 - 4. Mineral-Fiber Insulation:
 - a. Calsilite/Johns Manville Corporation.
 - b. Fibrex Insulations Inc.
 - c. Owens Corning.
 - d. Thermafiber.

2.2 INSULATING MATERIALS

- A. General: Provide insulating materials that comply with requirements and with referenced standards.
 - 1. Preformed Units: Sizes to fit applications indicated; selected from manufacturer's standard thicknesses, widths, and lengths.
- B. Extruded-Polystyrene Board Insulation: ASTM C 578, of type and density indicated below, with maximum flame-spread and smoke-developed indices of 75 and 450, respectively:
 - 1. Type IV, 1.60 lb/cu. ft., unless otherwise indicated.
- C. Unfaced Mineral-Fiber Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from basalt (volcanic rock) with maximum flame-spread and smoke-developed indices of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
- D. Cellulosic-Fiber Loose-Fill Insulation: ASTM C 739, chemically treated for flame-resistance and mold-resistance, processing, and handling characteristics. Min. 85% paper content.
 - 1. Self-Supported, Spray-Applied, Cellulosic Insulation: ASTM C 739 and ASTM E-119 for type indicated below, chemically treated for flame-resistance and mold resistance, processing, and handling characteristics.
 - a. Nu•Wool Attic Insulation (or Equal) for installation in attic space.
 - b. Nu•Wool Wallseal Cellulose Insulation (or Equal) spray in-place insulation for wall cavities.
 - c. Density of 3.5 lbs./cu.ft.
 - d. R-value: 3.8 per inch.
 - 1) Attic: R 45

2.3 PERIMETER FIRE-CONTAINMENT SYSTEMS

- A. Where indicated for gaps between the perimeter edge of fire-resistance-rated floor assemblies and non-fire-resistance-rated systems or intersecting walls, provide a perimeter fire-containment system with the fire-test-response characteristics indicated, as determined by testing identical systems per UBC Standard 26-9 and UL 2079 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Materials shall be identified with appropriate markings of applicable testing and inspecting agency.

2.4 VAPOR RETARDERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
- B. Polyethylene Vapor Retarder: ASTM D 4397, 6 mils thick, with maximum permeance rating of 0.13 perm.
- C. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.

2.5 AUXILIARY INSULATING MATERIALS

- A. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.
- B. Eave Ventilation Troughs: Preformed, rigid fiberboard or plastic sheets designed and sized to fit between roof framing members and to provide cross ventilation between insulated attic spaces and vented eaves.

2.6 INSULATION FASTENERS

- 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. Friction fit insulation supports:
 - a. Simpson Strong-Tie Co., Inc. 'IS' Insulation Supports in sizes to fix framing spacing.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for Sections in which substrates and related work are specified and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of substances harmful to insulations or vapor retarders, including removing projections capable of puncturing vapor retarders or of interfering with insulation attachment.
- B. Close off openings in cavities receiving poured-in-place insulation to prevent escape of insulation. Provide bronze or stainless-steel screens (inside) where openings must be maintained for drainage or ventilation.

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 and snow.

- C. Extend 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. Water-Piping Coordination: If water piping is located on inside of insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.
- E. Apply single layer of insulation to produce thickness indicated, unless multiple layers are otherwise shown or required to make up total thickness.

3.4 INSTALLATION OF PERIMETER AND UNDER-SLAB INSULATION

- A. On vertical surfaces, set units in adhesive applied according to manufacturer's written instructions. Use adhesive recommended by insulation manufacturer.
 - 1. If not indicated, extend insulation a minimum of 48 inches below exterior grade line.
- B. Protect below-grade insulation on vertical surfaces from damage during backfilling by applying protection board. Set in adhesive according to insulation manufacturer's written instructions.

3.5 INSTALLATION OF GENERAL BUILDING INSULATION

- A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- B. Seal joints between closed-cell (nonbreathing) insulation units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.
- C. Set vapor-retarder-faced units with vapor retarder to warm side of construction, unless otherwise indicated. Do not obstruct ventilation spaces, except for firestopping.
 - 1. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to surrounding construction to ensure airtight installation.
- D. Install mineral-fiber blankets in cavities formed by framing members according to the following requirements:
 - 1. Use blanket widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.
 - 2. Place blankets in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 - 3. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping stapling flanges to flanges of metal studs.

- E. For wood-framed construction, install mineral-fiber blankets according to ASTM C 1320 and as follows:
 - 1. With faced blankets having stapling flanges, lap blanket flange over flange of adjacent blanket to produce airtight installation after concealing finish material is in place.
- F. Place loose-fill insulation into spaces and onto surfaces as shown, either by pouring or by machine blowing to comply with ASTM C 1015. Level horizontal applications to uniform thickness as indicated, lightly settle to uniform density, but do not compact excessively.
 - 1. For cellulosic loose-fill insulation, comply with the Cellulose Insulation Manufacturers Association's Special Report #3, "Standard Practice for Installing Cellulose Insulation."
- G. Apply self-supported, spray-applied, cellulosic insulation according to manufacturer's written instructions. Do not apply insulation until installation of pipes, ducts, conduits, wiring, and electrical outlets in walls is completed and windows, electrical boxes, and other items not indicated to receive insulation are masked. After insulation is applied, make it even with studs by using method recommended by insulation manufacturer.
- H. Stuff mineral-fiber, loose-fill insulation into miscellaneous voids and cavity spaces. Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft..
- I. Install spray foam insulation solid into voids between framing members and all window and door units.

3.6 INSTALLATION OF PERIMETER FIRE-CONTAINMENT SYSTEMS

- A. Install perimeter fire-containment systems to fill gap between edge of concrete floor slab and back of spandrel panels of exterior curtain-wall systems to comply with fire-containment system manufacturer's written instructions to produce installations with ratings matching those established during fire-test-response testing.

3.7 INSTALLATION OF VAPOR RETARDERS

- A. General: Extend vapor retarder to extremities of areas to be protected from vapor transmission. Secure in place with adhesives or other anchorage system as indicated. Extend vapor retarder to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.
- B. Seal vertical joints in vapor retarders over framing by lapping not less than two wall studs. Fasten vapor retarders to framing at top, end, and bottom edges; at perimeter of wall openings; and at lap joints. Space fasteners 16 inches o.c.
- C. Seal overlapping joints in vapor retarders with adhesives or vapor-retarder tape according to vapor-retarder manufacturer's instructions. Seal butt joints and fastener penetrations with vapor-retarder tape. Locate all joints over framing members or other solid substrates.
- D. Firmly attach vapor retarders to substrates with mechanical fasteners or adhesives as recommended by vapor-retarder manufacturer.

- E. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarder.
- F. Repair any tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarder.

3.8 PROTECTION

- A. Protect installed insulation and vapor retarders 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 07210

SECTION 08110 STEEL DOORS AND FRAMES

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Steel doors, steel frames, louvers, transoms, sidelites and decorative glass and patio doors
- B. Related sections include:
 - 1. Carpentry: Division 6
 - 2. Sealants: Division 7 Joint Sealer Section.
 - 3. Glass and Glazing: Division 8 Glass and Glazing Section
 - 4. Hardware: Division 8 Hardware Section
 - 5. Drywall construction: Division 9 Wall Board Assemblies Section.
 - 6. Painting: Division 9 Painting Sections

1.02 REFERENCES

- A. General: Standards listed by reference including revisions by issuing authority, form a part of this specification section to the extent indicated. Standards listed are identified by the issuing authority, authority abbreviation, designation number, title or other designation, title or other designation established by issuing authority.
- B. American Society for testing and Materials (ASTM):
 - 1. ASTM A366 Standard Specification for Commercial Steel (CS) Sheet, Carbon (0.15 Maximum percent) Cold-Rolled.
 - 2. ASTM A 653 Standard Specification for Steel Sheet Zinc Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot -Dip process.
 - 3. ASTM A924 Standard Specification for General Requirements for steel sheet, metallic Coated by the Hot-Dip process.
 - 4. ASTM D610 Standard Test Method for Evaluating Degree of Rust on Painted Steel Surfaces.
 - 5. ASTM D714 Standard Test Method for Evaluating Degree of Blistering of Paints.
 - 6. ASTM D1622 Standard Test Method for Apparent Density of Rigid Cellular Plastics.
 - 7. ASTM D1654 Standard Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments.
- C. American National Standards Institute (ANSI):
 - 1. ANSI/DHI A115.IG Installation Guide for Doors and Hardware.
 - 2. ANSI/SDI Standard A224.1 Test Procedure and Test Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.

D. National Fire Protection Association (NFPA)

1. NFPA 80 fire Doors and Windows
2. NFPA 252 Fire Tests of Door Assemblies

E. Window and door Manufacturer's Association (WDMA)

1. N.A.F.S. 101/I.S.2/A440
2. AAMA/WDMA 101/I.S.2/-NAFS-02
3. ANSI/AAMA 101/I.S.2-97

F. Warnock Hersey, Inc. (WHI):

1. WHI Directory of Listed Products.
2. WHI Directory of Positive Pressure-Rated Door Assemblies and Components
3. SpecDirect web based listing of fire-rated components and systems.

1.03 SYSTEM DESCRIPTION

- A. Performance Requirements: provide metal doors and frames which have been manufactured, fabricated and installed to maintain performance criteria stated by the manufacturer without defects, damage or failure.

1.04 SUBMITTALS

- A. General: Submit listed submittals in accordance with Conditions of the Contract and Division 1 Submittals Procedures Section.
- B. Product Data: Submit Product Data, including manufacturers' product sheet for specified products.
- C. Shop Drawings: Submit Shop Drawings showing layout, profiles and product components including anchorage and accessories.
1. Indicate door type, frame, steel, core, material thickness, reinforcements, anchorages, exposed fasteners, hardware locations, openings (glazed, paneled or louvered) and hardware arrangement.
 2. Include schedule identifying each unit with door marks or numbers referencing schedules and drawings.
- D. Samples: Submit selection and verification samples for finishes, colors, and textures. Coordinate with Division 9 Painting Section for paint finishes.
- E. Quality Assurance Submittals: Submit the following:
1. Certificates: Product certificates signed by the manufacturer certifying that materials comply with specified performance characteristics and criteria and physical requirements.
 2. Manufacturer's instructions: Manufacturer's Installation Instructions.

3. Manufacturer's Field Reports: Specified herein.

F. Closeout Submittals: Submit the following:

1. Operation and maintenance data: Operation and maintenance data for installed products in accordance with Division 1 Closeout Submittals (Maintenance Data and Operation Data) section. Include methods for maintaining installed products and precautions against cleaning materials and methods detrimental to finishes and performance.
2. Warranty: Warranty documents specified herein.

1.05 QUALITY ASSURANCE

A. Installer qualifications: Installer should be experienced in performing work of this section and should have specialized in the installation of work similar to that required for this project.

1. Certificate: When requested submit certificate indicating qualifications.

B. Regulatory requirements: Specify applicable requirements of regulatory agencies.

1. Labeled Door and frame construction. Where noted or required provide Warnock Hersey labels with appropriate fire and or smoke resistance ratings for the opening as indicated.
2. Provide door and frame assemblies with the construction and assembly configurations as required by the National Accreditation Management Institute pursuant to meeting code and or local requirements for structural and or impact performance.

C. Mock-ups: Install at project site a job mock-up using acceptable products and manufacturer approved installation methods. Obtain owner's and Architect's acceptance of finish color, texture pattern, and workmanship standards. Comply with Division 1 Quality Control (Mock-ups requirements) Section.

1. Mock-up size: Specify size of mock-up.
2. Maintenance: maintain mock-up during construction for workmanship comparison; remove and legally dispose of mock-up if it is no longer required.
3. Incorporation: Mock up shall be incorporated into final construction upon Owner or Architect's approval.

D. Pre-installation Meetings: Conduct preinstallation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions, and manufacturer's warranty requirements.

1.06 DELIVERY, STORAGE and HANDLING

A. General: comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.

- B. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
 - 1. Handle and store products according to Therma-Tru recommendations published in technical materials. Leave product wrapped or otherwise protected and under clean dry storage conditions until required.
- C. Storage and Protection: Store materials protected from exposure to harmful weather conditions, at temperature and humidity conditions recommended by the manufacturer.
 - 1. Pre-Hung Door/frame assemblies: Pre-hung Units shall be stored in an upright position under cover on building site on wood sills or floor in a manner that will prevent rust and damage. Remove plastic wrap packaging as required from packaged Pre-hungs as necessitated by high humidity conditions. Avoid creating a humidity chamber by using a plastic or canvas shelter and not venting the area covered.
 - 2. Door Storage: Units shall be stored in an upright position under cover on building site on wood sills or floor in a manner that will prevent rust and damage. Remove plastic wrap packaging as required from packaged doors as necessitated by high humidity conditions. Avoid creating a humidity chamber by using a plastic or canvas shelter and not venting the area covered. Doors shall be protected at corners to prevent damage or marring to finish.
 - 3. Frame Storage: Frame Units shall be stored under cover on building site on wood sills or floor in a manner that will prevent rust and damage. Remove plastic wrap packaging as required from packaged Pre-hungs as necessitated by high humidity conditions. Avoid creating a humidity chamber by using a plastic or canvas shelter and not venting the area covered.

1.07 PROJECT CONDITIONS

- A. Field measurements: Verify actual measurements/openings by field measurements before fabrication: show recorded measurements on shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

1.08 WARRANTY

- A. Project Warranty: Refer to conditions of the contract for project warranty provisions.
- B. Manufacturer's warranty: Submit for owner's acceptance, manufacture's standard warranty documented by an authorized company official.
 - 1. Manufacturer's warranty commencing on shipment date.

PART 2 PRODUCTS

2.01 STEEL DOORS AND FRAMES 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. Steel Doors and Frames (General)
 - a. Ceco Door Products; a United Dominion Company.
 - b. Curries Company.
 - c. Kewanee Corporation (The).
 - d. Republic Builders Products.
 - e. Steelcraft; a division of Ingersoll-Rand.
 - f. BenchmarkHMF Commercial Door Systems
a division of Therma-Tru Doors
2. Apartment Entry and Exterior Steel Doors And Frames:
 1. Therma-Tru Multi-Family/Light Commercial Prehung Door Systems Contact: 1750 Indian Wood Circle, Maumee, OH 43537; Telephone: (419) 891-7400; Fax: (419) 482-9100; Web: www.thermatru.com
 2. Embossed Models in 24 ga.
 3. Adjusta-Fit[®]- Commercial grade 18 gauge steel wall adjustable frame engineered for optimum fit and performance for masonry and stud construction. Ideal for unit entries from outside or corridor.

B. Sizes:

1. Standard door sizes; as indicated on drawings.

C. Fire rating: Provide doors and frames with Warnock Hersey (Intertek Services) where specified.

D. Sound rating: Provide sound transmission class of standard units tested as required

E. Finishes:

1. Exposed surfaces on doors and frames shall be cleaned and painted with a rust inhibiting primer. Prime painted system shall be tested at a recognized independent laboratory in accordance with ANSI/SDI standard A.250.10 and meet the acceptance criteria as outlined in that document and required by the architect or owner.
2. Colors: Finish doors with primer paint ready for field painting.

2.03 MATERIALS

A. Steel materials:

1. Cold rolled steel: comply with ASTM A366 cold rolled carbon sheet steel.
2. Galvanized steel: comply with ASTM A924 general requirements for steel metallic coated by hot dip process.

- B. Primer materials: Comply with ANSI A250.10 test procedures and acceptance criteria for prime painted steel surfaces for steel doors and frames.
- C. Painted finish material: Comply with ANSI A250.3 test procedures and acceptance criteria for factory applied finish for steel doors and frames.
- D. Door color paint material: Provide manufacturer's standard finish and color.

2.04 DOORS

- A. Therma-Tru Light Commercial and Multi-Family Doors; Therma-Tru standard, ProEdge adjustable hinge and 12-24 TR Series steel doors
 - 1. Fire-Rating- All Doors available with up to 90 minute Positive Pressure Fire-Rating from Warnock Hersey.
 - 2. Doors shall have four inch high hinge preps machined, reinforced as follows:
 - a. ProEdge™ adjustable hinge-16 gage plates counter-sunk and extruded and tapped to 10 gauge equivalent to receive 12-24 screws for secure anchoring of hinges
 - 3. Steel face sheets shall be 24 Therma-Tru galvanized tension leveled steel for superior flatness & enhanced corrosion resistance.
 - 4. Paint Finish- Doors shall receive a factory prime finish for added rust inhibition. Primed surface shall be suitable for maximum adhesion of finish top coat.
 - 5. Insulated- Doors shall be foamed in place, stiffened & structurally reinforced with environmentally friendly polyurethane and bonded to inside skins with minimal voids.
 - 6. Rugged Construction- The door edges shall be mechanically overlapped and reinforced the full height on both sides of door and adhered with foamed in place polyurethane. The door shall be
 - 7. Stiffened with integrally formed top and bottom rails securely welded at top and bottom of door with two welds each.
 - 8. Advanced Lock Reinforcing -Latching and deadlocking hardware is supported with an advanced injection molded composite lock reinforcement with superior screw holding power. Advanced door avoids the problem of 'telegraphing' of the lock reinforcement typical with wood blocks. Design also allows for uniform foam flow for a flatter door face at lock area.
 - 9. Lock Machining- Lock preparations include 2-1/8" face bores at both 2-3/4" & 2-3/8" backsets. Edge preps for cylindrical preps shall feature 2-1/4" x 1-1/8". Deadlock edge prep located at 5-1/2" centers to latching edge prep. Deadlock cross bore optional.
 - 10. Mortise lock preps available for card reader and other commercial applications.
 - 11. Surface Mounted Hardware- Exit hardware and closure reinforcements shall be fabricated from 16 gage steel x 5" x 20" securely attached to both skins of the door.
 - 12. Screw applied bottom sweep for enhanced water and air infiltration resistance. Slide on double bulb sweep option for ProEdge doors with screwless application.

- B. Standard Flush Steel Doors.
1. General: Fabricate steel door and frame units to comply with ANSI A250.8 and to be rigid, neat in appearance, and free from defects including warp and buckle. Where practical, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at Project site.
 2. Exterior Door Construction: For exterior locations and elsewhere as indicated, fabricate doors, panels, and frames from metallic-coated steel sheet. Close top and bottom edges of doors flush as an integral part of door construction or by addition of 0.053-inch- thick, metallic-coated steel channels with channel webs placed even with top and bottom edges.
 3. Interior Door and Panel Faces: Fabricate exposed faces of doors and panels, including stiles and rails of nonflush units, from the following material:
 4. Cold-rolled steel sheet, unless otherwise indicated.
 5. Core Construction: Manufacturer's standard core construction that produces a door complying with SDI standards.
 6. Clearances for Non-Fire-Rated Doors: Not more than 1/8 inch at jambs and heads, except not more than 1/4 inch between pairs of doors. Not more than 3/4 inch at bottom.
 7. Single-Acting, Door-Edge Profile: Beveled edge, unless square edge is indicated.
 8. Double-Acting, Door-Edge Profile: Round vertical edges with 2-1/8-inch radius.
 9. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."
 10. Fabricate concealed stiffeners, reinforcement, edge channels, louvers, and moldings from either cold- or hot-rolled steel sheet.
 11. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat or oval heads for exposed screws and bolts.
 12. Thermal-Rated (Insulating) Assemblies: At exterior locations and elsewhere as shown or scheduled, provide doors fabricated as thermal-insulating door and frame assemblies and tested according to ASTM C 236 or ASTM C 976 on fully operable door assemblies.
 - a. Unless otherwise indicated, provide thermal-rated assemblies with U-value of 0.41 Btu/sq. ft. x h x deg F or better.
 - b. Unless otherwise indicated, provide acoustical assemblies with STC sound ratings of 33 or better.
 13. Hardware Preparation: Prepare doors and frames to receive mortised and concealed hardware according to final door hardware schedule and templates provided by hardware supplier. Comply with applicable requirements in ANSI A250.6 and ANSI A115 Series specifications for door and frame preparation for hardware.
 14. Reinforce doors to receive surface-applied hardware. Drilling and tapping for surface-applied hardware may be done at Project site.
- C. Vision Lite Systems: Manufacturer's standard kits consisting of glass lite moldings to accommodate glass thickness and size of vision lite indicated.

2.05 MANUFACTURED FRAME UNITS

A. Therma-Tru Light Commercial and Multi-Family Steel Frames-Adjusta-Fit. Adjusta-Fit[®] split-steel frame technology ensures optimum fit and performance. Ideal for interior as well as exterior applications, for suite entries from the outside or corridor.

1. Acceptable product: Therma-Tru Adjust-Fit Steel Frame.
2. Construction: Two-piece frames constructed of galvanized steel conforming to ASTM A 653, commercial quality, with A 40 coating
3. Designed for use in remodeling and new construction applications.
4. 90-minute positive pressure fire-rated with available 20-minute smoke rating from ITS/Warnock Hersey.
5. Base frame component: 18 gauge. The heaviest gauge available for split adjustable pre-hung steel frames.
6. Closure frame component: 22 gauge.
7. Profiles: Interlocking base and closure profiles for 1/2 inch throat dimension adjustment; manufacturer's standard throat dimensions to accommodate wall thicknesses 3-3/8 inches to 10 inches.
8. Single rabbet; rabbet for 1-3/4 inch door thickness on stop side of frame, 5/8 inch high stop with kerf for weatherstrip, 1-13/16 inches wide trim face, no return legs.
9. Corners: Butted at intersections of head and jambs.
10. Hardware preparation: Frames prepared for hardware, reinforced as follows:
 - a. Hinges: Stamped integral pocket provided for full- 4-inches by 4-hinges. located in accordance with manufacturers specifications
 - b. Strike: Reinforcement integral with frame, commercial strike option of 4-7/8" 115.1 ANSI prep.
 - c. Strike adapter plate for 'T' strike or full lip strike, both with or without deadbolt
 - d. Surface-mounted hardware: Reinforcement of minimum 16 gauge provided for other door hardware.
11. Weatherstrip: Manufacturer's standard foam filled compression weatherstrip, installed in kerf of frame.
12. Threshold: Barrier-free ADA-compliant type of extruded aluminum, mill finish with safety ribs, 4 inches wide by 1/2 inch height; ribbed extruded vinyl sweep across door bottom.
13. Frame finish: Factory-applied.
14. Wood casings: Specified in Section 06200
15. Composite casings.

B. STANDARD METAL FRAMES

1. Provide steel frames for doors, transoms, sidelights, borrowed lights, and other openings that comply with ANSI A250.8 and with details indicated for type and profile. Conceal fastenings, unless otherwise indicated.
 - a. 16 gauge for flush doors.
2. Frame Construction: Fabricate frames to shape shown.
 - a. Fabricate knock-down, drywall slip-on frames for in-place gypsum board partitions.
 - b. For exterior applications, fabricate frames with mitered or coped and continuously welded corners and seamless face joints.

3. Door Silencers: Except on weather-stripped frames, fabricate stops to receive three silencers on strike jambs of single-door frames and two silencers on heads of double-door frames. No 'stick-on' silencers allowed.
4. Supports and Anchors: Fabricated from not less than 0.042-inch- thick, electrolytic zinc-coated or metallic-coated steel sheet.
5. Inserts, Bolts, and Fasteners: Manufacturer's standard units. Where zinc-coated items are to be built into exterior walls, comply with ASTM A 153/A 153M, Class C or D as applicable.
6. Locate hardware as indicated on Shop Drawings or, if not indicated, according to ANSI A250.8.

2.06 RELATED MATERIALS

- A. Glazing Stops: Manufacturer's standard, formed from 0.032-inch- thick s steel sheet.
 - a. Provide nonremovable stops on outside of exterior doors and on secure side of interior doors for glass, louvers, and other panels in doors.
 - b. Provide screw-applied, removable, glazing stops on inside of glass, louvers, and other panels in doors.
- B. Astragals: As required by NFPA 80 to provide fire ratings indicated.

2.07 SOURCE QUALITY

- A. Source quality: Obtain metal door and frame products from manufacturers Inspected and audited by third party inspection agencies such as Intertek Services and the National Accreditation Management Institute.

PART 3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

- A. Compliance: Comply with manufacturer's product data, including product technical bulletins, product catalog installation instructions and product carton instructions for installation.

3.02 EXAMINATION

- A. Site Verification of Conditions: Verify that substrate conditions, which have been previously installed under other sections, are acceptable for product installation in accordance with manufacturer's instructions.
 1. Verify that door frame openings are installed plumb, true and level before beginning installation process. Select fasteners of adequate type, number and quality to perform the intended functions.

3.03 PREPARATION

A. Surface Preparation:

1. Preparation for Field Painting: Before application of finish coat of paint, surfaces must be dry and free of dirt, oil and dust. Finish coat shall be applied over a film which is intact. Scratches or bare edges shall be field primed with a rust inhibiting paint before top coating. Comply with instructions on finish coat application provided by paint manufacturer.

3.04 INSTALLATION

A. General:

1. Set frame product plumb, square, aligned and without twist at correct elevation.
2. Frame Installation: Install steel frames. Installation shall be plumb, straight and true, rigidly secured in place, and properly braced. Comply with Manufacturer's installation instructions and ANSI/DHI A115-IG installation guide.

B. Installation:

1. Secure anchorages and connections to adjacent construction.
2. Install hardware in accordance with manufacturers' templates and instructions.
3. Finish exposed field welds to present a smooth uniform surface. Touch up with a rust inhibitive primer.
4. Touch up exposed surfaces scratched or marred during shipment, installation or handling with a rust inhibitive primer.
5. Install glazing materials and compression weatherstrip.

C. Installation Reference Standard(s): Install metal doors and frames in accordance with requirements of applicable reference standards.

1. Comply with Door and Hardware Institute (DHI) installation standards.
2. Comply with Steel Door Institute (SDI) installation and maintenance standards.
3. Comply with NFPA80 installation standards.

D. Fire-Rated Construction:

1. Regulatory Requirements: Install fire labeled steel door and frame product in accordance with NFPA80, current edition, unless specified otherwise.

E. Related Products Installation: Refer to other sections listed under Related Sections for related products installation.

3.05 FIELD QUALITY REQUIREMENTS

- A. Manufacturer's Field Services: Upon Owner's request, provide manufacturer's field service consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

3.06 ADJUSTING

- A. Adjusting: Adjust hinge sets, locksets and other hardware. Lubricate using a suitable lubricant compatible with door and frame coatings.

3.07 CLEANING

- A. Cleaning: Remove temporary coverings and protection of adjacent work areas. Repair or replace products that have been installed and are damaged. Clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance. Remove construction debris from project site and legally dispose of debris.

3.08 PROTECTION

- A. Protection: Protect installed product and finish surfaces from damage during construction.

END OF SECTION

SECTION 08410 - ALUMINUM ENTRANCES AND STOREFRONTS

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.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Exterior storefront systems.
 - 2. Interior storefront systems.
- B. Related sections include the following:
 - 1. Division 7 Section "Joint Sealants" for joint sealants installed as part of aluminum entrance and storefront systems.
 - 2. Division 8 Section "Glazing."

1.3 SYSTEM DESCRIPTION

- A. General: Provide aluminum entrance and storefront systems capable of withstanding loads and thermal and structural movement requirements indicated without failure, based on testing manufacturer's standard units in assemblies similar to those indicated for this Project. Failure includes the following:
 - 1. Air infiltration and water penetration exceeding specified limits.
 - 2. Framing members transferring stresses, including those caused by thermal and structural movement, to glazing units.
- B. Glazing: Physically and thermally isolate glazing from framing members.
- C. Glazing-to-Glazing Joints: Provide glazing-to-glazing joints that accommodate thermal and mechanical movements of glazing and system, prevent glazing-to-glazing contact, and maintain required edge clearances.
- D. Structural Silicone-Sealant Joints: Provide systems with structural silicone-sealant joints complying with the following requirements:
 - 1. Tensile or shear stress in joints is less than 20 psi.
 - 2. Structural sealant withstands tensile and shear stresses imposed by storefront systems without failing adhesively or cohesively. When tested for adhesive compatibility with each substrate and condition required, provide sealant that fails cohesively before it fails adhesively. Adhesive and cohesive failure are defined as follows:

- a. Adhesive failure occurs when sealant pulls away from a substrate cleanly, leaving no sealant material behind.
 - b. Cohesive failure occurs when sealant breaks or tears within a joint but does not separate from each substrate because sealant-to-substrate bond strength exceeds sealant's internal strength.
- E. Thermally Broken Construction: Provide systems that isolate aluminum exposed to exterior from aluminum exposed to interior with a material of low thermal conductance.
- F. Wind Loads: Provide entrance and storefront systems, including anchorage, capable of withstanding wind-load design pressures calculated according to requirements of authorities having jurisdiction or the American Society of Civil Engineers' ASCE 7, "Minimum Design Loads for Buildings and Other Structures," 6.4.2, "Analytical Procedure," whichever are more stringent.
1. Deflection of framing members in a direction normal to wall plane is limited to 1/175 of clear span or **3/4 inch**, whichever is smaller, unless otherwise indicated.
 2. Static-Pressure Test Performance: Provide entrance and storefront systems that do not evidence material failures, structural distress, failure of operating components to function normally, or permanent deformation of main framing members exceeding 0.2 percent of clear span when tested according to ASTM E 330.
 - a. Test Pressure: 150 percent of inward and outward wind-load design pressures.
 - b. Duration: As required by design wind velocity; fastest **1 mile** of wind for relevant exposure category.
- G. Hurricane-Resistance Test Performance: Provide entrance and storefront systems that pass large and small missile-impact tests, as required by systems' location above grade, and cyclic-pressure tests according to testing requirements of authorities having jurisdiction.
- H. Seismic Loads: Provide entrance and storefront systems, including anchorage, capable of withstanding the effects of earthquake motions calculated according to requirements of authorities having jurisdiction or ASCE 7, "Minimum Design Loads for Buildings and Other Structures," Section 9, "Earthquake Loads," whichever are more stringent.
- I. Dead Loads: Provide entrance- and storefront-system members that do not deflect an amount which will reduce glazing bite below 75 percent of design dimension when carrying full dead load.
 1. Provide a minimum **1/8-inch** clearance between members and top of glazing or other fixed part immediately below.
- J. Live Loads: Provide entrance and storefront systems, including anchorage, that accommodate the supporting structures' deflection from uniformly distributed and concentrated live loads indicated without failure of materials or permanent deformation.
- K. Air Infiltration: Provide entrance and storefront systems with permanent resistance to air leakage through fixed glazing and frame areas of not more than **0.06 cfm/sq. ft.** of fixed wall area when tested according to ASTM E 283 at a static-air-pressure difference of **1.57 lbf/sq. ft.** .

- L. Water Penetration: Provide entrance and storefront systems that do not evidence water leakage through fixed glazing and frame areas when tested according to ASTM E 331 at minimum differential pressure of 20 percent of inward-acting wind-load design pressure as defined by ASCE 7, "Minimum Design Loads for Buildings and Other Structures," but not less than **6.24 lbf/sq. ft.** . Water leakage is defined as follows:
 - 1. Uncontrolled water infiltrating systems or appearing on systems' normally exposed interior surfaces from sources other than condensation. Water controlled by flashing and gutters that is drained back to the exterior and cannot damage adjacent materials or finishes is not water leakage.
- M. Thermal Movements: Provide entrance and storefront systems, including anchorage, that accommodate thermal movements of systems and supporting elements resulting from the following maximum change (range) in ambient and surface temperatures without buckling, damaging stresses on glazing, failure of joint sealants, damaging loads on fasteners, failure of doors or other operating units to function properly, and other detrimental effects.
 - 1. Temperature Change (Range): **120 deg F**, ambient; **180 deg F** , material surfaces.
- N. Structural-Support Movement: Provide entrance and storefront systems that accommodate structural movements including, but not limited to, sway and deflection.
- O. Condensation Resistance: Provide storefront systems with condensation resistance factor (CRF) of not less than 45 when tested according to AAMA 1503.1.
- P. Average Thermal Conductance: Provide storefront systems with average U-values of not more than **0.63 Btu/sq. ft. x h x deg F** when tested according to AAMA 1503.1.
- Q. Dimensional Tolerances: Provide entrance and storefront systems that accommodate dimensional tolerances of building frame and other adjacent construction.

1.4 SUBMITTALS

- A. Product Data: For each product specified. Include details of construction relative to materials, dimensions of individual components, profiles, and finishes.
- B. Shop Drawings: For entrance and storefront systems. Show details of fabrication and installation, including plans, elevations, sections, details of components, provisions for expansion and contraction, and attachments to other work.
 - 1. For entrance systems, include hardware schedule and indicate operating hardware types, quantities, and locations.
- C. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for units with factory-applied color finishes.
- D. Samples for Verification: Of each type of exposed finish required in manufacturer's standard sizes. Where finishes involve normal color and texture variations, include Sample sets showing the full range of variations expected.

- E. Cutaway Sample: Of each vertical-to-horizontal framing intersection of systems, made from minimum 6-inch lengths of full-size components and showing details of the following:
 - 1. Joinery.
 - 2. Anchorage.
 - 3. Expansion provisions.
 - 4. Glazing.
 - 5. Flashing and drainage.
 - 6. Structural-sealant joints.
- F. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.
- G. Sealant Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating that materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with sealants; include joint sealant manufacturers' written interpretation of test results relative to sealant performance and recommendations for primers and substrate preparation needed to obtain adhesion.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer to assume engineering responsibility and perform work of this Section who has specialized in installing entrance and storefront systems similar to those required for this Project and who is acceptable to manufacturer.
 - 1. Engineering Responsibility: Prepare data for entrance and storefront systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
- B. Source Limitations: Obtain each type of entrance and storefront system through one source from a single manufacturer.
- C. Product Options: Drawings indicate size, profiles, and dimensional requirements of entrance and storefront systems and are based on the specific systems indicated. Other manufacturers' systems with equal performance characteristics may be considered. Refer to Division 1 Section "Substitutions."
 - 1. Do not modify intended aesthetic effect, as judged solely by Architect, except with Architect's approval and only to the extent needed to comply with performance requirements. Where modifications are proposed, submit comprehensive explanatory data to Architect for review.
- D. Welding Standards: Comply with applicable provisions of AWS D1.2, "Structural Welding Code--Aluminum."

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.7 WARRANTY

- A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
 - 1. Structural failures including, but not limited to, excessive deflection.
 - 2. Adhesive sealant failures.
 - 3. Cohesive sealant failures.
 - 4. Failure of system to meet performance requirements.
 - 5. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 6. Failure of operating components to function normally.
 - 7. Water leakage through fixed glazing and frame areas.
- B. Warranty Period: 5 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. EFCO Corp.
 - 2. International Aluminum Corporation; U.S. Aluminum.
 - 3. Kawneer Company, Inc.
 - 4. Tubelite Architectural Systems.

2.2 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated, complying with the requirements of standards indicated below.
 - 1. Sheet and Plate: **ASTM B 209**.
 - 2. Extruded Bars, Rods, Shapes, and Tubes: **ASTM B 221**.
 - 3. Extruded Structural Pipe and Tubes: **ASTM B 429**.
 - 4. Bars, Rods, and Wire: **ASTM B 211**.
 - 5. Welding Rods and Bare Electrodes: **AWS A5.10**.
- B. Steel Reinforcement: Complying with **ASTM A 36** for structural shapes, plates, and bars; **ASTM A 611** for cold-rolled sheet and strip; or **ASTM A 570** for hot-rolled sheet and strip.

- C. Glazing as specified in Division 8 Section "Glazing."
- D. Glazing Gaskets: Manufacturer's standard pressure-glazing system of black, resilient glazing gaskets, setting blocks, and shims or spacers, fabricated from an elastomer of type and in hardness recommended by system and gasket manufacturer to comply with system performance requirements. Provide gasket assemblies that have corners sealed with sealant recommended by gasket manufacturer.
- E. Spacers, Setting Blocks, Gaskets, and Bond Breakers: Manufacturer's standard permanent, nonmigrating types in hardness recommended by manufacturer, compatible with sealants, and suitable for system performance requirements.

2.3 COMPONENTS

- A. Doors: Provide manufacturer's standard ~~1-3/4-inch-~~ thick glazed doors with minimum ~~0.125-inch-~~ thick, extruded tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deep penetration and fillet welded or that incorporate concealed tie-rods.
 - 1. Glazing Stops and Gaskets: Provide manufacturer's standard snap-on extruded-aluminum glazing stops and preformed gaskets.
 - 2. Stile Design: Wide stile; over ~~4 inches~~ wide.
- B. Brackets and Reinforcements: Provide manufacturer's standard brackets and reinforcements that are compatible with adjacent materials. Provide 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. Reinforce members as required to retain fastener threads.
 - 2. Do not use exposed fasteners, except for hardware application. For hardware application, use countersunk Phillips flat-head machine screws finished to match framing members or hardware being fastened, unless otherwise indicated.
- D. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123 or ASTM A 153 requirements.
- E. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing, compatible with adjacent materials, and of type recommended by manufacturer.
- F. Weather Stripping: Manufacturer's standard replaceable weather stripping as follows:
 - 1. Compression Weather Stripping: Molded neoprene complying with ASTM D 2000 requirements or molded PVC complying with ASTM D 2287 requirements.
 - 2. Sliding Weather Stripping: Wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing complying with AAMA 701 requirements.

2.4 HARDWARE

- A. General: Provide heavy-duty hardware units indicated in sizes, number, and type recommended by manufacturer for entrances indicated. Finish exposed parts to match door finish, unless otherwise indicated.
- B. Ball-Bearing Butts: ANSI/BHMA A156.1, Grade 1, 5-knuckle, 4-1/2-by-4-inch ball-bearing butts. Provide nonremovable pins at hinges exposed to door outside and provide nonferrous hinges for applications exposed to weather. Provide 3 hinges at each leaf for doors up to 36 inches wide and 80 inches tall; provide 4 hinges at each leaf for taller doors.
- C. Closers, General: Comply with manufacturer's recommendations for closer size, depending on door size, exposure to weather, and anticipated frequency of use.
 - 1. Closing Cycle: Comply with requirements of authorities having jurisdiction or the Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," whichever are more stringent.
 - 2. Opening Force: Comply with the following maximum opening-force requirements for locations indicated:
 - a. Exterior Doors: 15 lbf .
 - b. Interior Doors: 5 lbf .
- D. Door-Mounted Holders: ANSI/BHMA A156.16, Grade 1, flip-up type for mounting on door bottom rail and with rubber shoe.
- E. Door Stops: ANSI/BHMA A156.16, Grade 1, floor- or wall-mounted door stop, as appropriate for door location indicated, with integral rubber bumper.
- F. Cylinders: As specified in Division 8 Section "Door Hardware."
 - 1. Provide outside mortise cylinders.
- G. Deadlock: Manufacturer's standard mortise deadlock with minimum 1-inch- long throw bolt and complying with ANSI/BHMA A156.5, Grade 1 requirements.
- H. Vertical-Rod Exit Devices: Concealed, vertical-rod exit device complying with UL 305 requirements, with 2-point top and bottom latching that is released by a full-width crash bar or when locked down (dogged) by lock cylinder or retracting screws beneath housing.
- I. Pull Handles: As selected by Architect from manufacturer's full range of pull handles and plates.
- J. Push Bars: As selected by Architect from manufacturer's full range of full-door-width, single-bar push bars.
 - 1. Provide push plate affixed to push bar.

- K. Thresholds: At exterior doors, provide manufacturer's standard threshold with cutouts coordinated for operating hardware, with anchors and jamb clips, and not more than **1/2-inch**-high, with beveled edges providing a floor level change with a slope of not more than 1:2, and in the following material:
 - 1. Material: Aluminum, mill finish.
- L. Weather Sweeps: Manufacturer's standard weather sweep for application to exterior door bottoms and with concealed fasteners on mounting strips.

2.5 FABRICATION

- A. General: Fabricate components that, when assembled, will have accurately fitted joints with ends coped or mitered to produce hairline joints free of burrs and distortion. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.
 - 1. Fabricate components for screw-spline frame construction.
- B. Forming: Form shapes with sharp profiles, straight and free of defects or deformations, before finishing.
- C. Prepare components to receive concealed fasteners and anchor and connection devices.
- D. Fabricate components to drain water passing joints and condensation and moisture occurring or migrating within the system to the exterior.
- E. Welding: Weld components to comply with referenced AWS standard. Weld before finishing components to greatest extent possible. 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.
- F. Glazing Channels: Provide minimum clearances for thickness and type of glass indicated according to FGMA's "Glazing Manual."
- G. Metal Protection: Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- H. Storefront: Fabricate framing in profiles indicated for flush glazing (without projecting stops). Provide subframes and reinforcing of types indicated or, if not indicated, as required for a complete system. Factory assemble components to greatest extent possible. Disassemble components only as necessary for shipment and installation.

- I. Entrances: Fabricate door framing in profiles indicated. Reinforce as required to support imposed loads. Factory assemble door and frame units and factory install hardware to greatest extent possible. Reinforce door and frame units as required for installing hardware indicated. Cut, drill, and tap for factory-installed hardware before finishing components.
 1. Exterior Doors: Provide compression weather stripping at fixed stops. At other locations, provide sliding weather stripping retained in adjustable strip mortised into door edge.
 2. Interior Doors: Provide ANSI/BHMA A156.16 silencers at stops to prevent metal to metal contact. Provide 3 silencers on strike jamb of single-door frames and 2 silencers on head of double-door frames.

2.6 ALUMINUM FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.
- D. 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 manufacturer's written instructions.
 1. Fluoropolymer 2-Coat Coating System: Manufacturer's standard 2-coat, thermocured system composed of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 605.2.
 - a. Color and Gloss: As selected by Architect from manufacturer's full range of choices for color and gloss.

2.7 STEEL PRIMING

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying primer.
- B. Surface Preparation: Perform manufacturer's standard cleaning operations to remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel.
- C. Priming: Apply manufacturer's standard corrosion-resistant primer immediately after surface preparation and pretreatment.

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 entrance and storefront systems. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Comply with manufacturer's written instructions for protecting, handling, and installing entrance and storefront systems. Do not install damaged components. Fit frame joints to produce hairline joints free of burrs and distortion. Rigidly secure nonmovement joints. Seal joints watertight.
- B. Metal Protection: Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose. 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 and condensation and moisture occurring or migrating within the system to the exterior.
- D. Set continuous sill members and flashing in a full sealant bed to provide weathertight construction, unless otherwise indicated. Comply with requirements of Division 7 Section "Joint Sealants."
- E. Install framing components plumb and true in alignment with established lines and grades without warp or rack of framing members.
- F. Install entrances plumb and true in alignment with established lines and grades without warp or rack. Lubricate operating hardware and other moving parts according to hardware manufacturers' written instructions.
 - 1. Install surface-mounted hardware according to manufacturer's written instructions using concealed fasteners to greatest extent possible.
- G. Install glazing to comply with requirements of Division 8 Section "Glazing," unless otherwise indicated.
 - 1. Prepare surfaces that will contact structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.
 - 2. Install structural silicone sealant according to sealant manufacturer's written instructions.
 - 3. Mechanically fasten glazing in place until structural sealant is cured.
 - 4. Remove excess sealant from component surfaces before sealant has cured.

- H. Install secondary-sealant weatherseal according to sealant manufacturer's written instructions to provide weatherproof joints. Install joint fillers behind sealant as recommended by sealant manufacturer.
- I. Erection Tolerances: Install entrance and storefront systems to comply with the following maximum tolerances:
 - 1. Variation from Plane: Limit variation from plane or location shown to **1/8 inch in 12 feet** ,**1/4 inch** over total length.
 - 2. Alignment: Where surfaces abut in line, limit offset from true alignment to **1/16 inch** . Where surfaces meet at corners, limit offset from true alignment to **1/32 inch** .
 - 3. Diagonal Measurements: Limit difference between diagonal measurements to **1/8 inch** .

3.3 ADJUSTING AND CLEANING

- A. Adjust doors and hardware to provide tight fit at contact points and weather stripping, smooth operation, and weathertight closure.
- B. Remove excess sealant and glazing compounds, and dirt from surfaces.

3.4 PROTECTION

- A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure entrance and storefront systems are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 08410

SECTION 09650 - RESILIENT FLOORING (Resilient Linoleum Tile Flooring)

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Resilient linoleum tile flooring.
 - 2. Homogeneous linoleum floor tile and sheet, full spread adhesive method and seamless installation, Topshield™ finish
- B. Related Sections: Section(s) related to this section include:
 - 1. Concrete: Refer to Division 3 Concrete Sections for cast-in-place concrete, concrete toppings, and cementitious underlayments.
 - 2. Wood Subflooring: Refer to Division 6 Carpentry Section for wood subflooring and wood underlayment.
 - 3. Resilient Flooring Accessories: Refer to Division 9 Finishes Sections for resilient wall bases, reducer strips, metal edge strips and other resilient flooring accessories.

1.02 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. ASTM E 648 Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Energy Source.
 - 2. ASTM E 662 Test Method for Specific Density of Smoke Generated by Solid Materials.
 - 3. ASTM F 710 Practice for Preparing Concrete Floors and Other Monolithic Floors to Receive Resilient Flooring.
 - 4. ASTM F 970 Test Method for Static Load Limit.
- B. National Fire Protection Association (NFPA):
 - 1. NFPA 253 Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Energy Source.
 - 2. NFPA 258 Test Method for Specific Density of Smoke Generated by Solid Materials.

1.03 SYSTEM DESCRIPTION

- A. Performance Requirements: Provide flooring which has been manufactured, fabricated and installed to performance criteria certified by manufacturer without defects, damage, or failure.

1.04 SUBMITTALS

- A. General: Submit listed submittals in accordance with "Conditions of the Contract" and Division 1 Submittal Procedures Section.
- B. Product Data: Submit product data, including manufacturer's SPEC-DATA product sheet, for specified products.
- C. Samples: Submit selection and verification samples for finishes, colors, and textures.

- D. Quality Assurance Submittals: Submit the following:
 - 1. Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.
 - 2. Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria, and physical requirements.
 - 3. Manufacturer's Instructions: Manufacturer's installation instructions.
- E. Closeout Submittals: Submit the following:
 - 1. Operation and Maintenance Data: Operation and maintenance data for installed products in accordance with Division 1 Closeout Submittals (Maintenance Data and Operation Data) Section. Include methods for maintaining installed products, and precautions against cleaning materials and methods detrimental to finishes and performance.
 - 2. Warranty: Warranty documents specified herein.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Installer experienced in performing work of this section who has specialized in installation of work similar to that required for this project.
 - 1. Engage Installer who is certified in writing by resilient flooring manufacturer as qualified for installation of their products.
 - 2. Certificate: Submit certificate indicating qualification.
- B. Regulatory Requirements:
 - 1. Fire Performance Characteristics: Provide resilient linoleum tile flooring with the following fire performance characteristics as determined by testing products in accordance with ASTM method indicated below by a certified testing laboratory or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - a. Critical Radiant Flux: Class 1 Rating per NFPA 253 (ASTM 648) (0.45 watts/cm² or greater).
 - b. Smoke Density: Less than 450 per NFPA 258 (ASTM E 662).
- C. Pre-Installation Meetings: Conduct pre-installation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions, and manufacturer's warranty requirements. Comply with Division 1 Project Management and Coordination (Project Meetings) Section.
- D. Pre-Installation Testing: Conduct manufacturer's recommended bond, moisture and pH test.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. General: Comply with Division 1 Product Requirements Sections.
- B. Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.
- C. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

- D. Storage and Protection: Store materials protected from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.
 - 1. Material should be stored in areas that are fully enclosed, weathertight with the permanent HVAC system set at a uniform temperature of at least 68 degrees F (20 degrees C) for 48 hrs. prior to, during and after installation.

1.07 PROJECT CONDITIONS

- A. Environmental Requirements/Conditions: In accordance with manufacturer's recommendations, Areas to receive flooring should be clean, fully enclosed and weathertight with the permanent HVAC system operational and set at a minimum of 68° F (20° C) for a minimum of 7 days prior to, during, and 7 days after the installation. The flooring material should be conditioned in the same manner for at least 48 hours prior to the installation. Maximum temperature should not exceed 100 degrees F after installation. Areas to receive flooring shall be adequately lighted to allow for proper inspection of the substrate, installation and seaming of the flooring, and for final inspection.
- B. Temperature Requirements: Maintain air temperature in spaces where products will be installed for time period before, during, and after installation as recommended by manufacturer.
 - 1. Temperature Conditions: 68 degrees F (20 degrees C) for 7 days prior to, during and after installation.
- C. Field Measurements: Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

1.08 SEQUENCING AND SCHEDULING

- A. Finishing Operations: Install tile flooring after finishing operations, including painting and ceiling operations, have been completed.
- B. Concrete Curing: Do not install tile flooring over concrete substrates until substrates have cured and are dry to bond with adhesive as determined by resilient flooring manufacturer's recommended bond, moisture test, and pH test.

1.09 WARRANTY

- A. Project Warranty: Refer to "Conditions of the Contract" for project warranty provisions.
- B. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under Contract Documents.
 - 1. Warranty Period: One (1) year limited warranty commencing on Date of Substantial Completion.

1.10 MAINTENANCE

- A. Extra Materials: Deliver to Owner extra materials from same production run as products installed. Package products with protective covering and identify with descriptive labels. Comply with Division 1 Closeout Submittals (Maintenance Materials) Section.
 - 1. Quantity: Furnish quantity of flooring units equal to 5% of amount installed.
 - 2. Delivery, Storage and Protection: Comply with Owner's requirements for delivery, storage and protection of extra materials.

PART 2 PRODUCTS

2.01 RESILIENT LINOLEUM TILE FLOORING

- A. Manufacturer:
 - a. Forbo Flooring, Inc.
 - b. Johnsonite, A Tarkette Co.
- B. Products: The following product is used for purposes of establishing minimum requirements. Marmoleum Composition Tile (MCT) Linoleum Tile and Linoleum Tile Adhesive.
 - 1. Description: Homogeneous tile of primarily natural materials consisting of linseed oil, wood flour, and rosin binders, mixed and calendered onto a polyester backing. Pattern and color shall extend throughout total thickness of tile material.
 - 2. Size: approx. 13" x 13" (33.3 cm x 33.3 cm)
 - 3. Gauge: 0.080" (2.0 mm).
 - 4. Backing: Polyester backing.
 - 5. Pattern(s) and Color(s): As selected by Architect from manufacturers standard patterns and colors.
 - 6. Adhesive: Forbo Flooring, Inc., T 940 adhesive.
 - 7. Heat Welding Rod: Forbo Flooring, Inc., Marmoweld color-matched welding rod.
 - 8. Topshield™ finish

2.02 RESILIENT LINOLEUM SHEET FLOORING

- A. Manufacturer:
 - a. Forbo Flooring, Inc.
 - b. Johnsonite, A Tarkette Co.
- B. Products: The following product is used for purposes of establishing minimum requirements. Marmoleum Sheet Linoleum.
 - 1. Description: Homogeneous sheet of primarily natural materials consisting of linseed oil, wood flour, and rosin binders, mixed and calendered onto a jute backing. Pattern and color shall extend throughout total thickness of sheet material.
 - 2. Size: 79 inches wide
 - 3. Gauge: 1/10" (2.5 mm).
 - 4. Backing: Jute backing.
 - 5. Pattern(s) and Color(s): As selected by Architect from manufacturers standard patterns and colors.
 - 6. Heat Welding Rod: Forbo Flooring, Inc., Marmoweld color-matched welding rod.

2.03 RESILIENT LINOLEUM SAFETY SHEET FLOORING

- A. Manufacturer:
 - a. Forbo Flooring, Inc.
 - b. Johnsonite, A Tarkette Co.
- B. Products: The following product is used for purposes of establishing minimum requirements. Marmoleum Tractionstep Sheet Linoleum.
 - 1. Description: Homogeneous sheet of primarily natural materials consisting of linseed oil, wood flour, and rosin binders, mixed and calendered onto a jute backing. Pattern and color shall extend throughout total thickness of sheet material. Aluminum Oxide and Carborundum chips embedded into the wear layer surface.
 - 2. Size: 79 inches wide
 - 3. Gauge: 1/10" (2.5 mm).
 - 4. Backing: Jute backing.
 - 5. Pattern(s) and Color(s): As selected by Architect from manufacturers standard patterns and colors.
 - 6. Heat Welding Rod: Forbo Flooring, Inc., Marmoweld color-matched welding rod.

2.04 RELATED MATERIALS

- A. Related Materials: Refer to other sections for related materials as follows:
 - 1. Underlayment and Patching Compound: Refer to Division 3 Concrete Sections for portland cement-based underlayments and patching compounds.
 - 2. Resilient Flooring Accessories: Refer to Division 9 Finishes Sections for resilient flooring accessories.
 - 3. Expansion Joint Covers: Refer to other specification section for expansion joint covers to be used with resilient flooring.

2.05 SOURCE QUALITY

- A. Source Quality: Obtain flooring product materials from a single manufacturer.

PART 3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

- A. Compliance: Comply with manufacturer's product data, including product technical bulletins, product catalog installation instructions, and product carton instructions for installation.

3.02 EXAMINATION

- A. Site Verification of Conditions: Verify substrate conditions (which have been previously installed under other sections) are acceptable for product installation in accordance with manufacturer's instructions.
- B. Material Inspection: In accordance with manufacturer's installation requirements, visually inspect materials prior to installation. Material with visual defects shall not be installed. Labor costs required to replace material installed with visual defects shall be the responsibility of the installation contractor.

3.03 PREPARATION

- A. Adjacent Surfaces Protection: Protect adjacent work areas and finish surfaces from damage during product installation.
- B. Surface Preparation:
 - 1. General: Prepare floor substrate in accordance with manufacturer's instructions.
 - 2. Floor Substrate: Prepare floor substrate to be smooth, rigid, flat, permanently dry, clean and free of foreign materials such as dust, paint, grease, oils, solvent, curing and hardening compounds, sealers, asphalt and old adhesive residue.
 - 3. Concrete Floor Substrate: Concrete floor substrate shall have a minimum compressive strength of 3500 psi. Refer to Division 3 Concrete sections for patching and repairing crack materials, and leveling compounds with portland cement-based compounds.
 - a. Reference Standard: Comply with ASTM F 710 Practice for Preparing Concrete Floors and Other Monolithic Floors to Receive Resilient Flooring.
- C. Concrete Moisture Testing: Conduct moisture tests on all concrete floors regardless of the age, grade level or the presence of existing flooring. Conduct calcium chloride tests in accordance with ASTM F 1869. Measure the internal relative humidity of the concrete slab in accordance with ASTM F 2170. One test of each type should be conducted for every 1,000 sq. ft. of flooring. For projects less than 3,000 sq. ft., a minimum of three tests of each type should be conducted. The tests should be conducted around the perimeter of the room, at columns, and where moisture may be evident. Concrete moisture vapor emissions must not exceed 5.0 lbs. per 1,000 sq. ft. in 24 hrs. Concrete internal relative humidity must not exceed 75%. A diagram of the area showing the location and results of each test should be submitted to the Architect, General Contractor or End User. If any test result exceeds these limitations, the installation must not proceed until the problem has been corrected.
- D. Concrete pH Test: Perform pH tests on concrete floors regardless of the age or grade level. If the pH is greater than 10, it must be neutralized prior to beginning the installation.
- E. Wood Subfloor Substrate: Prepare wood subfloor substrate to be rigid, double construction with a one inch minimum thickness, free from harmful movement and have at least 18 inches of well ventilated air space below. Forbo floor coverings should not be installed over wooden subfloors built on sleepers over on or below grade concrete floors without first making sure that adequate precautions have been taken to ensure the structural integrity of the system, and to prevent moisture migration from the concrete slab.
 - a. Refer to Division 6 Carpentry sections for wood subfloor construction.

3.04 INSTALLATION

- A. Full Spread Adhesive Method Installation: Install tile flooring with full spread adhesive method from established area center marks, in order for tile at opposite edges of area to be of equal width. Avoid using cut tile widths at perimeter less than four inches of tile width. Install tiles square with room axis. Lay tile material into wet adhesive, as recommended by tile manufacturer.
 - 1. Full Spread Adhesive Method, Seamless Flooring Installation: Rout out seams and heat weld together with complementary colored heat welding rod in accordance with flooring manufacturer's recommendations.
 - 2. Adhesive Material Installation: Use trowel as recommended by flooring manufacturer for specific type of adhesive. Spread at a rate of approximately 150 sq. ft./gal. as recommended by flooring manufacturer.

- B. Installation Techniques:
1. Quarter turn tiles.
 2. Where demountable partitions and other items are indicated for installation on top of finished flooring, install flooring before these items are installed.
 3. Scribe, cut, fit flooring to butt tightly to vertical surfaces, permanent fixtures and built-in furniture, including pipes, outlets, edgings, thresholds, nosings, and cabinets.
 4. Extend flooring into toe spaces, door reveals, closets, and similar openings.
 5. Install flooring on covers for telephone and electrical ducts, and similar items occurring within finish floor areas. Maintain overall continuity of color and pattern with pieces of flooring installed on covers.
 6. Do not install resilient flooring over expansion joints. Use expansion joint covers manufactured for use with resilient flooring. Refer to other specifications sections for expansion joint covers.
 7. Adhere resilient flooring to flooring substrate without producing open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, or other surface imperfections in completed flooring installation.
 - a. Use adhesive applied to substrate in compliance with flooring manufacturer's recommendations, including those for trowel notching, adhesive mixing, and adhesive open and working times.
 8. Roll resilient flooring as required by flooring manufacturer.
- C. Finish Flooring Patterns: As selected by Architect.

3.06 CLEANING

- A. Cleaning: Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance. Remove construction debris from project site and legally dispose of debris.
1. Remove visible adhesive and other surface blemishes using cleaning methods recommended by tile floor manufacturer.
 2. Sweep and vacuum floor after installation.
 3. Do not wash floor until after time period recommended by flooring manufacturer.
 4. Damp-mop flooring to remove black marks and soil.

3.07 PROTECTION

- A. Protection: Protect installed product and finish surfaces from damage during construction. Remove and legally dispose of protective covering at time of Substantial Completion.

3.08 INITIAL MAINTENANCE PROCEDURES

- A. General: Include in Contract Sum Amount cost for initial maintenance procedures, and execute procedures after flooring installation as recommended by flooring manufacturer.
- B. Drying Room Yellowing: Expose installed linoleum to either natural or artificial light to allow "drying room yellowing" (the film is a natural occurrence of the oxidation of the linseed oil in linoleum products) on installed linoleum flooring to disappear prior to initiating temporary protection procedures.

END OF SECTION 09650

SECTION 09653 - RESILIENT WALL BASE AND ACCESSORIES

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.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Wall base.
 - 2. Stair accessories.
 - 3. Molding accessories.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For each type of product indicated.
- C. Samples for Verification: For each type of product indicated, in manufacturer's standard-size Samples but not less than 12 inches long, of each resilient product color, texture, and pattern required.

1.4 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Provide resilient stair accessories with a critical radiant flux classification of Class I, not less than 0.45 W/sq. cm, as determined by testing identical products per ASTM E 648 by a testing and inspecting agency acceptable to authorities having jurisdiction.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.6 PROJECT CONDITIONS

- A. Maintain temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive floor tile during the following time periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- B. After postinstallation period, maintain temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Install resilient products after other finishing operations, including painting, have been completed.

1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

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, products listed in other Part 2 articles.

2.2 COLORS AND PATTERNS

- A. Colors and Patterns: As selected by Architect from manufacturer's full range.

2.3 RESILIENT WALL BASE

- A. Wall Base: ASTM F 1861.
 - 1. Forbo Flooring Systems
 - 2. Johnsonite.
- B. Type: Homogeneous material of primarily natural materials consisting of linseed oil, wood flour, and rosin binders. Pattern and color shall extend throughout total thickness of material.
- C. Style: Cove with top-set toe.

- D. Minimum Thickness: 0.125 inch.
- E. Height: 4 inches and 6 inches.
- F. Lengths: Coils in manufacturer's standard length.
- G. Outside Corners: Premolded.
- H. Inside Corners: Premolded.
- I. Surface: Smooth.

2.4 RESILIENT STAIR ACCESSORIES

- A. One Piece Tread and Riser: FS RR-T-650.
 - 1. Johnsonite.
 - 2. Musson, R. C. Rubber Co.
 - 3. Nora Rubber Flooring, Freudenberg Building Systems, Inc.
 - 4. Pirelli Rubber Flooring.
 - 5. R.C.A. Rubber Company (The).
 - 6. Roppe Corporation.
- B. Material: Rubber, Composition A.
- C. Surface Design: Type 2 design (designed).
 - 1. Type 2 Design: Raised-rib pattern with visually impaired contrasting strip.
- D. Nosing Style: Square, adjustable to cover angles between 60 and 90 degrees.
- E. Nosing Height: 2 inches.
- F. Thickness: 1/8 inch.
- G. Size: Lengths and depths to fit each stair tread in one piece.
- H. Stringers: Of same thickness as risers, height and length after cutting to fit risers and treads and to cover stair stringers; produced by same manufacturer as treads and recommended by manufacturer for installation with treads.

2.5 RESILIENT MOLDING ACCESSORY

- A. Description: Carpet edge for glue-down applications, Nosing for carpet, Nosing for resilient floor covering, Reducer strip for resilient floor covering, Joiner for tile and carpet.
 - 1. Forbo Flooring Systems
 - 2. Johnsonite.
- B. Material: Homogeneous material of primarily natural materials consisting of linseed oil, wood flour, and rosin binders. Pattern and color shall extend throughout total thickness of material.

- C. Profile and Dimensions: As required for condition.

2.6 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic cement based formulation provided or approved by resilient product manufacturers for applications indicated.
- B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.
- C. Stair-Tread-Nose Filler: Two-part epoxy compound recommended by resilient tread manufacturer to fill nosing substrates that do not conform to tread contours.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances, moisture content, and other conditions affecting performance.
 - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
 - 2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written recommendations to ensure adhesion of resilient products.
- B. Concrete Substrates for Stair Accessories: Prepare according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
 - 3. Moisture Testing:
 - a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
 - b. Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
- C. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.

- D. Use trowelable leveling and patching compound to fill cracks, holes, and depressions in substrates.
- E. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
 - 1. Do not install resilient products until they are the same temperature as the space where they are to be installed.
- F. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 RESILIENT WALL BASE INSTALLATION

- A. Apply wall base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- B. Install wall base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
- C. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- D. Do not stretch wall base during installation.
- E. On masonry surfaces or other similar irregular substrates, fill voids along top edge of wall base with manufacturer's recommended adhesive filler material.
- F. Premolded Corners: Install premolded corners before installing straight pieces.

3.4 RESILIENT ACCESSORY INSTALLATION

- A. Resilient Stair Accessories:
 - 1. Use stair-tread-nose filler to fill nosing substrates that do not conform to tread contours.
 - 2. Tightly adhere to substrates throughout length of each piece.
 - 3. For treads installed as separate, equal-length units, install to produce a flush joint between units.
- B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor coverings that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

- A. Perform the following operations immediately after completing resilient product installation:
1. Remove adhesive and other blemishes from exposed surfaces.
 2. Sweep and vacuum surfaces thoroughly.
 3. Damp-mop surfaces to remove marks and soil.
 - a. Do not wash surfaces until after time period recommended by manufacturer.
- B. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer.
1. Apply protective floor polish to stair accessory surfaces that are free from soil, visible adhesive, and surface blemishes if recommended in writing by manufacturer.
 - a. Use commercially available product acceptable to manufacturer.
 - b. Coordinate selection of floor polish with Owner's maintenance service.
 2. Cover stair accessory products with undyed, untreated building paper until Substantial Completion.
 3. Do not move heavy and sharp objects directly over stair accessories. Place plywood or hardboard panels over surfaces and under objects while they are being moved. Slide or roll objects over panels without moving panels.

END OF SECTION 09653

SECTION 11450 - RESIDENTIAL EQUIPMENT

PART 1 - GENERAL

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

DESCRIPTION OF WORK:

Extent of residential equipment required is indicated on drawings and in schedules.

Types Of Residential Equipment Required Include The Following:

Electric Cooktops
Electric Oven
Range Hoods – non-vented type.
Refrigerator/freezers, French door.
Food Waste Disposer.

Card Operated Clothes Washer & Clothes Dryers

Not in Contract

Food Service Equipment is specified elsewhere in Division-11.

Plumbing requirements are specified in Division-15.

Electrical services and connections are specified in Division-16.

QUALITY ASSURANCE:

Certification Labels: Provide residential equipment which complies with standards and bears certification labels as follows:

Energy Ratings: Provide energy guide labels with energy cost analysis (annual operating costs) and efficiency information as required by Federal Trade Commission.

Energy Star: Provide Energy Star rated appliances when available.

UL Standards: Provide residential equipment with UL labels.

ANSI Standards: Provide gas-burning residential equipment with American Gas Assoc. (AGA) seal of approval, complying with ANSI Z21-series seal of approval.

Uniformity: Provide products of same manufacturer for each type of residential equipment required.

To greatest extent possible, provide residential equipment by single manufacturer for the entire project.

SUBMITTALS:

Product Data: Submit manufacturer's specifications and installation instructions for each type of residential equipment, including data indicating compliance with requirements. Submit operating and maintenance instructions for each item of residential equipment.

Schedule: Submit schedule of residential equipment, using same room designations shown on drawings.

DELIVERY AND STORAGE:

Deliver products to project site in manufacturer's undamaged protective containers, after spaces to receive them have been fully enclosed.

SPECIFIED PRODUCT WARRANTIES:

Submit manufacturer's standard written warranty for each item of residential equipment.

PART 2 - PRODUCTS

MATERIALS AND FABRICATION:

Colors: Provide manufacturer's standard colors as shown or scheduled. If no color indicated, provide white.

Wherever residential equipment by more than one manufacturer is installed in same space, provide units with color matching largest equipment item, unless otherwise indicated

EQUIPMENT LIST:

Electric Cooktop:

32" Countertop Type: Built-in unit with glass ceramic top, two 6 inch and two 9 inch single radiant type heating elements, hot surface indicator light, front left controls.

FRIGIDAIRE MODEL No. FFEC3225LW

Range Hoods:

Non-Ventilating Type: 36" hood for mounting below wall cabinets, with two-speed fan, permanent washable grease filter, built-in lighting, baked-on enamel finish. Control switches to be located on unit so when installed will not be more than 54" above finish floor.

FRIGIDAIRE MODEL No. F36WC19ES

Electrical Wall Ovens:

Single Oven: Built-in unit with self-cleaning upper oven, side swing oven door for installation in 27" wide cabinet; control panel with clock, timer, and automatic oven controls; upper oven equipped with self-cleaning feature, broiling element, oven light, and door with window and automatic safety locking feature; 3 adjustable chrome racks and glass door. Provide optional porcelain enamel broiler pan with chrome grille insert.

FRIGIDAIRE MODEL No. GLEB27Z7HS

Refrigerator/Freezers:

French Door Type: Energy Star Rated. Freestanding, two-door with freezer drawer unit; both compartments frostless, with separate temperature controls; storage features including adjustable glass shelves, meat drawer, vegetable crisper, dairy compartment, door shelves, and not less than 2 ice cube trays; adjustable rollers.

Total volume: 26.6 cubic feet.

FRIGIDAIRE MODEL No. FGUN2642LP

Food Waste Disposer:

Residential Type: Compact, continuous feed type with wall switch, ¾ hp heavy duty single phase motor with permanently lubricated upper and lower bearings, galvanized steel grinding elements with two stainless steel 360 degree swivel lugs, self-service wrench

INSINKERATOR BADGER 5XP.

PART 3 - EXECUTION

INSTALLATION:

General: Comply with manufacturer's instructions and recommendations.

Built-In Equipment: Securely anchor units to supporting cabinetry or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and rough openings are completely concealed.

Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate for proper operation of equipment.

Utilities: Refer to Divisions 15 and 16 for plumbing and electrical requirements.

ADJUST AND CLEAN:

Testing: Test each item of residential equipment to verify proper operation. Make necessary adjustments.

Accessories: Verify that accessory items required have been furnished.

Cleaning: Remove packing material from residential equipment items and leave units in clean condition, ready for operation.

END OF SECTION 11450

SECTION 12356 - KITCHEN CASEWORK

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.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Wood-faced kitchen cabinets.
 - 2. Wood-faced vanity cabinets.
 - 3. Plastic-laminate countertops.
- B. Related Sections include the following:
 - 1. Division 11 Section "Residential Appliances" for appliances mounted in kitchen casework.
 - 2. Division 15 Section "Plumbing Fixtures" for sink units mounted in countertops.

1.3 DEFINITIONS

- A. Exposed Surfaces of Casework: Surfaces visible when doors and drawers are closed, including visible surfaces in open cabinets or behind glass doors.
- B. Semiexposed Surfaces of Casework: Surfaces behind opaque doors or drawer fronts, including interior faces of doors and interiors and sides of drawers. Bottoms of wall cabinets are defined as "semiexposed."
- C. Concealed Surfaces of Casework: Surfaces not usually visible after installation, including sleepers, web frames, dust panels, bottoms of drawers, and ends of cabinets installed directly against and completely concealed by walls or other cabinets. Tops of wall cabinets and utility cabinets are defined as "concealed."

1.4 SUBMITTALS

- A. Product Data: For the following:
 - 1. Cabinets.
 - 2. Plastic-laminate countertops.
 - 3. Cabinet hardware.

- B. Shop Drawings: For cabinets and countertops. Include plans, elevations, details, and attachments to other work. Show materials, finishes, filler panels, hardware, edge and backsplash profiles, cutouts for plumbing fixtures, and methods of joining countertops.
- C. Samples for Initial Selection: Manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available for each type of material exposed to view.
- D. Samples for Verification: For the following materials; in sets showing the full range of color, texture, and pattern variations expected:
 - 1. Wood-veneered panels with transparent finish, **8 by 10 inches** , for each species.
 - 2. Solid wood with transparent finish, **50 sq. in.**, for each species.
 - 3. Plastic laminate for countertops, **8 by 10 inches** .
 - 4. One unit of each type of exposed hardware.
- E. Samples for Verification: As follows:
 - 1. One full-size, finished base cabinet complete with hardware, doors, and drawers, but without countertop.
 - 2. One full-size, finished wall cabinet complete with hardware, doors, and adjustable shelves.
 - 3. Plastic laminate for countertops, **8 by 10 inches**.
 - 4. Solid-surfacing material for countertops, **6 inches** square.
- F. Product Certificates: Signed by manufacturers of casework certifying that products furnished comply with requirements.

1.5 QUALITY ASSURANCE

- A. Source Limitations for Cabinets: Obtain cabinets through one source from a single manufacturer.
- B. Product Designations: Drawings indicate size, configurations, and finish material of casework by referencing designated manufacturer's catalog numbers. Other manufacturers' casework of similar sizes, similar door and drawer configurations, same finish material, and complying with the Specifications may be considered. Refer to Division 1 Section "Substitutions."
- C. Quality Standards: Unless otherwise indicated, comply with the following standards:
 - 1. Cabinets: KCMA A161.1.
 - a. KCMA Certification: Provide cabinets with KCMA's "Certified Cabinet" seal affixed in a semiexposed location of each unit and showing compliance with the above standard.
 - b. HUD Guide Specifications for Public/Indian Housing Guide Specifications, Section 12370-HUD Severe Use.
 - 2. Plastic-Laminate Countertops: KCMA A161.2.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install kitchen casework until building is enclosed, wet-work is complete, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Established Dimensions: Where kitchen casework is indicated to fit to other construction, establish dimensions for areas where casework is to fit. Coordinate construction to ensure that actual dimensions correspond to established dimensions. Provide fillers and scribes to allow for trimming and fitting.
- C. Field Measurements: Where kitchen casework is indicated to fit to existing construction, verify dimensions of existing construction by field measurements before fabrication and indicate measurements on Shop Drawings. Provide fillers and scribes if necessary.
- D. Field Measurements for Countertops: Verify dimensions of countertops by field measurements after base cabinets are installed but before countertop fabrication is complete. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.7 COORDINATION

- A. Coordinate layout and installation of blocking and reinforcement in partitions for support of kitchen casework.

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. Kitchen Cabinets and Bathroom Vanities:
Armstrong World Industries, Inc.
Tru-Wood Cabinets, Inc.
 - 2. Plastic Laminate for Countertops:
Wilson Plastics Co., Dart Industries, Inc.
 - 3. Filled Polymer for Window Sills:
Du Pont Co., Corian

2.2 COLORS, TEXTURES, AND PATTERNS

- A. Colors, Textures, and Patterns: As selected by Architect from manufacturer's full range for these characteristics.

2.3 CABINET MATERIALS

A. Exposed Materials: Comply with the following:

1. Exposed Wood Species: As follows. Do not use two adjacent exposed faces that are noticeably dissimilar in color, grain, figure, or natural character markings.
 - a. Manufactures Standard Hardwood Species.
2. Solid Wood: Clear hardwood lumber of species indicated, free of defects, selected for compatible grain and color, and kiln dried to 7 percent moisture content.
3. Plywood: Hardwood plywood complying with HPVA HP-1 with face veneer of species indicated, selected for compatible color and grain with Grade A faces and Grade C backs of same species as faces.
 - a. Edge band exposed edges with minimum **1/8-inch-** thick, solid-wood edging of same species as face veneer.

B. Semiexposed Materials: Unless otherwise indicated, provide the following:

1. Solid Wood: Sound hardwood lumber, selected to eliminate appearance defects and kiln dried to 7 percent moisture content. Stained to be compatible with exposed surfaces.
2. Plywood: Hardwood plywood complying with HPVA HP-1 with Grade C faces stained to be compatible with exposed surfaces and Grade 3 backs of same species as faces.

C. Concealed Materials: Comply with the following:

1. Solid Wood or Plywood: Any hardwood or softwood species, with no defects affecting strength or utility. Hardwood and softwood lumber kiln dried to 7 and 10 percent moisture content, respectively.

2.4 COUNTERTOP MATERIALS

A. Plastic Laminate: High-pressure decorative laminate complying with NEMA LD 3.

1. Grade: HGS general purpose, for use on horizontal and vertical surfaces.
2. Grade: HGP for postforming applications only.

B. Particleboard: ANSI A208.1, Grade M-2.

C. Plywood: Exterior softwood plywood complying with PS 1, Grade C-C Plugged, touch sanded.

D. Solid-Surfacing Material: Homogeneous solid sheets of filled plastic resin complying with material and performance requirements of ANSI Z124.3, Type 5 or Type 6, without a precoated finish.

2.5 CASEWORK HARDWARE

- A. General: Manufacturer's standard units complying with BHMA A156.9, of type, material, size, and finish as selected from manufacturer's standard choices.
- B. Hinges: Semiconcealed (wraparound) butt hinges.
- C. Drawer Guides: Epoxy-coated-metal, self-closing drawer guides; designed to prevent rebound when drawers are closed; with nylon-tired, ball-bearing rollers; and complying with BHMA A156.9, Type B05091.
- D. Pulls: Ives Wire Pull No. 38 or Amerock BP76313 on all doors and drawers.
 - 1. Door Hinges and pulls color and finish to match

2.6 CABINET CONSTRUCTION

- A. Face Style: Flush overlay; door and drawer faces cover cabinet body members or face frames with only enough space between faces for operating clearance.
- B. Face Frames: **3/4-by-1-5/8-inch** solid wood with glued mortise and tenon or doweled joints.
- C. Door and Drawer Fronts: 3/4 inch thick solid panel of edge glued wood strips. Milled raised panel style w/ chamfered edges.
- D. Exposed Cabinet Ends: Veneer-faced plywood.
- E. Cabinet Ends: **1/2-inch**- thick plywood.
- F. Cabinet Tops and Bottoms: **1/2-inch**- thick plywood, fully supported by and secured in rabbets in end panels, front frame, and back rail.
- G. Back, Top, and Bottom Rails: **3/4-by-2-1/2-inch** solid wood, interlocking with end panels and rabbeted to receive top and bottom panels. Back rails secured under pressure with glue and with mechanical fasteners.
- H. Wall-Hung Unit Back Panels: **1/2-inch**- thick plywood fastened to rear edge of end panels and to top and bottom rails.
- I. Base Unit Back Panels: **1/2-inch** thick plywood fastened to rear edge of end panels and to top and bottom rails.
- J. Front Frame Drawer Rails: **3/4-by-1-1/4-inch** solid wood mortised and fastened into face frame.
- K. Drawers: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.
 - 1. Join subfronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners or with glued dovetail joints.
 - 2. Subfronts, Backs, and Sides: **3/4-inch**- thick solid wood.
 - 3. Bottoms: **1/2-inch**- thick pressure treated plywood.

- L. Shelves: 1/2-inch- thick plywood.
- M. Joinery: Rabbet backs flush into end panels and secure with concealed mechanical fasteners. Connect tops and bottoms of wall cabinets and bottoms and stretchers of base cabinets to ends and dividers with mechanical fasteners. Rabbet tops, bottoms, and backs into end panels.
- N. Factory Finishing: To greatest extent possible, finish casework at factory. Defer only final touchup until after installation.

2.7 PLASTIC-LAMINATE COUNTERTOPS

- A. Configuration: Provide countertops with the following front, cove (intersection of top with backsplash), backsplash, and end-splash style:
 - 1. Front: Self-edge.
 - 2. Front: Wood-trimmed edge as indicated.
 - 3. Backsplash: Square edge with scribe.
 - 4. End Splash: Square edge with scribe.
- B. Plastic-Laminate Substrate: Particleboard not less than 3/4 inch thick.
 - 1. For countertops at sinks and lavatories, use phenolic-resin particleboard or exterior-grade plywood.
 - 2. Build up countertop thickness to 1-1/2 inches at front, back, and ends with additional layers of particleboard laminated to top.
- C. Backer Sheet: Provide plastic-laminate backer sheet on underside of countertop substrate.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install casework with no variations in flushness of adjoining surfaces; use concealed shims. Where casework abuts other finished work, scribe and cut for accurate fit. Provide filler strips, scribe strips, and moldings in finish to match casework face.
- B. Install casework without distortion so doors and drawers fit openings and are aligned. Complete installation of hardware and accessories as indicated.
- C. Install casework and countertop level and plumb to a tolerance of 1/8 inch in 8 feet.
- D. Fasten cabinets to adjacent units and to backing.
 - 1. Fasten wall cabinets through back, near top and bottom, at ends and not less than 24 inches o.c. with No. 10 wafer-head screws sized for 1-inch penetration into wood framing, blocking, or hanging strips.
 - 2. Fasten wall cabinets through back, near top and bottom, at ends and not less than 24 inches o.c., with toggle bolts through metal backing behind gypsum board.

- E. Fasten plastic-laminate countertops by screwing through corner blocks of base units into underside of countertop. Form seams using splines to align adjacent surfaces, and secure with glue and concealed clamping devices designed for this purpose.

3.2 ADJUSTING AND CLEANING

- A. Adjust casework and hardware so doors and drawers are centered in openings and operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.
- B. Clean casework on exposed and semiexposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

END OF SECTION 12356

SECTION 142100
ELECTRIC TRACTION ELEVATORS

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Electric Traction Elevators.
- B. Products Supplied But Not Installed Under this Section:
 - 1. Hoist Beam
 - 2. Pit Ladder
- C. Work Supplied Under Other Sections:
 - 1. Temporary lighting, including temporary lighting in hoistway for machine space with switch located in hoistway on the strike jamb side of top landing door.
 - 2. Hoistway ventilation shall be in accordance with local and national building code requirements.
 - 3. Guide Rail Support shall be structurally adequate to extend from pit floor to top of hoistway, with spans in accordance with requirements of authority having jurisdiction and final layouts.
 - 4. Removable barricades at all hoistway openings, in compliance with OSHA 29 CFR 1926.502 in addition to any local code requirements.
 - 5. Lifeline attachments capable of withstanding 5000 lb load in accordance with OSHA 29 CFR 1926.502. Provide a minimum of 2 at the top, front of each hoistway.
 - 6. Pit lighting: Fixture with switch and guards. Provide illumination level equal to or greater than that required by ASME A17.1/CSA B44 2000, or applicable version.
 - 7. Control space lighting with switch. Coordinate switch with lighting for machine space as allowable by code.
 - 8. Access Doors: As required for access to governor. Access door shall be self-closing, self-locking if necessary and operable from the inside without a key.
- D. Related sections:
 - 1. Section 015000 - Temporary Facilities and Controls
 - 2. Section 033000 - Cast-in-Place Concrete:
 - 3. Section 042000 - Unit Masonry
 - 4. Section 055000 - Metal Fabrications
 - 5. Section 071600 - Cementitious Waterproofing
 - 6. Section 230000 - Heating, Ventilating, and Air Conditioning
 - 7. Section 260000 - Electrical
 - 8. Section 263000 - Electric Power Generating and Storing Equipment
 - 9. Section 273000 - Voice Communications
 - 10. Section 283100 - Fire Detection and Alarm
 - 11. Section 310000 - Earthwork
- E. Industry and government standards:
 - 1. ICC/ANSI A117.1 Accessible and Usable Buildings and Facilities
 - 2. ADAAG - Accessibility Guidelines for Buildings and Facilities
 - 3. ANSI/NFPA 70, National Electrical Code
 - 4. ANSI/NFPA 80, Standard for Fire Doors and Fire Windows
 - 5. ASME/ANSI A17.1, Safety Code for Elevators and Escalators.

1.02 DESCRIPTION OF ELEVATOR

- A. Elevator Equipment: KONE EcoSpace™ gearless traction elevator
- B. Equipment Control: KCM831
- C. Quantity of Elevators: 1
- D. Landings: 4
- E. Openings: 4 Front Openings, 0 Back Openings
- F. Travel: 34'-2"
- G. Rated Capacity: 3500 lbs (1588 kg)
- H. Rated Speed: 150 fpm
- I. Clear Inside Dimensions (W x D): 6'-6" x 5'-6 3/16"
- J. Cab Height: 8'
- K. Clear height under suspended ceiling: 7'-7"
- L. Entrance Width & Type: & Right Opening
- M. Entrance Height: 7'
- N. Main Power Supply: 208 Volts + 5%, three-phase
- O. Operation: Simplex
- P. Machine Location: Inside the hoistway mounted on car guide rail
- Q. Control Space Location: Remote Closet
- R. Elevator Equipment shall conform to the requirements of Seismic Zone 2A.
- S. Maintenance Service Period: 12 Months

1.03 PERFORMANCE REQUIREMENTS

- A. Car Performance
 - 1. Car Speed \pm 5% of contract speed under any loading condition or direction of travel.
 - 2. Car Capacity: Safely lower, stop and hold (per code) up to 125% of rated load.

- B. System Performance
 - 1. Vertical Vibration (maximum): 25 mg
 - 2. Horizontal Vibration (maximum): 25 mg
 - 3. Jerk Rate (maximum): 1.3 ft/sec³
 - 4. Acceleration (maximum) 1.3 ft/sec²
 - 5. In Car Noise: = 55 dB(A)
 - 6. Leveling Accuracy: ±0.2 inches
 - 7. Starts per hour (maximum): 120

1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's product literature for each proposed system.
 - 1. Cab design, dimensions and layout.
 - 2. Layout, finishes, and accessories and available options.
 - 3. Controls, signals and operating system.
 - 4. Color selection charts for cab and entrances.
- B. Shop Drawings:
 - 1. Clearances and travel of car.
 - 2. Clear inside hoistway and pit dimensions.
 - 3. Location and layout of equipment and signals.
 - 4. Car, guide rails, buffers and other components in hoistway.
 - 5. Maximum rail bracket spacing.
 - 6. Maximum loads imposed on building structure.
 - 7. Hoist beam requirements.
 - 8. Location and sizes of access doors.
 - 9. Location and details of hoistway door and frames.
 - 10. Electrical characteristics and connection requirements.
- C. Operation and maintenance data:
 - 1. Provide manufacturer's standard maintenance and operation manual.

1.05 QUALITY ASSURANCE

- A. Manufacturer: Minimum of ten years experience in the fabrication, installation and service of elevators of the type and performance of the specified. The manufacturer shall have a documented quality assurance program.
- B. Installer: The equipment manufacturer shall install the elevator.
- C. Inspection and Testing: In accordance with requirements of local jurisdiction, obtain required permits, inspections and tests.

1.06 DELIVERY, STORAGE AND HANDLING

- A. If the construction site is not prepared to receive the elevator equipment at the agreed ship date, the General Contractor shall be responsible to provide a safe, dry, and easily accessible storage area on or off the premises. Additional labor costs for double handling will be the responsibility of the general contractor.

- B. Delivered elevator materials shall be stored in a protected environment in accordance with manufacturer recommendations. A minimum storage area of 10 feet by 20 feet is required adjacent to the hoistway.

1.07 WARRANTY

- A. Provide manufacturer warranty for a period of one year. The warranty period is to begin upon Substantial Completion of the Contract. Warranty covers defects in materials and workmanship. Damage due to ordinary use, vandalism, improper or insufficient maintenance, misuse, or neglect do not constitute defective material or workmanship.

1.08 MAINTENANCE SERVICE

- A. The elevator manufacturer shall provide maintenance service consisting of regular examinations and adjustments of the elevator equipment for a period of 12 Months after date of substantial completion. Replacement parts shall be produced by the original equipment manufacturer.
- B. Maintenance service be performed during regular working hours of regular working days and shall include emergency 24-hour call back service.
- C. Maintenance service shall not include adjustments, repairs or replacement of parts due to negligence, misuse, abuse or accidents.

PART 2 PRODUCTS

2.01 MANUFACTURER

- A. Provide AC gearless machine room-less elevator systems subject to compliance with the design and performance requirements of this specification. Elevator manufacturers may include but are not limited to one of the following:
 - 1. Basis of Design: EcoSpace™ traction elevators by KONE, Inc. (www.kone.com).
 - 2. Other acceptable machine room-less products:
 - a. Otis Elevator Co. - Gen2™ Product
 - b. Schindler Elevator Corp. - 400A Product

2.02 EQUIPMENT: CONTROL COMPONENTS AND CONTROL SPACE

- A. Controller: Provide microcomputer based control system to perform all of the functions.
 - 1. All high voltage (110V or above) contact points inside the controller cabinet shall be protected from accidental contact in a situation where the controller doors are open.
 - 2. Controller shall be separated into two distinct halves; Motor Drive side and Control side. High voltage motor power conductors shall be routed and physically segregated from the rest of the controller.
 - 3. Provide a serial cardrack and main CPU board containing a non-erasable EPROM and operating system firmware.
 - 4. Variable field parameters and adjustments shall be contained in a non-volatile memory module.

- B. Drive: Provide Variable Voltage Variable Frequency AC drive system to develop high starting torque with low starting current.
- C. Controller Location: Within 100'-0" (30.48m) Controller(s) shall be located in a remote cabinet or room within 140'-0" (42.6 m) wire feet of the elevator machine.

2.03 EQUIPMENT: HOISTWAY COMPONENTS

- A. Machine: AC gearless machine, with permanent magnet synchronous motor, direct current electro-mechanical disc brakes and integral traction drive sheave, mounted to the car guide rail at the top of the hoistway.
- B. Governor: Friction type over-speed governor rated for the duty of the elevator specified.
- C. Buffers, Car and Counterweight: Polyurethane buffer.
- D. Hoistway Operating Devices:
 - 1. Emergency stop switch in the pit
 - 2. Terminal stopping switches.
 - 3. Emergency stop switch on the machine
- E. Positioning System: System consisting of magnets and proximity switches.
- F. Guide Rails and Attachments: Steel rails with brackets and fasteners.

2.04 EQUIPMENT: HOISTWAY ENTRANCES

- A. Hoistway Entrances
 - 1. Sills: extruded.
 - 2. Doors: Hollow metal construction with vertical internal channel reinforcements.
 - 3. Fire Rating: Entrance and doors shall be UL fire-rated for 1-1/2 hour.
 - 4. Entrance Finish: Brushed Stainless Steel.
 - 5. Entrance Markings Jamb Plates: Provide standard entrance jamb tactile markings on both jambs, at all floors. Plate Mounting: Refer to manufacturer drawings.

2.05 EQUIPMENT: CAR COMPONENTS

- A. Car Frame: Provide car frame with adequate bracing to support the platform and car enclosure.
- B. Platform: Platform shall be per manufacturers standard.
- C. Car Guides: Provide guide-shoes mounted to top and bottom of both car and counterweight frame. Each guide-shoe assembly shall be arranged to maintain constant contact on the rail surfaces. Provide retainers in areas with Seismic design requirements.
- D. Load weighing device shall be strain gauge type mounted to dead-end hitch attached atop the hoistway guide-rail.

- E. Steel Cab
 - 1. Panels: Non-removable vertical panels, plastic laminate selected from standard manufacturer's catalog of choices.
 - 2. Car Front Finish: Brushed stainless steel.
 - 3. Car Door Finish: Brushed stainless steel.
 - 4. Ceiling:
 - a. Standard Translucent Panels - LF-1: Polygal Translucent three panel suspended ceiling with T-5 Fluorescent lighting and Brushed Aluminum frame.
 - 5. Handrail:
 - a. Custom Flat - satin stainless steel - 2 in. wide. Rails to be located on Back Wall and Side Walls of car enclosure.
 - 6. Flooring: By others. (Not to exceed 2sqft & 1/2" finished depth.)
 - 7. Threshold: Aluminum
 - 8. Protective pad hooks and quilted fire retardant protective pads: Pad to be hung from suspended ceiling
- F. Emergency Car Signals
 - 1. Emergency Siren: Siren mounted on top of cab that is activated when the alarm button in the car operating panel is engaged. Siren shall have rated sound pressure level of 80 dB(A) at a distance of three feet from device. Siren shall respond with a delay of not more than one second after activation of alarm button.
 - 2. Emergency Car Lighting: Provide emergency power unit employing a 12-volt sealed rechargeable battery and totally static circuits shall illuminate the elevator car and provide current to the alarm bell in the event of building power failure.
 - 3. Emergency Exit Contact: An electrical contact shall be provided on the car-top exit.
- G. Ventilation: Fan.

2.06 EQUIPMENT: SIGNAL DEVICES AND FIXTURES

- A. Car Operating Panel: Provide car operating panel with all push buttons, key switches, and message indicators for elevator operation.
 - 1. Full height car operating panel shall contain a bank of round, mechanical, illuminated buttons marked to correspond to landings served, emergency call button, door open button, door close button, and key switches for lights, inspection, and exhaust fan. Buttons have amber illumination (halo). All buttons to have raised text and Braille marking on left hand side. The car operating display panel shall be amber 7 Segment. All texts, when illuminated, shall be amber. The full height car operating panel shall have a polycarbonate face plate that is shatterproof and impact resistant in a color and pattern per manufacturers standard selection.
 - 2. Additional features of car operating panel shall include:
 - a. Car Position Indicator within operating panel (amber).
 - b. Elevator Data Plate marked with elevator capacity and car number on car top.
 - c. Help buttons with raised markings.
 - d. In car stop switch per local code.
 - e. Firefighter's hat.
 - f. Firefighter's Phase II Key-switch.
 - g. Call Cancel Button.
 - h. Pre-programmed integrated ADA phone (complete description of krms features included as standard)
 - i. Help Button/Communicator. Activation of help button will initiate two-way

communication between car and a location inside the building, switching over to alternate location if call is unanswered, where personnel are available to take the appropriate action. Visual indicators are provided for call initiation and call acknowledgement.

- j. Firefighter's Phase II emergency in-car operating instructions.
- B. Hall Fixtures: Wall mounted hall fixtures shall be provided with necessary push buttons and key switches for elevator operation. Wall mounted hall fixtures shall have a polycarbonate face plate that is shatterproof and impact resistant in a color per manufacturers standard selection.
 - 1. Hall fixtures shall feature round, mechanical, illuminated buttons in raised fixture housings. Hall fixtures shall correspond to options available from that landing. Buttons shall be flat flush in vertically mounted fixture. Hall fixtures should not be jamb-mounted. Hall lanterns shall feature amber illumination.
- C. Hall Lanterns and Chime: A directional lantern visible from the corridor shall be provided at each hall entrance. When the car stops and the doors are opening, the lantern shall indicate the direction in which the car is to travel and a chime will sound. The chime will sound once for up and twice for down.
- D. Combination Hall Position Indicator and Hall Lantern located at First Floor. Hall lanterns and hall indicators shall feature amber illumination, all numbers will be amber display.

2.07 EQUIPMENT: ELEVATOR OPERATION AND CONTROLLER

- A. Elevator Operation
 - 1. Simplex Collective Operation: Using a microprocessor-based controller, operation shall be automatic by means of the car and hall buttons. If all calls in the system have been answered, the car shall park at the last landing served.
 - 2. Zoned Car Parking.
 - 3. Relative System Response Dispatching.
- B. Standard Operating Features to include:
 - 1. Full Collective Operation
 - 2. Fan and Light Control.
 - 3. Load Weighing Bypass.
 - 4. Ascending Car Uncontrolled Movement Protection
 - 5. Top of Car Inspection Station.
- C. Additional Operating Features to include:
 - 1. Hoistway Access Bottom Landing
 - 2. Hoistway Access Top Landing
 - 3. Intercom Provisions
- D. Elevator Control System for Inspections and Emergency
 - 1. Provide devices within controller to run the elevator in inspection operation.
 - 2. Provide devices on car top to run the elevator in inspection operation.
 - 3. Provide within controller an emergency stop switch to disconnect power from the brake and prevents motor from running.
 - 4. Provide the means from the controller to mechanically lift and control the elevator brake to safely bring car to nearest available landing when power is interrupted.

5. Provide the means from the controller to reset the governor over speed switch and also trip the governor.
6. Provide the means from the controller to reset the emergency brake when set because of an unintended car movement or ascending car over speed.
7. Provide the means for the control to reset elevator earthquake operation.

2.08 EQUIPMENT: DOOR OPERATOR AND CONTROL

- A. Door Operator: A closed loop permanent magnet VVVF high-performance door operator shall be provided to open and close the car and hoistway doors simultaneously. Door movement shall be cushioned at both limits of travel. Electro-mechanical interlock shall be provided at each hoistway entrance to prevent operation of the elevator unless all doors are closed and locked. An electric contact shall be provided on the car at each car entrance to prevent the operation of the elevator unless the car door is closed.
- B. The door operator shall be arranged so that, in case of interruption or failure of electric power, the doors can be readily opened by hand from within the car, in accordance with applicable code. Emergency devices and keys for opening doors from the landing shall be provided as required by local code.
- C. Doors shall open automatically when the car has arrived at or is leveling at the respective landings. Doors shall close after a predetermined time interval or immediately upon pressing of a car button. A door open button shall be provided in the car. Momentary pressing of this button shall reopen the doors and reset the time interval.
- D. Door hangers and tracks shall be provided for each car and hoistway door. Tracks shall be contoured to match the hanger sheaves. The hangers shall be designed for power operation with provisions for vertical and lateral adjustment. Hanger sheaves shall have polyurethane tires and pre-lubricated sealed-for-life bearings.
- E. Electronic Door Safety Device. The elevator car shall be equipped with an electronic protective device extending the full height of the car. When activated, this sensor shall prevent the doors from closing or cause them to stop and reopen if they are in the process of closing. The doors shall remain open as long as the flow of traffic continues and shall close shortly after the last person passes through the door opening.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Field measure and examine substrates, supports, and other conditions under which elevator work is to be performed.
- B. Do not proceed with work until unsatisfactory conditions are corrected.
- C. Prior to start of Work, verify hoistway is in accordance with shop drawings. Dimensional tolerance of hoistway from shop drawings: -0 inches +2 inches. Do not begin work of this section until dimensions are within tolerances.

- D. Prior to start of Work, verify projections greater than 2 inches (4 inches if ASME A17.1/CSA B44 2000 applies) must be beveled not less than 75 degrees from horizontal.
- E. Prior to start of Work, verify landings have been prepared for entrance sill installation. Traditional sill angle or concrete sill support shall not be required.
- F. Prior to start of Work, verify elevator pit has been constructed in accordance with requirements, is dry and reinforced to sustain vertical forces, as indicated in approved submittal. Verify that sumps or sump pumps located within pit will not interfere with installed elevator equipment.
- G. Prior to start of Work, verify control space has been constructed in accordance with requirements, with access coordinated with elevator shop drawings, including Sleeves and penetrations.
- H. Verify installation of GFCI protected 20-amp in pit and adjacent to each signal control cabinet in control space.

3.02 PREPARATION

- A. Coordinate installation of anchors, bearing plates, brackets and other related accessories.

3.03 INSTALLATION

- A. Install equipment, guides, controls, car and accessories in accordance with manufacturer installation methods and recommended practices.
- B. Properly locate guide rails and related supports at locations in accordance with manufacturer's recommendations and approved shop drawings. Anchor to building structure using isolation system to minimize transmission of vibration to structure.
- C. All hoistway frames shall be securely fastened to fixing angles mounted in the hoistway. Coordinate installation of sills and frames with other trades.
- D. Lubricate operating system components in accordance with manufacturer recommendations.
- E. Perform final adjustments, and necessary service prior to substantial completion.

3.04 CONSTRUCTION

- A. Interface with Other Work:
 - 1. Guide rail brackets attached to steel shall be installed prior to application of fireproofing.
 - 2. Coordinate construction of entrance walls with installation of door frames and sills. Maintain front wall opening until elevator equipment has been installed.
 - a. Ensure adequate support for entrance attachment points at all landings.
 - b. Coordinate wall openings for hall push buttons, signal fixtures and sleeves. Each elevator requires sleeves within the hoistway wall.
 - c. Coordinate emergency power transfer switch and power change pending signals as required for termination at the primary elevator signal control cabinet in each group.
 - d. Coordinate interface of elevators and fire alarm system.
 - e. Coordinate interface of dedicated telephone line.

3.05 TESTING AND INSPECTIONS

- A. Perform recommended and required testing in accordance with authority having jurisdiction.
- B. Obtain required permits and provide originals to Owner's Representative.

3.06 DEMONSTRATION

- A. Prior to substantial completion, instruct Owner's Representative on the proper function and required daily maintenance of elevators. Instruct personnel on emergency procedures.

END OF SECTION

SECTION 15010- BASIC MECHANICAL REQUIREMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

- A. The Drawings and general provisions of the Contract, including General and Supplementary Conditions, and Division 1 Specification Sections, apply to work of this Section.

1.02 INCLUDED IN THIS SECTION:

- A. General Requirements for Mechanical Work
- B. Nameplates
- C. Access Doors
- D. Tags and Charts
- E. Electrical Motors
- F. Electric Motor Starters
- G. Sleeves, Inserts and Anchor Bolts
- H. Firestopping
- I. Plastic Pipe Markers
- J. Seismic Requirements

1.03 DESCRIPTION OF WORK:

- A. This Section specifies general requirements for mechanical, plumbing and fire protection work. Definitions, intent, drawings, interpretation of documents, approvals, submittals, substitutions, code requirements, permits, fees, royalties, patents, seismic requirements, record drawings, instruction of Owner's personnel, and warranty are described.
- B. Operation and maintenance manuals shall be submitted to the Architect prior to the scheduled instruction of Owner's representatives. These manuals shall contain equipment lists, manufacturer's literature, valve charts, and time schedule for recommended maintenance.
- C. Brass tags shall be securely attached to each valve. Valve charts shall list each valve and describe its function. One copy of each valve chart shall be placed under glass, framed, and hung in a conspicuous location in the main mechanical equipment room.
- D. Plastic pipe markers shall be provided on exterior of piping for identification purposes. These markers shall be manufacturer's standard pre-printed, color-coded, pressure-sensitive vinyl type.

1.04 DEFINITIONS:

- A. "Provide" means to supply, erect, install, and connect up in complete readiness for regular operation, the particular work referred.
- B. "Furnish" means to supply and deliver to the job.

- C. "Install" means to erect, install and connect up in complete readiness for regular operation.
- D. "Conduit" includes, in addition to conduit, all fittings, sleeves, connections, hangers, and other accessories related to such conduit.
- E. "Wiring" means, in addition to wire, all needed connectors, circuit breakers, switches and devices, junction boxes and other items necessary for normal operation of the item being referred to.
- F. "Piping" includes, in addition to pipe, all fittings, valves, hangers, and other accessories related to such piping.
- G. "Concealed" means hidden from sight, as in chases, furred spaces, shafts, hung ceilings, or embedded in construction.
- H. "Exposed" means not concealed as defined above. Trenches, crawl spaces, and tunnels shall be considered exposed.
- I. "Governmental" means all municipal, state, and federal governmental agencies.
- J. "Owner" means the tenant who shall occupy the space after final acceptance.
- K. "Extend" means to supply, erect, install and connect up on complete readiness for regular operation the particular work referred.

1.05 INTENT:

- A. It is the intention of the Drawings and Specifications to call for finished work, tested and ready for operation. All materials, equipment and apparatus shall be new and of first class quality.
- B. Any apparatus, appliance, material, or work not shown on the Drawings, but mentioned in the Specifications, or vice versa, or any incidental accessories, or minor details not shown, but necessary to make the work complete and perfect in all respects, and ready for operation, even if not particularly specified, shall be provided by the Contractor without additional expense to the Owner.
- C. With the submission of bid, the Contractor shall give written notice to the Architect of any materials, apparatus or omissions believed to be in violation of laws, ordinances, rules or regulations or authorities having jurisdiction. In the absence of such written notice it is mutually agreed that the Contractor shall include the cost of providing all systems in accordance with applicable regulations without extra compensation.

1.06 DRAWINGS:

- A. The Drawings are generally diagrammatic and are intended to convey the scope of work and indicate general arrangement of equipment, ducts, conduits, piping, fixtures and connections.

- B. Consider architectural and structural drawings part of this work insofar as these drawings furnish information relating to design and construction of the building.
- C. The Drawings do not indicate all offsets, fittings, and accessories which may be required. Investigate structural and finish conditions affecting this work, and arrange work accordingly, providing such fittings, valves, and accessories required to meet the conditions.
- D. The locations of all items shown on the Drawings or called for in the Specifications, that are not definitely fixed by dimensions, are approximate only. The exact locations necessary to secure the best conditions and results must be determined at the project, and shall have the approval of the Architect before being installed. **DO NOT SCALE DRAWINGS.**
- E. Follow Drawings as closely as actual building conditions will permit in laying out work. Check Drawings for other trades to verify spaces in which work will be installed. Maintain maximum headroom and space conditions throughout. Where headroom or space conditions appear inadequate, the Architect shall be notified before proceeding with installation.
- F. If directed by the Architect, the Contractor shall, without extra charge, make reasonable modifications in the layout as needed to prevent conflict with work of other trades or for proper execution of the work.

1.07 INTERPRETATION OF DRAWINGS AND SPECIFICATIONS:

- A. Any questions or disagreements arising as to the true intent of this Specification or the Drawings, or the kind and quality of work required thereby, shall be decided by the Architect, whose interpretations thereof shall be final, conclusive and binding on all parties.
- B. In the case of disagreement between Drawings and Specifications, or within either document itself, the better quality, greater quantity or more costly work shall be included in the contract price, and the matter referred to the Architect's attention for decision and/or adjustment.

1.08 APPROVALS:

- A. The materials, workmanship, design and arrangement of all work installed under the Contract shall be subject to the approval of the Architect. If material or equipment is installed before it is approved, the Contractor shall be liable for removal and replacement, at no extra cost to the Owner, if, in the opinion of the Architect, the material or equipment does not meet the intent of the Drawings and Specifications.

1.09 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES:

- A. The Contractor shall submit five (5) copies of Shop Drawings, Product Data and/or Samples to the Architect for review prior to releasing an order for fabrication and/or shipment. These submittals shall be given for materials and equipment and as called for under each particular Section of the Specifications.
- B. Product Data submittals shall consist of complete catalog data clearly indicating all applicable items, in the following manner:

1. State sizes, capacities, brand names, motor HP, accessories, materials, gauges, dimensions, and other pertinent information.
 2. List on catalog covers page numbers of submitted items.
 3. Underline applicable data. Highlighting applicable data is not sufficient.
 4. Wiring diagrams showing all equipment and devices.
- C. Incomplete or unclear submittals will be returned unreviewed for correction and resubmission. Additional copies beyond five (5), or submittals of items other than what is called for under each particular Section, will be returned unreviewed.
- D. Submittals of equipment or materials other than those indicated on the Drawings or in the Specifications will be returned unreviewed, except for reasons as noted under SUBSTITUTIONS.
- E. This Division shall coordinate all aspects of respective subsections with the contractor including material data, overall drawings, installation sequencing, etc. See Division 1 requirements.

1.10 SUBSTITUTIONS:

- A. Substitutions of equipment or materials other than those shown on the Drawings or called for in the Specifications will be considered for review only under one or more of the following conditions.
1. Less than three (3) acceptable manufacturers are indicated on the Drawings or in the Specifications.
 2. Substitution is required for compliance with subsequent interpretations of code requirements or insurance regulations.
 3. Substitution is required due to unavailability of special products, through no fault of the Contractor. Excluded is lack of availability within a desired time frame due to Contractor's failure to order equipment or material early enough.
 4. Manufacturer/fabricator refuses to certify or guarantee performance of specified product as required.
 5. Within fifteen (15) days of Award of Contract, the Contractor and Subcontractors under this Division shall submit to the Architect a complete list of manufacturers and model numbers proposed for the work of Division 15. Refer to the Paragraphs of this Section regarding: Approvals; Shop Drawings, Product Data and Samples; and Substitutions. The intent by the Contractor or Subcontractors to use the exact manufacturers and/or model numbers specified does not void the requirement for this Submission for Approval.

- B. The particular condition necessitating a substitution must be clearly indicated on the substitution's transmittal or it will be returned unreviewed.
- C. The Contractor shall submit a substitution for review before releasing an order for fabrication and/or shipment. The Architect reserves the right to reject such substitution, provided the item offered, in his opinion, is not equal to the item specified.
- D. When a Contractor proposes to use an item of equipment other than that specified or detailed on the Drawings, and which requires any redesign of structure, partitions, foundations, piping, wiring, or of any other part of the mechanical, electrical, or architectural layout, the Contractor shall assume responsibility for additional costs incurred in planning, design and construction to accommodate the substitution. If approved by the Architect, redesigned drawings and details to accommodate the substitution may be prepared by the Contractor at his own expense.
- E. If a substitution requires a different quantity and arrangement of piping, wiring, conduit, and equipment from that specified or indicated on the Drawings, subject to approval of the Architect, the Contractor shall provide any such piping, structural supports, insulation, controllers, motors, starters, electrical wiring and conduit, and any other additional equipment required by the system, at no additional cost to the Owner.

1.11 CODE REQUIREMENTS, PERMITS AND FEES:

- A. Perform work in accordance with applicable provisions of the accepted version of the State Building Code, State Mechanical Code, State Plumbing Code, International Plumbing Code, International Mechanical Code, NFPA codes including the National Electric Code and Life Safety Code, ASHRAE Handbooks/ Standards, SMACNA Technical Manuals/Standards, American National Standards Institute, Inc. (ANSI) Standards including A117.1, applicable edition, and all state and local codes. All work shall also be in compliance with utility companies' requirements.
- B. In cases of differences between building codes, state laws, local ordinances, utility company regulations, and Contract Documents, the most stringent shall govern. Promptly notify Architect in writing of such differences.
- C. Include in the work, without extra cost to the Owner, any labor, material, service, test, apparatus, or drawing (in addition to Contract Drawings and Documents) in order to comply with applicable laws, ordinances, rules, regulations, and local authority's requirements, whether or not shown on Drawings and/or specified.
- D. Give all necessary notices, obtain all permits before commencing work, and pay all governmental taxes, fees and other costs in connection with the work. File all necessary plans, prepare all documents, and obtain all necessary approvals of the authorities having jurisdiction. Obtain all required Certificates of Inspection for the work, and deliver them to the Owner before requesting final payment for the work.
- E. The Contractor shall ensure that all system components, methods of installation, and materials complies with ASTM, OSHA, and Owners' standards for off-gassing.

- F. The Contractor shall be licensed in accordance with the guidelines of the Department of Consumer Protection. The workers employed by the Contractor shall be skilled and licensed to perform the work involved.

1.12 ROYALTIES AND PATENTS:

- A. The Contractor shall pay all royalties and shall defend all suits or claims for infringement of any patent rights and shall save the Owner harmless from loss on account thereof.
- B. If the Contractor observes that a process or article specified is an infringement of a patent, the Contractor shall promptly notify the Architect in writing, and any necessary changes shall be adjusted as provided in the Contract for changes in the work. If the Contractor performs any work specified, knowing it to be an infringement of a patent, the Contractor shall bear all costs arising therefrom.

1.13 RECORD DRAWINGS:

- A. Clearly record differences between mechanical and electrical work as installed and as shown or called for in the Contract Documents. Accurate notations of all locations, sizes and inverts of all concealed materials shall be made. These records shall be marked, concurrent with progress, on a set of prints labeled "RECORD DRAWINGS."
- B. On completion of project, mark a set of prints with data transferred from the Record Drawings, and submit them to the Architect for review for legibility and clearness of presentation of the recorded conditions of construction.

1.14 INSTRUCTION OF OWNER'S PERSONNEL:

- A. After completion of all work and all tests and at such time as designated by the Owner's representative, the Contractor shall provide the necessary skilled personnel to operate each entire installation for a period of two (2) days of eight hours each day.
- B. During the operating period, the Contractor shall fully instruct the Owner's representative in the complete operation, adjustment, and maintenance of the entire installation.

1.15 OPERATION AND MAINTENANCE MANUALS:

- A. Prepare a manual of operation and maintenance instructions, in draft form, and submit to the Architect for review.
- B. The Manual shall contain the following items:
 - 1. Brief description of each system covering its basic operating characteristics.
 - 2. List of all equipment with manufacturer's name and model number for each item.
 - 3. Contractor's own written operating and maintenance instructions, including detailed step-by-step instruction for starting, summer operation, winter operation, and

shutdown of each system.

4. Copies of submittals having final review stamps.
 5. Manufacturer's bulletins, data, parts lists, operating and maintenance instructions, guarantees and any other information pertinent to the proper operation of each system and item of equipment installed, including service manual which covers disassembly and reassembly of the equipment.
 6. Copy of each automatic control diagram with respective sequence of operation.
 7. Copy of each valve chart.
 8. Information of actions to be taken in the event of a malfunction or other emergency.
 9. Time schedule for recommended maintenance operation.
- C. At least two weeks prior to the scheduled instruction of Owner's representatives, provide the Architect with five (5) complete copies of the final form of the Operation and Maintenance Manual, bound in booklet form in durable binders, suitable indexed with labeled tabs for each item.

1.16 WARRANTY:

- A. The Contractor shall warrant that all work installed will be free from any and all defects, and that all apparatus will develop capacities and characteristics specified, and that if, during a period of one (1) year from date of completion and acceptance of the work, any such defects in workmanship, materials, or performance appear, the Contractor shall immediately replace, repair or otherwise correct the defect or deficiency without cost and within a reasonable time to be specified in writing to the Owner.
- B. The Contractor shall also replace or repair, to the satisfaction of the Owner and Architect, all damage done to any material or finish in consequence of work performed in fulfilling the warranty.
- C. In the case of default on this warranty by the Contractor, the Owner may have such work done as required, and charge the cost to the Contractor.

1.17 VISITING THE SITE:

- A. Before submitting a final proposal, the Contractor shall examine the site of the proposed work to determine the existing conditions that affect the work. The Contractor will be held responsible for any assumptions made by him in regard thereto. Time for this examination must have prior approval of the Owner.
- B. No subsequent allowance for time or money will be considered for any consequence related to failure to examine site conditions. All existing systems shall remain in operation at all times except as otherwise arranged under shutdowns.

1.18 FINAL ACCEPTANCE:

- A. Preliminary Procedures: Before requesting final inspection for certification of final acceptance and final payment, complete the following list:
1. Submit the final payment request to the Architect with releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.
 2. Submit an updated final statement to the Architect, accounting for final additional changes to the Contract Sum.
 3. Submit a certified copy of the Architect's Final Inspection list of items to be completed or corrected, stating that each item has been completed or corrected, stating that each item has been completed or otherwise resolved for acceptance, and the list has been endorsed and dated by the Architect.
 4. Submit consent of surety to final payment.
 5. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
- B. Reinspection Procedure: The Architect will reinspect the Work upon receipt of notice from the Contractor that the Work, including Final Inspection list items from earlier inspections, has been completed, except items whose completion has been delayed because of circumstances acceptable to the Architect.
1. Upon Completion of reinspection, the Architect will prepare a certificate of final acceptance, or advise the Contractor of Work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance.
 2. If necessary, reinspection will be repeated, and the Contractor will bear the cost.

1.19 COORDINATION DRAWINGS:

- A. The contractor is to prepare and submit for review and approval coordination drawings for each trade detailing all systems and components including but not limited to:
- Ductwork fabrication
 - Piping Fabrication
 - Plumbing, Fire Protection and Mechanical equipment components and all associated accessories.
 - Electrical Fixtures and Sprinkler Terminals
 - Electrical Components
 - Conduits, Junctions boxes and all associated accessories.
- B. Drawings are to be to scale: (1/4" = 1'-0" Min.) Drawings are to include all spaces above and below ceilings including all boiler rooms, mechanical rooms, electrical rooms, water rooms, and all specific and common spaces and indicating all the latest architectural and structural

components. Coordination drawings are to be in addition to any individual submittals of associated items. Each trade must sign-off on coordination drawings indicating respective trade disciplines have been coordinated. Each trade contractor must include in their bid all associated cost for such coordination drawings. Contractor to indicate respective costs on billing schedule of values.

- C. Contractor shall prepare coordination drawings and installation layouts. Such drawings shall consist of dimensioned plans and elevations (above and below ceilings), and shall give complete information, particularly as to size and location of sleeves, inserts, attachments, openings, conduits, ducts, boxes, structural interferences, etc. Such drawings shall incorporate all trades.
 - 1. Accurate structural steel locations shall be represented on the composite shop drawings, as the basis for coordination by the trades.
- D. These coordination shop drawings and field installation layouts shall be coordinated in field by Contractor and his subcontractors for proper relationship to work of other trades, based on field conditions, and shall be checked for accuracy and accepted by them before submission to Architect for his final acceptance. Contractor shall have competent technical personnel readily available for such coordination and checking as well as for supervision of field installation of work in accordance with shop drawings and field installations as determined by the Contractor to be correct and carrying Architect's submittal review stamp.

1.20 FABRICATION DRAWINGS:

- A. The contractor shall provide plain view 1/4" scale shop (fabrication) drawings of all mechanical (pipe and air), plumbing, fire protection systems. Fabrication drawings shall indicate and include all materials and accessories (fittings, adapters, flexible connections, equipment, connections, etc) to completely define how the contractor proposes to provide such plumbing, fire protection and mechanical systems. Fabrication drawings are to be submitted in conjunction with contractor's submission of coordinate drawings.

PART 2 - PRODUCTS

2.01 MANUFACTURER'S IDENTIFICATION:

- A. Manufacturer's nameplate, name, or trademark shall be permanently affixed to all equipment and material furnished under this Specification. The nameplate of a subcontractor or distributor will not be acceptable.

2.02 NAMEPLATES:

- A. Provide for each item of equipment, including controls, a permanently attached nameplate made of laminated bakelite with incised letters; nameplate shall have black surface and white core.
- B. Nameplates shall be a minimum of 3" long by 1-1/2" wide and shall bear the equipment name and item as designated in the equipment schedule.

2.03 ACCESS DOORS:

- A. Furnish access doors to provide access to valves, cleanouts, dampers, controls, junction boxes, etc. concealed behind finished construction. Doors shall have a fire-resistance rating classification to match the construction which they are installed in. Doors shall be of the flush type with slot head-operated cam lock, 16-gage anchor frame, and hinged panel, as manufactured by Goal Inc., Karp Associates Inc., Elmdor Mfg. Co., or Milcor. Minimum size shall be 12" x 12". Doors shall be furnished by each Section of Division 15 for installation by other Divisions.

2.04 TAGS AND CHARTS:

- A. The Contractor shall furnish and attach to each valve a 1-1/2" diameter brass tag with 1/2" indented numerals filled with durable black compound. Tags shall be securely attached to stems of valves with copper wire and "S" hooks.
- B. Valves charts shall list each valve and describe its function. Upon completion of the work, one (1) copy of each chart, sealed to rigid backboard with clean lacquer, placed under glass and framed, shall be hung in a conspicuous location in the main equipment room, unless otherwise directed by the Architect. Two (2) additional unmounted copies shall be delivered to the Architect.
- C. Provide tags for the following valves:
 - 1. Zone control, bypass, shut-off and balancing valves.
 - 2. Control, bypass, shut-off, balancing and drain valves for major pieces of equipment.
 - 3. Building and area shut-off and balancing valves.
 - 4. System drain valves.

2.05 ELECTRICAL MOTORS:

- A. All electric motors shall conform to requirements of IEEE, NEMA, UL, NEC, and shall be suitable for required load, duty, voltage, phase, frequency, service and location.
- B. All motors shall be suitable for continuous duty at rated horsepower with temperature rise not to exceed 40°C for drip-proof motors, 50°C for splash-proof motors, and shall be capable of withstanding momentary overloads of 25% without injurious overheating.
- C. Motors 1/2 horsepower and larger shall have ball or roller bearings with pressure grease lubrication, except where otherwise noted.
- D. Direct connected motors shall be furnished without an adjustable base. All motors connected to driven equipment by belt or chain shall be furnished with adjustable sliding bases, except fractional motors with slotted mounting holes.
- E. All motor leads shall be permanently identified and supplied with connectors.
- F. Motors shall have nameplates giving manufacturer's name, serial number, horsepower, speed

and current characteristics.

- G. Motors smaller than 1/2 horsepower shall be capacitor-start or split-phase type designed for 120 volts, single phase, 60 cycles alternating current. Motors 1/2 horsepower and larger shall be squirrel cage induction or wound motor, induction type for 3 phase, 60 cycles, alternating current as noted on the plans.
- H. Motors 1 horsepower and greater shall be 1800 RPM, polyphase, open drip-proof or totally enclosed fan-cooled. (all motor efficiencies to meet maximum utility company rebate, contractor to coordinate).

2.06 ELECTRIC MOTOR STARTERS:

- A. All electric motor starters shall conform to requirements of IEEE, NEMA, UL, NEC, and shall be suitable for required load, duty, voltage, phase, frequency, service and location.
- B. When interlocking or automatic control of single-phase motors is required, motors shall be furnished with magnetic across-the-line starters.
- C. Three-phase motors shall be furnished with full voltage, magnetic across-the-line starters.
- D. All magnetic starters shall have start-stop pushbuttons in cover, except when interlocking or automatic control is required. Then starters shall have Hand-Off-Automatic selector switches with pilot lights in cover.
- E. All magnetic starters shall include overload and low voltage protection, one (1) set of auxiliary make-and-break contacts, and green pilot lights for running condition.
- F. All magnetic starters shall have 120 volt, single phase, 60 cycle control circuit regardless of line voltage and include 0.5 KW transformer to provide 120 volt circuit where required.
- G. All magnetic starters shall have overload relays, one for each phase, of the melting alloy type. These thermal units shall be of one-piece construction and shall be interchangeable. The starter shall be inoperative if any thermal unit is removed.
- H. Acceptable Manufacturers: Subject to compliance with requirements, provide products of one of the following:
 - 1. Cutler-Hammer
 - 2. General Electric Corporation
 - 3. Square D

2.07 SLEEVES, INSERTS AND ANCHOR BOLTS:

- A. Each Section of Division 15 shall be responsible for the location and proper position of sleeves and anchor bolts. If failure to do so requires cutting and patching of finished work, it shall be done at no extra cost to the Owner.

- B. Piping or conduits passing through concrete, masonry, and fire rated or smoke rated aboveground floors/walls/ceilings/partitions shall be provided with sleeves having a minimum internal diameter 1/2" larger than the outside of the piping and conduit. Seal for acoustical purposes and to maintain fire and smoke ratings.
- C. Sleeves through aboveground concrete floors or interior masonry walls shall be Schedule 40 black steel pipe, set flush with wall, floor or ceiling surface. Sleeves through aboveground floors shall be sealed with a fireproof, resilient material to maintain the fire rating integrity of the assembly.
- D. Sleeves through aboveground floors of wet areas such as equipment rooms, toilet rooms, etc., shall extend 2" above finished floor surface and be sealed as noted above. In addition, caulk with waterproof compound to the approval of the Architect.

2.08 FIRESTOPPING:

- A. Requirements: Conduits, cables, busways plumbing and mechanical piping, HVAC or mechanical ducting that penetrate fire rated walls or floors shall be sealed by means of a UL listed system. Refer to the UL Fire Resistance Directory, Vol. II, most recent edition. Other equivalent third party testing agencies, such as Factory Mutual Systems Approval, are acceptable. Piping penetrating framed walls shall meet UL No. 187, and piping penetrating concrete floors or block walls shall meet UL No. 281.
- B. Failure of the Architect or Engineer to designate a required firestop does not relieve the Contractor of the responsibility to provide an approved system.
- C. Design: Unless otherwise specified, the "F" rating (burn thru time) of the system(s) shall be equal to or longer than the wall or floor being penetrated. Where penetrants pass thru finished walls and floors, the firestop materials when cured shall be compatible with the wall or floor finish. (For example, a firestop thru a painted block wall shall be sandable and paintable.) Where open (as opposed to closed piping) penetrants such as cable tray or busway are fire-stopped, the individual conductors shall be properly sealed by means of a cable sealant or factory installed, UL listed internal (in the case of busway) firestop or other approved method. Fire stop system shall meet the following: ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops, ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials and ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
- D. Installation: All seals shall be installed in accordance with the manufacturer's design and instructions. Demonstrate to the Owner that the installer is capable of installing each system properly by submitting samples or by performing one or more installations in the presence of the Owner. Include with the Record Drawings a UL system number for each firestop.
- E. Acceptable Manufacturers: Subject to compliance with requirements, provide products of one of the following:
 - 1. Dow Corning Corporation
 - 2. 3M Fire Protection Products

3. International Protective Coatings
4. HILTI, Inc.

2.09 PLASTIC PIPE MARKERS:

- A. Provide manufacturer's standard pre-printed, permanent adhesive, color-coded, pressure-sensitive vinyl pipe markers, complying with ANSI A13.1.
- B. Markers shall be fastened to pipe (or insulation) by adhesive lap joint in pipe marker overlap, or by color-coded plastic adhesive tape, not less than 3/4" wide, full circle at both ends of pipe marker, tape lapped 1-1/2".
- C. Lettering: Manufacturer's standard preprinted nomenclature which best describes piping system in each case.
- D. Acceptable Manufacturers: Subject to compliance with requirements, provide products of one of the following:
 1. Seton Name Plate Company
 2. W.H. Brady Company
 3. Allen Systems
 4. Emed Co., Inc.
 5. Marking Services, Inc.

2.10 LIMITED-COMBUSTIBLE MATERIAL:

- A. All materials installed in concealed spaces shall have a Btu content not exceeding 1000 Btu per square foot or shall be classed as limited-combustible having a potential heat value not exceeding 3500 Btu per lb.

2.11 MATERIALS AND EQUIPMENT:

- A. Prior to ordering or use of any material or equipment, it shall be the sole responsibility of the Contractor to ensure that the manufacturer certifies in writing that all material and equipment supplied is suitable and approved by code, and in accordance with the manufacturer's recommendations and installation instructions for use in the particular manner and location intended. Contractor shall make due allowance for this in the bid and shall include any accessories or revisions required at no additional charge.
- B. New materials and equipment installed into existing work shall be compatible with the existing work. The Contractor shall advise the Architect before ordering and/or installing any materials or equipment if he disputes those items and/or methods specified. Otherwise, the Contractor shall take full responsibility for their performance and suitability. Only new materials and/or equipment shall be used.

PART 3 - EXECUTION

3.01 PROTECTION OF WORK AND PROPERTY:

- A. The Contractor shall be responsible for the maintenance and protection of all equipment, materials and tools supplied by the Contractor and stored or installed on the job site, from loss or damage of all causes, until final acceptance by the Owner.
- B. The Contractor shall be responsible for the protection of any finished work of other trades from damage or defacement by the Contractor's operation and must remedy any such injury at the Contractor's own expense.

3.02 SCAFFOLDING, RIGGING, AND HOISTING:

- A. The Contractor shall provide all scaffolding, rigging, hoisting and services necessary for erection and delivery into the premises for all equipment and materials furnished, and remove same from premises when no longer required.

3.03 CUTTING, PATCHING, EXCAVATION AND BACKFILL:

- A. All cutting, patching, excavation and backfill shall be provided by other Divisions. Coordinate all requirements well in advance.

3.04 ACCESSIBILITY:

- A. The Contractor shall install all items so that parts requiring inspection, maintenance and repair are readily accessible. Minor deviations from the Drawings may be made to accomplish this, but changes of magnitude shall not be made without prior written approval of the Engineer.

3.05 PIPE EXPANSION:

- A. All pipe connections shall be installed to allow for freedom of movement of the pipe during expansion and contraction without springing. Swing joints, expansion loops and expansion joints with proper anchors and guides shall be provided by the Contractor where necessary, and/or where shown on the Drawings. Anchors and guides shall be subject to the approval of the Architect.
- B. The Contractor shall provide all bases and supports not part of the building structure, of required size, type, and strength, as approved by the Architect, for all equipment and materials furnished by the Contractor.
- C. All equipment, bases and supports shall be adequately anchored to the building structure to prevent shifting of position under operating conditions.

3.06 SEISMIC REQUIREMENTS:

- A. All new mechanical and electrical machinery, equipment, piping, ductwork, wiring and

conduit shall be installed to resist vertical and lateral forces in accordance with the State Building Code and applicable regional seismic codes, with the exception of the following:

1. Piping (excluding natural or propane gas piping) in boiler and mechanical rooms less than 1-1/4" inside diameter.
 2. All other piping (excluding natural or propane gas piping) less than 2-1/2" inside diameter.
 3. All electrical conduit less than 2-1/2" inside diameter.
 4. All rectangular air-handling ducts less than 6 square feet in cross-sectional area.
 5. All round air-handling ducts less than 28" in diameter.
 6. All piping suspended by individual hangers 12" or less in length from the top of the pipe to the bottom of the support for the hanger.
 7. All ducts suspended by hangers 12" or less in length from the top of the duct to the bottom of the support for the hanger.
- B. New ductwork and piping shall be provided with seismic restraints in accordance with Seismic Hazard Level (SHL) B of the latest edition of SMACNA "Seismic Restraint Manual Guidelines For Mechanical Systems" and in accordance with the State Building Code.
- C. Where seismic restraints are installed, the spring vibration isolators or other restraint assemblies shall be designed and installed in accordance with the manufacturer's specifications. The restraint assembly shall be designed to withstand the seismic lateral forces established in the State Building Code for a Zone 2 seismic area.
- D. Provide seismic snubbers, separate from or integral with spring isolators, for attachment to machinery and equipment bases, designed to provide seismic restraint in all modes (directions) in accordance with the State Building Code and applicable regional seismic codes. These snubbers shall have no contact with equipment during normal operation and shall have minimum clearances of 1/4" in all directions. Seismic snubbers shall be installed in strict accordance with the manufacturer's recommendations.
- E. Spring Isolators shall have the following characteristics.
1. Minimum outside diameter to overall height ratio of 0.8:1.0.
 2. Corrosion resistance where exposed to corrosive environment with:
 - a. Springs cadmium plated or electro-galvanized.
 - b. Hardware cadmium plated.
 - c. All other metal parts hot-dip or hot spray galvanized for outdoor applications.
 3. Reserve deflection (from published load ratings to solid height) of 50% of the rated

- deflection.
4. Minimum 1/4" thick neoprene acoustical base pad or cup on underside.
 5. Designed and installed so that ends of springs remain parallel.
 6. Mason Industries Type SLF or similar type by other acceptable manufacturer.
- F. Spring isolators shall be provided for all floor mounted and suspended HVAC air handling units and fan powered VAV boxes as follows.
1. Spring element seated on a steel washer within a neoprene cup incorporating a rod isolation bushing enclosed in a steel retainer box.
 2. Molded (min. 1-3/4" thick) neoprene element with projecting bushing lining the rod clearance hole. Static deflection at rated load shall be a minimum of 0.35".
- G. Air Handling Units:
- A. Anchorage of Equipment to Housekeeping Pads: Place floor mounted equipment on 4" high concrete housekeeping pads properly doweled or expansion shielded to the floor to meet acceleration criteria. Anchor isolators and/or bases to housekeeping pads. Concrete work shall be provided by other Divisions.
- H. Anchorage of Housekeeping Pads: All concrete housekeeping pads must be anchored to the structure to meet acceleration criteria. This Contractor shall coordinate this with other Divisions.
- I. Acceptable Manufacturers: Subject to compliance with requirements, provide seismic restraint and isolation products of one of the following manufacturers.
1. Mason Industries, Inc.
 2. Vibration Eliminator Co., Inc.
 3. Vibration Mountings and Controls, Inc.
 4. Kinetic Noise Control
- J. Submit product data and details of all seismic restraints and isolators.

3.07 QUIET OPERATION:

- A. All equipment and material provided by the Contractor shall operate under all conditions of load without any sound or vibration which in the opinion of the Architect is objectionable. Where sound or vibration is objectionable in the opinion of the Engineer, the Contractor shall eliminate it in a manner approved by the Architect.

3.08 PAINTING:

- A. Other Divisions shall clean and paint all new exposed, unpainted, non-galvanized, metal surfaces of pipes, conduits, equipment, hangers, supports and accessories with one (1) prime

coat and two (2) finish coats. Coordinate all requirements well in advance.

B. Other Divisions shall also paint exposed surfaces of inertia bases and housekeeping pads.

C. Paint colors shall be as follows. Confirm colors with Architect, including for items not listed.

1.	Natural Gas Piping (Outdoors)	Medium Grey
2.	Natural Gas Piping (Indoors)	Safety Yellow
3.	Sprinkler Piping	Safety Red
4.	Drain or Relief Piping	Medium Green
5.	Sanitary or Waste Piping	Medium Green
7.	Storm Piping	Medium Green
8.	Vent Piping	Medium Blue
9.	Inertia Base/Housekeeping Pad	Medium Blue
10.	Equipment	Light Grey

3.09 CLEANING OF PIPING AND EQUIPMENT:

A. Clean exposed piping, ductwork, equipment and fixtures. Repair damaged finishes and leave everything in working order satisfactory to the Architect.

B. Thoroughly clean all equipment inside and outside of all foreign substances before being placed into operation. If any part of a system should be stopped by any foreign matter after being placed in operation, the system shall be disconnected, cleaned and reconnected wherever necessary to locate and remove obstructions. Any work damaged in the course of removing obstructions shall be repaired or replaced when the system is reconnected, at no additional cost to the Owner.

3.10 PLASTIC PIPE MARKERS:

A. Install pipe markers on each mechanical system, and include arrows to show normal direction of flow.

B. Locate pipe markers and color bands as follows wherever piping is exposed to view, as well as above removable acoustical ceilings.

1. Near each valve and control device.

2. Near each branch, excluding short take-offs for fixtures and terminal units. Mark each pipe at branch where there could be question of flow pattern.

3. Near locations where pipes pass through walls or floors/ceilings, or enter non-accessible enclosures. Omit this on piping above removable acoustical ceilings.

4. At access doors, and similar access points which permit view of concealed piping.

5. Near major equipment items and other points of origination and termination.
6. Spaced intermediately at maximum spacing of 50' along each piping run, except reduce spacing to 25' in congested areas of piping and equipment.

3.11 TESTS:

- A. All equipment shall be tested as determined by all authorities having jurisdiction, but in no case less than that specified under each section of the Specifications. Labor, materials, instruments and power required for testing shall be furnished by the Contractor, unless otherwise indicated under the particular section of the Specifications.
- B. Tests shall be performed to the satisfaction of the Architect and such other parties as may have legal jurisdiction.
- C. All defective work shall be promptly repaired or replaced and the tests shall be repeated until the particular system and component parts thereof receive the approval of the Architect.
- D. Any damages resulting from tests shall be repaired and damaged materials replaced, all to the satisfaction of the Architect.
- E. Equipment and systems which normally operate during certain seasons of the year shall be tested during the appropriate season. Tests shall be performed on individual equipment, systems and their controls. Whenever the equipment of a system under test is interrelated with, and depends upon, the operation of other equipment, systems and controls for proper operation, functioning and performance, the latter shall be operated simultaneously with the equipment or system being tested.

3.12 DESIGNATIONS:

- A. This contractor shall confirm in writing all rooms, name, number and area designations with the Architect prior to final usage for any system. Contractor may utilize designations on drawings as a temporary measure but final usage must be confirmed with the Architect.

END OF SECTION 15010

SECTION 15300- FIRE PROTECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

- A. The Drawings and general provisions of the Contract, including General and Supplementary Conditions, and Division 1 Specification Sections, apply to work of this Section.
- B. The requirements specified in Section 15010, "Basic Mechanical Requirements," apply to this Section.
- C. Codes and Standards (comply with applicable editions) shall include, but are not limited to:
 - 1. Comply with the State Building, Plumbing, Fire, Mechanical and Energy Codes.
 - 2. Comply with NFPA 13, NFPA 14, NFPA 20 and NFPA 24, as amended by the Massachusetts Building Code.

1.02 SCOPE OF WORK:

- A. This Section includes the providing of all labor, materials, fixtures, equipment, accessories, services and tests necessary to complete and make ready for operation by the Owner all Fire Protection work as shown on the Drawings and described in these Specifications. It is the intent of these Documents to terminate with complete, operational fire protection sprinkler and standpipe systems within the building. The materials, products, devices, methods, systems, design, and installation of any and all aspects of a fire protection sprinkler systems shall be in conformance with the Commonwealth of Massachusetts Fire Safety Code and NFPA 13, NFPA 14, NFPA 20, and NFPA 24 as applicable.
- B. Sprinklers and standpipes are required throughout all areas of the building except as noted otherwise in this Section. Material and installation required is listed herein. Provide complete preliminary layouts and approved "Working Plans" and hydraulic calculations as required under SUBMITTALS.
 - 1. Dry Sprinkler protection to NFPA 13 is required in the unheated attic area.
 - 2. City water is available and for standpipe operation, the project shall be fed from an electric centrifugal fire pump system to NFPA 20, complete. Coordinate all requirements with Division 2. Water supply type and arrangements shall be subject to approval of the Authority Having Jurisdiction.
 - 3. Subject to limitations of these Fire Protection performance specifications, all Fire Protection designs, Fire Protection Construction Documents, Fire Protection Shop Drawing Preliminary plans and calculations, Fire Protection Shop Drawing Working Drawing plans and calculations shall be provided by a Fire Protection Professional Engineer in the employ of the Fire Protection Contractor and each shall be wet sealed and signed by a licensed Professional Engineer licensed in the state where the project is located. Submissions without the specified seal/signature will be return unreviewed.

- C. Insurance Rating Bureau approval shall be predicated on the lowest applicable rate premium without penalty.
- D. Complete installation shall be in strict accordance with NFPA 13, NFPA 14, NFPA 20, NFPA 24, the Standards for Sprinkler Systems of the National Board of Fire Underwriters (latest editions), Owner's Fire Insurance Rating Organization, the Fire Marshal and all authorities having jurisdiction.
- E. Contractor shall include and pay for all local utility company and city service charges.
- F. Sprinkler items indicated on Drawings accompanying these specifications are to be used as a guide to indicate minimum requirements only. Provide additional sprinklers, piping and equipment as required to suit the Contractor's final sprinkler design and to meet all requirements of code and authorities having jurisdiction at no additional cost to the Owner.
- G. The work shall include but not be limited to the following:
 - 1. Piping and Fittings
 - 2. Sprinklers
 - 3. Hangers, Supports and Sleeves
 - 4. Fire Department Connection
 - 5. Valves
 - 6. Alarm Valves
 - 7. Backflow Preventers
 - 8. Fire Pump and Jockey Pump
 - 9. Fire Pump Controller, Transfer Switch and appurtenances
 - 10. Fire Department Connection
 - 11. Flow and Test Connections

1.03 INCLUDED SYSTEMS:

- A. Sprinkler and standpipe systems shall be automatic, NFPA 13 and NFPA 14 compliant. Sprinkler system shall include dry and wet systems to suit location and duty proposed. Sprinkler and standpipe systems indicated on the accompanying Drawings are diagrammatic only and may not necessarily fit in locations shown. The locations on the Drawings are a general guide only. It is the sole responsibility of this Contractor to arrange the systems to fit within the structure in an approved manner at no additional cost to the Owner.
- B. Fire Protection water supply system shall be automatic and the NFPA 20 compliant UL/FM approved electric centrifugal packaged fire pump system located in the rated fire pump room suitable for use as a sprinkler and standpipe water supply; see the Work By Others section below. The fire pump system shall include the UL Listed /FM approved electric fire pump, UL/FM Fire Pump Controller, Jockey Pump, UL Listed Jockey Pump Controller, Pressure Sensing Lines Complete per NFPA 20, listed OS & Y Gate & Butterfly Valves, Suction and Discharge Pressure Gauges, Automatic Casing Air Release Valve, Casing Pressure Relief Valve, hose header with Valves, Caps & Chains, Suction and Discharge Piping per NFPA 20.

1.04 WORK BY OTHERS:

- A. Related work by other Divisions shall include, but not be limited to, the following.
 - 1. Cutting and patching shall be by other Divisions.
 - 2. Excavation and backfill shall be by other Divisions.
 - 3. Finish painting shall be by other Divisions.
 - 4. Electrical power wiring shall be by Division 16. Coordinate all requirements well in advance.
 - 5. Boxing-in of exposed piping in finished areas shall be by other Divisions.
 - 6. Fire protection systems for kitchen hoods shall be by other Divisions where required.
 - 7. Underground site piping shall be provided by the site contractor.
 - 8. Demolition shall be by other Divisions.

1.05 QUALITY ASSURANCE:

- A. **Qualifications:** Use only qualified personnel who are thoroughly trained and experienced in the skills required and who shall be completely familiar with the referenced standards and requirements of this work.
- B. Comply with all pertinent requirements of NFPA Standards 13, 14, 20 and 24, Owner's Fire Insurance Rating Organization and Local Authorities. Provide all necessary material and equipment required by authorities.
- C. All systems shall be in accordance with and as approved by the Owner, Architect, the Owner's Fire Insurance Rating Organization and all authorities having jurisdiction.
- D. **UL and FM Compliance:** Fire protection system materials and components shall be Underwriter's Laboratories listed and labeled, and Factory Mutual approved for the application anticipated.

1.06 SUBMITTALS:

- A. Submit preliminary layout shop drawings to Architect showing new equipment, valving, controls, mains, risers, and sprinkler locations in all areas. Additional sprinklers may be required to provide a coordinated pattern; piping relocation may also be required. These sprinklers and piping shall be furnished at no additional cost to the Owner.
- B. Submit a complete listing of new materials and equipment, including manufacturers' names and product data, to the Architect for review. Product data submittal shall include, but not be limited to:

1. Sprinklers
 2. Alarm Check Valve
 3. Dry-Pipe Valve
 4. Dry-Pipe Air Compressor and Accessories
 5. Backflow Preventers
 6. Water Control (Shutoff) Valves, Gate Valves and Butterfly Valves
 7. Check Valves
 8. Fire Department Connection
 9. Water-Motor Gong and Electric Bell
 10. Water Flow Indicators and Tamper Switches
 11. Spare Sprinklers, Cabinets and Wrenches (list quantities, sizes and types)
 12. Pressure fluctuation maintenance Watchmen's Kit Trim.
- C. Following preliminary reviews and prior to delivery of any materials to job site, detailed "Working Plans" as defined by NFPA 13 and NFPA 14 shall be prepared by an accredited sprinkler installation company. Drawings and hydraulic piping design calculations shall be submitted to the Architect for review. Revise to incorporate all review comments and then submit to Owner and Owner's Fire Insurance Rating Organization for approval. Detailed fabrication drawings and hydraulic calculations shall be revised to incorporate all review comments, and then resubmitted to the Owner and Owner's Fire Insurance Rating Organization. These revisions and resubmittals shall continue to occur until all review comments are incorporated and lowest applicable rate premium is obtained.

1.07 CONTRACTOR'S PROPOSAL:

- A. Where the Contractor wishes to use a different arrangement of sprinkler piping which would require a different arrangement of boxing-in or lowered ceilings than what is indicated on the Drawings, the Contractor shall submit details of such proposed boxing-in or lowered ceiling change, and all other details that the change would affect, to the Architect in advance or in conjunction with sprinkler shop drawings. The Architect may not accept such proposed change and may require various arrangements shown on the Drawings be provided instead.

PART 2 - PRODUCTS

2.01 PIPING AND FITTINGS:

- A. Underground fire water service piping shall be Class 54 ductile iron or similar material to match piping on site in accordance with NFPA 24 and Owner's certified water operator requirements.
- B. Aboveground sprinkler and standpipe pipe and fittings 2" and smaller shall be seamless ASTM A-53 Schedule 40 black steel. Pipe and fittings 2-1/2" and larger shall be ASTM A-53 Schedule 10 seamless black steel. Fittings shall be in accordance with NFPA 13 and NFPA 14 as applicable.
- C. All material shall be of standard and approved manufacturer, free of all defects and the best made in the classes for which it is used. All piping and fittings shall be suitable for the location, pressure class and duty proposed. All fittings, piping, devices and complete system to be 250 psi rated.

- D. Use of grooved mechanical couplings shall be permitted on piping 2-1/2" and larger, where in accordance with NFPA and Local Authorities' requirements.
- E. All threads shall be as designated by the Authority Having Jurisdiction.
- F. When corrosive conditions are known to exist due to fumes from corrosive chemicals or moisture, or both, types of piping, fittings, and hangers that resist corrosion shall be used or a protective coating shall be applied to all unprotected exposed surfaces of the sprinkler system to resist corrosion. Areas where corrosive conditions are known to exist include, but are not limited to, the following: Boiler Room.

2.02 SPRINKLERS:

- A. Sprinklers: Quick response type, and style as indicated or required by the application. Unless otherwise indicated or required, provide sprinklers with nominal ½ inch discharge orifice, for "Ordinary" temperature range. Fast Response Sprinklers (residential sprinklers or Quick-Response sprinklers) shall be used wherever possible.
- B. Sprinklers in areas with finished ceilings, except as noted below, shall be standard pendent type, polished chrome finish, installed with only the head below the ceiling. Two piece (split type) polished chrome ceiling escutcheon shall conceal ceiling opening.
- C. Sprinklers in unfinished or exposed areas without suspended ceilings shall be standard upright and/or sidewall styles: chrome plated in finish spaces, exposed to view; rough bronze finish for sprinklers in unfinished spaces and not exposed to view.
- D. Sprinklers in areas above finished ceilings or in concealed spaces shall be standard upright and/or sidewall styles and shall have rough brass or bronze finish.
- E. Sprinklers shall be listed corrosion-resistant or wax-coated where installed exposed to acids, chemicals, or other corrosive fumes.
- F. Sprinklers shall have temperature ratings to match code requirements and good practice for conditions in which they shall be located.
- G. Quick-Response sprinklers shall be UL listed as having been tested to UL 199 standard. Fast response residential sprinklers shall be UL listed as having been tested to UL 1626 standard.

2.03 HANGERS, SUPPORTS AND SLEEVES:

- A. Pipe hangers and supports shall be in accordance with NFPA 13 and NFPA 14.
- B. Furnish and install chrome plated escutcheons around all exposed pipes passing through walls and ceilings in finished areas.
- C. Furnish and set standard weight steel pipe sleeves where pipes pass through masonry construction and fire or smoke rated partitions. Pack these sleeves with approved fire/smoke rated filling compound and/or fiberglass to maintain these ratings.

2.04 FIRE DEPARTMENT CONNECTION:

- A. Provide a fire department connection, not less than 4" size, for emergency water supply in accordance with NFPA 13 and NFPA 14.
- B. The fire department connection shall be dual inlet (siamese) type and shall be of the flush wall type of polished chrome, with lettering, supports, thrust blocking where required, 2 clappers, 2 caps with chains, and 2 adapters if necessary. Unit shall be Potter-Roemer model 5021-D. Approved straightway horizontal check valve with ball drip shall be provided in the fire department connection piping within the building.
- C. Location of the fire department connection shall meet the requirements of the local Fire Marshal and Authorities Having Jurisdiction. Verify requirements well in advance.
- D. Check valves shall be non-slamming ball drip type.

2.05 VALVES:

- A. Water control (shutoff) valves shall be UL listed, FM approved, suitable for 175 PSI cold water working pressure, non-shock. Valves shall be capable of being repacked under pressure, with valve wide open. OS&Y valves shall be solid wedge, rising stem type. Valves 2" and smaller shall have body and bonnet of cast bronze, with threaded ends; 2-1/2" and larger shall be iron body, bronze mounted, with flanged ends. Valves shall be installed at test connections, drains, drawoffs, alarm lines and wherever else required.
- B. Water control (shutoff) valves on site shall be in accordance with local water company's requirements.
- C. Provide tamper switches on all water control valves, excluding valves on site.
- D. Check valves shall be non-slamming type.

2.06 ALARM VALVES:

- A. Alarm check valves for wet pipe system(s) shall be standard approved type with retard chamber, electric pressure switch, and all required tappings and trim necessary for normal operation.
- B. Dry-pipe valves for dry-pipe system(s) shall be standard approved type, with pressure gauges, pressure switch, air compressor, air maintenance device, and all required tappings and trim necessary for normal operation.
- C. Alarm check and dry-pipe valves shall be equipped with circuit closers for transmitting alarm. Alarm shall be wired and connected by Division 16 to the public fire alarm system as approved by the local fire department, and to activate an electric bell mounted on exterior of building. Provide units with all necessary contacts to actuate these public alarms. Alarm condition shall also activate 8" to 10" round red water-motor gong.

2.07 BACKFLOW PREVENTERS:

- A. Backflow preventers shall be reduced pressure detector check valve type having two independent check modules, UL/FM listed OS&Y shut-off valves, meter, and ball type test cocks. Complete assembly shall be listed for fire protection use and approved by the local water company. Backflow preventers 3" size and larger shall be Watts 909RPDA-AG; 2-1/2" and smaller shall be Watts 909-AG with separate UL/FM listed OS&Y gate valves, unless noted otherwise.

2.08 FLOW AND TEST CONNECTIONS:

- A. Provide approved flow and test connections as required.
- B. Flow switches and tamper switches shall be complete with necessary matching electrical contacts. All hand valves shall be complete with approved tamper switches.
- C. Provide 27" wide x 30" high x 10" deep (minimum) prefabricated 18 gauge recessed steel cabinets with surface mounted flanges and hinged, self-closing, full size, steel doors and a spring loaded cam-catch assembly to enclose sprinkler flow switches, shutoff valves with tamper switches, drain valves, inspectors test valves and site glass as shown on Drawings. Caulk pipe openings. Box-in piping and cabinet, floor to ceiling, with gypsum wallboard on metal studs.

2.09 FIRE PUMP SYSTEM

- A. Extent of fire pump and jockey pump required by this Section is indicated on Drawings and schedules, and by requirements of this Section. Types of pumps specified in this Section include the following:
 - 1. Horizontal split case shaft driven centrifugal fire pump with electric motor drive.
 - 2. In line pressure maintenance jockey pump
- B. Provide vibration control of fire pumps to manufacturer's recommendations. Provide seismic restraint of fire pump to the requirements of Section 15010.
- C. Refer to Electrical section for the following work; not work of this section.
 - 1. Power supply wiring from power source to power connection on fire pumps. Include starters, disconnects, and required electrical devices, except where specified as furnished, or provided by manufacturer.
 - 2. Interlock wiring between fire pumps; and between fire pumps and field-installed control devices.
- D. Interlock wiring specified as factory-installed is work of this Section.
- E. Provide Fire Pump, Controller, and Automatic Transfer Switch as specified and as supplied by the manufacturers of the fire pump and controller.

- F. Provide fire pumps and accessories in accordance with NFPA 20 "Standard for the Installation of Centrifugal Fire Pumps". Fire pumps shall develop a minimum total dynamic head of 130 psi at rated capacity.
- G. Comply with Underwriters Laboratory requirements and recommendations as applicable to indicated fire pump work.
 - 1. Where applicable, provide fire pumps and auxiliary products UL labelled.
 - 2. Provide fire pumps and accessories in accordance with NFPA 70 "National Electrical Code".
 - 3. Provide electrical motors and devices in accordance with NEMA standards.
 - 4. Provide fire pumps constructed in accordance with UL 448 "Pumps for Fire Protection Service", and relief valves in accordance with UL 1478 "Fire Pump Relief Valves".
 - 5. Provide pumps whose performances, under specified operating conditions, are certified by manufacturer, who shall provide start-up of systems.
- H. Submit manufacturer's technical product data, including current accurate pump characteristic performance curves with selection points clearly indicated, weights, furnished specialties and accessories; and installation and start-up instructions. Start-up shall be by manufacturer. Supplier who shall maintain full time service personnel and an established office within 50 miles of project site.
- I. Submit manufacturer's assembly-type shop drawings indicating dimensions, weight loadings, required clearances, and methods of assembly of components.
- J. Submit manufacturer's electrical requirements for power supply wiring to fire pumps. Submit manufacturer's ladder-type wiring diagrams for interlock and control wiring. Clearly differentiate between portions of wiring that are factory-installed and portions to be field-installed.
- K. Submit maintenance data and parts lists for each fire pump, driver, control, and accessory; including "trouble-shooting" maintenance guide. Include this data, product data, shop drawings, and wiring diagrams in maintenance manual.
- L. Provide factory-assembled and tested horizontal fire pumps as indicated, and of capacity and electrical characteristics as scheduled. Fire pumps motor shall be mounted on a common base and be connected by means of a flexible coupling. Pump shall be equipped with a coupling guard. Sectionalize to permit building entry.
- M. Provide fire pumps capable of delivering not less than 150% of rated flow at not less than 65% rated head; with shutoff head not more than 120% of rated head.
- N. Hydrostatically test, and run test each pump prior to shipment. Hydrostatically test at 150% of shut off head plus suction head; but not less than 250 psig. Provide certified pump curve.

- O. Provide fire pumps of horizontal centrifugal construction, specifically labeled for fire service. Provide cast-iron pump casing with suction and discharge flanges machined to ANSI B16.1 dimensions, of size and pressure rating scheduled. Provide red paint finish.
- P. Provide the following accessory fittings, of pressure rating matching suction or discharge ratings as scheduled:
 - 1. Concentric tapered discharge increaser.
 - 2. Hose valve test head rated for 750 GPM (provide separately).
 - 3. Hose valves with caps and chains for 750 GPM (provide separately).
 - 4. Pump casing relief valve.
 - 5. Automatic air release valve.
 - 6. Ball drip valve.
 - 7. Suction and discharge pressure gages.
 - 8. Casing relief valve.
- Q. Provide horizontal, foot mounted, ball-bearing, induction motor with open drip-proof NEMA enclosure, of scheduled capacity. Mount motor on steel base common to pump, connected with flexible coupling, and protected by coupling guard. Align pump and motor shafts prior to shipment.
- R. Motor Controllers: Provide wye-delta type equal to Firetrol FTA1350-AA60H start type motor controller with automatic and manual emergency transfer switch, UL-listed and FM approved for fire pump service; and service entrance. Complete installation to NFPA 20. The controller shall be complete with a disconnect switch, circuit breaker, adjustable pressure switch to automatically start/stop pump, pilot light, alarm relay, minimum run timer, remote annunciator panel (Firetrol model FTA 200 Type A), and alarm circuit.
- S. Automatic Transfer Switch: Automatic transfer switch equal to Firetrol FTA900-BD225H shall be approved by UL Laboratories and meet the requirements of NFPA 20. Automatic transfer switch shall be factory assembled, tested, and shipped as a complete unit with fire pump controller. The transfer switch section shall include a flange mounted disconnect switch for the incoming emergency power supply. Mounted on the enclosure flange shall be "Transfer Switch Normal" and "Transfer Switch Emergency" indicating lights, emergency isolating switch, "off" lights, test and transfer by-pass switch, alarm bell, and silence alarm push button. Mounted internally shall be emergency power isolating switch, control relays, solid state sensing and timing equipment, and power transfer switch. Transfer module shall be equipped with adjustable time delay relays to override momentary normal power outages. Fire Pump Controller and Transfer Switch shall be mounted in common two-compartment NEMA-3 cabinet.
- T. Provide rate controller and transfer switch for scheduled horsepower. Provide transfer switch and controller capable of interrupting short circuit current at least equal to short circuit current in controller supply circuit.
- U. Subject to compliance with requirements, provide horizontal Fire Pumps, Controllers, and applicable Automatic Transfer Switch as listed under approved manufacturers only.

V. MANUFACTURERS REPRESENTATIVE RESPONSIBILITIES

1. The fire pump shall be given a complete field flow test by the manufacturers representative in accordance with the latest edition of NFPA 20 and as required by the "Authority having jurisdiction". The manufacturers representative shall include all testing equipment including hosemonsters, fire hose, digital tachometer and any other equipment necessary to complete the test in accordance with NFPA 20.
PLAYPIPES WILL NOT BE ALLOWED FOR TESTING

2.10 MANUFACTURERS:

- A. Subject to compliance with requirements, provide products of one of the following manufacturers listed.
- B. Water Control, Gate and Butterfly Valves:
 1. Fairbanks
 2. Grinnell Corporation
 3. Jenkins Bros.
 4. Stockham
- C. Swing and Wafer Check Valves:
 1. Fairbanks
 2. Grinnell Corporation
 3. Jenkins Bros.
 4. Reliable Automatic Sprinkler Co., Inc.
 5. Star Sprinkler Corp.
 6. Stockham
- D. Grooved Mechanical Couplings:
 1. Grinnell Corporation
 2. Stockham
 3. Victaulic Company of America
- E. Water Flow Indicators:
 1. Grinnell Corporation
 2. Reliable Automatic Sprinkler Co., Inc.
 3. Star Sprinkler Corp.
 4. Viking Corp.
- F. Water-Motor Gongs and Electric Bells:
 1. Grinnell Corporation
 2. Reliable Automatic Sprinkler Co., Inc.
 3. Star Sprinkler Corp.
 4. Viking Corp.
- G. Alarm Check Valves and Dry-Pipe Valves:
 1. Grinnell Corporation
 2. Reliable Automatic Sprinkler Co., Inc.
 3. Star Sprinkler Corp.
 4. Viking Corp.

- H. Fire Department Connections:
 - 1. Potter-Roemer, Inc.
 - 2. Crocker, Div. of Fire-End & Crocker Corporation
 - 3. Guardian Fire Equipment, Inc.

- I. Sprinklers:
 - 1. Grinnell Corporation
 - 2. Reliable Automatic Sprinkler Co., Inc.
 - 3. Star Sprinkler Corp.
 - 4. Viking Corp.

- J. Backflow Preventers:
 - 1. Ames Company, Inc.
 - 2. Conbraco Industries, Inc.
 - 3. Hershey Products
 - 4. Watts Regulator Company

- K. Hangers and Supports:
 - 1. Fee & Mason Manufacturing Company
 - 2. Grinnell Company
 - 3. Carpenter-Patterson

- L. Fire Pump:
 - 1. Patterson Pump Company
 - 2. A-C Pump, ITT Fluid Technology Corporation
 - 3. Peerless Pump Company
 - 4. Aurora Pump
 - 5. Fairbanks Morse Pump

PART 3 - EXECUTION

3.01 INSTALLATION:

- A. All piping shall be installed in a first class and workmanlike manner. Piping shall be substantially supported from the building structure with hangers of a type approved for use by the National Fire Protection Association.

- B. Joints shall be made true and tight and under no strain. Joint compound shall be used sparingly and applied only on the male threads. Reaming shall be done before threads are cut.

- C. Piping shall be run concealed wherever possible. Exposed piping is not acceptable in rooms having full or partial suspended ceilings. Exposed piping is only acceptable where specifically noted on the Drawings.

- D. Provide adequate protection from freezing and corrosion.

- E. Install sprinklers visually straight, in true alignment, and in an equal pattern as approved by the Architect. Sprinklers in suspended acoustical ceilings shall be centered in ceiling tiles.

- F. Backflow preventers shall be installed in the horizontal position and drain lines shall be individually piped full size indirectly down to floor drain, service sink, 6" above finished floor, or as noted on the Drawings.
- G. Do not install sprinkler piping directly over electrical panels. Refer to Drawings for panel locations; confirm final locations on site.
- H. Unless otherwise indicated or required, terminate all piping drains, inspector's test drains, drains from water motor gongs, etc. to spill indirectly outside of building 12" above gravel at finished grade level.
- I. All piping exposed to view shall be painted by other Divisions as specified in Section 15010.
- J. Locate sprinklers clear of obstructions, including ceiling fans indicated on electrical plans, to code and add additional sprinklers as needed to meet requirements.
- K. Sprinkler piping is not permitted in elevator shafts and elevator machine rooms except for piping directly supplying sprinklers at not more than one floor level within these areas. Provide a shutoff valve for each branch line in an accessible location outside of these areas.
- L. Sprinkler piping is not permitted in stairwell, except for piping directly supplying sprinklers in these areas.
- M. For underground piping, apply two coats of rust inhibitive coating prior to burial.
- N. At job conclusion, entire system shall be flushed out and left clean in every respect. Remove all contaminants to the full satisfaction of the Architect.

3.02 PRODUCT HANDLING:

- A. Use all means necessary to protect sprinkler materials and equipment before, during and after installation, and to protect the installed work and materials of other trades.
- B. Deliver materials and equipment to the job site and store all in a safe area. Use care in the off-loading to prevent damage.
- C. In the event of damage, make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

3.03 FREEZE PROTECTION:

- A. Use extreme care to ensure that all sprinkler components are installed well within the heated building envelope, clear of any possible danger of freezing.
- B. Where any particular location constitutes a possible low temperature condition, take positive means to protect the system from freezing, including connection to a dry-pipe system or other approved protection.
- C. The entire attic area is unheated and requires a complete dry-pipe sprinkler system.

- D. Sprinkler piping at attic level, even if located under attic insulation, shall not be considered to be protected from freezing; this piping shall be connected to a dry-pipe sprinkler piping system.

3.04 FIRE PUMP SYSTEMS

- A. Fire pump and jockey pump systems shall be installed in strict compliance with NFPA 20 and tested to perform as required therein and in accordance with the drawings and these specifications.
- B. Handle fire pumps and components carefully to prevent damage, breaking, denting and scoring. Do not install damaged fire pumps or components; replace with new.
- C. Store fire pumps and components in clean dry place. Protect from weather, dirt, fumes, water, construction debris, and physical damage.
- D. Comply with Manufacturer's rigging and installation instructions for unloading fire pumps, and moving them to final location.
- E. Mount controllers and applicable automatic transfer switch on wall for field electrical connections.
- F. Provide sensing pipes to pump controllers as indicated, not less than 1/2" size, with 1/2" globe valves for testing mechanism of controller. Provide bronze check valves with 3/32" orifice in clapper or ground-face unions with noncorrosive diaphragm having 3/32" orifice.
- G. Examine areas and conditions under which fire pumps are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to manufacturer.
- H. Install fire protection pumps where shown, in accordance with manufacturer's published installation instructions, complying with NFPA 20, and with recognized industry practices, to ensure that fire protection pumps comply with requirements and serve intended purposes.
- J. Install fire pumps on minimum of 6" high concrete base equal or greater than 3 times total weight of pump and motor, with anchor bolts poured in place. Set and level plumb, grout under pump base with non-shrink grout.
- K. Provide piping; accessories; hangers, supports, and anchors; valves; meters and gages; and equipment supports; as indicated for complete installation.
- L. Lubricate pumps before start-up. Manufacturer shall start-up in accordance with manufacturer's instructions.
- M. Coordinate with other work, including plumbing, electrical, standpipe and fire sprinkler piping as necessary to interface installation of fire pumps properly with other components of fire water protection system.
- N. Check alignment and, where necessary, (and possible), realign shafts of motors and pumps

within tolerances recommended by manufacturer.

- P. Install pumps and pump drives on vibration isolators to manufacturer's recommended installation method, if any, and with other sections of these specifications.
- R. Electrical Wiring: Install electrical devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's wiring diagram submittal to Electrical Contractor.
 - 1. Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Electrical section. Do not proceed with equipment start-up until wiring installation is acceptable to equipment manufacturer.
- S. Upon completion of installation of fire protection pumps, perform field acceptance tests of pumps, complying with operating instructions and procedures of NFPA 20 to demonstrate compliance with requirements. Where possible, field correct malfunctioning units, then retest to demonstrate compliance. Replace units which cannot be satisfactorily corrected.

3.05 INSPECTIONS AND TESTS:

- A. Water flow test data must be current, accurate and applicable; if it is not, perform a flow test on or close to the site in accordance with NFPA 291 and local water company's procedures and requirements. Show test data on "Working Plans" and hydraulic calculations; include elevations where test data was taken in relation to each building elevation.
- B. All inspections, examinations, tests, fees, cost and surcharges required by NFPA, Owner's Fire Insurance Rating Organization, local Fire Marshal, and other authorities having jurisdiction shall be arranged and paid for by this Section as necessary to obtain complete and final acceptance of the sprinkler system. Deliver certificates of all such inspections to the Architect.
- C. Systems shall not be considered complete and approved until the required tests are satisfactorily completed and certificate of complete compliance and approval is obtained from the Owner's Fire Insurance Rating Organization.
- D. Testing shall include, but not be limited to, the following:
 - 1. Piping:
 - a. All systems shall be tested as required by the appropriate NFPA Codes and the requirements of the Authority Having Jurisdiction.
 - b. All sprinkler and standpipe piping shall be certified hydrostatically tested as required by NFPA 13 and NFPA 14 and NFPA 24.
 - c. No visible leaks, losses in pressure, or increases in vacuum shall occur during the specified test periods.
 - 2. Equipment: Demonstrate that all equipment and apparatus fulfill the requirements

of the specifications. All equipment shall be operated and tested for rated capacities and specified characteristics.

3. Test Log: Five (5) copies of a complete tabulated log of all test readings including pressures, water quantities, R.P.M., electric motor voltage and current shall be submitted to the Architect for approval.

3.06 STOCK OF SPARE SPRINKLERS:

- A. Provide a stock of spare sprinklers of each type, temperature rating and orifice size used in the system. Also provide a spare sprinkler wrench for each type of new sprinkler.
- B. Mount spare sprinklers and wrenches in a red cabinet(s) designed for this purpose. Locate cabinet(s) in an acceptable location subject to review by the Architect; show location on "Working Plans."
- C. Cabinets and stock of spare sprinklers/wrenches shall be in accordance with both NFPA 13 and NFPA 14 and NFPA 13A.

3.07 IDENTIFICATION:

- A. All new devices and valves shall be provided with identification signs as required by NFPA and Section 15010.

END OF SECTION 15300

SECTION 15400 - PLUMBING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

- A. The Drawings and general provisions of the Contract, including General and Supplementary Conditions, and Division 1 Specification Sections, apply to work of this Section.
- B. The requirements specified in Section 15010, "Basic Mechanical Requirements," apply to this Section.
- C. Codes and Standards (comply with applicable editions) shall include, but are not limited to:
 - 1. Comply with ANSI Standard A117.1: "Specifications for Making Buildings and Facilities Accessible To and Usable By Physically Handicapped People" as amended for Massachusetts.
 - 2. Comply with "Architectural Barriers Act of 1968", as amended.
 - 3. Comply with the State Building, Plumbing, Fire, Mechanical and Energy Codes.
 - 4. Comply with the Existing Building Codes, as applicable in the state where the project is located.

1.02 SCOPE OF WORK:

- A. This Section includes the providing of all labor, materials, fixtures, equipment, accessories, services and tests necessary to complete and make ready for operation by the Owner all plumbing work as shown on the Drawings and described in these Specifications. It is the intent of these Documents to terminate with complete, operational plumbing systems within the building. The materials, products, devices, methods, systems, design, and installation of any and all aspects of a plumbing systems shall be in conformance with 248 CMR 3.00 through 10.00, including that all products used in any plumbing or gas fitting systems shall be Product-Approved by the Board.
- B. The work shall include but not be limited to the following:
 - 1. A complete sanitary system including fixtures, drains, and vent connections. Terminate this piping 5'-0" outside of building for continuation by Division 2.
 - 2. A complete system of cold water piping as shown on the plans or as required for fixture connections. Terminate this piping 5'-0" outside of building for continuation by Division 2.
 - 3. A complete system of domestic service hot water and recirculating hot water piping from the domestic water heating plant, including recirculating pumps and controls.
 - 4. A complete set of plumbing fixtures, fittings and trim.

5. Insulation of piping and equipment.
6. Roughing and connections to Owner's fixtures and equipment.
7. Nameplates.
8. Tags and charts.
9. Sleeves, inserts, anchor bolts.
10. Pipe expansion compensation.
11. Seismic requirements.
12. Plastic pipe markers.
13. Access doors.
14. Testing and instruction of Owner's representatives.

1.03 WORK BY OTHERS:

- A. The following paragraphs list the only items of labor and materials incident to or related to the installation of the plumbing work which will be provided by others at no cost to this Section.
- B. All paper holders, towel bars, grab bars, mirrors, medicine cabinets and other accessories will be provided by other Divisions.
- C. Installation of base flashing around all vent stacks and soil stacks will be by other Divisions.
- D. All chases and furred spaces will be furnished by other Divisions. Notify well in advance of all requirements.
- E. Finish painting of exposed work installed under this contract will be by other Divisions unless specifically noted otherwise.
- F. All electric wiring to equipment installed under this Section will be by the Division 16. Coordinate all requirements in advance.
- G. Demolition, cutting, patching, excavation and backfill outside and inside the building shall be by other Divisions.
- H. Access panels shall be furnished by this Section for installation by the other Divisions unless otherwise indicated.
- I. Temporary services and facilities shall be by other Divisions.
- J. Relocation of the existing adjacent building site sewer lateral over 5'-0" away from the addition.

1.04 SHOP DRAWINGS:

- A. Submit five (5) copies of Product Data to the Architect in accordance with Section 15010, "Basic Mechanical Requirements."
- B. Submittals shall be given for the following materials and equipment.
 - 1. Plumbing fixtures, fittings and trim.
 - 2. Fixture supports, drains and cleanouts.
 - 3. Backflow preventers and pressure reducing valves.
 - 4. Piping, fittings, coupling assemblies and piping specialties
 - 5. Piping and fitting insulation and covering.
 - 6. Coordination and Fabrication Drawings

PART 2 - PRODUCTS

2.01 SANITARY, WASTE AND VENT PIPING MATERIAL:

- A. Soil, waste and vent stacks of sizes indicated on Drawings shall be run as indicated on Drawings. All offsets shall be made at an angle of not more than 45 degrees and all horizontal piping 4 inches and larger shall have a pitch of not less than 1/8" per foot; 3" sanitary and waste piping shall not pitch less than 1/4" per foot. Branch soil, waste and vent connections shall be run to the soil stack, waste stack, house drain or vent stack as shown on plans. Where practical, two or more vent pipes shall be connected together and extended as one pipe through the roof. Vertical vent pipes may be connected to main vent riser above fixtures vented. Where an end-circuit vent pipe from any fixture, or line of fixtures, is to be connected to a vent line serving other fixtures, the vent line shall be extended above the highest flood rim before being connected to the other vent lines, so as to prevent the use of any vent line as a waste pipe.
- B. All changes in pipe size on soil, waste and drain lines shall be made with reducing fittings or recessed reducers. Y-fittings and 1/8 or 1/16 bends or combination Y and 1/8 bends shall be used where possible.
- C. Sanitary long-sweep bends and T's shall be used for connection to branch lines for fixtures. On vertical runs of pipe, long-turn fittings shall be used wherever conditions permits.
- D. All horizontal lines not assigned invert elevations shall run at 1/4" per foot pitch. Check carefully all existing elevations before proceeding so as to keep within areas shown on Architectural Drawings.
- E. Where vent piping is run concealed in partitions, use special care to insure that all lines are maintained in their proper locations in the partitions so that no bends, fittings or parts of the piping will be visible.

- F. Vent piping through the roof shall be 4". Wherever 3" or less soil or vent stacks pass through the roof, they shall be increased to 4" in size.
- G. Vent or soil stacks run adjacent to the exterior walls of the building shall be offset back so that their roof penetrations will be inconspicuous from the street.
- H. Stainless steel coupling assemblies used in conjunction with No-Hub cast iron soil, waste and vent pipe in buildings up through two stories shall be tightened to 60 inch-pounds torque on each nut or bolt head with a torque wrench specifically designed for the purpose. Each nut or bolt head shall be retorqued after not less than four (4) hours. The use of screwdrivers or other types of wrenches shall not be permitted for this purpose.
- I. For all other applications, heavy duty stainless steel couplings used in conjunction with No-Hub cast iron soil, waste and vent pipe shall be tightened to 80 inch-pounds or torque per band (Husky), 125 inch-pounds or torque (Clamp-All per band, MG per screw).
- J. For piping under slab, minimum size shall be 3" for sanitary and waste piping, 2" for waste piping serving hand sinks or lavatories only, and 2" for vent piping.
- K. Sanitary, waste and vent piping is not permitted in stairwells, except piping directly supplying fixtures terminating in these areas.

2.02 WATER PIPING MATERIALS:

- A. Water piping below ground shall be to local water company's requirements and match materials brought to building by Division 2; alternatively, where approved by the local inspection authorities and local water company, provide cement lined ductile iron.
- B. Water piping above grade shall be hard drawn copper tubing, Type L, in strict accordance with Federal Specification WE-T-799.
- C. All exposed water supply piping to fixtures, including piping within cabinets or vanities shall be chrome plated copper or polished chrome plated brass. Provide chromed escutcheons at piping penetrations of walls and cabinets.
- D. Water piping is not permitted in stairwells, except piping directly supplying fixtures terminating in these areas.

2.03 PIPE JOINTS AND CONNECTIONS:

- A. Compression type gaskets, as manufactured by Husky Technologies, a Division of Anaheim Foundry Co., or Clamp-All Manufacturing Corp., MG Coupling Co., or Tyler Pipe & Foundry Company conforming to ASTM Spec. C1540, are permitted in conjunction with cast iron soil piping below grade for buildings up through two stories. Provide "heavy duty" No-Hub couplings for all other applications as manufactured by Husky Technologies, a Division of Anaheim Foundry Co. (Husky SD-4000 "orange shield"), or clamp-all manufacturing (Hy-Torq 125) or MG Coupling Co. (MG Cast Iron Coupling).

- B. Coupling assemblies for No-Hub cast iron soil pipe shall consist of a stainless steel corrugated shield and tightening device, conforming to CISPI Std. 310-95, and a neoprene sealing sleeve, conforming to ASTM Spec. C564, assembled at the factory as a complete unit.
- C. Heavy duty no-hub couplings shall be type 304 stainless steel or cast iron and provide a minimum shield thickness of 0.015" and width of 3" for pipe sizes through 4", 4" width for pipes 5" and larger.
- D. Copper tubing shall be soldered with 95-5 and noncorrosive flux. Thoroughly clean inside and outside surfaces with sandpaper or wire brush before assembly. Defective joints shall be dismantled, cleaned and resoldered.
- E. All joints between steel or iron and copper shall be made with approved isolating fittings equal to Epoxo, or Walter Vallett Company 'V' line insulating couplings.
- F. All joints in threaded pipe shall be made with approved components. The ends of each pipe shall be reamed free from burrs and kept free from scale and dirt. A thin coat of approved pipe compound shall be applied to male fittings.

2.04 CLEANOUTS:

- A. Finished Floor: J.R. Smith 4023-U-PB, cast iron body, round adjustable polished bronze top with vandal proof screws.
- B. Carpeted Floor: J.R. Smith 4023-U-Y-PB, cast iron body, round adjustable polished bronze top with vandal proof screws and carpet marker.
- C. Terrazzo Floor: J.R. Smith 4183-U-NB, cast iron body, round adjustable nickel bronze top with vandal proof screws, recessed for terrazzo and similar poured floors.
- D. Unfinished Floors: J.R. Smith 4243-U, cast iron body, round adjustable scoriated cast iron top with vandal proof screw.
- E. Wall: J.R. Smith 4553-U-PB, cast iron cleanout tee with No Hub outlet, vandal proof screws and polished bronze frame and cover. Provide factory fabricated extension to wall as required.

2.05 UNIONS:

- A. Where union connections are installed on pipe 2" in diameter and smaller, they shall be of brass composition 'B' in accordance with Federal Specification WW-U-516.
- B. In general, all piping shall be provided at intervals with unions to permit alterations and repairs.

2.06 VALVES:

- A. Ball valves, 2" and smaller, shall be Jenkins figure 32-A, or equal, having two piece bronze body (ASTM B584), integral body bolts, TFE seat, threaded ends and rated for 400 PSI-

WOG. Ball valves shall be full port and suitable for the WOG duty indicated.

- B. Gate valves 2-1/2" and smaller shall be Fairbanks figure 0280 C-C or equal. 3" and larger shall be Fairbanks figure 0403 F.E. or equal.
- C. Stop and waste gate valves 2" and smaller, shall be Fairbanks figure 0284, bronze body, solid wedge, non-rising stem, solder ends, rated for 300 PSI non-shock.
- D. Check valves 2" and smaller, shall be Jenkins figure 4093, bronze, rated for 300 PSI-WOG, solder ends, bronze disc, horizontal swing.
- E. Pressure reducing valves, 2" and smaller, shall be Watts U5B, bronze body, union inlet with threaded tailpiece, integral stainless steel strainer, built in thermal expansion bypass check valve and rated for 300 PSI.
- F. Pressure reducing valves, 3" size, shall be Watts No. N223 with auxiliary regulator tappings piped to 3/4" Watts No. 223.
- G. Hose end drain valves, 1-1/2" and smaller, shall be Jenkins 112 or 113, bronze body, threaded inlet and hose outlet, rated for 300 PSI non-shock water.

2.07 HANGERS:

- A. Hangers, anchors, and supports shall be of metal and of sufficient strength to support the piping and its contents. Hangers and anchors shall be securely attached to the building at sufficiently close intervals to support the piping and its contents.
- B. Hangers for copper tubing shall be copper plated, equal to Tolco Fig. 81. All other hangers shall be adjustable clevis or trapeze hangers. Hanger rods shall have machine threads.
- C. Hangers shall include seismic restraint devices indicated elsewhere in these specifications.

2.08 FLASHING:

- A. Each plumbing pipe projecting through the roof shall be made tight with a 16 oz. counter flashing. Counter flashing shall be of recommended type to match the roofing construction and shall be as approved by the Architect. Counter flashing shall lap base flashing by at least 3". Base flashing shall be by other Divisions.

2.09 INSULATION:

- A. Cover all piping scheduled below with Owens Corning Fiberglas 25 ASJ insulation with sealed vapor barrier jacket.

SERVICE	PIPE SIZE	THICKNESS
Cold Water	1-1/2" and smaller	1.0"
	2" and larger	1.5"
Hot Water	2" and smaller	1.0"

	2-1/2" and larger	1.5"
Recirc. Hot Water	2" and smaller	1.0"
	2-1/2" and larger	1.5"

- B. Cover all fittings and valve bodies with Zeston premolded PVC insulated pipe fittings. Glass fiber blanket in the Zeston fitting shall be compressed to the thickness of the adjacent insulation. On cold water fittings, the Zeston jacket shall be vapor sealed and banded to the adjacent covering. On hot water fittings, the jacket shall be banded only. With prior approval from the Architect, the following option may be exercised on cold water fittings in constricted work areas: cover with fiberglass blanket insulation with vapor barrier jacket lapping adjacent pipe insulation.
- C. Insulate the exposed waste and hot and cold water piping of handicapped lavatories, and other lavatories where noted, with Truebro "Handi Lav-Guard" insulation kit model 102. Where piping extends beyond material furnished in kit, provide additional matching insulation as required. For offset strainers in handicapped lavatories, also provide Truebro insulation kit model 105. Attach with fasteners furnished in kits.

2.10 BACKFLOW PREVENTORS:

- A. Backflow preventers, 1/2" size, shall be Watts No. 9D.
- B. Backflow preventors 3/4" size and larger, shall be Watts 909S-AG-QT-HW for hot water piping and Watts 909S-AG-QT for cold water piping, operating on reduced pressure principle with bronze strainer, ball valve shut-offs, air gap and stainless steel check modules.
- C. All backflow preventors shall be installed in the horizontal position and drain lines shall be individually piped full size indirectly down to floor drain, service sink, 6" above finished floor or as noted on the Drawings.
- D. Unless indicated otherwise, provide matching backflow preventers installed in parallel so as to permit inspection, testing and repair of either unit during normal working hours of the local water utility.

2.11 PLUMBING FIXTURES:

- A. Unless indicated otherwise, provide complete installation shall be to manufacturer's recommendations.
- B. Lavatory Supports: Unless indicated otherwise, provide adjustable cast iron, with thin concealed arms and sleeves, and complete with escutcheons and mounting fasteners.
- C. Water Closet Supports: Unless indicated otherwise, provide adjustable, factory painted, cast iron face plate, support base, and appropriate type waste fitting having face plate gasket; zinc plated steel fixture studs and fasteners; coated and threaded adjustable wall coupling with neoprene closet outlet gasket; and chrome plated fixture cap nuts and fiber fixture washers. Provide an appropriate model to suit deep or shallow rough-in, siphon jet water closet, and type of sanitary piping system to which it is connected.

- D. Urinal Supports: Unless indicated otherwise, provide concealed arm supports for urinals shall be furnished with equipment manufacturer and have steel top and bottom plates with bolts to support fixture independently from the wall; adjustable sleeves, steel tubular uprights and alignment trusses, steel plates with adjustable holes, bolts, nuts, and chrome plated cap nuts and washers. Top supporting plates shall have cutouts when used with back inlet urinals.
- E. Toilet Seats: Unless indicated otherwise, provide elongated, solid white heavy duty, plastic comfort curve seat having stainless steel check hinge and replaceable bumpers. Residential water closets shall include a cover on seat and non-residential water closets shall be less cover.
- F. Supplies and Stops for Lavatories and Sinks: Unless indicated otherwise, provide polished chrome-plated, loose-keyed angle stop having 1/2" inlet and 3/8" O.D. x 12" long flexible tubing outlet, and wall flange and escutcheon.
- G. Supplies and Stops for Water Closets: Unless noted otherwise for tank type, provide polished chrome-plated, loose-keyed angle stop having 1/2" inlet and 3/8" O.D. x 12" long flexible tubing outlet with collar, and wall flange and escutcheon. Unless noted otherwise, for flush valve type, provide concealed, individual, in-line ball valve for isolation purposes where no other means of individual flush valve isolation is provided. Provide access door where valves are not easily accessible.
- H. Traps: Unless indicated otherwise, provide cast brass, 1-1/4" adjustable "P" trap with cleanout and waste to wall.
- I. Escutcheons: Unless indicated otherwise, provide chrome-plated cast brass with set screw.
- J. Unless noted otherwise, showers shall be complete with vented trap, grid strainer and lever type, tight sealing, vented trap drain stop with lever located in overflow trim.

2.12 GAS PIPING:

- A. All gas piping shall be Steel Pipe: ASTM A 53A, Schedule 40, seamless, black steel pipe, beveled ends. For house line pressure 14" w.c. or less:
 - 1. Screwed through 2".
 - 2. Welded 2-1/2" and over.

2.13 GAS FIRED WATER HEATER:

- A. Water heater(s) shall be by manufacturer and model number indicated on the drawings, or other approved manufacturer as indicated hereafter.
- B. Heaters shall each have a minimum gas firing rate, input rating and recovery rate indicated.
- C. The 160 psi design pressure tank shall be glass-lined with an alkaline borosilicate composition and fused to the steel by firing at 1600°F. The heater(s) shall be equipped with 1-1/4" NPT water inlet and outlet openings, (2) 3" handhole cleanouts, and carry a National Board stamping. The heaters shall each be ASME and the entire unit listed by Underwriters

Laboratories. Controls shall include: high temperature limit control (manual reset), upper and lower thermostats, combination temperature and pressure gauge, low water cutoff, ASME rated temperature and pressure relief valve, and be arranged for Category IV, Direct Vent, Sealed Combustion requiring no room air for combustion, ventilation nor temperature control. Control compartment door shall be hinged for easy access and include cam locks for security. The heaters shall be equipped with multiple anodes for cathodic protection. The heaters shall be insulated with glass fiber insulation and meet or exceed current standard of ASHRAE 90.1-1999 for standby loss and recovery efficiency. The heater(s) shall include a drain valve and flame observation port. The jacket shall be baked powder coat finish. Heater vessels shall have a 3 year limited warranty against failure as outlined in the written warranty. Provide listed burners, safety valves, flame safeguards, electronic ignition and diaphragm air switches for proof of flame operation. Fully illustrated instruction manual to be included. Heater shall meet the minimum energy factory required by the Federal National Appliance Energy Conservation Act of 1987.

2.14 ACCEPTABLE MANUFACTURERS:

- A. Subject to compliance with requirements, provide equipment or material of one of the following manufacturers listed.
- B. Water Closets, Urinals, Lavatories and Service Sinks shall be of the same manufacturer when located in the same room.
 - 1. American Standard, Inc.
 - 2. Kohler Co.
 - 3. Eljer
 - 4. Crane/Fiat
 - 5. Zurn Industries, LLC
- C. Sinks:
 - 1. Elkay Manufacturing Company
 - 2. Just Manufacturing Company
 - 3. American Standard, Inc.
 - 4. Kohler Co.
 - 5. Eljer
 - 6. Moen Incorporated
- D. Fixture Trim:
 - 1. Symmons Industries, Inc.
 - 2. Moen Incorporated
 - 3. American Standard, Inc.
 - 4. The Chicago Faucet Co.
 - 5. Delta Faucet Co.
 - 6. Elkay Manufacturing Company
- E. Water Closets Seats:
 - 1. Olsonite Corporation
 - 2. Church Seat Company
 - 3. Bemis Manufacturing Company

- F. Electric Water Coolers:
 - 1. Halsey Taylor Div.; Household International Co.
 - 2. Oasis; EBCO Manufacturing Co.
 - 3. Elkay Manufacturing Company
 - 4. Haws Drinking Faucet Co.

- G. Cleanouts, Fixture Supports and Floor Drains:
 - 1. Jay R. Smith Mfg. Co.
 - 2. Wade Division/Tyler Pipe
 - 3. MiFab Manufacturing, Inc.
 - 4. Watts Water Technologies Company

- H. Valves:
 - 1. Apollo
 - 2. Crane Company
 - 3. Milwaukee
 - 4. Watts Water Technologies Company
 - 5. Nibco Inc.
 - 6. Hammond Valve Corp.
 - 7. Jomar International

- I. Backflow Preventers:
 - 1. Watts Water Technologies Company
 - 2. Wilkins Division, Zurn Industries
 - 3. Conbraco Industries, Inc.
 - 4. Lawler
 - 5. Ames

- J. Piping and Equipment Insulation:
 - 1. Owens-Corning Fiberglas Corporation
 - 2. Manville
 - 3. Knauf Fiber Glass
 - 4. CertainTeed Corporation

- K. Pumps:
 - 1. ITT Bell & Gossett
 - 2. Taco, Inc.
 - 3. Armstrong Pumps Inc.
 - 4. Aurora

- L. Thermostatic Mixing Valves:
 - 1. Powers Process Controls
 - 2. Lawler
 - 3. Leonard Valve Company
 - 4. T & S Brass & Bronze Works Inc.
 - 5. Bradley Corporation

- M. Water Heaters:
 - 1. A. O. Smith
 - 2. Bradford White

3. PVI
 4. State
 5. Hesco Industries
- N. No-Hub Coupling Assemblies:
1. Up through Two Stories
 - a) Tyler Pipe & Foundry Company
 - b) Husky Technologies, Anaheim Foundry Company
 - c) Clamp-All Manufacturing Corp.
 - d) MG Coupling Company
 2. Over Two Stories, Heavy Duty:
 - a) Husky Technologies, Anaheim Foundry Company (Orange Shield HD 4000)
 - b) Clamp-All Manufacturing Corp. (Hy-Torq 125)
 - c) MG Coupling Company (MG Cast Iron Couplings)
- O. Fixture Supports:
1. J.R. Smith
 2. Tyler Pipe
 3. Zurn Industries, Inc.
 4. Wade
 5. Josam
- P. Tub-Showers:
1. Lasco
 2. Aquarius
 3. AquaGlass
 4. Aker

PART 3 - EXECUTION

3.01 SANITARY, WASTE AND VENT PIPING INSTALLATION:

- A. Soil, waste and vent stacks of sizes indicated on Drawings shall be run as indicated on Drawings. All offsets shall be made at an angle of not more than 45 degrees and all horizontal piping shall have a pitch of not less than 1/4" per foot. Branch soil, waste and vent connections shall be run to the soil stack, waste stack, house drain or vent stack as shown on plans. Where practical, two or more vent pipes shall be connected together and extended as one pipe through the roof. Vertical vent pipes may be connected to main vent riser above fixtures vented. Where an end-circuit vent pipe from any fixture, or line of fixtures, is to be connected to a vent line serving other fixtures, the vent line shall be extended above the highest flood rim before being connected to the other vent lines, so as to prevent the use of any vent line as a waste pipe.
- B. All changes in pipe size on soil, waste and drain lines shall be made with reducing fittings or recessed reducers. Y-fittings and 1/8 or 1/16 bends or combination Y and 1/8 bends shall be used where possible.

- C. Sanitary long-sweep bends and T's shall be used for connection to branch lines for fixtures. On vertical runs of pipe, long-turn fittings shall be used wherever conditions permits.
- D. All horizontal lines not assigned invert elevations shall run at 1/4" per foot pitch. Check carefully all existing elevations before proceeding so as to keep within areas shown on Architectural Drawings.
- E. Where vent piping is run concealed in partitions, use special care to insure that all lines are maintained in their proper locations in the partitions so that no bends, fittings or parts of the piping will be visible.
- F. Minimum vent piping through the roof (VTR) shall be 4". VTR shall be elevated so the minimum opening elevation above the roof plane shall be to code, above the snow load and clear from windows, doors and intakes. Minimum VTR opening elevation shall be thirty (30") inches on flat roofs (where flat roofs may be considered to have a pitch not exceeding three-quarter inch per linear foot) and eighteen (18") inches on pitched roofs. Wherever 3" or less soil or vent stacks pass through the roof, they shall be increased to 4" in size.
- G. Vent or soil stacks run adjacent to the exterior walls of the building shall be offset back so that their roof penetrations will be inconspicuous from the street.
- H. Stainless steel coupling assemblies used in conjunction with No-Hub cast iron soil, waste and vent pipe in buildings up through two storys shall be tightened to 60 inch-pounds torque on each nut or bolt head with a torque wrench specifically designed for the purpose. Each nut or bolt head shall be retorqued after not less than four (4) hours. The use of screwdrivers or other types of wrenches shall not be permitted for this purpose.
- I. For all other applications, heavy duty stainless steel couplings used in conjunction with No-Hub cast iron soil, waste and vent pipe shall be tightened to 80 inch-pounds or torque per band (Husky), 125 inch-pounds or torque (Clamp-All per band, MG per screw).
- J. For piping under slab, minimum size shall be 3" for sanitary and waste piping, 2" for waste piping serving hand sinks or lavatories only, and 2" for vent piping.
- K. Sanitary, waste and vent piping is not permitted in stairwells, except piping directly supplying fixtures terminating in these areas.
- L. The stand pipe receptor for an automatic clothes washing machine shall be individually trapped and vented.

3.02 WATER SERVICE:

- A. Division 2 providing water service equipment and complete distribution to within five feet (5'-0") of the building. Maintain 5'-0" cover at all points outside the building footprint.
- B. Make arrangements with the local authorities for the domestic water service entrance and metering. Complete installation shall be in accordance with local water company's requirements.

- E. Provide concrete thrust blocks and retaining clamps at all changes of direction and wall penetrations when required by Architect or other authorities having jurisdiction. Coordinate final location with all trades (so penetration of foundation walls to miss footings in locations of haunched footings, etc.).

3.03 WATER PIPING INSTALLATION:

- A. All branches from mains shall be supplied with ball valves. Connections shall be made from the top of the mains, unless otherwise specified; branches shall drain toward the mains. The piping installation shall be so arranged that the entire system can be drained through accessible valves at low points; provide the necessary valves.
- B. Furnish and install a stop valve at each fixture supply. Also provide a water hammer arrester at each hot and cold water supply for each fixture. Where a branch supply serves more than one fixture piped within the same plumbing chase, one water hammer arrester may service the group of fixtures. Water hammer arresters shall be by Precision Plumbing Products, Inc. and shall be sized in accordance with the manufacturer's recommendations. Provide access doors to allow replacement of arresters.
- C. All piping shall be run concealed throughout finished spaces, either in furred spaces, shafts or above false ceilings, furred beams, etc., as indicated. Piping shall be run exposed in Mechanical Room and other areas where concealment is not possible.
- D. In all cases, pipes shall be installed within the heated building envelope and as close to overhead construction as conditions will permit to give maximum headroom and avoid structural members. Check all structural, architectural, electrical and heating/ventilating/air conditioning drawings to confirm that piping will not conflict with such work. Ensure all piping, valves and appurtenances are on the heated side of insulation.
- E. Provide chromed escutcheon plates at all exposed piping penetrations of walls, floors, ceilings and partitions.
- F. Water piping is not permitted in stairwells, except for piping directly supplying fixtures in these areas.

3.04 CLEANOUT INSTALLATION:

- A. Provide cleanouts of the same size as the line served up to 4", or of 4" size for larger lines, at the following locations: at base of each subsoil and waste stack, at changes in direction greater than 45 degrees in soil, waste, and drain lines in the building, at intervals not to exceed 50' in all runs of soil, waste, and drain lines, and elsewhere as shown on the drawings or as required by the State Building and Plumbing Codes. Final locations of visible finishes and locations shall be reviewed with and have approval of the Architect. Relocate as directed by the Architect at no additional cost to the owner.
- B. Cleanouts shall be extra heavy cast iron, with heavy brass or bronze plugs, and shall be extended to and brought flush with floor or wall surfaces. Plugs shall have countersunk nuts and shall be coated and installed so that they are readily accessible and removable for cleaning the lines.

3.05 VALVE INSTALLATION:

- A. Furnish and install valves where shown on the plans and where necessary to make the system complete in its operation. A valve shall be installed at the base of each new hot and cold water riser. All valves shall be located to permit easy system operation, replacement and repair, and to permit complete control of all plumbing systems.

3.06 HANGERS, ANCHORS, GUIDES AND SUPPORTS IN BUILDING:

- A. All piping shall be supported from the building structure by means of approved hangers and supports. Piping shall be supported to maintain required grading and pitching of lines, to prevent vibration, and to secure piping in place. Piping shall also be so arranged as to provide for expansion and contraction.
- B. Vertical cast iron soil pipe shall be secured at sufficiently close intervals to keep pipe in alignment and to support the weight of the pipe and its contents. Support stacks at their bases and at each floor interval using approve metal clamps or hangers for this purpose.
- C. Horizontal cast iron soil pipe shall be supported at five foot intervals except that where ten-foot lengths of cast iron soil pipe are used, ten-foot intervals between supports.
- D. Vertical PVC pipe shall be secured to the structure at each story height, but not more than ten foot intervals and elsewhere as required to maintain proper alignment.
- E. Horizontal PVC piping suspended above grade shall be supported at three foot intervals for piping diameters up through 1-1/2", and at four foot intervals for larger piping, to maintain alignment and prevent sagging or grade reversal. Hangers shall be located not more than 18" from the joints.
- D. Vertical copper tubing shall be supported at each floor interval and at a maximum of ten foot intervals for piping 1-1/2" and larger, and at not more than four foot intervals for piping 1-1/4" and smaller.
- E. Horizontal copper tubing shall be supported at six foot intervals for piping 1-1/2" and smaller and ten foot intervals for piping 2" and larger.

3.07 GROUNDS AND SUPPORTS:

- A. Unless otherwise specified, plumbing fixtures and accessories are to be secured to grounds or other woodwork with heavy, countersunk, steel wood screws.
- B. Coordinate the exact locations of wood blocking, backing or metal framing for the proper hanging of all fixtures.

3.08 PLUMBING FIXTURES - GENERAL REQUIREMENTS:

- A. Provide all fixtures in accordance with the Drawings and with the Plumbing Fixture Schedule.

- B. All materials specified as chromium plated shall be thoroughly cleaned and polished before plating. Plate shall be heavily, thoroughly and evenly applied, and guaranteed not to strip or peel.
- C. Provide escutcheons when they are not furnished with plumbing fixtures. Polished chrome escutcheons shall be installed at all exposed piping penetrations of walls.
- D. Each fixture shall be separately trapped, using the type and size of trap required by the State Plumbing Code.
- E. Unless otherwise specified, faucets and all exposed fittings and trim shall be chromium plated.
- F. Flush controls for handicap accessible water closets shall be mounted for use from the wide side of the area and mounted at heights shown on architectural drawings.
- G. Plumbing fixtures shall be of the best quality as fabricated by manufacturers of established reputation.
- H. All fixtures shall have the manufacturer's guarantee label or trademark indicating first quality. All acid resisting enameled ware shall bear the manufacturer's symbol signifying acid resisting material.
- I. Brass shall conform to Federal Specification QQ-B-611 'A' (composition 'A'). Brass tubing shall not be lighter than #17 gauge.
- J. Chromium plating for brass shall be applied on a base plating of nickel. Chromium plating shall be in accordance with Federal Specification WW-P-541.
- K. All fixtures requiring hot and cold water shall have cold water supply on the right hand side of the fixture and hot water supply on the left hand side of the fixture.
- L. The Architect shall be the final judge as to whether fixtures fulfill the requirements of the specifications and as to whether they are of a suitable quality.
- M. Electrical characteristics (voltage and phase) of all electrical equipment, including pumps and water heaters, shall be verified with Division 16 before ordering.
- N. Install plumbing fixtures level and plumb, in accordance with fixture manufacturer's written instructions, rough-in drawings, and pertinent codes and regulations, the original design, and the referenced standards.
- O. Comply with the installation requirements of the State and local codes and ANSI A117.1 with respect to plumbing fixtures for the physically handicapped. Comply with all federal American with Disabilities Act (ADA) guidelines.
- P. Fasten plumbing fixtures securely to supports or building structure. Secure supplies behind or within wall construction to provide rigid installation.
- Q. Install a stop valve in an accessible location in all water connections to each fixture.

- R. Install escutcheons at each wall, floor, and ceiling penetration in exposed finished locations even within and beneath cabinets and millwork.
- S. Seal fixtures to walls and floors using approved sealant; match sealant color to fixture color.
- T. Test fixtures to demonstrate proper operation upon completion of installation and after units are water pressurized. Replace malfunctioning units, then retest.
- U. Inspect each installed unit for damage. Replace damaged fixtures.
- V. Adjust water pressure at service for drinking fountains, faucets, shower valves, flush valves, etc. to provide proper flow and stream.
- W. Replace washers and/or cartridges of leaking or dripping faucets and stops.
- X. Clean fixtures, trim, and strainers using manufacturer's recommended cleaning methods and materials.
- Y. Provide protective covering for installed fixtures, water coolers, and trim; remove protective coverings prior to final review and reclean as necessary.
- Z. Do not allow use of fixtures for temporary facilities unless expressly approved in writing by the Owner.
- AA. Rough-in sizing shall be as noted in Plumbing Fixture Schedule on drawings.
- BB. Set shower receptor in a leveling bed of cement grout.

3.09 PROTECTION OF FIXTURES:

- A. Protect against injury from building materials, acids, tools and equipment, all plumbing fixtures included in this section of the Specifications, with suitable and substantial covers. Any damage to, or replacement of, fixtures or equipment made necessary by failure of this Contractor to provide suitable protection, shall be paid for by this Contractor.

3.10 INSULATION:

- A. All insulation shall be applied in accordance with the recommendations of the manufacturer and in a neat and workmanlike manner by personnel regularly employed at this trade.
- B. Hangers in direct contact with cold water piping shall be insulated from the pipe to a distance of 6" along the hanger and rod with Zeston PVC tape, 10 mil thick, with pressure sensitive adhesive backing. Tape shall be spiral-wound with overlapping edges.
- C. Hangers on the exterior of insulated piping shall be supported by a rigid insert, minimum 12" long, to protect the insulation.

3.11 GAS PIPING/SYSTEM INSTALLATION:

- A. Provide all gas systems in strict accordance with the requirements of NFPA 54 and local gas utility.
- B. Exterior gas piping shall be painted by other Divisions with one prime coat and two finish coats. Color shall be approved by Architect prior to painting.
- C. The contractor shall provide all regulators or devices as required on the main gas service to ensure all gas systems are low pressure and do not exceed connected equipment operating ranges.
- D. Gas piping is not permitted in stairwells, except for piping directly supplying equipment in these areas.

3.12 TESTING:

- A. After sanitary, waste and vent stacks are in place and before being concealed, plug lower ends and fill with water up to roof. Piping is to be left tight under these conditions and water level shall be maintained intact for a period of at least four (4) hours, but no less than as required by Local Authority.
- B. Test all water piping by applying a hydrostatic pressure of 125 PSI, using a pump for this purpose. Make sure that all lines are properly plugged or capped and their air has been vented before applying pressure which shall remain constant without pumping for one (1) hour. Provide testing at a higher pressure and/or for a longer period of time as required by the Authority having jurisdiction.
- C. Any leaks in joints or evidence of defective pipe or fittings disclosed by these tests shall be immediately corrected by replacing defective parts with new joints or materials and retested. Makeshift repairs effected by caulking threaded pipe with lead wool, or by application of wicking or patented compounds, shall not be permitted.
- D. Test gas piping to the recommendations of NFPA 54, local gas utility and all authorities having jurisdiction. Test piping for tightness by filling piping with an inert gas or dry air to a pressure measured with a manometer or an approved pressure measuring device calibrated to read and indicate pressure loss due to leakage during the test period. Test pressures shall be no less than 1-1/2 times the proposed maximum working pressure, but not less than 3 psig irrespective of design pressure. Test pressures shall not exceed 125 psig. Test duration for system volumes less than 10 cubic feet of pipe volume shall be 10 minutes; durations for larger systems shall exceed 1/2 hour per 500 cubic feet of pipe volume, or fraction thereof. Provide procedures recommended by NFPA 54, local gas utility and all authorities having jurisdiction to place equipment in operation, including burner input adjustments, primary air adjustments, checking proper operation and adjustment of safety shutoff devices protective devices (such as limit control, fan control to blower, temperature and pressure relief valve, low water cutoff device, manual operating features, pilot burners, etc.) where provided, automatic ignition, and re-verifying operating conditions when placed in service. Following completion of all testing, advise the supplying gas utility of the completion of all modifications to existing systems and the results of the testing and safety inspections.

- E. Clean and disinfect all water piping by using the purging and disinfecting procedure described in AWWA C651, AWWA C652, or as prescribed by the Authority Having Jurisdiction.

END OF SECTION 15400

SECTION 15500- H.V.A.C.

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. The Drawings and general provisions of the Contract, including General and Supplementary Conditions, and Division 1, General Requirements, apply to work specified in this Section.
- B. The requirements specified in Section 15010, "Basic Mechanical Requirements," apply to this Section.

1.02 INCLUDED IN THIS SECTION:

- A. Air-handling Units
- B. Fans
- C. Ductwork
- D. Air Outlets and Inlets
- E. Hot Water Heating Piping
- F. Chilled Water Piping
- G. Insulation
- H. Fire Dampers
- I. Pumps and Hot Water Specialties
- J. Boiler-Burner Units
- K. Breeching
- L. Filters
- M. Unit and Cabinet Unit Heaters
- N. Chiller/Condenser Air Cooled
- O. Water Treatment
- P. Fan Coil Units
- Q. Underground Piping

1.03 DESCRIPTION OF WORK:

- A. This Section includes the providing of all labor, materials, equipment, accessories, services and tests necessary to complete and make ready for operation by the Owner and Tenants all heating, ventilating and air conditioning work as shown on the Drawings and called for in these Specifications. It is the intent of these Documents to terminate with complete, operational HVAC systems within the building.
- B. Also included, but not limited to, are the following items subject to applicable provisions of Section 15010, "Basic Mechanical Requirements," which are to be provided under this Section of the Specifications.
 - 1. Nameplates.
 - 2. Access doors: furnish to other Divisions.
 - 3. Tags and charts.
 - 4. Electric motors, magnetic starters and thermal protection.

5. Sleeves, inserts and anchor bolts.
6. Pipe expansion compensation.
7. Seismic requirements.
8. Plastic pipe markers.

1.04 WORK BY OTHERS:

- A. The following work is included under other Divisions of the Specifications, except where otherwise indicated.

1. Concrete and masonry work.
2. Setting of access doors.
3. Finish painting.
4. Flashing of roof curbs or wall louvers.
5. Temporary heat.
6. Cutting and patching.
7. Excavation and backfill.
8. Disconnect switches for all motors: Division 16.
9. Thermal starting switches for all single phase motors: Division 16.
10. Manually operated devices such as pushbuttons and manual starters: Division 16.
11. Electric power wiring for all motors, starters and controls: Division 16.
12. Mounting of all magnetic starters, except where furnished as an integral part of factory assembled equipment: Division 16.

1.05 SHOP DRAWINGS:

- A. Furnish shop drawings (including product data) in accordance with the provisions set forth in Section 15010, "Basic Mechanical Requirements." Shop drawings (including product data) shall be submitted on the following material, and equipment and systems.

1. Ductwork Fabrication Shop Drawings
2. Piping Fabrication Shop Drawings
3. Fans
4. Fire Dampers
5. Air Outlets and Inlets
6. Air Handling Units
7. Unit Heaters and Cabinet Unit Heaters
8. Boiler-Burner Units
9. Pumps
10. Hot Water Specialties
11. Boiler Flue and Fabrication Shop Drawings
12. Insulation
13. Filter Housings
14. Valves
15. Chiller/Condensing Air Cooled
16. Fan Coil Units
17. Underground Piping

1.06 ACCEPTABLE MANUFACTURERS:

- A. Subject to compliance with requirements, provide equipment or material of one of the following manufacturers.

- B. Chillers:
 - 1. Trane Company
 - 2. Carrier Corporation
 - 3. McQuay

- C. Fans:
 - 1. Loren Cook Co.
 - 2. Panasonic
 - 3. Nutone

- D. Air Outlets and Inlets:
 - 1. Krueger
 - 2. Titus
 - 3. Tuttle & Bailey, Hart & Cooley, Inc.

- E. Insulation:
 - 1. Owens-Corning Fiberglas Corp.
 - 2. Johns Manville
 - 3. Knauf Fiber Glass
 - 4. CertainTeed Corporation

- F. Fire Dampers:
 - 1. Ruskin, Mfg.
 - 2. Prefco Products, Inc.
 - 3. Air Balance, Inc.

- G. Duct Access Doors:
 - 1. Ventfabrics, Inc.
 - 2. Air Balance Inc.
 - 3. Duro Dyne Corp.
 - 4. Elmdor Mfg. Co.
 - 5. Karp Assocs.

- H. Pumps and Specialties:
 - 1. ITT Bell & Gossett
 - 2. Taco, Inc.
 - 3. Aurora

- I. Hot Water and Chilled Water Specialties:
 - 1. ITT Bell & Gossett
 - 2. Taco, Inc.
 - 3. Aurora

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- J. Valves:
 - 1. Crane
 - 2. Jenkins
 - 3. Fairbanks
 - 4. Apollo
 - 5. Nibco

- K. Boiler Burner Units:
 - 1. Aerco
 - 2. Weil McLain
 - 3. Camus
 - 4. Burnham

- L. Breeching:
 - 1. Metal-Fab, Inc.
 - 2. Van Packer
 - 3. American Metal Products, Inc. (Div. of MASCO Corp.)

- M. Filters:
 - 1. Farr Company
 - 2. American Air Filter
 - 3. Purolator Products Company

- N. Unit and Cabinet Unit Heaters:
 - 1. Sterling
 - 2. Vulcan
 - 3. Trane

- O. Fan Coil Units:
 - A. Whalen
 - B. Temspec
 - C. Trane

- P. Variable Frequency Drives.
 - A. NBB
 - B. Square D
 - C. Danfoss Graham

- Q. Fan Coil Units (Vertical):
 - A. Whalen
 - B. FIRST CO.

- R. Underground Piping
 - 1. Microflex
 - 2. Rhinoflex
 - 3. Ricwil

PART 2 - PRODUCTS

2.01 DUCT ACCESS DOORS:

- A. General: Provide duct access doors of size indicated. Where no size is indicated, access door shall be 12"x12" minimum size unless duct is smaller. Duct access doors shall be located wherever necessary to access concealed valves, dampers, controls, etc. and at other locations necessary for inspection purposes.
- B. Construction: Construct of same or greater gage as ductwork served.
- C. Access doors in insulated ductwork shall be insulated type, with sheet metal surrounding the insulation so that no insulation will be in direct contact with the ductwork airflow.

2.02 FLEXIBLE CONNECTIONS:

- A. General: Provide flexible duct connections wherever ductwork connects to vibration isolated equipment. Construct flexible connections of neoprene-coated flameproof fabric crimped into duct flanges for attachment to duct and equipment. Make airtight joint. Provide adequate joint flexibility to allow for thermal, axial, transverse, and torsional movement, and also capable of absorbing vibrations of connected equipment.

2.03 DUCTWORK:

- A. All ducts shall be constructed as shown on plans. Unless otherwise noted, ductwork shall be Wheeling 'Soltite' galvanized steel or equal, constructed, supported and installed in strict accordance with SMACNA Standards. Insulated flexible ductwork may be used, except in attics or above gypsum board ceilings, for vertical (not horizontal) branch connections to supply and return (not exhaust) air outlets (8'-0" maximum length): Owens Corning INL-25.
- B. Sheet metal duct construction shall conform to the latest recommendation in the ASHRAE Handbook or SMACNA Standards and NFPA 90A. All ducts shall have tight joints with all interior surfaces smooth. All joints must be made in direction of flow. Bends shall be made with at least 50% radius or with correctly designed interior vanes as directed or approved.
- C. The sizes and approximate locations are shown on the Drawings. Check all architectural drawings as well as those of other trades to make sure that there will be no conflict between this work and that of other trades. Minor deviations shall be included to clear obstructions while maintaining full free area.
- D. Ducts may be offset to clear structural members as required. Offsets shall be made with smooth flowing fittings and will not be approved if they alter the dimensions in such a manner as to decrease the cross-sectional area.

- E. Seal all ductwork in accordance with SMACNA "HVAC Air Duct Leakage Test Manual" with a minimum of Seal Class C.
- F. Drier exhaust ductwork shall be soldered aluminum.

2.04 DUCTWORK HANGERS AND SUPPORTS:

- A. Sheet metal horizontal ducts less than 30" wide shall be supported by means of 1" X 1/2" bent galvanized steel strap on 8'-0" or less, fastened and held in place by metal screws at the sides on the ducts with 2" turned under the duct.
- B. Sheet metal ducts 30" wide or over shall be supported by angle iron suspended by 3/8" rods.
- C. No hangers formed by wires, chains, horizontal pieces of pipe or perforated metal bands will be permitted in any part of the work.

2.05 INSULATION AND THERMAL ACOUSTICAL LINING:

- A. General: Thermal acoustical lining and all insulation work shall be done by workers regularly employed in this field. Insulating work that does not present a workmanlike appearance will not be acceptable.
 - 1. Insulation, jackets and finish shall meet all applicable UL requirements and shall have a flame spread rating not exceeding 25 and smoke developed rating not exceeding 50.
 - 2. Insulation shall be installed in strict accordance with the manufacturer's recommendations.
 - 3. No covering shall be applied until all materials have been tested and approved.
- B. Duct Insulation:
 - 1. All supply, return, and outdoor air ductwork shall be insulated. Unless noted otherwise, plenums attached to wall louvers shall be insulated. Exhaust ductwork within 15'-0" of wall or soffit louvers, or of roof exhaust fans or hoods, shall be insulated. All ductwork exterior to building shall be insulated.
 - 2. Insulation shall be 1-1/2" thick (installed R = 4 minimum) fiberglass below roof level, and 3" thick (installed R = 8 minimum) fiberglass above roof level. Insulation shall be faced one side with approved foil vapor barrier facing with 2" tab on one edge. Insulation shall be wrapped on ducts with facing overlapping all joints at least 2", sealed with adhesive. Secure the insulation in place with outward clinch staples and on the underside with mechanical anchors welded or adhered to the duct on 18" centers. All

seams, staple and anchor penetrations of the foil facing shall be sealed with adhesive.

C. Ductwork Acoustical Lining: Install acoustical lining inside all supply, return and outdoor air ductwork within 15'-0" of heating or cooling units. Acoustical lined ductwork need not be externally insulated. Duct liner shall be 1-1/2" thick (R = 4 minimum) below roof level, and 2" thick (R = 8.0 minimum) when outdoors or within roof level. Duct liner shall be fibrous glass laminated to internal surfaces of duct with adhesives to ASTM C916 and mechanical fasteners to SMACNA standards, all in strict accordance with manufacturer's recommendations. Duct liner shall be furnished and installed to the recommendations of the manufacturer and SMACNA HVAC Duct Construction Standards. Duct sizes indicated on Drawings are clear, unobstructed, free area dimensions.

D. Piping Insulation:

1. Insulate all hot water supply and return piping chilled water supply and return piping, condensate drain piping, condensate piping, and cold water make-up piping with Owens Corning Fiberglas ASJ pipe insulation having a factory applied all service jacket. Insulate refrigerant suction (RS) and liquid (RL) piping with weatherproof AP Armaflex insulation. Thickness of insulation shall be as follows. Runouts refer to piping to individual terminal units not exceeding 12'-0" in length.

<u>Piping Service</u>	<u>Piping Size</u>	<u>Insulation Thickness</u>
HWS,HWR 141-200F	Runouts • 2"	1/2"
	Up to 1-1/2"	1-1/2"
	Over 1-1/2"	2"
CW, Condensate Drain	Up to 1"	1"
	Over 1"	1-1/2"
CWS, CWR	Runouts • 2"	1"
	Over 1"	2"

2. All flanges, valves bodies, pump bodies and fittings shall be insulated with molded or fabricated mitered segments of pipe insulation of a thickness equal to that off the adjoining pipe insulation, securely fastened in place and covered with Zeston covers.

3. Insulation shall be applied to clean, dry pipe with side and end joints butted tightly. Seal lap of jacket and butt joint strips with an approved lagging adhesive.

4. All piping shall be insulated and shall have color coded flow directional arrows added to ANSI Standards.

5. All chilled and heating supply and return piping, valves, hangers and accessories shall be on the heated inside of the building.

2.06 FANS (EXHAUST AND SUPPLY):

- A. Provide quiet operating fans of size, type and capacity as noted on the plans. All fans shall be UL listed.
- B. Exhaust fans shall be interlocked with appropriate HVAC units by Division 15.

2.07 FIRE DAMPERS:

- A. Provide fire dampers, 1-1/2 hour rated unless noted or required otherwise, at locations shown on the Drawings and at all ductwork penetrations of assemblies required to have a fire resistance rating. Dampers shall bear the UL label and shall be listed as complying with UL 555 and UL 555S.
- B. Fire dampers shall be of galvanized steel construction with folding curtain type blades and shall be complete with a 165oF fusible link and Type B or C frame. Type A frame shall only be permitted where specifically noted on the Drawings. The fire damper shall be so designed as to permit damper blade to be reset without being removed from the partition or wall in which it is installed. Fire dampers shall be Prefco model 5500 E4-BC.
- C. Fire dampers shall be installed in strict accordance with manufacturer's recommendations.
- D. Access doors shall be provided in accessible locations to allow dampers to be reset. Fire damper duct access doors shall be labeled "Fire Damper Access", and shall be insulated in accordance with adjacent duct insulation value.

2.08 AIR OUTLETS AND INLETS:

- A. All air outlets and inlets shall be furnished and installed as shown on plans in accordance with sizes indicated thereon. They shall be of the same make throughout and shall be as noted on plans.

2.09 PIPING AND VALVES:

- A. Provide all necessary water specialties of B & G Manufacturer as shown or as required for the complete systems.
- B. Valves shall be as follows:
 1. Gate Valves 2" and smaller: 125 lbs. brass, screwed.
 2. Globe Valves 2" and smaller: 150 lbs. screwed bronze.
 3. Angle Valves 2" and smaller: 150 lbs. bronze, screwed.

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4. Check Swing 2" and smaller: 125 lbs. bronze, screwed.
 5. Check Silent, all sizes: 125 lbs. flanged, semi-steel.
 6. Drain Valves 2" and smaller: 200 lbs. hose end, bronze.
 7. Blow-off Valves 2" and smaller: 150 lbs. bronze, Y-type.
 8. Strainer 2" and smaller: 225 lbs. screwed, bronze. Screen size 1/16" for water.
- C. Check valves installed in the horizontal position shall be swing checks; valves installed in the vertical position shall be silent checks.
- D. Triple duty valves shall be as manufactured by Bell & Gossett, Armstrong or Tour Anderson.
- E. Provide drain valves at all low points of all water systems and where shown on Drawings.
- F. Piping run underground shall be listed for such service (perma-pipe or approved equal) with pipe in pipe with insulation.
- G. Pipe and Fittings (unless specifically noted otherwise):

Service

Component

Cold Water Make-up,
Condensate Drain Lines

Pipe: Type 'L' hard tempered copper tubing
ASTM B-88.

Fittings: Forged copper with recessed ends for
solder joints.

Drain Traps: Deep seal suitable for system static
pressure.

Hot Water Heating
Supply and Return
Chilled Water
Supply & Return

Pipe: Schedule 40 black carbon steel ASTM
A-53A or A-20.

Fittings: Standard weight best grey cast iron, 125
lbs., screwed ends, 2- 1/2" and smaller. Long turn
welding fittings 3" and larger.

2.10 METAL PIPE FABRICATION:

- A. All piping shall be fabricated and tested in accordance with the latest revision of Section 1 of the ASA-B31.1 "Code for Pressure Piping."
- B. All reductions in sizes of piping in the direction of downward pitch shall be installed with eccentric fittings to maintain a level top for water.
- C. Face bushings, close nipples or street ells shall not be used, except where specifically indicated.
- D. Outside surface at ends of copper pipe and inside surfaces of fittings shall be thoroughly cleaned with steel wool or emery cloth and all burrs shall be removed. After cleaning, surfaces to be jointed shall be evenly and completely covered with flux.
- E. Joints shall be well supported during the heating process and shall not be strained during the cooling period.
- F. All soldered joints shall be made with 95-5 wire solder. Paste or liquid solder will not be allowed. Excess solder shall be removed while still in a plastic state, leaving a fillet around the cup as it cools.

2.11 PRESSURE GAUGES:

- A. Pressure gauges shall be steel encased Bourdon type with snubber orifice and all working parts of corrosion resistant metal. They shall be four inches (4") in diameter, suitable for service in all cases and have easily read properly graduated faces in both PSI and feet of head for the systems pressures. It shall be possible to see and read all gauges from normal viewing angles and heights. Provide snubbers and petcock shutoff for all gauges.
- B. Pressure gauges shall be provided where noted on the plans.

2.12 THERMOMETERS:

- A. Thermometers shall be of the bimetal dial type with a four inch (4") face and separable socket suitable for the system pressure and temperature ranges. Faces shall be graduated in the largest suitable increments for each service and shall be installed to allow easy reading from normal viewing angles and heights. Remote capillary types shall be used where direct type cannot be read.
- B. Thermometers shall be installed where noted on the plans.

2.13 BELT DRIVES:

- A. Belt drives shall have V-belts with variable pitch pulleys and shall have a service rating of 140% of maximum driven load with minimum power transmitting

efficiency of 95%. This Section shall provide proper drives to operate all belt driven equipment to meet system characteristics and shall change the initially furnished drives if necessary at no additional cost to the Owner.

2.14 MACHINERY GUARDS:

- A. All exposed moving parts such as pulleys, belts, shafts and couplings shall have #16 gauge expanded metal 1/2" mesh guards with 1-1/4" X 1-1/4" X 1/8" angle iron frames properly supported and shall be removable. The entire assembly shall be rattle free.
- B. Opening for tachometer readings shall be provided opposite rotating shafts.

2.15 VIBRATION ISOLATION:

- A. All mechanical equipment shall be mounted and isolated from the building structure by vibration isolators. All vibration isolators shall be as manufactured by Mason Industries or approved equal.
- B. Rubber-in-shear isolators shall be properly housed and provided with adequate facilities for bolting. Spring isolators shall be equipped with sound deadening pads, snubbers and leveling bolts and shall be free standing for deflections over 1". All spring isolators shall be properly sized by the manufacturer according to load and deflection. Efficiency of isolation shall not be less than 95%.
- C. Refer also to "Seismic Requirements" in Section 15010.

2.16 BOILER BURNER UNITS:

- A. Provide as herein specified, shown or scheduled on the Contract Drawings, new hydronic sealed combustion high efficiency type boilers for forced hot water heating service and arranged for completely automatic operation firing Natural Gas. The contractor shall pipe the boilers as shown on the drawings. Boiler shall be designed for sealed combustion of Natural Gas and it shall be a factory packaged unit, completely assembled with insulated metal jacket, burners and controls mounted and wired at the factory to facilitate handling, sealed in plastic and crated for protection during delivery. Modulex Series Boiler Model MLX-909. The boiler plant shall consist of 2 hydronic boilers as manufactured by Aerco International, Inc. Each boiler shall be CSA Listed, CSD-1 compliant, ASME coded and stamped, and incorporate a gas train designed in accordance with Factory Mutual. Each boiler shall have an input of 909 mbh with a gross output of 781 to 835 mbh (dependent upon return water temperature) when fired with natural gas. The boiler manufacturer *must* publish known part load value efficiencies; the thermal efficiency must increase as the firing rate decreases.
- B. Manual reset function shall be a direct result of a low water cutoff condition, it shall not cause a lock-out in the event of a failure in the power supply. Device shall automatically recycle and allow the burner to function when power is resumed after an interruption, simple time delay shall not be considered acceptable in this

installation. The automatic temperature control contractor shall provide an advanced proportional plus derivative microprocessor control with algorithm to minimize droop and overshoot. This control shall provide up to six stages of heating with the set point automatically adjusted based on outdoor air temperature. Range from 80°F - 220°F. As the temperature begins to fall below the set point the first stage of heat shall be enabled. If after a fixed time delay, the control senses additional heat is required another boiler shall be turned on. This process shall continue until the heating load is satisfied or all boilers are energized. The reset ration shall be adjustable from 1:4 to 4:1 with the adjustable control band of 2 to 16°F. A system starter shall be provided to enable the control when the outdoor temperature is below 65°F, or the set point selected. The control shall include LED's to show which stage of heating is energized. Staging lead/lag function shall be employed to equalize run time between steps. The sensors shall be of the thermistor type with a temperature coefficient of 4.8 ohms/degree F. and a resistance of 3484 ohms at 77°F. The contractor shall mount the control in the vicinity of the boilers on a suitable wood mounting board and provide the necessary 24VAC transformer and low voltage wiring to the boiler control circuit.

- C. After completion of installation, manufacturer shall supply the services of a factory representative to supervise contractor initial startup of boiler plant. All safety and operating controls will be tested and verified. All aspects of the installation shall be inspected and control setpoints recorded. Contractor shall submit a manufacturer's letter indicating satisfactory installation and commissioning has been completed.
- D. Provide high offset operating control system with programmable setback of heating set point during designated periods. Setback shall incorporate Battery Backup, Balanced Recovery feature, and Mode indication.
- E. Provide Dual Pump Operating control system to include a separate sequencing panel for the control of heating pumps. Panel shall include LED indicators, automatic switch over upon lead pump failure, and manual selection switch for pump testing and changeover.
- F. Electrical service to each unit shall be 120V/1/60Hz 15 amp service. The boiler control panel shall be proprietary in design and incorporate the functions of thermal controller, combustion safeguard control, message annunciation, and fault diagnostic display, on individual field replaceable circuit boards mounted within a single housing. Each boiler shall have a footprint of no more than 44" W, 27" D, and 42" H. The boiler installed weight shall not exceed 672 lbs. dry. The boiler shall have an ASME approved relief valve setting of 50 psig.
- G. Classification - Boilers module shall be ANSI Category IV natural gas fired, condensing cast sectional design with a modulating forced draft power burner and positive pressure vent discharge.
- H. The heat exchanger shall be comprised of 6 thermal modules that shall be capable of a 23 to 1 turndown ratio of the firing rate without loss of combustion efficiency. The premix burner shall be metal fiber mesh covering a stainless steel head, with spark ignition and flame rectification. All burner material

exposed to the combustion zone shall be of stainless steel construction. There shall be no moving parts within the burner itself. A modulating gas valve and variable speed fan shall meter the natural gas and air input, respectively.

- I. The heat exchanger shall be constructed of cast aluminum and capable of handling return water temperatures down to 40 F without any failure due to thermal shock or fireside condensation. It shall be ASME stamped for a working pressure not less than 50 psig. The water tubes shall have a maximum water volume of 2.7 gallons. The boiler water pressure drop shall not exceed 23 Ft. of Head at 84 gpm. The boiler water connections shall be 2" NPT. Inspection openings in the pressure vessel shall be in accordance with ASME Section IV pressure vessel code.
- J. Efficiency - The boiler shall be designed so that the thermal efficiency increases as the boiler firing rate decreases. Boilers must be able to achieve efficiencies in excess of 90% with proper return temperatures. The heat exchanger shall be cast sectional construction. Access to the fireside of the thermal modules is available by burner removal. Minimum access opening shall be no less than 13.5" x 3.5" per thermal module.
- K. The exhaust manifold shall be of stainless steel with a 4" diameter flue connection. The condensate tray shall be of stainless steel and shall have a gravity drain for the elimination of the condensation with P-trap.
- L. The boiler control system shall consist of one master controller to which individual thermal module controllers are linked as slaves. The entire system shall be CSA Recognized. Each of the thermal module controllers shall consist of a combustion safeguard. Individual thermal module controllers shall be field replaceable. The combustion safeguard/flame monitoring system shall utilize spark ignition and a rectification type flame sensor. The boiler control system shall announce boiler & sensor status and include extensive self-diagnostic capabilities. The boiler control system shall incorporate a fault relay for simple remote fault alarm. Each boiler shall incorporate dual over-temperature protection with manual reset and an electric low water cut-off with manual reset, both in accordance with ASME Section IV and CSD-1.
- M. Contractor shall supply and install a Master Modulating Boiler Control System to coordinate the operation of all modulating input boilers in the system. Controls shall be installed in accordance with all regulatory agencies having jurisdiction. System shall be composed of a Master Controller with Expansion Modules to fit the number and type of boilers installed. The controller shall be a full microprocessor control with at least a 16-bit, 20MHz integrated microprocessor chip. The Control shall include an on-board real-time clock with a Lithium-Ion battery for back up during power outages. Entire system shall operate on 120/1/60 grounded source voltage. System shall be HBX Controls Model CPU-1000 or engineers approved equal.

- N. The boilers shall operate in 0 to 10 VDC Temperature Mode. Each boiler shall include integral factory wired operating controls to control all operation and energy input of the boiler. The individual thermal module controllers shall vary their respective thermal module's input throughout its full range to maximize the condensing capability of the boiler without header temperature swings.

- O. Installation - All aspects of installation of Boiler Plant shall be in strict accordance with manufacturer's instructions. The vent system *must conform to* all manufacturer's recommendations and shall utilize UL listed stainless steel AL-29-4C , PVC, ABS, or CPVC Positive Pressure venting materials. The vent must be sized in accordance with manufacturer's recommendations.

- P. Boiler plant piping shall be field constructed of materials as specified. Each boiler shall have individually isolating shutoff valves by installing contractor for service and maintenance. Each boiler shall require a minimum gas pressure of 4" W.C. at 909 scfh (full load rated capacity).

- Q. Warranty - The pressure vessel/heat exchanger of the boiler shall carry a non-prorated 7 year warranty against failure due to condensate corrosion, thermal stress, mechanical defects or workmanship. All other components shall carry an 18-month warranty against failure due to defective materials or workmanship. A Warranty Certificate must be issued to the owner from the manufacturer and a copy of warranty must be submitted for engineer's approval.

- R. Field Services - Contractor shall provide the services of a local factory authorized representative to supervise all phases of equipment startup. A letter of compliance with all factory recommendations and installation instructions shall be submitted to the engineer with operation and maintenance instructions.

2.17 HOT WATER PUMPS:

- A. Provide circulating pumps of size, type and capacity as noted on the Drawings.

- B. Pumps shall be bronze fitted, complete with mechanical seals, split vertical case, keyed impellers, flexible couplings, drip-proof motors, resilient mounting and all accessories.

- C. Pumps shall include flexible couplings, oil lubricated bearings, mechanical seals to 240 deg. F and resilient mounted motors. Provide rigid base plate on base mounted pumps.

- D. The motor shall be non-overloading at any point on the pump curve.

- E. Pumps shall each be with a listed capacity and motor as shown on drawings. Provide H.O.A. starter arranged for automatic temperature control.

- F. Each pump starter shall be proved complete with pilot lights to indicate operation.

- G. Provide all motors (efficiencies) to meet maximum utility rebate.
- H. Provide all pumps with variable frequency drives and controllers. (Refer to VFD subsection).

2.18 COMPRESSION TANK AND HOT WATER SPECIALTIES:

- A. Provide compression tank for hot and chilled water systems of size and capacity noted on the Drawings. Tank shall be fabricated and tested in accordance with the ASME Code for "Unfired Pressure Vessels" and shall be so stamped. Test pressure: 188 psi. Tank shall have valved sight glass.
- B. Manual vents shall be provided wherever necessary throughout the hot water system for initial venting of the system.
- C. Provide all necessary hot water specialties as shown or as required for complete system. In-line air separator shall be installed to serve each water system.

2.19 BOILER FLUES (must be matched to boilers) (INTAKE AND RELIEF):

A. INTAKE AND RELIEF.

1. Vent system installation must be in accordance with National Fuel Gas Code NFPA 54/ANSI Z221.3, Part-7 Venting of equipment, or applicable provisions of local building codes.
2. The boilers require a Special Gas Vent. The product is designed to use AL 29-4C Stainless Steel vent system components. The following manufacturer's offer similar AL 29-4C components and are approved for use with this product. Heat-Fab Inc. Saf-T-Vent, Flex-L International Inc-Star-34, and Z-flex U.S. Inc. Z-vent. The use of these alternate manufacturer's venting systems will require adapters to connect to the Burnham supplied vent connector and vent terminal. These adapters are not supplied with this unit and should be obtained from the supplier of the alternate manufacturer's venting system.
3. All vent pipe must be adequately supported with vent supports no less than five (5) feet apart. The complete vent system must be rigid and able to withstand minor impacts without collapse.
4. Vent length restrictions are based on equivalent length of vent/air pipe (total length of straight pipe plus equivalent length of fittings). Maximum vent/air lengths per manufacturers literature. Do not include Vent/Air terminals in equivalent feet calculations.
5. Do not install venting system components on the exterior of the building except as specifically required by these instructions.

6. This boiler may be operated with vertical venting.
7. Vent pipe minimum clearance to combustible material is six (6) inches

2.20 UNIT HEATERS:

- A. Provide suspended unit heaters of size, type and capacity as scheduled on the plans.
- B. Units shall be quiet operating, complete with finned coil of heavy wall seamless copper with aluminum fins and rated at 150 PSIG.
- C. Unit casing shall be die formed steel, phosphatized and finished baked enamel.
- D. Fans shall be motor driven propeller type with resilient mounted motors.
- E. Units shall be complete with adjustable outlet louvers and wire guard over fan.
- F. Units shall be as manufactured by Sterling.

2.21 CABINET UNIT HEATERS:

- A. Casings shall be constructed of die-formed, heavy gauge steel parts, phosphatized for rust resistance, and finished with bake enamel. All hardware used in the casing shall be plated for rust resistance. Cabinets shall be constructed with well rounded corner, and shall be equipped with a removable front for access to the interior.
- B. Heating elements shall be constructed of copper tubes and aluminum plate-type fins. Tubes shall be 1/2" O.D., with air vents. The fins shall be spaced with integral collars. The joint between fin and tube shall be obtained by mechanically expanding the tube within the collar for a permanently tight thermal contact. The heating element shall be of the multi-pass serpentine type, with the supply and return connections at the base end of the unit. Heating elements shall be held rigidly in the unit casing, yet provisions shall be made to allow freedom for expansion and contraction within the casing. Capacities shall be as listed on the Drawings. Fan units shall be forward-curved, double inlet galvanized steel, mounted on a large-diameter steel shaft. All motors shall be provided with built-in thermal overload protection of the automatic reset 3 speed type. Units shall be complete with cleanable filters.
- C. Discharge and recirculating grilles shall be of the louver type, stamped directly in the face.

2.22 SPARE FILTERS:

- A. Two complete sets of spare filters for each piece of equipment shall be supplied for use during construction and testing and balancing period. Provide two additional sets of filters for each piece of equipment for owner's future use.

2.23 CHILLER / CONDENSING UNIT (AIR COOLED):

A. General:

Units are to be leak tested and pressure tested at 450 psig high side and 300 psig low side. All air-cooled chillers are factory tested to confirm operation prior to shipment. Units are shipped with an operating charge of oil and a holding charge of nitrogen. Unit panels, structural elements and control boxes are to be constructed of 12- gauge galvanized steel and mounted on a welded structural steel base. Unit panels and control boxes are to be finished with a baked-on powder paint. The structural base is to be finished with an air dry paint. All paint meets the requirements of the U.S. Navy and other Federal Government Agencies for outdoor equipment.

B. Evaporator:

The evaporator is to be a tube-in-shell heat exchanger, design with internally-finned copper tubes that are roller expanded into the tube sheet. The evaporator is to be designed, tested and stamped for a refrigerant side working pressure of 300 psig, in accordance with ASME. The evaporator is to be designed for a waterside working pressure of 215 psig. Water connections are to be grooved pipe. The evaporator is to have one water pass, with a series of internal baffles. Each shell is to include a vent and drain connection, as well as factory-mounted entering and leaving water temperature control sensors and evaporator refrigerant temperature sensors. The evaporator is to be insulated with 1/2-inch Armaflex 11 or equal insulation ($K = 0.26$).

The evaporator is to be skid-mounted and is shipped with from the outdoor (condensing) unit. Refrigerant accessories, including electronic expansion valve, moisture indicating sightglass and removable core filter drier, are to be shipped with the evaporator skid. All refrigerant connections are to be routed to one end of the evaporator skid for easy connection. All electrical wiring are to be factory installed and routed to a terminal box (entering and leaving water temperature sensor, evaporator refrigerant temperature sensor and electronic expansion valve control wiring). Suction refrigerant temperature sensors (two) must be field installed in the field suction line piping next to the evaporator connections.

C. Condenser and Fans:

The air-cooled condenser coils are to have aluminum fins mechanically bonded to internally-finned seamless copper tubing. The condenser coil is to have an integral subcooling circuit and also provides oil cooling for the compressor bearing and injection oil. Condensers are to be factory proof and leak tested at 506 psig.

Direct-drive, vertical discharge condenser fans are to be dynamically balanced. Three phase condenser fan motors, with permanently lubricated ball bearings and internal thermal overload protection, are to be provided. Standard units are to start and operate down to 15 F ambient. Provide all accessories as required for ambient operation below 15 F.

D. Compressor and Lube Oil System:

The rotary screw compressor is to be a semi-hermetic, direct drive, 3600 rpm, with capacity control slide valve, rolling element bearings, differential refriger-

ant pressure oil pump and oil heater. The motor is to be a suction gas-cooled, hermetically sealed, two-pole squirrel cage induction motor.

The oil separator and filtration devices are to be provided separate from the compressor. Check valves in the compressor discharge and lube oil system and a solenoid valve in the lube system are to be provided.

E. Refrigeration Circuits:

Each unit is to have two independent refrigerant circuits, with one rotary screw compressor per circuit. Each refrigerant circuit is to include a compressor discharge service valve, liquid line shutoff valve, removable core filter drier, liquid line sight glass with moisture indicator, charging port and an electronic expansion valve. Fully modulating compressors and electronic expansion valves are to provide variable capacity modulation over the entire operating range.

F. Unit Controls:

All unit controls are to be housed in a weather-tight enclosure with removable plates, to allow for connection of power wiring and remote interlocks. All controls, including sensors, are to be factory-mounted and tested prior to shipment. All cataloged units are to be UL listed. All control wiring between the remote evaporator terminal box and the outdoor unit control panel to be 30 volts or less.

Microcomputer controls are to provide all control functions, including startup and shutdown, leaving chilled water temperature control, compressor and electronic expansion valve modulation, fan sequencing, anti-recycle logic, automatic lead/lag compressor starting and load limiting.

The unit control module, utilizing the Adaptive Control" microprocessor, is to automatically take action to avoid unit shutdown due to abnormal operating conditions associated with low refrigerant temperature, high condensing temperature and motor current overload. Should the abnormal operating condition continue until a protective limit is violated, the unit will be shut down.

Unit protective functions to include loss of chilled water flow, evaporator freezing, loss of refrigerant, low refrigerant pressure, high refrigerant pressure, reverse rotation, compressor starting and running over current, phase loss, phase imbalance, phase reversal, and loss of oil flow.

This package is to include a digital cycle counter and hour meter for each compressor, under/over voltage protection, remote alarm and compressor run indication contacts and a % volts display.

Provide with a menu driven digital display indicates over 20 operating data points, including chilled water setpoint, current limit setpoint, leaving chilled water temperature, evaporator and condenser refrigerant pressures and temperatures. Over 60 diagnostic checks are to be made and displayed when a problem is detected. The digital display is to be read and advanced on the unit without opening any control panel doors.

Standard power connections include main three-phase power and a 115 volt single phase power connections for control power.

G. Accessories:

1. Provide a corrosion protective coating is available on condenser fins, for sea coast applications or other adverse environments.
2. Provide a Building Automation System Communication Interface that permits either bi-directional communication to the Trane Integrated Comfort™ system or permits remote chilled water set point and demand limiting, by accepting a 4-20 mA or 2- 10 VDC analog signal.
3. Provide a Remote Display in addition to controlling chiller operation from a location within the building, the remote display will provide the capability to monitor unit alarms and diagnostics. Provide a twisted-pair wire is required between the chiller and the remote display.
4. Provide Chilled Water Reset. This option is to provide the control logic and factory-installed sensors for either load-based (return water temperature) or temperature-based (ambient) reset of leaving chilled water temperature.
5. Provide Architectural Louvered Panels to cover the exterior of the condensing coils and the service area beneath the coils.
6. Provide Control Power Transformer to eliminate the need to run separate 115 volt control power to the unit. A control power transformer is factory installed and wired.
7. Provide Low Ambient Operation consisting of special control logic and fans, to permit low temperature operation (to -10 F).
8. Provide Low Ambient Lockout A factory-installed ambient sensor and control logic to prevent unit start-up below the recommended temperature.
9. Provide Power Disconnect Switch (non-fused), with a through-the-door operating handle, is provided to disconnect main power.
10. Provide Coil Protection Louvered panels to cover the condenser coils.
11. Provide Access Guard being a wire mesh that protects access into the service area beneath the coils. Unit Isolation Neoprene isolators are to be provided for unit isolation from building structure.

2.25 AIR HANDLING UNITS WITH COILS:

- A. Provide air handling units, with coils, or size, type and capacity as noted on the plans.
- B. Fabricate draw-thru type air handling units suitable for the scheduled air pressure operation.

- C. Fabricate units with fan section, coil sections, mixing box, filter sections, face and bypass damper sections, and all accessories.
- D. Factory fabricate and test air handling units of sizes, capacities, and configuration as indicated and specified. Units shall be fully assembled on 6 inch base rail up to practical shipping limitations. On units not shipped fully assembled, manufacturer shall tag each section to indicate location in direction of airflow to facilitate assembly at the job site.
- E. Construct unit casing exterior panels of minimum 18 gauge galvanized steel. Unit shall be designed and constructed such that all exterior panels are non-load bearing. Removal of all exterior panels shall not affect the structural integrity of the unit. Units with welds on exterior surfaces or welds that have burned through from interior welds shall receive a final shop coat of zinc-rich protective paint in manufacturer's standard color.
- F. Insulate all sections handling air with 1" thick 1-1/2 lb. per cubic feet density matt faced fiberglass. Install insulation with adhesive. If edges of fiberglass insulation are exposed, the contractor shall be responsible for sealing exposed edges with mastic sealer to prevent erosion into the airstream. Insulation, adhesive, and mastic sealer shall conform to NFPA 90/A.
- G. As required for routine service access, unit shall be supplied with full weight, galvanized, double wall, hinged, removable access doors. Access door shall have a full perimeter automotive type gasket to prevent air leakage, and ventlock style handle that can be opened from unit interior.
- H. Units shall have internal motor and drives and shall be provided with a full size removable service door on the drive side of the fans. Doors shall have insulated construction. Where unit is provided with external motor, unit shall include a totally enclosed belt guard over drive components to prevent possible injury. Belt guard shall be provided with tachometer holes to facilitate RPM readings of the fan.
- I. Provide supply fan sections with BI double width, double inlet centrifugal fan designed and suitable for class of service indicated in the unit schedule. Fan shaft to be properly sized and protectively coated with lubricating oil. Fan shafts shall be solid and properly designed so that fan shaft does not pass through first critical speed as unit comes up to rated RPM. Fans shall be statically and dynamically tested as an assembly at the required RPM to meet design specifications. Fan wheel shall be properly secured to shaft to prevent slippage.
- J. Provide self-aligning, grease lubricated pillow-block ball bearings with lubrication fittings. Provide extended grease lines to drive side of unit casing, for all fan bearings, rigidly attached for easy service access. If extended grease lines are not provided, unit shall include an opposite drive side access door and service room must be allowed on the opposite side of the unit to perform regular maintenance. All bearings shall perform to L-50 200,000 hour average life.

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- K. Fans shall be internally isolated with 2" seismic isolators. Where unit requires external isolation, the contractor shall be responsible for isolating the entire unit including the duct work and piping at the manufacturer's specified load points.
- L. Fan motors to be mounted and isolated on the same integral base as the fan.
- M. Fan motors shall be heavy duty, high efficiency TEFC, operable at 208 volts, 60 Hz, 3-phase.
- N. V-belt drive shall be variable pitch rated at 1.5 times the motor nameplate.
- O. Coils shall be manufactured by the same company as the supplier of the air handling unit. Coils shall be designed with aluminum plate fins and copper tubes.
- P. Fins shall have collars drawn, belled and firmly bonded to the tubes by means of mechanical expansion of the tubes. No soldering or tinning shall be used in the bonding process. Coils shall be mounted in the unit casing to be accessible for service and can be removed from the unit either through the side or top. Capacities, pressure drips and selection procedure shall be certified in accordance with ARI Standard 410.
- Q. Provide factory installed extended drain and vent connections for water coils.
- R. Water Coils:
 - 1. All water heating coils shall be enclosed in a coil section. Coil headers and U-bends shall not be exposed.
 - 2. Water flow shall be counter to airflow.
 - 3. Coils shall have a supply header to ensure distribution of hot water to each tube of coil.
 - 4. Coils shall be proof tested to 300 psig and leak tested to 200 psig, air pressure under water.
 - 5. Tubes shall be 5/8 inch OD, .020" thick.
- S. Provide factory fabricated filter section of the same construction and finish as unit casing with filter guides and hinged, removable double wall access doors with automotive style gasket for minimum leakage for filter removal. Filter boxes shall be fabricated to flange to the base unit components. Flanges and bulwarks shall be provided by the unit manufacturer as required to prevent air bypass around filters.
- T. Provide 2' angled filter section with throw-away filters in the pre-filter position. Filters shall be removable from one side of the filter section.

- U. Provide internally mounted outside air and return air return air dampers. Dampers to be Rusking CD60 or equivalent. Dampers shall be of airfoil design and galvanized construction; they shall be either parallel or opposed blade type with metal compressible jamb seals and extruded vinyl blade edge seals on all blades. Blades shall rotate on stainless steel sleeve bearings. Maximum damper blade length shall be 60 inches. Leakage rate shall not exceed 8 cfm/square foot at one inch WG and 12 cfm/square foot at 4 inches Wg. Electronic damper operators shall be furnished and mounted by manufacturer at the factory as coordinated with the automatic temperature control contractor. Provide full size bypass around all hot water coils including all multiple dampers and accessories.

2.26 FAN COIL UNITS (TWO PIPE) (Vertical)

- A. Type: The fan coil unit shall be of the factory assembled, integral fan type with separate hot water heating coil, chilled water cooling riser heat exchanger, and integral hot water supply, return and drain risers, and shall be made for direct application of "drywall" plaster board.
- B. Capacity: Shall be as indicated on the drawings, which are based on Whalen units.
- C. Cabinet: The unit cabinet shall be fabricated of reinforced 22 gauge continuous galvanized steel. Interior of the cabinet shall be fully insulated with 1/2" thick, 2 lb. density thermal acoustical fiberglass insulation having a black vapor barrier coating conforming to NFPA A90A.
- D. Coils: The coils shall be self-venting without the use of manual or automatic air vents and be constructed of seamless copper tubing mechanically expanded into aluminum plate fins.
- E. Risers: The unit shall incorporate factory-assembled chilled water riser heat-exchanger, independent hot water risers for the hot water coil and a drain riser of suitable length to reach floor-to-floor without additional contractor-furnished material. All risers shall be protected by a galvanized steel pipe chase the length of the cabinet. The tops of all riser shall be swaged, so that the risers can be joined during installation without couplings. On down-feed units, the unit manufacturer shall furnish factory-assembled bottom U-bends with drains inside the bottom unit on each set of chilled water risers. On up-feed units, the unit manufacturer shall furnish factory-assembled top U-bends with manual air vents in the top unit on each set off chilled water risers, plus an extended manual air vent on each hot water riser.
- F. Drain Pan: Drain pan shall collect and drain condensate which may form from any element internal to the fan coil unit and shall be fabricated of not less than 18 gauge continuous galvanized steel. The copper condensate drain line shall be rolled and soldered into the pan, prior to coating of the pan with rustproof and waterproof fire-rated mastic.

- G. Fan: The fan shall be slow speed forward-curved centrifugal type, accessible through the return air grille.
- H. Motor: Shall be of the permanent split capacitor type (PSC), suitable for the current characteristics shown on the drawings, and shall have built-in thermal overload protection. Motors shall be two-speed with 1050 RPM maximum.
- I. Supply and Return Air Grilles: The return air grille shall be fabricated of extruded aluminum, and shall be of suitable size for service access to the interior of the fan-coil unit. The supply grilles shall be of the single deflection type fabricated of extruded aluminum to match the return grille. On units with two supply grilles, one grille shall have an opposed blade damper. All supply openings shall be painted black and a sight baffle must be provided when one unit is serving two separate rooms. Steel grilles or panels are not acceptable. Provide complete with accessory secondary room supply grille and ductwork.
- J. Controls: The unit manufacturer shall furnish a 115 volt wall thermostat for field mounting on the front of the unit after the wall is finished. The thermostat shall plug into the unit through a polarized male-female plug. The thermostat shall be of the automatic changeover type. The fan shall run continuously when the speed switch is in the HI or LO position. Face and bypass dampers for control of cooling shall be operated by a two-position. Face and bypass dampers for control of heating shall be operated by a two-position motor which drives positively in both directions. The hot water heating control valve shall be an electric two-position type with a 50 psi minimum shut-off differential. Furnish two ball-type shutoff valves in each unit. Control and shutoff valve piping packages shall be installed by the manufacturer. Control contractor shall provide motorized damper in outdoor air connection to unit wired to unit controls.
- K. STANDARD FOR SAFETY: All units shall be listed by Underwriters Laboratories, Inc., and shall bear the U.L. label.
- L. Sound Levels: Manufacturer shall submit octave band analysis from a recognized independent testing laboratory.
- M. Fan Coil: Units shall be manufactured in the United States of America, and shall be so labeled.
- N. Disconnect Switch: Each unit shall include an unfused (fused) disconnect switch, factory mounted and wired.
- O. Insulated Riser Extensions: The riser extensions shall be factory-insulated with 3/8" Armaflex or equal.
- P. Hinged Return Air Grille: Each unit shall include a hinged extruded aluminum return air grille with quick-removal fasteners for easy filter maintenance.

- Q. Stainless Steel Drain Pan: Drain pane shall collect and drain condensate which may form from any element internal to the fan coil unit and shall be fabricated of welded and soldered 20 gauge, 304 stainless steel. The copper condensate drain shall be rolled and soldered into the pan, prior to coating the pan with waterproof fire-rated mastic.
- R. Insulated Sight Baffle: Sound insulation shall be furnished on the sight baffle to limit the transmission of sound between two rooms utilizing the same unit.
- S. Supply and Return Grilles: The return air grille shall be fabricated of custom painted extruded aluminum. The supply grilles shall be of the single deflection type fabricated of custom painted extruded aluminum to match the return grille. Steel grilles or panels are not acceptable.

2.27 VARIABLE FREQUENCY DRIVE

- A. Contractor shall provide variable frequency drives and controllers. Installation of Variable Frequency Drives on the following:
Coordinate with unit manufacturer all hydronic water pumps and all new AHUs.

- B. REFERENCES

- 1. The variable frequency drives (VFDs) with all options shall be UL listed as a complete assembly and shall be built in compliance with the latest standards of IEEE, NEMA and IEC 16800 Parts 1 and 2.

- C. QUALITY ASSURANCE

- 1. Manufacturer: Company specializing in manufacture, assembly, and field performance of Variable Frequency Drives with ten (10) years experience.
- 2. It is required that the variable frequency drive manufacturer have an existing representative, exclusively for HVAC applications, an independent service and start-up organization, and a parts stocking depot local to the installation.
- 3. Testing:
 - A. All printed circuit boards shall be completely tested and burnd-in before being assembled into the completed VFD. The VFD shall then be subjected to a computerized systems test (cold), burn-in, and computerized systems test (hot). The burn-in shall be at 104 deg. F (40-C), at full rated load.
 - B. All testing and manufacturing procedures shall be ISO 9001 certified.

4. Failure Analysis:

- A. VFD manufacturer shall have an analysis laboratory to evaluate the failure of any component. The failure analysis lab shall allow the manufacturer to perform complete electrical testing, x-ray of components, and decap or delaminate of components and analyze failures within the component.

D. SUBMITTALS

1. Submit shop drawings and product data under provisions of the Contract Documents that apply to the work in this section.
2. Submit manufacturer's installation instructions under provisions of the Contract Documents that apply to the work in this section.

E. OPERATION AND MAINTENANCE DATA

1. Submit operation and maintenance data under provisions of the Contract Documents that apply to the work in this section.
2. Include assembly views and replacement parts lists.

F. DELIVERY, STORAGE, AND HANDLING

1. Deliver products to site under provisions of the Contract Documents that apply to the work in this section.
2. Store and protect products under provisions of the Contract Documents that apply to the work in this section.

G. WARRANTY AND START-UP SERVICE.

1. The VFD manufacturer shall provide a start up service package for all VFD's provided. Service shall include inspection, final adjustment, operational checks, and a final report for record purpose. Start Up service shall be performed by a factory approved and certified technician.
2. To be included with start up service, for a period of 24 months after initial start up, not to exceed 30 months from date of manufacture, the VFD manufacturer shall include a full parts and labor on-site warranty at no additional costs.

H. VARIABLE FREQUENCY DRIVES

1. The variable frequency drives (VFD) shall be manufactured by Asea Brown Boveri (ABB), designated ACH series.

2. Construction

- a. The VFD shall be solid state, with a Pulse Width Modulated output. The VFD shall employ a full wave rectifier (to prevent input line notching), Integral Line Reactor (s), DC bus filter capacitors, and Insulated Gate Bipolar Transistors (IGBT's) as the output switching device. The drive efficiency shall be 97% or better at full speed and full load. Fundamental power factor shall be 0.98 at all speeds and loads.
- b. The VFD shall be housed in a NEMA 1 enclosure.
- c. Standard operating conditions shall be:
 - 1) Input 380/415/440/460/480 VAC +/-10 %, 3 phase, 48-63 Hz or input 200/208/220/230/240 VAC +/- 10%, 3 phase, 48-63 Hz.
 - 2) Output Frequency 0 to 250 Hz. Operation above 60 Hz shall require programming changes to prevent inadvertent high-speed operation.
 - 3) Environmental operating conditions: 0 to 40 deg C, 0 to 3300 feet above sea level, less than 95% humidity, non-condensing.
- d. All VFD's shall include the following features:
 - 1) All VFDs shall have the same customer interface, including digital display, and keypad, regardless of horsepower rating. The keypad is to be used for local control, for setting all parameters, and for stepping through the displays and menus. The keypad shall be removable, capable of remote mounting and shall have it's own non-volatile memory. The keypad shall allow for uploading and downloading of parameter settings as an aid for start-up of multiple VFD's.
 - 2) The keypad shall include Hand-Off-Auto membrane selections. When in "Hand", the VFD will be started and the speed will be controlled from the up/down arrows. When in "Off", the VFD will be stopped. When in "Auto", the AFD will start via an external contact closure and the VFD speed will be controlled via an external speed reference. The drive shall incorporate "bumpless transfer" of speed reference when switching between "Auto" and "Hand" modes.

- 3) The VFD's shall utilize pre-programmed application macro's specifically designed to facilitate start-up. The Application Macros shall provide one command to reprogram all parameters and customer interfaces for a particular application to reduce programming time.
- 4) The VFD's shall have the ability to automatically restart after an over current, over voltage, under voltage, or loss of input signal protective trip. The number of restart attempts, trial time, and time between reset attempts shall be programmable.
- 5) The VFD's shall be capable of starting into a rotating load (forward or reverse) and accelerate or decelerate to set point without safety tripping or component damage (flying start). The VFD's shall also be capable of DC injection braking at start to stop a reverse spinning motor prior to ramp.
- 6) The VFD's shall be equipped with an automatic extended control power loss ride through circuit, which will utilize the inertia of the load to keep the drive powered. Minimum power loss ride-through shall be one-cycle, based on full load and no inertia. Typical control power loss ride-through for a fan load shall be 2 seconds minimum. Removing power from the motor is not an acceptable method of increasing power loss ride-through.
- 7) If the input reference (4-20mA or 2-10V) is lost, the AFD shall give the user the option of either (1) stopping and displaying a fault, (2) running at a programmable preset speed, (3) hold the VFD speed based on the last good reference received, or (4) cause a warning to be issued, as selected by the user. The drive shall be programmable to signal this condition via a keypad warning, relay output and/or over the serial communication bus.
- 8) The customer terminal strip shall be isolated from the line and ground.
- 9) The drive shall employ current limit circuits to provide trip free operation:
 - a. The Slow Current Regulation limit circuit shall be adjustable to 150 % (minimum) of the VFD's normal duty current rating. This adjustment shall be made via the keypad, and shall be dis-

- played in actual amps, and not as percent of full load.
- b. The Current Switch-off limit shall be fixed at 350% (minimum, instantaneous) of the VFD's normal duty current rating.
- 10) The overload rating of the drive shall be 110% of its normal duty current rating for 1 minute in every 10 minutes.
 - 11) The VFD shall have an integral Line Reactor(s) to reduce the harmonics to the power line and to increase the fundamental power factor.
 - 12) The VFD shall be capable of sensing a loss of load (broken belt / no water in pump) and signal the loss of load condition. The drive shall be programmable to signal this condition via a keypad warning, relay output, and/or over the serial communications bus. Relay outputs shall include programmable time delays that will allow for drive acceleration from zero speed without signaling a false under load condition.
 - 13) The AFD shall have programmable "Sleep" and "Wake up" functions to allow the drive to be started and stopped from the level of a process feedback signal.
- e. All VFD's to have the following adjustments:
- 1) Two (2) programmable critical frequency lockout ranges to prevent the VFD from operating the load continuously at an unstable speed.
 - 2) PID Set point controller shall be standard in the drive, allowing a pressure or flow signal to be connected to the VFD, using the microprocessor in the VFD for the closed loop control. The VFD shall have 250 mA of 24 VDC auxiliary power and be capable of loop powering a transmitter supplied by others. The auxiliary power supply shall have overload and over current protection. The PID set point shall be adjustable from the VFD keypad, analog inputs, or over the communications bus.
 - 3) Two (2) programmable analog inputs shall accept a current or voltage signal for speed reference, or for reference and actual (feedback) signals for PID controller. Analog inputs shall include a filter, programmable from 0.01 to 10 seconds to remove any oscillation in the input signal. The minimum and maximum values (gain and offset) shall be adjustable

within the range of 0 - 20 ma and 0 - 10 Volts.

Additionally, the reference must be able to be scaled so that maximum reference can represent a frequency less than 60 Hz, without lowering the drive maximum frequency below 60 Hz. Process variables shall be modifiable by math functions such as multiplication and division between the two signals (fan tracking), high/low select, as well as inverted follower.

- 4) Five (5) programmable digital inputs for maximum flexibility in interfacing with external devices. One digital input is to be utilized as a customer safety connection point for fire, freeze, and smoke interlocks (Enable). Upon remote, customer reset (reclosure of interlock) drive is to resume normal operation.
- 5) One (1) programmable analog output proportional to Frequency, Motor Speed, Output Voltage, Output Current, Motor Torque, Motor Power (kW), DC Bus voltage, Active Reference, and other data.
- 6) Two (2) programmable digital relay outputs. The relays shall be rated for maximum switching current of 8 amps at 24 VDC and 0.4 A at 250 VAC; Maximum voltage 300 VDC and 250 VAC; Continuous current rating 2 amps RMS. Outputs shall be true form C type contacts; open collector outputs are not acceptable. Relays shall be capable of programmable on and off delay times. Seven (7) programmable preset speeds.
- 7) Two independently adjustable accel and decel ramps. These ramp times shall be adjustable from 1 to 1800 seconds.
- 8) The VFD shall Ramp or Coast to a stop, as selected by the user.

- f. The following operating information displays shall be standard on the VFD digital display. All applicable operating values shall be capable of being displayed in engineering (user) units. A minimum of two operating values from the list below shall be capable of being displayed at all times. The display shall be in complete English words (alphanumeric codes are not acceptable):

- Output Frequency
- Motor Speed (RPM, %, or Engineering units)
- Motor Current
- Calculated Motor Torque
- Calculated Motor Power OM
- DC Bus Voltage
- Output Voltage
- Heatsink Temperature
- Analog Input Values
- Analog Output Value
- Keypad Reference Values

Elapsed Time Meter (resettable)
kWh meter (resettable)
kWh meter
Digital input status
Digital output status

- g. The VFD shall have the following protection circuits. In the case of a protective trip, the drive shall stop, and announce the fault condition in complete words (alphanumeric codes are not acceptable).
- Over current trip 350 % instantaneous (170 % RMS) of the VFD's variable torque current rating.
 - Over voltage trip 130% of the VFD's rated voltage
 - Under voltage trip 65% of the VFD's rated voltage
 - Over temperature +90 deg. C
 - Ground Fault either running or at start
 - Adaptable Electronic Motor Overload (I squared T). The Electronic Motor Overload protection shall protect the motor based on speed, load curve, and external fan parameter. Circuits, which are not speed dependent, are unacceptable. The electronic motor overload protection shall be UL Listed for this function.
- h. Speed Command Input shall be via:
- 1) Keypad.
 - 2) Two Analog inputs, each capable of accepting a 0-20mA, 4-20mA, 0-10V, 2-10V signal.
 - 3) Floating point input shall accept a three-wire input from a Dryer Photo helic (or equivalent type) instrument.
 - 4) Serial Communications
- i. Serial Communications
1. The VFD shall have an RS-485 port as standard. The standard protocol shall be Modbus.
 2. The VFD shall be able to communicate with PLC's, DCS's, and DDC's.
 3. Serial communications capabilities shall include, but not be limited to, run-stop control; speed set adjustment, proportional / integral / derivative PID control adjustments, current limit, and accel/decel time adjustments. The drive shall have the capability of allowing the DDC to monitor feedback such as process variable feedback, output speed/frequency, current (in amps), % torque, power (kW), kilowatt hours (resettable), operating hours (resettable), relay outputs, and diagnostic warning and fault information. Additionally, remote (LAN) VFD fault reset shall be possible. A minimum of 15 field parameters shall be capable of being monitored.

4. The VFD's shall allow the DDC to control the drive's digital and analog outputs via the serial interface. The serial communications interface shall allow for DO (relay) control and AO (analog) control. In addition, all drive digital and analog inputs shall be capable of being monitored by the DDC system.
 5. The VFD's shall have the capability of accepting fiber optic cables for connection to standard ABB fieldbus adapters. Communications between the drive and field bus adapters shall be at 1 Mega Baud.
 6. The VFD shall be connectable to a PC based software tool capable of operating, programming, monitoring the drive as well as diagnosing faults.
- j. Accessories to be furnished and mounted by the drive manufacturer and contained in a single enclosure.
1. Customer Interlock Terminal Strip - provide a separate terminal strip for connection of fire, smoke, freeze contacts and external start command
 2. Door interlocked disconnect or circuit breaker, pad lockable in off position.
 3. Manual Transfer to line power via contactors and including class 20 bimetal motor thermal overload relays and fuse or circuit breaker protection while in bypass operation complete with automatic bypass capability.
- k. Compliance to IEEE-519
1. The VFD manufacturer is responsible for the cost of all equipment required to meet IEEE-519-1992, General Category, at no additional costs to the user. Equipment which can be provided include AC input line reactors, DC bus reactors and/or harmonic trap filters. In order to determine what harmonic filtering equipment is required, the VFD manufacturer must conduct a harmonics analysis of the site prior to the bid.
 2. The VFD manufacturer shall provide calculations (required by paragraph C.1 above), based on utility transformer impedance, KVA, and voltage data and electrical distribution wiring data supplied by the owner/engineer, specific to this installation showing the total harmonic distortion reflected into the electrical distribution system by the VFD's is limited to the level defined by IEEE-519-1992 for general systems. Harmonic analysis will be required for VFD submittal review.

3. VFD manufacturer shall conduct on-site Harmonic measurements before and after start-up of the VFD'S. Results of the measurements showing harmonic contribution of VFD's shall be provided to the engineer one month after start up.

I. INSTALLATION

1. Install Variable Frequency Drives in accordance with manufacturer's instructions. VFD installation shall be the responsibility of the Mechanical Contractor. Power wiring of the to the disconnect of the VFD shall be the responsibility of the Electrical Contractor. All wiring from the VFD to more shall be provided by the mechanical contractor.
2. Provide access space for service. Provide no less than minimum as recommended by manufacturer.
3. The Variable Frequency Drive manufacturer shall provide a start-up service package for all Variable Frequency Drives provided. Service shall include inspection, final adjustment, operational checks, and a final report for record purposes. Start up service shall be performed by a factory approved and certified technician.

2.28 UNDERGROUND PIPING

- A. Provide a complete hydronic system for transmission of the space heating, chilled water and domestic water as shown on the plans and as specified. System shall be complete with all materials and controls from one single manufacturer source. Submittals must include manufacturer complete specification sheets with dimensions for all components and accessories being supplied as part of the system for engineer's approval.
- B. The installation shall be in strict accordance with all manufacturers' instructions in accordance with their warranty policy. All materials shall come complete with a manufacturer's standard 10-year warranty.
- C. PEX Carrier Tubing
 1. Carrier piping shall be ComfortPro Systems polyethylene (PEX-A) cross-linked piping with Oxygen Diffusion Barrier or engineer approved equal. All tubing shall be protected with a manufacturer applied oxygen diffusion barrier. Oxygen barrier shall perform in accordance with DIN Standard 4726 or better.
 2. Tubing shall be DIN and ASTM approved and stamped with the appropriate code references. The PEX pipe shall have an operating temperature of 203F at an operating pressure of 87 psig.

3. Tubing shall be sized as indicated and scheduled on the plans, without restriction or reduction of cross-section within the insulated jacket.

D Internal Pipe Insulation

1. Insulation of all carrier piping shall consist of a micro cellular, cross-linked polyethylene foam in multi-layer arrangements. The insulation closed cell structure shall insure minimal water absorption at all times to preserve insulating effect against thermal loss.
2. Insulation shall have a thermal conductivity performance equal to DIN Standard 56212 or higher for underground thermal loss.
3. All material shall be CFC free and completely flexible to the radius required to meet the layout of the piping as shown on the plans.

E. Corrugated HDPE Outer Jacket

1. The exterior jacket shall be made of high-density polyethylene (HDPE) to protect the carrier pipe and insulating materials from external influences.
2. The jacket shall be cast with a corrugated pattern along its entire length. The corrugation pattern shall provide flexibility in the longitudinal direction and rigidity against radial forces.
3. The corrugation outer edges shall employ a closed cell construction to provide a double layer of protection from piercing of the outer jacket. Single wall exterior jackets shall be deemed not equal for the long-term protection of the Owner.

2.35 CHEMICAL WATER TREATMENT:

- A. Provide complete chemical and anti-freeze of the propylene glycol heating and chilled water system for the air handling units as noted under PART 3 - EXECUTION of this section.

PART 3 - EXECUTION

3.01 PIPING INSTALLATION AND SUPPORT:

- A. All piping shall be grouped wherever practical and properly aligned in straight parallel lines. Pipe shall be spaced to allow for full insulation and to permit access for service and operation of valves and other accessories. The exact locations of piping and related equipment are not necessarily as indicated on the Drawings and shall be determined by actual field conditions to permit maximum ease of service and accessibility consistent with a neat and workmanlike installation. It shall be understood that the locations of piping, valves, controls,

equipment, etc., are subject to such modifications as may be found necessary or desirable at the time of the installation in order to meet any structural or mechanical conditions. Such changes shall be made by this Section, upon approval by the Architect, without extra charges.

- B. Connections of dissimilar metals between pipe, fittings, hangers, equipment, etc. shall be avoided wherever practical. Wherever such connections are unavoidable they shall be insulated against direct contact with high grade dielectric fittings.
- C. Piping shall be cut accurately to measurements established at the site and shall be worked into place without springing or forcing.
- D. Piping shall be pitched for proper circulation and drainage. Supply run outs shall pitch upward in the direction of flow. Drain piping shall pitch a minimum of 1/4" per foot down in the direction of flow, unless noted otherwise.
- E. Piping shall be supported, guided and anchored to prevent creeping, sagging, buckling, vibration or misalignment.
- F. Pipes shall not be hung from other piping or from equipment of other trades, and hanger rods shall not pierce ducts without specific approval.
- G. Wire, chain, bank iron, tape or wood hangers shall not be used to support piping.
- H. Pipe supports shall be capable of vertical adjustments after installation of piping.
- I. Piping of all equipment and control valves shall be supported to prevent strains or distortions in the connected equipment and control valves. Piping shall be supported to allow for removal of equipment, valves and accessories with a minimum of dismantling and without requiring additional supports after these items are removed.
- J. Pipes shall be supported at all changes in direction and at intervals of not more than 10 feet on straight runs. Supports shall be subject to the Architect's approval.
- K. Piping at ceiling shall be supported on clevis, roller or trapeze hangers, with rods suspended for inserts.
- L. Piping at floor shall be supported on offset clamps, floor stands or roller stands fastened to concrete piers.
- M. Piping at walls shall be supported on hook plates, offset clamps or wall brackets with U bolts or roller stands.
- N. Where building construction is not suited to these methods of supporting piping, supports shall be as detailed on the Drawings or as approved by the Architect.

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- O. Trapeze hangers shall consist of two (2) structural steel channels bolted back to back with space between for hanger rods and hold down bolts or one of the formed steel systems with appropriate clamps and fittings.
- P. Hanger rods shall be fully threaded and galvanized and shall be secured in place with double nuts and lock washers.
- Q. Anchors shall be as approved by the Architect.
- R. Wherever insulated piping is to be installed on supports, protection saddles shall be welded to bottom of pipe to provide a bearing surface and to protect the insulation.
- S. Wherever cold insulated pipe is installed, curved steel plate half-sleeves shall be cemented to the lower half of the outside surface of the insulation to provide a bearing surface and to protect the insulation.
- T. All hangers and supports shall be finished by other Divisions with two (2) coats of zinc chromate paint. Coordinate all quantities and locations.
- U. Vertical pipes shall be supported at the bottom on base elbows or floor stands fastened to concrete piers.

3.02 DUCTWORK INSTALLATION:

- A. Provide ductwork mounted volume dampers in supply, return, and exhaust ducts at branch takeoffs connecting to each air inlet and air outlet. Also provide ductwork mounted volume dampers in outdoor air ductwork at connections to individual HVAC units. These dampers shall be provided whether indicated or not on contract drawings.

3.03 ANCHORS AND GUIDES

- A. Provide anchors and guides, Fee & Mason or approved equal, on hot water heating supply and return piping throughout the buildings. Furnish and install these items in accordance with manufacturer's recommendations. Coordinate all locations with General Contractor prior to installation.

3.04 AUTOMATIC TEMPERATURE CONTROLS

- A. Provide a complete and fully operational automatic temperature control system as specified.

3.05 STARTING UP:

- A. Prior to starting up the system, flush all system piping and ducts until clean. Any damage to the building or system components caused by failure to clean the system properly, shall be corrected to the satisfaction of the Architect and the

cost shall be paid for by this Section. Eliminate all noise and vibration, and take all measures to secure proper circulation.

3.06 UNDERGROUND PIPING:

A. Installation - Handling, Trenching, and Backfill

1. Pipe should be stored and transported in such a way to avoid sharp objects, stones, or other damaging external influences. Pipe coils should not be dragged along the ground, but rolled or lifted into place.
2. All PEX carrier piping ends shall be protected with tape over the ends during the installation process. Tape shall not be removed until carrier tubing is connected to system piping.
3. Only nylon or textile straps should be used for fastening or hoisting. Chains should not be used under any circumstances.
4. All trenches up to 4 feet deep shall be vertical trenches with straight sidewalls. Excavation should be carried out in an approved manner, within the rules and regulations of all local and OSHA requirements.
5. A minimum laying temperature of 23deg.F. outdoors is required.
6. A minimum layer of 4" sand shall be placed and compacted along the entire bottom of the trench, or as specified in the site trench details before placing lines in trench.
7. Tubing can be laid out directly from coil by pulling on the carrier pipe. Pulling connections should never be made onto the outer jacket, but on the carrier pipe end.
8. An adequate excess of material for connection should be left and secured at the beginning of the trench as the remaining coil is rolled out into place.
9. As the tubing is uncoiled, sand shall be placed on to the outer jacket every 10 feet or as required to keep the tubing in place.
10. Once the tubing has been installed and pressure tested in the trench as needed, backfill can be made over the entire tubing length. Backfill in direct contact with the tubing outer jacket shall be layered sand in 8" depth without rocks or sharp objects. Sand shall be compacted by hand only. Care should be taken to remove any stone or sharp objects from backfill to avoid damaging the outer jacket layer. When backfill has been brought to a minimum of 20" above tubing outer jacket, a vibrating tamper may be used to compact the remainder of the soil.

B. Connections and Underground Protection

1. All connections from the carrier pipe as sized to equipment and internal connections shall be a cast bronze clamp-on style connection to convert to a male NPT threaded end similar to a Jentro connector. The connectors shall have a clap on type closure around the entire perimeter of the carrier tubing. Compression ring type connectors will not be considered equal.
2. All underground joints will be composed of the appropriate number for PEX x NPT adapters and the required fitting (tee, coupling, etc.). Manufacturer shall provide preformed plastic insulation casings to be clamped over the pipe connections after assembly and pressure testing. Casing shall completely encased connections and all edges of connecting outer jacket HDPE corrugations for a watertight fit. Casings shall be supplied complete with internal dry insulation and watertight sealant for edges of casing.
3. Where a set of supply and return or hot and cold water lines are being taken off a set of parallel mains, an inspection chamber with removable top cover shall be provided with re-enterable top inspection port. All outer jackets of entering pipe shall be secured to inspection chamber with water tight fit.
4. Manufacturer shall supply the appropriate number of dry or shrink-wrap end sleeves as required by the project. Contractor shall install end caps after installation of the tubing but before installation of end connectors.
5. If the exterior HDPE jacket is damaged in any way during the installation process, contractor shall install heat-shrinkable heat tape from the system manufacturer to seal outer jacket. Tape shall be wrapped completely around the exterior jacket with an overlap of at least 3" from each side of the damaged portion. Tape shall be heated with a heat gun or low heat torch to conform to the corrugations of the exterior jacket.

C. Hydrostatic Pressure Testing

1. Pressure testing shall be required for any run of piping that has underground piping connections.
2. Any runs that do not contain any connections can be back filled directly after laying the pipe in the trench without further testing.
3. After installation of preinsulated tubing and before backfilling of the trench, all MicroFlex piping required shall be pressure tested to a minimum of 60 psig for a 24-hour period. Contractor shall notify factory and general contractor representatives for verification both before and after testing period.

4. All piping shall be bled of air pockets and minimum 4 inch test gauges shall be installed temporarily for testing. If test pressure drops more than 2 psig over the 24 hour period, system shall be re-checked and re-tested. Any tubing showing signs of damage at the jobsite before pour shall be replaced without any concealed joints whatsoever.

D. Building Penetrations, Attachments, Sleeves

1. All penetrations below grade into and out of building sections shall be installed in a manner that protects the exterior jacket of piping and provides a watertight seal to prevent any water entering building.
2. For all sub-grade penetrations, an appropriate size plastic or metal sleeve shall be set into the wall or core drilled to guide and protect the piping entry.
3. Wall sleeves shall be sized and planned to allow the installation of a mechanical link seal type filler between sleeve interior and exterior HDPE casing of MicroFlex piping. Link type seal device shall be field supplied.
4. Where piping system penetrates building walls, a fixed-point bracket shall be installed to secure piping and allow minor expansion and contraction of the PEX carrier tube. A bracket shall be used to secure the line attaching to the carrier tubing after the point of conversion to hard piping. Do not clamp onto the PEX carrier tubing at any point.
5. Where exterior jacket and insulation end inside, a heat shrinkable cap shall be provided by the manufacturer to prevent water or other liquids from entering the insulation space. Installers shall use a heat gun or low heat torch to completely surround exterior jacket and interior PEX carrier piping after all connections are made and pressure tested.
6. For entry above grade, a non-watertight entry may be made. A heat-shrinkable sleeve shall be installed over exterior of HDPE exterior jacket for protection. Sleeve shall be placed on jacket so that sleeve is inside wall penetration when in the final installed position. Any air gaps or spaces shall be filled with foam type insulation to complete penetration.

E. Manufacturers Assistance and Field Services:

1. Manufacturer shall supply a detailed drawing of all pipe routing with sizes and connections clearly marked with submittal detail. Site backgrounds shall be provided manufacturer for drawing development in AutoCAD format.

2. A local representative of the system manufacturer shall supervise and provide contractor field assistance in the installation of all piping.
3. Factory representative shall inspect all aspects of system installation, and provide a letter of compliance to contractor when completed. Letter of compliance shall indicate that system has been installed and tested in accordance with the instructions of the manufacturer. Any deficiencies or concerns shall be included for resolution by the contractor and engineer.
4. During the installation and before any backfill, contractor shall take sufficient digital photos of system to verify and provide reference for Owner for future use and modification as needed.
5. Contractor shall submit letter of compliance with manufacturer's instructions, digital photos, and as-built system drawing as part of O&M close out documentation.

3.07 CHEMICAL WATER TREATMENT:

- A. Provide complete chemical treatment for the propylene glycol heating and cooling system serving the air handling units and fan coil units for the duration of the warranty period.
- B. Treatment shall consist of a 50 gallon propylene glycol feeder system Model GF-1 A-5 manufactured by Morr Control or approved equal (typical for two arrangements). Feeder pump shall be interlocked with and controlled by Electric Contract Water Meter provided and located in the propylene glycol heating water system cold water make-up. Provide, and assist in, complete system operation with instructions in accordance with the manufacturer's recommendations.
- C. Treatment shall also include providing 40% propylene glycol solution and necessary inhibitor, for the duration of the warranty period, as manufactured by Dow Chemical Company or approved equal.
- D. Treatment shall be non-staining and non-toxic.

3.07 TESTS:

- A. Equipment: Demonstrate that all equipment and apparatus fulfill the requirements of the Drawings and the Specifications. All equipment shall be operated and tested for rated capacities and specified characteristics. Voltage and amperage readings shall be taken on all electric motors.
- B. Air Systems: Air systems shall be initially balanced to achieve the specified CFM. Final balance shall be done to maintain even space temperatures under occupied load conditions.

- C. Test Log: Five (5) copies of a complete tabulated log of all test readings including pressures, temperatures, R.P.M., electric motor voltage and current shall be submitted to the Owner for approval. Water balancing shall be performed to achieve even temperature drops throughout the systems. Pump readings shall also be taken and submitted.

END OF SECTION 15500

SECTION 15985- SEQUENCE OF OPERATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. The Drawings and general provisions of the Contract, including General and Supplementary Conditions, and Division 1, General Requirements, apply to work specified in this Section.
- B. The requirements specified in Section 15010, "Basic Mechanical Requirements," apply to this Section.
- C. The requirements specified in Section 15500, "HVAC", apply to this Section.

1.02 INCLUDED IN THIS SECTION:

- A. HVAC Control Sequences
- B. Hot Water Supply Control Sequences
- C. Exhaust Fan Control Sequences
- D. Unit and Cabinet Unit Heater Control Sequences
- E. Domestic (110oF) Hot Water Recirculation Pump Control
- F. Chiller Control
- G. Boiler Control

1.03 DESCRIPTION OF WORK

- A. Sequence of operation is hereby defined as the manner and method by which controls function. Requirements for each type of control system operation are specified in this Section.
- B. Submittals:
 - 1. Fabrication Drawings: Submit project specific fabrication drawings for the factory and field wiring portion of this specific project for each system automatically controlled, containing the following information:
 - a. Schematic flow diagram of system showing fan coils, package terminal units, condensing units, fans, dampers, valves and control devices.
 - b. Label each control device with setting or adjustable range of control.
 - c. Indicate ductwork; factory and field wiring.

- d. Indicate each control panel required, with internal and external piping and wiring clearly indicated. Provide detail of panel face, including controls, instruments, and labeling. Include verbal description of sequence of operation.
- 2. Maintenance Data: Include copy of shop drawings in each maintenance manual.

PART 2 - PRODUCTS (Not Applicable).

PART 3 - EXECUTION

3.01 GENERAL

- A. Control sequences shall be subject to safety permissives, whether specifically indicated or not.
- B. Provide night setback operation on common area cooling and heating.

3.02 VENTILATION CONTROL

- A. Exhaust fans serving individual apartment bathrooms shall be manually switch operated.
- B. Exhaust fans serving the remainder of the areas shall be interlocked or manually switch operated by Division 16 as indicated on Drawings.
- C. Pilot-lit switches shall be identified with black bakelite signs with white incised lettering indicating "EXHAUST FAN".
- D. Corridor ventilation shall run continuously during normal occupancy periods, cycling electric heating coils to maintain space temperature.

3.03 COOLING CONTROL

- A. Fan coil units to have integral controls with units.

3.04 REFRIGERATION EQUIPMENT CONTROL SEQUENCES:

- A. Chiller Control: Provide electrical signal connection to factory-installed control package. Provide 2 flow switches to prevent chiller from operating when chiller water or condenser water is not flowing.
- B. Provide for automatic start and manual summer/winter changeover.

3.05 BOILER AND HEATING CIRCULATION PUMP SYSTEMS CONTROL

- A. Provide electric/electronic outdoor air reset control for the boiler system.
- B. Outdoor thermostat shall inversely reset the boiler water temperature, through an immersion aquastat, in an adjustable schedule inversely with outdoor air temperature.
- C. Provide necessary relays, outdoor air thermostat, etc., to activate the controls when the outdoor air temperature is below 65 degrees Fahrenheit (adjustable).
- D. Provide sun-shield and secure protective guard for outdoor air thermostat.
- E. For heating pumps, provide panel-mounted lead-lag switch. Also provide automatic alternator and differential pressure switches. If a differential pressure switch senses loss of flow in the operating pump, alternator shall automatically start standby pump, illuminate one of two red "PUMP FAILURE" warning lights on cover of control panel, and shall activate a warning buzzer with panel-mounted manual silence switch.
- F. Provide an advanced proportional plus derivative microprocessor control with algorithm to minimize droop and overshoot. Also provide all necessary controls as indicated in Section 15500 and as recommended by the boiler manufacturer for a complete and fully operational system.
- G. All control wiring for boiler system shall be in conduit.
- H. Provide separate automatic temperature control panel(s) which shall contain all control components located in the Mechanical Room.
- I. Boiler control shall be provided with domestic priority override for domestic water.
- J. Provide for automatic start and manual summer/winter changeover.

3.06 AHU SYSTEM HVAC UNIT CONTROL

- A. Time Clock: For each split system unit, provide time clock to establish occupied and unoccupied cycles. Mount all time clocks in an automatic temperature control panel in Mechanical Room. Provide 3 hour timer, mounted recessed next to each unit thermostat, to allow occupants to manually override the unoccupied cycle. Label timer "UNOCC. OVERRIDE."
 - 1. Heating: When space temperature falls below thermostat setpoint for heating the unit shall index to heating.
 - 2. Cooling: When space temperature rises above thermostat setpoint for cooling, mechanical refrigeration shall be energized. (System sampling to be used as index).

3.07 DOMESTIC RECIRCULATION PUMP CONTROL

- A. Provide strap-on aquastat on hot water recirculating piping to energize and de-energize each recirculation pump motor based on an adjustable 100F range of fluid temperature. When fluid temperature falls below adjustable pre-set point, pump shall be energized and shall continue to operate until temperature increases by 100F.
- B. Each recirculation pump shall have a standby pump with matching controls. Provide manual switch to allow selection of the operating pump.

3.08 UNIT AND CABINET UNIT HEATER CONTROL

- A. Provide single-temperature line-voltage room thermostat to cycle fan motor to maintain constant space temperature.
- B. Provide strap-on aquastat on unit return piping, to de-energize fan motor when fluid temperature falls below adjustable setting of aquastat. For cabinet unit heaters, locate strap-on aquastat within cabinet piping end pocket.

3.09 ELEVATOR MACHINE ROOM CONTROL

- A. Provide a wall mounted thermostat in the Elevator Machine Room. On a rise in temperature above its setting, the thermostat shall start the air conditioning unit and exhaust fan. Provide a gasketed, tight closing, low leakage, opposed blade motorized damper on the outdoor air intake duct; arrange to open when the fans operate and close when the fans stop.

3.10 PLUMBING WATER HEATER AND PUMP CONTROL

- A. Provide all necessary controls, including storage tank immersion aquastats, etc., for control of the water heaters and associated pumps in accordance with the heater manufacturer's recommendations.

3.11 ELECTRIC HEAT CONTROL

- A. As specified under Division 16.

END OF SECTION 15985

SECTION 15990- TESTING, ADJUSTING AND BALANCING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. The Drawings and general provisions of the Contract, including General and Supplementary Conditions, and Division 1, General Requirements, apply to work specified in this Section.
- B. The requirements specified in Section 15010, "Basic Mechanical Requirements," apply to this Section.
- C. Related Sections:
 - 1. Other Division 15 Sections specify balancing devices and their installation, and materials and installation of mechanical systems.
 - 2. Individual Division 15 system sections specify leak testing requirements and procedures.

1.02 INCLUDED IN THIS SECTION:

- A. Testing, adjusting, and balancing of mechanical systems.
- B. Verification of temperature control system operation.
- C. Testing systems for proper sound and vibration levels.

1.03 DESCRIPTION OF WORK:

- A. This Section specifies the requirements and procedures for total mechanical systems testing, adjusting, and balancing. Requirements include measurement and establishment of the fluid quantities of the mechanical systems as required to meet design specifications, and recording and reporting the results.
- B. Test, adjust, and balance the following mechanical systems:
 - 1. Supply air systems, all pressure ranges, including variable volume systems.
 - 2. Return air systems.
 - 3. Exhaust air systems.
 - 4. Outdoor air systems.
 - 5. Hydronic systems.
 - 6. Chilled Water System.
 - 7. Temperature control system: verify operation.
- C. Test systems for proper sound and vibration levels.

- D. This Section does not include:
1. Specifications for materials for patching mechanical systems.
 2. Specifications for materials and installation of adjusting and balancing devices. If devices must be added to achieve proper adjusting and balancing, refer to the respective system sections for materials and installation requirements.
 3. Requirements and procedures for piping and ductwork systems leakage tests.
 4. Testing boilers and pressure vessels for compliance with safety codes.

1.04 DEFINITIONS:

- A. Systems testing, adjusting, and balancing is the process of checking and adjusting all the building environmental systems to produce the design objectives. It includes:
1. The balance of air, water and steam distribution.
 2. Adjustment of total system to provide design quantities.
 3. Electrical measurement.
 4. Verification of performance of all equipment and automatic controls.
 5. Sound and vibration measurement.
- B. Test: To determine quantitative performance of equipment.
- C. Adjust: To regulate the specified fluid flow rate and air patterns at the terminal equipment (e.g., reduce fan speed, throttling).
- D. Balance: To proportion flows within the distribution system (sub-mains, branches, and terminals) according to specified design quantities.
- E. Procedure: Standardized approach and execution of sequence of work operations to yield reproducible results.
- F. Report Forms: Test data sheets arranged for collecting test data in logical order for submission and review. These data should also form the permanent record to be used as the basis for required future testing, adjusting, and balancing.
- G. Terminal: The point where the controlled fluid enters or leaves the distribution system. These are supply inlets on water or steam terminals, supply outlets on air terminals, return outlets on water terminals, condensate outlets on steam terminals, and exhaust or return inlets on air terminals such as registers, grilles, diffusers, louvers, and hoods.
- H. Main: Duct or pipe containing the system's major or entire fluid flow.

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- I. Submain: Duct or pipe containing part of the systems' capacity and serving two or more branch mains.
- J. Branch Main: Duct or pipe serving two or more terminals.
- K. Branch: Duct or pipe serving a single terminal.

1.05 SUBMITTALS:

- A. Agency Data: Submit proof that the proposed testing, adjusting, and balancing agency meets the qualifications specified below.
- B. Certified Reports: Submit testing, adjusting, and balancing reports bearing the seal and signature of the Test and Balance Engineer. The reports shall be certified proof that the systems have been tested, adjusted, and balanced in accordance with the referenced standards; are an accurate representation of how the systems have been installed; are a true representation of how the systems are operating at the completion of the testing, adjusting, and balancing procedures; and are an accurate record of all final quantities measured, to establish normal operating values of the systems. Follow the procedures and format specified below:
 - 1. Final Reports: Upon completion of testing, adjusting, and balancing procedures, prepare final reports on the approved forms. Final reports must be complete, factual, accurate, type written, and organized and formatted as specified below. Submit 5 complete sets of final reports.
 - 2. Report Format: Report forms shall be those standard forms prepared by the referenced standard for each respective item and system to be tested, adjusted, and balanced. Bind report forms complete with schematic systems diagrams and other data in reinforced, vinyl, three-ring binders. Provide binding edge labels with the project identification and a title descriptive of the contents. Divide the contents of the binder into the below listed divisions, separated by divider tabs:
 - a. General Information and Summary.
 - b. Air Systems.
 - c. Hydronic Systems/Chilled Systems.
 - d. Temperature Control Systems.
 - e. Special Systems.
 - 3. Report Contents: Provide the following minimum information, forms and data.
 - a. General Information and Summary: Inside cover sheet to identify testing, adjusting, and balancing agency, Contractor, Owner, Architect, Engineer, and Project. Include addresses, contact names, and telephone numbers. Also include a certification sheet containing the seal, name, address, telephone number, and signature of the Certified Test and Balance Engineer.

- b. The remainder of the report shall contain the appropriate forms containing as a minimum, the information indicated on the standard report forms prepared by the AABC and NEBB, for each respective item and system.

1.06 QUALITY ASSURANCE:

A. Agency Qualifications:

- 1. Employ the services of an independent testing, adjusting, and balancing agency meeting the qualifications specified below, to be the single source of responsibility to test, adjust, and balance the building mechanical systems identified above, to produce the design objectives. Services shall include checking installations for conformity to design, measurement and establishment of the fluid quantities of the mechanical systems as required to meet design specifications, and recording and reporting the results.
- 2. An independent testing, adjusting, and balancing agency certified by Associated Air Balance Council (AABC) or National Environmental Balancing Bureau (NEBB) in those testing and balancing disciplines required for this project. Agency shall have at least one Professional Engineer registered in the state in which the services are to be performed, and certified by AABC or NEBB as a Test and Balance Engineer.

B. Codes and Standards:

- 1. AABC: "National Standards for Total System Balance."
- 2. ASHRAE: ASHRAE Handbook, 1984 Systems Volume, Chapter 37, Testing, Adjusting, and Balancing.
- 3. NEBB: "Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems."

1.07 PROJECT CONDITIONS:

- A. Systems Operation: Systems shall be fully operational prior to beginning procedures.
- B. Sequencing and Scheduling: Test, adjust, and balance the air systems before hydronic, and refrigerant systems.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 PRELIMINARY PROCEDURES FOR AIR SYSTEM BALANCING:

- A. Before operating the system, perform these steps:
1. Obtain design drawings and specifications and become thoroughly acquainted with the design intent.
 2. Obtain copies of approved shop drawings of all air handling equipment, outlets (supply, return, and exhaust) and temperature control diagrams.
 3. Compare design to installed equipment and field installations.
 4. Walk the system from the system air handling equipment to terminal units to determine variations of installation from design.
 5. Check filters for cleanliness.
 6. Check dampers (both volume and fire) for correct and locked position, and temperature control for completeness of installation before starting fans.
 7. Prepare report test sheets for both fans and outlets.
 8. Determine best locations in main and branch ductwork for most accurate duct traverses.
 9. Place outlet dampers in the full open position.
 10. Check fan belt tension.
 11. Check fan rotation.
 12. Prepare schematic diagrams of system "as-built" ductwork and piping layouts to facilitate reporting.
 13. Lubricate all motors and bearings.

3.02 PRELIMINARY PROCEDURES FOR WATER (HEATING AND CHILLED) SYSTEM BALANCING:

- A. Before operating the system perform these steps:
1. Open valves to full open position. Close coil bypass valves.
 2. Remove and clean all strainers.
 3. Examine systems and determine if water has been treated and cleaned.
 4. Check pump rotation.

5. Clean and set automatic fill valves for required system pressure.
6. Check expansion tanks to determine that they are not air bound and that the system is completely full of water.
7. Check air vents at high points of systems and determine if all are installed and bleed air completely.
8. Set temperature controls so all coils are calling for full flow.
9. Check operation of automatic bypass valves.
10. Lubricate all motors and bearings.
11. Check and set operating temperatures of chillers to design requirements.

3.03 MEASUREMENTS:

- A. Provide all required instrumentation to obtain proper measurements, calibrated to the tolerances specified in the referenced standards. Instruments shall be properly maintained and protected against damage.
- B. Provide instruments meeting the specifications of the referenced standards.
- C. Use only those instruments which have the maximum field measuring accuracy and are best suited to the function being measured.
- D. Apply instrument as recommended by the manufacturer.
- E. Use instruments with minimum scale and maximum subdivisions and with scale ranges proper for the value being measured.
- F. When averaging values, take a sufficient quantity of readings which will result in a repeatability error of less than 5 percent. When measuring a single point, repeat readings until 2 consecutive identical values are obtained.
- G. Take all reading with the eye at the level of the indicated value to prevent parallax.
- H. Use pulsation dampeners where necessary to eliminate error involved in estimating average of rapidly fluctuation readings.
- I. Take measurements in the system where best suited to the task.

3.04 PERFORMING TESTING, ADJUSTING, AND BALANCING:

- A. Perform testing and balancing procedures on each system identified, in accordance with the detailed procedures outlined in the referenced standards.

- B. Cut insulation, ductwork, and piping for installation of test probes to the minimum extent necessary to allow adequate performance of procedures.
- C. Patch insulation, ductwork, and housings, using materials identical to those removed.
- D. Seal ducts and piping, and test for and repair leaks.
- E. Seal insulation to re-establish integrity of the vapor barrier.
- F. Mark equipment settings, including damper control positions, valve indicators, fan speed control levers, and similar controls and devices, to show final settings. Mark with paint or other suitable, permanent identification materials.
- G. Retest, adjust, and balance systems subsequent to significant system modifications, and resubmit test results.

3.05 RECORD AND REPORT DATA:

- A. Record all data obtained during testing, adjusting, and balancing in accordance with, and on the forms recommended by the referenced standards, and as approved on the sample report forms. Specific test results for outdoor air flow rates must be included; values listed on the Drawings are minimum requirements.
- B. Prepare report of recommendations for correcting unsatisfactory mechanical performances when system cannot be successfully balanced.

3.06 TESTING FOR SOUND AND VIBRATION:

- A. Test and adjust mechanical systems for sound and vibration in accordance with the detailed instructions of the referenced standards.

3.07 COMMISSIONING OF HVAC SYSTEMS:

- A. Constant-Air-Volume (CAV) HVAC Systems
 - 1. Verification of correct system installation. The system shall be defined as the HVAC unit, the air system ducts and diffusers, all sensors and all control devices.
 - 2. Verification that there are no unusual noises or vibrations.
 - 3. Verification that the controls have been calibrated.
 - 4. Verification that operation and maintenance manuals have been provided.
 - 5. Verification that the owner's representative and/or operator has been instructed in the proper operation and maintenance of the equipment.

- B. Seven-Day Programmable Thermostats With Deadband and Battery Backup
 - 1. Verification of clock operation and correct time and day.
 - 2. Verification that a battery backup has been provided.
 - 3. Verification that the thermostat is field calibrated.
 - 4. Verification that an instruction manual has been provided.

- C. Dry-Bulb and Enthalpy Economizers:
 - 1. Verification of correct system installation. The system shall be defined as any sensors, control devices, ducts, dampers and fan(s).
 - 2. Verification that all sensors and control devices are field calibrated and input and output signals are documented.
 - 3. Verification that the dampers and/or fans automatically follow the intended operation and function as designed and intended.
 - 4. Verification that operation and maintenance manuals have been provided.
 - 5. Verification that the owner's representative and/or operator has been instructed in the proper operation and maintenance of the equipment.

- D. Motor Speed Controls
 - 1. Verification that the design professional's written documentation on how the system is intended to operate has been provided.
 - 2. Verification of correct system installation and correct direction of rotation. The system shall be defined as any sensor(s), control device(s), speed controller(s), electrical isolation equipment, the fan, pump or equipment.
 - 3. Verification that all sensors and control devices are field calibrated and the input and output signals are documented.
 - 4. Verification that the fans, pumps or equipment automatically follow the intended operation and function as designed.
 - 5. Verification that operation and maintenance manual have been provided.
 - 6. Verification that the owner's representative and/or operator has been instructed in the proper operation and maintenance of the equipment.

- E. Low-Leakage Ducts and Low-Leakage Dampers
 - 1. Verification of correct installation of the ducts, dampers and damper operators and controls.
 - 2. Verification that the leakage test results have been provided.
 - 3. Verification that the damper operators automatically follow the intended operation and function as designed.
 - 4. Verification that operation and maintenance manuals for the low leakage dampers have been provided.
 - 5. Verification that the owner's representative and/or operator has been instructed in the proper operation and maintenance of the low-leakage dampers.

- F. Energy Management Systems and Other Controls
 - 1. Verification that the design professional's written documentation on how the system is intended to operate has been provided. This document is called the design intent.
 - 2. Verification that all the correct equipment and/or systems included in the ECC contract are being controlled.
 - 3. Verification of correct system installation.
 - 4. Verification that all sensors and points of control are correctly identified by the controller.
 - 5. Verification that all sensors and control devices are calibrated and the input and output signals are documented.
 - 6. Verification that the control program contains sound control theory and that theory is in harmony with sound HVAC energy-efficient operations.
 - 7. Verification that the points of control automatically follow the intended operation and function as designed. This verification of control and HVAC performance shall be through monitoring, testing, timing and studying of trended input and output data.
 - 8. Verification that owner's representative and/or operator has been instructed in the proper operation and maintenance of the equipment.

3.08 DEMONSTRATION:

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A. Training:

1. Train the Owner's maintenance personnel on troubleshooting procedures and testing, adjusting, and balancing procedures. Review with the Owner's personnel, the information contained in the Operating and Maintenance Data specified in Section 15010.
2. Schedule training with Owner through the Architect with at least 7 days prior notice.

END OF SECTION 15990

SECTION 16010 - BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

- A. The Drawings and general provisions of the Contract, including General and Supplementary Conditions, and Division 1 Specification Sections, apply to work of this Section.

1.02 INCLUDED IN THIS SECTION:

- A. General Requirements for Electrical Work
- B. Nameplates
- C. Access Doors
- D. Sleeves, Inserts, and Anchor Bolts
- E. Firestopping

1.03 DESCRIPTION OF WORK:

- A. This Section specifies general requirements for electrical work. Definitions, intent, drawings, interpretation of documents, approvals, submittals, substitutions, code requirements, permits, fees, royalties, patents, record drawings, instruction of Owner's personnel, and warranty are described.
- B. Operation and maintenance manuals shall be submitted to the Architect prior to the scheduled instruction of Owner's representatives. These manuals shall contain equipment lists, manufacturer's literature, and time schedule for recommended maintenance.

1.04 DEFINITIONS:

- A. "Provide" means to supply, erect, install, and connect up in complete readiness for regular operation, the particular work referred.
- B. "Furnish" means to supply and deliver to the job.
- C. "Install" means to erect, install and connect up in complete readiness for regular operation.
- D. "Conduit" includes, in addition to conduit, all fittings, sleeves, connections, hangers, and other accessories related to such conduit.
- E. "Wiring" means, in addition to wire, all needed connectors, circuit breakers, switches and devices, junction boxes and other items necessary for normal operation of the item being referred to.
- F. "Concealed" means hidden from sight, as in chases, furred spaces, shafts, hung ceilings, or embedded in construction.
- G. "Exposed" means not concealed as defined above. Trenches, crawl spaces, and tunnels shall be considered exposed.

- H. "Governmental" means all Municipal, State, and Federal governmental agencies.
- I. "Owner" means the tenant who shall occupy the space after final acceptance.

1.05 INTENT:

- A. It is the intention of the Drawings and Specifications to call for finished work, tested and ready for operation. All materials, equipment and apparatus shall be new and of first class quality.
- B. Any apparatus, appliance, material, or work not shown on the Drawings, but mentioned in the Specifications, or vice versa, or any incidental accessories, or minor details not shown, but necessary to make the work complete and perfect in all respects, and ready for operation, even if not particularly specified, shall be provided by the Contractor without additional expense to the Owner.
- C. With the submission of bid, the Contractor shall give written notice to the Architect of any materials, apparatus or omissions believed to be in violation of laws, ordinances, rules or regulations or authorities having jurisdiction. In the absence of such written notice it is mutually agreed that the Contractor shall include the cost of providing all systems in accordance with applicable regulations without extra compensation.

1.06 DRAWINGS:

- A. The Drawings are generally diagrammatic and are intended to convey the scope of work and indicate general arrangement of equipment, conduits, piping, fixtures and connections.
- B. Consider architectural and structural drawings part of this work insofar as these drawings furnish information relating to design and construction of the building.
- C. The drawings do not indicate all offsets, fittings, and accessories which may be required. Investigate structural and finish conditions affecting this work, and arrange work accordingly, providing such fittings, valves, and accessories required to meet the conditions.
- D. The locations of all items shown on the Drawings or called for in the Specifications that are not definitely fixed by dimensions, are approximate only. The exact locations necessary to secure the best conditions and results must be determined at the project, and shall have the approval of the Architect before being installed. DO NOT SCALE DRAWINGS.
- E. Follow Drawings as closely as actual building construction will permit in laying out work. Check Drawings for other trades to verify spaces in which work will be installed. Maintain maximum headroom and space conditions throughout. Where headroom or space conditions appear inadequate, the Architect shall be notified before proceeding with installation.
- F. If directed by the Architect, the Contractor shall, without extra charge, make reasonable modifications in the layout as needed to prevent conflict with work of other trades or for proper execution of the work.

1.07 INTERPRETATION OF DRAWINGS AND SPECIFICATIONS:

- A. Any questions or disagreements arising as to the true intent of this Specification or the Drawings, or the kind and quality of work required thereby, shall be decided by the Architect, whose interpretations thereof shall be final, conclusive and binding on all parties.
- B. In the case of disagreement between Drawings and Specifications, or within either document itself, the better quality, greater quantity or more costly work shall be included in the contract price, and the matter referred to the Architect's attention for decision and/or adjustment.

1.08 APPROVALS:

- A. The materials, workmanship, design and arrangement of all work installed under the Contract shall be subject to the approval of the Architect. If material or equipment is installed before it is approved, the Contractor shall be liable for removal and replacement, at no extra cost to the Owner, if, in the opinion of the Architect, the material or equipment does not meet the intent of the Drawings and Specifications.

1.09 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES:

- A. The Contractor shall submit five (5) copies of Shop Drawings, Product Data and/or Samples to the Architect for review prior to releasing an order for fabrication and/or shipment. These submittals shall be given for materials and equipment and as called for under each particular Section of the Specifications.
- B. Product Data submittals shall consist of complete catalog data clearly indicating all applicable items, in the following manner:
 - 1. State sizes, capacities, brand names, motor HP, accessories, materials, gauges, dimensions, and other pertinent information.
 - 2. List on catalog covers page numbers of submitted items.
 - 3. Underline applicable data. Highlighting applicable data is not sufficient.
 - 4. Job specific wiring diagrams and riser diagrams showing all equipment, devices, and wiring.
 - 5. Lay outs of Equipment Room.
 - 6. Submit Fault Current Calculation for each panel.
 - 7. Submit product information systems as a complete package (ie..submit all lighting fixture types as one submittal).
- C. Incomplete or unclear submittals will be returned unreviewed for correction and re-submission. Additional copies beyond five (5), or submittals of items other than what is called for under each particular Section, will be returned unreviewed.

- D. Submittals of equipment or materials other than those indicated on the Drawings or in the Specifications will be returned unreviewed, except for reasons as noted under SUBSTITUTIONS.
- E. This Division shall coordinate all aspects of respective subsections with the contractor including material data, overall drawings, installation sequencing, etc. See Division 1 requirements.

1.10 SUBSTITUTIONS:

- A. Substitutions of equipment or materials other than those shown on the Drawings or called for in the Specifications will be considered for review only under one or more of the following conditions.
 - 1. Less than three (3) acceptable manufacturers are indicated on the Drawings or in the Specifications.
 - 2. Substitution is required for compliance with subsequent interpretations of code requirements or insurance regulations.
 - 3. Substitutions is required due to unavailability of special products, through no fault of the Contractor. Excluded is lack of availability within a desired time frame due to Contractor's failure to order equipment or material early enough.
 - 4. Manufacturer/fabricator refuses to certify or guarantee performance of specified product as required.
- B. The particular condition necessitating a substitution must be clearly indicated on the substitution's transmittal or it will be returned unreviewed.
- C. The Contractor shall submit a substitution for review before releasing an order for fabrication and/or shipment. The Architect reserves the right to reject such substitution, provided the item offered, in his opinion, is not equal to the item specified.
- D. When a Contractor proposes to use an item of equipment other than that specified or detailed on the Drawings, and which requires any redesign of structure, partitions, foundations, piping, wiring, or of any other part of the electrical, or architectural layout, the Contractor shall assume responsibility for additional costs incurred in planning, design and construction to accommodate the substitution. If approved by the Architect, redesigned drawings and details to accommodate the substitution may be prepared by the Contractor at his own expense.
- E. If a substitution requires a different quantity and arrangement of wiring, conduit, and equipment from that specified or indicated on the Drawings, subject to approval of the Architect, the Contractor shall provide any such piping, structural supports, insulation, controllers, motors, starters, electrical wiring and conduit, and any other additional equipment required by the system, at no additional cost to the Owner.

1.11 CODE REQUIREMENTS, PERMITS AND FEES:

- A. Perform work in accordance with applicable provisions of the accepted version of NFPA codes, including the National Electric Code and Life Safety Code, and all state and local codes. All work shall also be in compliance with utility companies' requirements.
- B. In cases of differences between building codes, state laws, local ordinances, utility company regulations, and Contract Documents, the most stringent shall govern. Promptly notify Architect in writing of such differences.
- C. Include in the work, without extra cost to the Owner, any labor, material, service, test, apparatus, or drawing (in addition to Contract Drawings and Documents) in order to comply with applicable laws, ordinances, rules, regulations, and local authority's requirements, whether or not shown on Drawings and/or specified.
- D. Give all necessary notices, obtain all permits and pay all governmental taxes, fees and other costs in connection with the work. File all necessary plans, prepare all documents, and obtain all necessary approvals of the governmental departments having jurisdiction. Obtain all required Certificates of Inspection for the work, and deliver them to the Architect before request for final payment for the work.
- E. Contractor shall ensure that all system components, methods of installation and materials complies with ASTM, OSHA and Owner's standards for off-gassing.
- F. The Contractor shall be licensed in accordance with the guidelines of the Department of Consumer Protection. The workers employed by the Contractor shall be skilled and licensed to perform the work involved.

1.12 ROYALTIES AND PATENTS:

- A. The Contractor shall pay all royalties and shall defend all suits or claims for infringement of any patent rights and shall save the Owner harmless from loss on account thereof.
- B. If the Contractor observes that a process or article specified is an infringement of a patent, the Contractor shall promptly notify the Architect in writing, and any necessary changes shall be adjusted as provided in the Contract for changes in the work. If the Contractor performs any work specified, knowing it to be an infringement of a patent, the Contractor shall bear all costs arising therefrom.

1.13 RECORD DRAWINGS:

- A. Clearly record differences between mechanical and electrical work as installed and as shown or called for in the Contract Documents. Accurate notations of all locations, sizes and inverts of all concealed materials shall be made. These records shall be marked, concurrent with progress, on a set of prints labeled "RECORD DRAWINGS."
- B. On completion of project, mark a set of prints with data transferred from the Record Drawings, and submit them to the Architect for review for legibility and clearness of presentation of the recorded conditions of construction.

1.14 INSTRUCTION OF OWNER'S PERSONNEL:

- A. After completion of all work and all tests and at such time as designated by the Owner's representative, the Contractor shall provide the necessary skilled personnel to operate each entire installation for a period of two (2) days of eight hours.
- B. During the operating period, the Contractor shall fully instruct the Owner's representative in the complete operation, adjustment, and maintenance of the entire installation.

1.15 OPERATION AND MAINTENANCE MANUALS:

- A. Prepare a manual of operation and maintenance instructions, in draft form, and submit to the Architect for review.
- B. The Manual shall contain the following items:
 - 1. Brief description of each system covering its basic operating characteristics.
 - 2. List of all equipment with manufacturer's name and model number for each item.
 - 3. Contractor's own written operating and maintenance instructions.
 - 4. Copies of submittals having final review stamps.
 - 5. Manufacturer's bulletins, data, parts lists, operating and maintenance instructions, guarantees and any other information pertinent to the proper operation of each system and item of equipment installed, including service manual which covers total disassembly, reassembly of the equipment and trouble shooting.
 - 6. Information of actions to be taken in the event of a malfunction or other emergency.
 - 7. Provide a programming ability (CD, etc.) literature.
 - 8. Provide a copy of the original program.
 - 9. Time schedule for recommended maintenance operation.
 - 10. Programming software for fire alarm equipment.
- C. At least two weeks prior to the scheduled instruction of Owner's representatives, provide the Architect with five (5) complete copies of the final form of the Operation and Maintenance Manual, bound in booklet form in durable binders and suitable indexed.

1.16 WARRANTY:

- A. The Contractor shall warrant that all work installed will be free from any and all defects, and that all apparatus will develop capacities and characteristics specified, and that if, during a period of one (1) year from date of completion and acceptance of the work, any such defects in workmanship, materials, or performance appear, the Contractor shall immediately replace,

repair or otherwise correct the defect or deficiency without cost and within a reasonable time to be specified in writing to the Owner.

- B. The Contractor shall also replace or repair, to the satisfaction of the Owner and Architect, all damage done to any material or finish in consequence of work performed in fulfilling the warranty.
- C. In the case of default on this warranty by the Contractor, the Owner may have such work done as required, and charge the cost to the Contractor.

1.17 VISITING THE SITE:

- A. Before submitting a final proposal, the Contractor shall examine the site of the proposed work to determine the existing conditions that affect the work. The Contractor will be held responsible for any assumptions made by him in regard thereto. Time for this examination must have prior approval of the Owner.
- B. No subsequent allowance for time or money will be considered for any consequence related to failure to examine site conditions.

1.18 FINAL ACCEPTANCE:

- A. Preliminary Procedures: Before requesting final inspection for certification of final acceptance and final payment, complete the following list exceptions in the request.
 - 1. Submit the final payment request to the Architect with releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.
 - 2. Submit an updated final statement to the Architect, accounting for final additional changes to the Contract Sum.
 - 3. Submit a certified copy of the Architect's Final Inspection list of items to be completed or corrected, stating that each item has been completed or corrected, stating that each item has been completed or otherwise resolved for acceptance, and the list has been endorsed and dated by the Architect.
 - 4. Submit consent of surety to final payment.
 - 5. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
- B. Reinspection Procedure: The Architect will reinspect the Work upon receipt of notice from the Contractor that the Work, including Final Inspection list items from earlier inspections, has been completed, except items whose completion has been delayed because of circumstances acceptable to the Architect.

1. Upon Completion of reinspection, the Architect will prepare a certificate of final acceptance, or advise the Contractor of Work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance.
2. If necessary, reinspection will be repeated, and the Contractor will bear the cost.

1.19 COORDINATION DRAWINGS:

- A. The contractor is to prepare and submit coordination drawings for each trade detailing all systems and components including but not limited to:
 - Electrical equipment components and all associated accessories.
 - Electrical Fixtures
 - Conduits, Junctions boxes and all associated accessories.
 - Lay out of Electric Rooms.
- B. Drawings are to be to scale: (1/4" = 1'-0" Min.) indicating all the latest architectural and structural components. Coordination drawings are to be in addition to any individual submittals of associated items. Each trade must sign-off on coordination drawings indicating respective trade disciplines have been coordinated. Each trade contractor must include in their bid all associated cost for such coordination drawings. Contractor to indicate respective costs on billing schedule of values.
- C. Contractor shall prepare coordination drawings and installation layouts. Such drawings shall consist of dimensioned plans and elevations, and shall give complete information, particularly as to size and location of sleeves, inserts, attachments, openings, conduits, ducts, boxes, structural interferences, etc. Such drawings shall incorporate all trades.
 1. Accurate structural steel locations shall be represented on the composite shop drawings, as the basis for coordination by the trades.
- D. These coordination shop drawings and field installation layouts shall be coordinated in field by Contractor and his subcontractors for proper relationship to work of other trades, based on field conditions, and shall be checked for accuracy and accepted by them before submission to Architect for his final acceptance. Contractor shall have competent technical personnel readily available for such coordination and checking as well as for supervision of field installation of work in accordance with shop drawings and field installations as determined by the Contractor to be correct and carrying Architect's submittal review stamp.

PART 2 - PRODUCTS

2.01 MANUFACTURER'S IDENTIFICATION:

- A. Manufacturer's nameplate, name, or trademark shall be permanently affixed to all equipment and material furnished under this Specification. The nameplate of a subcontractor or distributor will not be acceptable.

2.02 NAMEPLATES:

- A. The Contractor shall provide for each item of equipment, including panels, a permanently attached nameplate made of laminated bakelite with incised letters; nameplate shall have black surface and white core.
- B. Nameplates shall be a minimum of 3" long by 1-1/2" wide and shall bear the equipment name and item as designated in the equipment schedule.
- C. All panel directories shall be typed, indicating what each circuit breaker or fuse controls.
- D. Tape Labels: Embossed adhesive tape with 3/16" white letters on black background.
- E. Wire and cable markers: Cloth markers split sleeve or tubing type.

2.03 ACCESS DOORS:

- A. Furnish access doors to provide access to pull boxes and junction boxes, etc. concealed behind finished construction. Doors shall have a fire-resistance rating classification to match the construction which they are installed in. Doors shall be of the flush type with Allen head-operated cam lock, 16-gage anchor frame, and hinged panel, as manufactured by Goal Inc., Karp Associates Inc., or Milcor. Minimum size shall be 12" x 12". Doors shall be furnished by Division 16 for installation by other Divisions.

2.04 SLEEVES, INSERTS AND ANCHOR BOLTS:

- A. Each section of Division 16 shall be responsible for the location and proper position of sleeves and anchor bolts. If failure to do so requires cutting and patching of finished work, it shall be done at no extra cost to the Owner.
- B. Conduits passing through concrete or masonry floors, walls or partitions shall be provided with sleeves having an internal diameter 1/2" larger than the outside of the conduit. Seal to maintain fire ratings.
- C. Sleeves through concrete floors or interior masonry walls shall be Schedule 40 black steel pipe, set flush with wall, floor or ceiling surface. Sleeves through floors shall be sealed with a fireproof, resilient material to maintain the fire rating integrity of the assembly.
- D. Sleeves through floors of wet areas such as equipment rooms, toilet rooms, etc., shall extend 2" above finished floor surface and be sealed as noted above. In addition, caulk with waterproof compound to the approval of the Architect.

2.05 FIRESTOPPING:

- A. Requirements: Conduits, cables, and busways that penetrate fire rated walls or floors shall be sealed by means of a U.L. listed system. Refer to the U.L. Fire Resistance Directory, Vol. II, 1993 edition. Other equivalent third party testing agencies, such as Factory Mutual Systems Approval, are acceptable. Conduit penetrating framed walls shall meet UL No. 187

requirements, and conduit piping penetrating concrete floor or block walls shall meet UL No. 281 requirements.

- B. Submittals: Submit manufacturer's literature, specifications, installation instructions and material safety data sheets for the product(s) intended for use. Include with the submittal a list of all walls and floors that are to be penetrated, cross referenced to the U.L. system to be used. Where designated on the plans, use a system that is capable of retrofit without damage to the system. Failure of the Architect or Engineer to designate a required firestop does not relieve the Contractor of the responsibility to provide an approved system.
- C. Design: Unless otherwise specified, the "F" rating (burn thru time) of the system(s) shall be equal to or longer than the wall or floor being penetrated. Where penetrants pass thru finished walls and floors, the firestop materials when cured shall be compatible with the wall or floor finish. (For example, a firestop thru a painted block wall shall be sandable and paintable.) Where open (as opposed to closed piping) penetrants such as cable tray or busway are fire-stopped, the individual conductors shall be properly sealed by means of a cable sealant or factory installed, U.L. listed internal (in the case of busway) firestop or other approved method. Fire stop system shall meet the following: ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops, ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials and ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
- D. Installation: All seals shall be installed in accordance with the manufacturer's design and instructions. Demonstrate to the Architect that the installer is capable of installing each system properly by submitting samples or by performing one or more installations in the presence of the Architect. Include with the Record Drawings a U.L. system number for each firestop.
- E. Acceptable Manufacturers: Subject to compliance with requirements, provide products of one of the following:
 - 1. Dow Corning Corporation
 - 2. 3M Fire Protection Products
 - 3. International Protective Coatings
 - 4. HILTI, Inc.

2.06 MATERIALS AND EQUIPMENT:

- A. Prior to ordering or use of any material or equipment, it shall be the sole responsibility of the Contractor to ensure that the manufacturer certifies in writing that all material and equipment supplied is suitable and approved by code, and in accordance with the manufacturer's recommendations and installation instructions for use in the particular manner and location intended. Contractor shall make due allowance for this in the bid and shall include any accessories or revisions required at no additional charge.
- B. New materials and equipment installed into existing work shall be compatible with the existing work. The Contractor shall advise the Architect before ordering and/or installing any materials or equipment if he disputes those items and/or methods specified. Otherwise, the Contractor shall take full responsibility for their performance and suitability.

PART 3 - EXECUTION

3.01 PROTECTION OF WORK AND PROPERTY:

- A. The Contractor shall be responsible for the maintenance and protection of all equipment, materials and tools supplied by the Contractor and stored or installed on the job site, from loss or damage of all causes, until final acceptance by the Owner.
- B. The Contractor shall be responsible for the protection of any finished work of other trades from damage or defacement by the Contractor's operation and must remedy any such injury at the Contractor's own expense.

3.02 SCAFFOLDING, RIGGING, AND HOISTING:

- A. The Contractor shall provide all scaffolding, rigging, hoisting and services necessary for erection and delivery into the premises for all equipment and materials furnished, and remove same from premises when no longer required.

3.03 CUTTING, PATCHING, EXCAVATION AND BACKFILL:

- A. All cutting, patching, excavation and backfill shall be provided by other Divisions. Coordinate all requirements well in advance.

3.04 ACCESSIBILITY:

- A. The Contractor shall install all items so that parts requiring inspection, maintenance and repair are readily accessible. Minor deviations from the Drawings may be made to accomplish this, but changes of magnitude shall not be made without prior written approval of the Architect.

3.05 SEISMIC REQUIREMENTS:

- A. All new electrical equipment, wiring and conduit shall be installed to resist vertical and lateral forces in accordance with the State Building Code and applicable regional seismic codes, with the exception of the following: All electrical conduit less than 2-1/2" inside diameter.
- B. Where seismic restraints are installed, the spring vibration isolators or other restraint assembly shall be designed and installed in accordance with the manufacturer's specifications. The restraint assembly shall be designed to withstand the seismic lateral forces established in the State Building Code for a Zone 2 seismic area.

- C. Provide seismic snubbers, separate from spring isolators, for attachment to machinery and equipment bases, designed to provide seismic restraint in all modes (directions) in accordance with the State Building Code and applicable regional seismic codes. These snubbers shall have no contact with equipment during normal operation and shall have minimum clearances of 1/4" in all directions. Seismic snubbers shall be installed in strict accordance with the manufacturer's recommendations.
- D. Anchorage of Equipment to Housekeeping Pads: Place floor mounted equipment on 4" high concrete housekeeping pads properly doweled or expansion shielded to the floor to meet acceleration criteria. Anchor isolators and/or bases to housekeeping pads. Concrete work shall be provided by other Divisions.
- E. Anchorage of Housekeeping Pads: All concrete housekeeping pads must be anchored to the structure to meet acceleration criteria. This Contractor shall coordinate this with other Divisions.
- F. Acceptable Manufacturers: Subject to compliance with requirements, provide seismic restraint and isolation products of one of the following manufacturers.
 - 1. Mason Industries, Inc.
 - 2. Vibration Eliminator Co., Inc.
 - 3. Vibration Mountings and Controls, Inc.
- G. Submit product data and details of all seismic restraints and isolators.
- H. Each recessed fluorescent light fixture installed on four sides in a seismically supported suspended ceiling grid shall be secured to the ceiling grid with four hazard clips.

3.06 QUIET OPERATION:

- A. All equipment and material provided by the Contractor shall operate under all conditions of load without any sound or vibration which in the opinion of the Architect is objectionable. Where sound or vibration is objectionable in the opinion of the Architect, the Contractor shall eliminate it in a manner approved by the Architect.

3.07 PAINTING:

- A. Other Divisions shall clean and paint all new exposed, unpainted, non-galvanized, ferrous metal surfaces of pipes, conduits, equipment, hangers, supports and accessories with one (1) prime coat and two (2) finish coats. Coordinate all requirements well in advance.

3.08 CLEANING OF EQUIPMENT:

- A. Clean exposed equipment and fixtures. Repair damaged finishes and leave everything in working order satisfactory to the Architect.
- B. Thoroughly clean all equipment inside and outside of all foreign substances before being placed into operation. If any part of a system should be stopped by any foreign matter after being placed in operation, the system shall be disconnected, cleaned and reconnected

wherever necessary to locate and remove obstructions. Any work damaged in the course of removing obstructions shall be repaired or replaced when the system is reconnected, at no additional cost to the Owner.

3.09 TESTS:

- A. All equipment shall be tested as determined by all authorities having jurisdiction, but in no case less than that specified under each section of the Specifications. Labor, materials, instruments and power required for testing shall be furnished by the Contractor, unless otherwise indicated under the particular section of the Specifications.
- B. Tests shall be performed to the satisfaction of the Architect and such other parties as may have legal jurisdiction.
- C. All defective work shall be promptly repaired or replaced and the tests shall be repeated until the particular system and component parts thereof receive the approval of the Architect.
- D. Any damages resulting from tests shall be repaired and damaged materials replaced, all to the satisfaction of the Architect.
- E. Equipment and systems which normally operate during certain seasons of the year shall be tested during the appropriate season. Tests shall be performed on individual equipment, systems and their controls. Whenever the equipment of a system under test is interrelated with, and depends upon, the operation of other equipment, systems and controls for proper operation, functioning and performance, the latter shall be operated simultaneously with the equipment or system being tested.

3.10 SUSPECTED EXISTING MATERIALS:

- A. Should asbestos or suspected asbestos be encountered during the course of the work, immediately discontinue all work in that area and report the condition to the Owner for resolution.
- B. All such suspected asbestos shall be reviewed and removed as required by the Owner under a separate contract by other contractors engaged directly by the Owner.
- C. No work in the area shall proceed until suspected asbestos is reviewed, all work on such has been completed, and the Owner notifies the Contractor to proceed accordingly.
- D. Should PCB be encountered during the course of the work in existing ballasts, transformers, etc., the Contractor shall remove from the site and properly dispose of, in accordance with all State and local codes.

3.11 REMOVED EQUIPMENT:

- A. All existing material or equipment replaced or superseded by the Contractor's work shall be removed by the Contractor in an approved manner and the existing structure and surfaces shall be restored by the Contractor to match the finished product. All removed equipment

shall remain the property of the Owner and shall be carefully stored at the job site or removed from the premises by the Contractor as directed by the Owner.

3.12 RELOCATED EQUIPMENT:

- A. All equipment, scheduled for relocation, shall be carefully removed by the Contractor and stored in a protected manner until relocated. Any damage done to relocated equipment during removal, storage or relocation shall be corrected by the Contractor in an approved manner, including repair or replacement, as directed by the Architect.

3.13 INSTALLATION OF LABELS AND MARKERS:

- A. Decrease and clean surfaces to receive nameplates and labels.
- B. Install nameplates (and tape labels) parallel to equipment lines.
- C. Secure nameplates to equipment fronts using screws, rivets, or adhesive. Secure nameplate to inside face of recessed panelboard doors in finished locations.
- D. Embossed tape will not be permitted for any applications.
- E. Apply typed tape labels to inside of all receptacles and light switchplates to indicate panel and circuit that items is fed from.
- F. Provide wire markers on each conductor in panelboard gutters, pullboxes, junction boxes, and at load connection. Identify with branch circuit or feeder number for power and lighting circuits.
- G. Nameplate Engraving Schedule
 - 1. Provide nameplates of minimum letter height as schedule below.
 - 2. Panelboards, switchboards and motor control centers: 1/4 inch; identify equipment designation 1/8 inch; identify voltage rating and source.
 - 3. Individual circuit breakers, switches, and motor starters in panelboards, switchboards, and motor control centers: 1/8 inch; identify circuit and load served, including location.
 - 4. Individual circuit breakers, enclosed switches, and motor starters: 1/8 inch; identify load served.
 - 5. Transformers: 1/4 inch; identify equipment designation. 1/8 inch; identify primary and secondary voltages, primary source and secondary load and location.

3.14 DESIGNATIONS:

- A. This contractor shall confirm in writing all rooms, name, number and area designations with the Architect prior to final usage for any system. Contractor may utilize designations on drawings as a temporary measure but final usage must be confirmed with the Architect.

END OF SECTION 16010

SECTION 16100- ELECTRICAL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

- A. The Drawings and general provisions of the Contract, including General and Supplementary Conditions, and Division 1, General Requirements, apply to work specified in this Section.
- B. The requirements specified in Section 16010, "Basic Electrical Requirements", apply to this Section.

1.02 INCLUDED IN THIS SECTION:

- A. Complete Secondary Distribution System
- B. Switchboard, Panelboards, and Circuit Breakers
- C. Feeders and Branch Circuits
- D. Raceways with Multi-outlets, Receptacles, and Switches
- E. Lighting Fixtures and Lamps
- F. Emergency Lighting System
- G. Empty Raceways and Outlets for Telephone and Data System.
- H. Wiring for all electrical equipment being furnished by others, including temperature control panels (low voltage wiring shall be provided by the Division supplying the equipment)
- I. Testing and Load Balancing
- J. Call-for-Aid Alarm System and Wiring
- K. Fire Alarm System and Wiring
- L. Hearing and Visually Impaired Alert System
- M. Stand by Generator and Transfer Switch Complete
- N. Intercom System and wiring
- O. Cable Television and Wiring
- P. Lighting Control System
- Q. Surge Suppressors
- R. Shop Drawings and Record Drawings

1.03 DESCRIPTION OF WORK:

- A. This Section includes furnishing all labor and material to complete and make ready for operation by the Owner all electrical work as shown on the Drawings and as described in these specifications. It is the intent of these documents to terminate with complete, operational electrical systems within the building and on the project site.
- B. Panelboards shall be dead front type equipped with thermal-magnetic molded case circuit breakers designed for operation on 120/208 volt system as manufactured by Square D, General Electric, or Cutler Hammer.
- C. Wiring devices shall be of the type as indicated on the Drawings, and shall be manufactured by P&S, Hubbell, or Leviton.

- D. Lighting fixtures shall be in strict compliance with the latest National Electric Code and Local Utilities' Energy Conscious Construction Program.
- E. For use by the Owner's telephone system vendor, provide a telephone conduit system consisting of outlets and conduit.

1.04 CODES, REGULATIONS AND STANDARDS:

- A. The electrical installation shall be in accordance with the current rules, regulations and recommendations of the local electrical inspection authority, the National Fire Protection Association, The National Electric Code, the Electric Utility Company furnishing service, Local and State Ordinances. In the event of a conflict in code requirements, the local code shall apply. All permits and certificates as required shall be obtained and paid for by this Contractor. Approved Inspection Certificates by the authorities having jurisdiction shall be furnished with request for final payment.
- B. All material and equipment shall conform to the applicable standards (current edition) of the following organizations.
 - 1. National Electrical Manufacturers Assoc. (NEMA)
 - 2. Underwriters Laboratories (UL)
 - 3. Insulated Power Cable Engineers Assoc. (IPCEA)
 - 4. Institute of Electrical & Electronics Engineers (IEEE)
 - 5. American Society for Testing Materials (ASTM)
 - 6. Federal Specifications (U.S. Department of Commerce)
 - 7. Illuminating Engineers Society (IES)

1.05 SCOPE OF WORK:

- A. This Section includes the providing of all labor, materials, fixtures, equipment, accessories, services and tests necessary to complete and make ready for operation by the Owner all electrical work as shown on the Drawings and described in these Specifications. It is the intent of these Documents to terminate with complete, operational electrical systems within the building.
- B. The work shall include but not be limited to the following:
 - 1. Secondary Distribution System complete.
 - 2. Switchboard, Panelboards and Circuit Breakers.
 - 3. Feeders and Branch Circuits.

4. Raceways with multi-outlets, receptacles, switches and outlets complete with cover plates.
 5. All lighting fixtures and lamps.
 6. Emergency lighting system.
 7. Empty raceways and outlets for telephone and Data system.
 8. Wiring for all electrical equipment being furnished by Owner or other Divisions including temperature control panel (low voltage wiring shall be provided by the Division supplying the equipment).
 9. Testing and load balancing.
 10. Shop drawings and Record Drawings.
 11. Call for Aid Alarm System and wiring.
 12. Hearing and Visually Impaired Alert System.
 13. Standby Generator and Transfer Switch Complete.
 14. Intercom System and wiring.
 15. Fire Alarm System and wiring.
 16. Cable Television and Wiring.
 17. Surge Suppressors.
 18. Lighting Control System.
- C. Furnish all labor, materials, tools, transportation, equipment, services and facilities required for the complete and proper installation of all electrical work. All fixtures, devices and equipment shown, noted or required on the drawings and/or contained herein shall be connected from the source of electric power to the final connection, tested and made ready for satisfactory operation.
- D. This Section shall be responsible for knowledge of the areas that may affect his work for coordinating with the local inspection authorities and with all other trades on this project. This Section shall thoroughly coordinate all work with other Divisions and shall ensure that all equipment requiring electrical work be wired and incorporated as required in the basic work of the project.
- E. Make all field measurements and shall be responsible for their accuracy.

- F. The Specifications and Drawings are complimentary each to the other and that which is called for on one shall be as binding as if called for on both. In the event of a conflict, it shall be resolved by the Architect.
- G. Any violation of the applicable electrical code standards or conflict between Drawings and Specifications not called to the attention of the Architect before the contract is executed shall be corrected at this Contractor's expense.
- H. This Section hereby waives all claim to extra compensation for work performed and materials furnished beyond the scope of the contract without written authorization by the Architect.

1.06 WORK BY OTHERS:

- A. Temporary light and power shall be furnished by other Divisions. Similarly, for installation of telephones, telephone equipment and cables, and temperature control wiring, refer to other Divisions. Finish painting, cutting, patching, excavation and backfilling shall by other Divisions (low voltage wiring shall be provided by the division supplying the equipment).

1.07 INSPECTIONS:

- A. This Section shall be responsible for the proper inspection of his work during its installation by all lawful authorities, shall take out and pay for all necessary permits, inspection fees and comply with all laws relating to persons employed on this work.

1.08 SHOP DRAWINGS:

- A. Submit five (5) copies of Product Data to the Architect in accordance with Section 16010 Basic Electrical Requirements.
- B. Submittals shall be given to the Architect for the following materials.
 - 1. Switchgear and Panelboards.
 - 2. Devices.
 - 3. Lighting Fixtures and Ballasts.
 - 4. Call-for-Aid Equipment.
 - 5. Fire Alarm Equipment.
 - 6. Hearing and Visually Impaired Alert System.
 - 7. Standby Generator and Transfer Switch.
 - 8. Lighting Control System.
 - 9. Intercom Systems.

10. Surge Suppressors.

PART 2 - PRODUCTS

2.01 CIRCUIT BREAKER PANELBOARDS:

- A. Furnish and install circuit breaker lighting panelboards as indicated in the panelboard schedule and where shown on the plans. Panelboards shall be equipped with thermal-magnetic molded case circuit breakers with frame and trip ratings as shown on the schedule.
1. Circuit Breakers: Circuit breakers shall be quick-make, quick-break, thermal-magnetic, trip indicating, and have common trip on all multipole breakers. Trip indication shall be clearly shown by the breaker handle taking position between ON and OFF when the breaker is tripped. Branch circuit breakers feeding convenience outlets shall have sensitive instantaneous trip settings of not more than 10 times the trip rating of the breaker to prevent repeated arcing shorts resulting from frayed appliance cords. UL Class A (5 milliamperere sensitivity) ground fault circuit protection shall be provided on 120 Volt AC branch circuits as specified on the plans or panelboard schedule. This protection shall be an integral part of the branch circuit breaker which also provides overload and short circuit protection for branch circuit wiring. Tripping of a branch circuit breaker containing ground fault circuit interruption shall not disturb the feeder circuit to the panelboard.
 2. A single pole circuit breaker with integral ground fault circuit interruption shall require no more panelboard branch circuit space than a conventional single pole circuit breaker. Connections to the bus shall be bolt-on. (Provide interrupting capacity for all circuit breakers equal to or greater than the panel bus interrupting capacity). Where circuit breakers are used for switching lighting, provide "SWD" type breakers approved for that purpose as required, whether indicated or not.
 3. Panelboard Bus Assembly: Bus bar connections to the branch circuit breakers shall be the "distributed phase" or "phase sequence" type. Single phase, three-wire panelboard bussing shall be such that any two adjacent single-pole breakers are connected to opposite polarities in such a manner that two-pole breakers can be installed in any location. Three-phase, four-wire bussing shall be such that any three adjacent singlepole breakers are individually connected to each of the three different phases in such a manner that two or three-pole breakers can be installed at any location. All current-carrying parts of the buss assembly shall be plated. Mains ratings shall be as shown in the panelboard schedule or on the plans.
 4. Wiring Terminals: Terminals for feeder conductors to the panelboard mains and neutral shall be UL listed as suitable for the type of conductor specified. Terminals for branch circuit wiring, both breaker and neutral, shall be UL listed as suitable for the type of conductor specified.
 5. Circuit Numbering: Panelboard circuit numbering shall be such that starting at the top, odd numbers shall be used in sequence down the left and side and even numbers shall be used in sequence down the right-hand side.

6. Cabinets and Fronts: The panelboard bus assembly shall be enclosed in a steel cabinet. The size of the wiring gutters and gauge of steel shall be in accordance with NEMA Standards Publication No. PB1-1977 and UL Standards No. 67 for panelboards. The box shall be fabricated from galvanized steel or equivalent rust-resistant steel. Fronts shall include door in a door assemblies and have flush, stainless steel, cylinder tumbler-type locks with catches and spring-loaded door pulls. The flush lock shall not protrude beyond the front of the door. All panelboard locks shall be keyed alike. Fronts shall have adjustable indicating trim clamps which shall be completely concealed when the doors are closed. Doors shall be mounted by completely concealed steel hinges. Fronts shall not be removed with door in the locked position. A circuit directory frame and card with a clear plastic covering shall be provided on the inside of the door. The directory card shall provide a space at least 1/4" high x 3" long or equivalent for each circuit. The directory shall be typed to identify the load fed by each circuit. Fronts shall be of code gauge steel.
7. Equipment Short Circuit Rating: Each panelboard, as a complete unit, shall have a short circuit current rating equal to or greater than the Utility Company rating at the secondary side of the transformer (no series ratings).
8. UL Listing: Panelboards shall be listed by Underwriters Laboratories and bear the UL label. Panelboards shall be Square D, Cutler Hammer or General Electric, and designed for operation on 120/208 volts.
9. Apartment Panels:
 - a. Load centers shall have main ratings and branch circuit breaker ratings sized and numbered as indicated on the drawings. Load centers shall be plug-on type construction. All current carrying parts of the bus assembly shall be plated. Terminals for feeder conductors to mains and branch neutral shall be UL listed as suitable for the type conductor specified. The load center bus assembly shall be enclosed in a steel cabinet. The size of the wiring gutters and gauge steel shall be in accordance with UL Standards No. 67 and No. 50. Fronts shall include door and be provided with a directory for circuit identification. Load center boxes and fronts shall have corrosion resisting phosphate treatment and a gray baked enamel finish. Load centers shall be UL listed and meet Federal Specification W-P-115b as Type 1, Class 2.
 - b. Branch circuit breakers up to 150 amperes shall be Square D type QO, Q1 or approved equal. All breakers shall be plug-on type, toggle action with quick-make quick-break mechanism. Trip indication shall be clearly shown on the breaker handle taking a position between "ON" and "OFF" when the breaker is tripped. All multi-pole breakers shall be single operating handle, common trip variety. Branch circuit breakers feeding convenience outlets shall have sensitive, instantaneous trip in order to give "flash protection" for frayed, stranded wire cords.
 - c. Load centers shall have a series rated short circuit ratings.

- B. UL Listing: Panelboards and load centers shall be listed by Underwriters Laboratories and bear the UL label and designed for operation on 120/208 volts. Panelboards and load centers shall be Square D, Cutler Hammer or General Electric.

2.02 CONDUIT - RACEWAY AND FITTINGS:

- A. All raceways under slab on grade or in soil shall be schedule 40 PVC unless otherwise noted on plans.
- B. All raceways in masonry, not noted otherwise, shall be run in Electrical Metallic Tubing (EMT) or MC cables. Raceways above ceilings shall be MC cable.
- C. Electrical Metallic Tubing may be used for all power receptacle and lighting branch circuit wiring run in masonry and within furred ceilings or furred walls. EMT shall not be embedded in concrete slabs or run underground.
- D. Armored cable type MC with ground wire may be used in furred ceiling and hollow stud wall construction as approved by local inspection authorities for power and lighting branch circuits only.
- E. All exposed wiring in finished areas shall be run in wiremold.
- F. Minimum size shall be 3/4" trade size unless otherwise noted.

2.03 GROUNDING AND BONDING:

- A. Furnish and install an electrical grounding and bonding systems with assembly of materials, including, but not limited to, cables/wires, connectors, solderless lug terminals, grounding electrodes and plate electrodes, bonding jumper braid, surge arresters, and additional accessories needed for a complete installation. Where materials or components are not indicated, provide products which comply with NEC, UL, AND IEEE requirements.

2.04 WIRING:

- A. Single conductor cables shall be used for feeders and branch circuit wiring. Minimum wire size shall No. 12 A.W.G. for 20 AMP circuits unless indicated otherwise. Wire sizes No. 8 A.W.G. and smaller shall be solid. No. 6 A.W.G. and larger shall be stranded. All conductors shall be of 98 percent conductivity copper unless otherwise noted on plans.
- B. All wiring shall be 600 volt dual coded type "THHN/THWN". Wire of higher temperature ratings shall be used where required by National Electrical Code, Special Conditions and as described in the contract Drawings. Wiring shall be kept clear of heating and hot water lines a minimum of 6 inches.

2.05 LIGHTING FIXTURES:

- A. Furnish and install lighting fixtures, lighting equipment and lamps and/or tubes for all lighting outlets as shown on the plans and listed in the "Fixture Schedule".
- B. Furnish and install all mounting accessories, brackets, stems, etc., required for the complete installation of the lighting fixtures.

- C. Fluorescent lamps to be General Electric, (energy saving Type 'T8'), Siemens or Sylvania rapid start. (3500° Kelvin).
- D. All ballasts in fluorescent fixtures shall be electronic type with low harmonics (10% maximum) to comply with Local Utility Rebate Program.
- E. Each lighting fixture shall be U.L. listed. Any fixture with a listing / label other than UL shall have the manufacturer obtain written approval of the Authority Having Jurisdiction for such products acceptability to state and local codes prior to shop drawing submittal; submit approvals.

2.06 WIRING DEVICES:

- A. Where shown on the plans, furnish and install wiring devices indicated by the symbols and symbol list.
- B. Wiring devices shall be of the type as specified herein and shall be as manufactured by Pass & Seymour, Hubbell, or Arrow-Hart. Numbers specified refer to Pass & Seymour. Color ivory, confirm color with Architect.

Wall Switches, 20A, 120/277V	26211 Series
Receptacles (Grounding)	
15 AMP, 125V Duplex	TR5262 for living unit 15 AMP circuits
20 AMP, 125V, Duplex	TR5362-1 for living unit and public areas
20 AMP	circuits
20 AMP, 208V, Single Pole	TR 5351-1
20 AMP, 120V, Ground Fault	2095 TR-1
30 AMP, 208V, 2-Pole, Single	3864
50 AMP, 208V, 2-Pole, Single	3894
20 AMP, 125V, Exterior Duplex	2095TRWR/WIN 20CR
- C. Plates shall be thermoplastic mylon, Pass & Seymour TP Series.
- D. Provide draft barriers on all devices mounted or located in an exterior wall (Lessco Box #5700.01).

2.07 OUTLET BOXES:

- A. Outlet boxes and covers shall be pressed steel, except as noted, and protected against corrosion with zinc applied by the electric galvanizing, hot dipping or sherardizing process.
- B. Outlet boxes shall be of sizes and type to accommodate: (1) structural conditions, (2) size and number of raceways and conductors or cables entering, and (3) device or fixture for which required. Size of box to match size of device with no overhang. Surface mounted equipment shall be furnished with applicable surface type box semi-flush mounted equipment shall be furnished with applicable semi-flush type box and trim.
- C. Outside lighting outlets shall have galvanized or cadmium plated cast iron boxes with gaskets, drilled and tapped to take fixture specified for these locations.

- D. Floor boxes where shown on plans shall be adjustable, water-tight, cast iron, with brass cover and flange to match floor finish. Box shall be drilled and tapped to accommodate entering conduits and furnished with power or low tension pedestal head as indicated. Furnish in Steel City, National or equal.
- E. Pull and splice boxes are not indicated on drawings but shall be provided as required for splice and ease of pulling conductors and NEC requirements.

2.08 MISCELLANEOUS STEEL AND HARDWARE:

- A. Furnish and install all the necessary steel for supporting lighting fixtures, panels, starters, disconnects, conduit etc. "Kindorf" framing systems, rods, channels, and fittings with galvanized or cadmium finish shall be used. Unprotected ferrous metals shall not be permitted.

2.09 FIRE ALARM SYSTEM:

- A. Furnish and install an automatic and manual closed circuit, double supervised programmable microprocessed base Fire Alarm System, with battery standby, fire alarm system according to the following specifications to be wired, connected, and left in first class operating condition. All equipment shall be listed by the Underwriters' Laboratories, shall meet with approval of the local and state fire departments, and meet the requirements of NFPA 72, and as manufactured by Notifier and supplied by WEL-DESIGN ALARM, inc. or approved equal by Pyrotronics or Edwards.
- B. System Operation:
 - 1. The building Fire Alarm System shall consist of a semi-flush mounted Main Control panel to accommodate plug-in modules, batteries, battery charger, relay boards and terminal connections for complete control system along with remote annunciators, detection devices, manual pull stations and required auxiliary devices to provide a complete and operating system.
 - 2. The system shall be capable of being expanded at any time to the predetermined capacity of the system. The fire alarm system shall be capable of monitoring a minimum of 636 addressable initiating devices, but not limited to the following, pull stations, smoke detectors, ducts, smoke detectors, flow switches, tamper switches and heat detectors.
 - 3. The system shall contain addressable and independently supervised initiating circuits and notification appliance circuits. The alarm activation of any initiating device or zone shall not prevent the subsequent alarm operation of any other initiating device or zone. Initiating circuits shall be style 4. There shall be a minimum of one isolated addressable circuit per 20 addressable devices.
 - 4. The system alarm operation following the alarm activation of any manual station, automatic detection device, or sprinkler flow switch shall be as follows:

- a. All audible devices to sound a temporal ringing pattern until the system is manually acknowledged or reset.
- b. All system visual alarm devices to flash until the alarm condition has been manually acknowledged or reset.
- c. The alarm shall be displayed on an 80 character English Language L.C.D. display. The top line shall be the point label and the second line shall be the device type identifier.
- d. A pulsing alarm tone shall occur within the control panel until the event has been acknowledged.
- e. Release fire door.
- f. Transmit the alarm condition to the local fire department.
- g. Log the alarm condition in the control panel's memory.
- h. Override general sound system.

C. Main Control Panel:

1. The control panel shall be Notifier NF2-640 Series with modular expansion capability. The control panel shall have a minimum of 636 addressable initiating devices.
2. The control panel shall be programmed to accept the analog values from smoke sensors and compare them to a preset alarm threshold. Threshold values may be set to ranges between .5% and 3.8% gray smoke obscuration within the control panel/transponder program. Through peak value averaging, the program shall determine sensor dirt accumulation and automatically and constantly maintain the preset obscuration percent level required for an alarm condition to exist.
3. When a sensor value received is compensated beyond an initial preset level, a "DIRTY" indication and "Trouble" signal shall be generated at the control panel/transponder. A second preset level shall indicate an "EXCESSIVELY DIRTY" indication.
4. Upon receipt of a value beyond the preset alarm threshold level or beyond the compensation level the control panel/transponder shall revert to its preprogrammed general alarm response.
5. The Control Panel shall have a 4 line x 20 character liquid crystal display which shall be backlit for enhanced readability. So as to conserve battery standby power, it shall not be lit during an AC power failure unless an alarm condition occurs or there is a keypad activity.
6. There shall be two (2) access levels with level 2 being the highest level. Level 1 actions shall not require a passcode. Passcodes shall consist of up to five (5) digits.
7. The system shall be capable of operating Two Wire type detection devices. To ensure proper logging of alarm information under catastrophic alarm conditions, there shall be NO LIMIT to the number of devices supported in alarm condition and where on the system or on the same wiring circuit.

8. Provide batteries of sufficient capacity to operate and supervise entire alarm system for 60 hours with commercial power disconnected and to sound alarm for ten minutes at end of this period.
9. To assure that the owner can achieve competitive bids on future expansion and maintenance of the fire alarm system it shall be completely programmable from an integral Qwerty keypad. Manufacturers whose system is not programmable from the keypad shall include the programmer, software, laptop, etc. necessary for those capabilities as part of their bid.

D. Analog Addressable Sensor Base:

1. The detector base shall be of the twist/lock design with screw clamp terminals. The base shall utilize self-wiping contacts and shall be interchangeable with other plug in type sensors.
2. The detector base shall be Notifier B710LP. Device identification shall be transmitted to the control panel for processing according to the program instructions. Should the sensor be removed, a discrete sensor trouble signal unique to the device shall be transmitted to and annunciated at the control panel.
3. The detector shall be compatible with addressable manual stations and addressable Zone Adapter Modules on the same addressable initiating loop.
4. The addressable detector shall require a two-wire circuit of #18 twisted wire enclosed in conduit.
5. Provide detector base with sounder in apartments. If more than one detector is required in an apartment sounder bases shall be interconnected within that apartment.
6. Where in apartment units and where indicated on drawings the base shall have an integral sounder installed. These sounders shall be interconnected within each unit so that all sounders will sound within the unit on any local alarm. These sounders will also sound on any general alarm condition.

E. Analog Smoke Sensor Heads:

1. Smoke sensors shall be of the photoelectric type and shall be a plug in unit which mounts to a twist lock base and shall be UL-268 listed.
2. The sensor shall fit into a base that is common with the ionization type sensor and shall be compatible with other addressable detectors, addressable manual stations and addressable Zone Adapter Modules on the same circuit.
3. There shall be no limit to the number of detectors or Zone Adapter modules which may be activated or "in alarm" simultaneously.

4. The detector shall require a two-wire circuit of #18 twisted shielded wire enclosed in conduit.
 5. Analog addressable smoke sensor heads shall be Notifier FSP-851 Series.
- F. Analog Addressable Duct Smoke Detector:
1. The detector shall be a non polarized 24VDC type which is compatible with the Fire Alarm Panel and, obtains its operating power from the supervisory current in the fire alarm detection loop.
 2. Detectors shall be of the solid state photoelectric type and shall operate on the light scattering, photo diode principle. To minimize nuisance alarms, detectors shall have an insect screen and be designed to ignore invisible airborne particles or smoke densities that are below the factory set alarm point. No radioactive material shall be used.
 3. The detector head shall be directly interchangeable with an ionization detector type. The 24VDC detector may be reset by actuating the control panel reset switch.
 4. Smoke Detectors shall not have addressing in the detection part of the assembly due to the requirement for this part to be removed for cleaning and servicing. Detector construction shall have a mounting base with a twist-lock detecting head that is lockable. The locking feature must be field removable when not required. Contact between the base and head shall be of the bifurcated type utilizing spring type, self-wiping contacts. Removal of the detector head shall interrupt the supervisory circuit of the fire alarm detection loop and cause a trouble signal at the control panel. Detector design shall provide compatibility with other normally open fire alarm detection look devices (heat detectors, pull stations, etc.)
 5. For maintenance purposes, it shall be possible to clean the duct housing sampling tubes by accessing them through the duct housings front cover.
 6. To minimize false alarms, voltage and RF transient suppression techniques shall be employed as well as smoke signal verification circuit and insect screen.
 7. Duct housing shall contain an integral auxiliary relay that shall be discreetly programmable to function with or completely independent of the duct smoke detector alarm circuit.
 8. Analog addressable duct smoke detector shall be Notifier DNR with appropriate sampling tubes.
 9. Provide a Notifier RTS-151KEY Led test switch for each duct smoke detector located in an easily accessible space below the unit.
- G. Addressable Pull Stations:

1. Addressable pull stations will contain electronics that communicate the station's status (alarm, normal) to the transponder over two wires which also provide power to the pull station. The address will be set on the station. They will be manufactured from high impact red Lexan. Station will mechanically latch upon operation and remain so until manually reset by opening with a key common to all system locks.
 2. The front of the station is to be hinged to a backplate assembly and must be opened with a key to reset the station. The key shall be common with the control panels. Stations which use Allen wrenches or special tools to reset, will not be accepted. The station shall consist of high impact Lexan plastic, red in color.
 3. The addressable manual station shall be capable of programming of its "address" location on an addressable initiating circuit. The manual station shall be fitted with screw terminals for field wire attachment.
 4. There shall be no limit to the number of stations, detectors or Zone Adapter modules, which may be activated or "in alarm" simultaneously.
 5. Addressable pull station shall be Notifier NBG-12LX dual action pull station.
- H. Analog Heat Sensor Heads:
1. The Analog Addressable Thermal Fire sensor shall be a plug in unit which mounts to a twist lock base and shall be UL-268 listed. The sensor shall be of the rate compensation/fixed temperature type.
 2. The detector shall fit into a base that is common with the ionization and photo type sensor and shall be compatible with other addressable detectors, addressable manual stations and addressable Zone Adapter Modules on the same circuit.
 3. There shall be no limit to the number of detectors or Zone Adapter modules which may be activated or "in alarm" simultaneously.
 4. The detector shall require a two-wire circuit of #18 twisted shielded wire enclosed in conduit.
 5. The analog addressable heat sensor head shall be Notifier FST-851.
- I. Zone Adapter Module (ZAM):
1. Zone Adapter Modules shall be used for monitoring of waterflow, valve tamper, non-addressable detectors, and for control of evacuation indicating appliances and AHU systems.
 2. An addressable interface module shall be provided for interfacing normally open direct contact devices to an addressable initiating circuit. The device shall be a Notifier FMM-1.

3. Modules will be capable of mounting in a standard electric outlet box. Modules will include cover plates to allow surface or flush mounting. Modules will receive their 24VDC power from a separate two wire pair running from an appropriate power supply.
 4. There shall be two types of devices:
 - a. Monitor Module:
 1. For conventional 2-wire smoke detector and/or contact device monitoring with Class B wiring supervision. This type of addressable device module will provide power to and monitor the status of a zone consisting of conventional 2-wire smoke detectors and/or N\O contact devices as specified elsewhere. The supervision of the zone wiring will be Class B. These Modules will communicate the zone's status (normal, alarm, trouble) to the control panel.
 2. Provide Class B monitor module Notifier FMM-1.
 - b. Control Module:
 1. For non-supervised control, this type of addressable device will provide double pole double throw relay switching for loads up to 120VAC. It will contain easily replaceable 2 amp fuses, one on each common leg of the relay.
 2. The module shall be supervised and uniquely identified by the control panel. Device identification shall be transmitted to the control panel for processing according to the program instructions. Should the module become non-operational, tampered with, or removed, a discrete trouble signal, unique to the device, shall be transmitted to, and annunciated at, the control panel.
 3. The module shall be capable of being programmed for its "address" location on the addressable device initiating circuit. The module shall be compatible with addressable manual stations and addressable detectors on the same addressable initiating circuit.
 4. Provide control module Notifier FCM-1.
- J. Visual and Audible Combination Units:
1. Provide Notifier Spectra-Alert series semi-flush mounted audio/visual units.
 2. The visual portion shall contain a xenon strobe type light source capable of meeting ADA output requirements for the areas served. They shall flash at 1 Hz. And shall operate on 24VDC. Notifier Spectra-alert Series. All visual devices shall be synchronized.
 3. Individual unit strobe lights shall be programmed to operate on activation of any unit smoke detector or heat detector and also must active on any general alarm condition.

K. Supervisory Valves:

1. The supervisory valves shall be provided by the Fire Protection Contractor as shown on the Fire Protection plans.
2. Provide a monitor type of Zone Adapter Module at each Supervisory Valve location to tie it's alarm point into the addressable system loop.

L. Fire Protection Flow Switches (FS):

1. The Flow Switches shall be provided by the Fire Protection Contractor as shown on the Fire Protection Plans.
2. Provide a monitor type Zone Adapter Module at each Flow Switch location to tie it's alarm point into the addressable system loop.

M. City Interconnection:

1. Provide equipment and programming at the Main Control Panel as necessary to permit communications to a central monitoring service as selected by the owner.
2. The digital dialer shall report each device connected to the fire alarm system as a distinct and separate entity. Notifier model UDACT.
3. All setup, programming and testing of the digital dialer to the owner selected central station shall be included in this contract.

N. Emergency Call for Aid System:

1. Furnish and install, where indicated on plans, emergency call for aid switch Tek Tone model SF117/4B or approved equal with pull cord operated switch on face plate marked "Emergency" . Canceling the call shall be possible only at the point of origin.
2. Furnish and install, where indicated on plans, visual call for aid light Tek Tone model LI381 or approved equivalent. Each unit shall be mounted on a flame retardant ABS plastic panel, which shall be removable for bulb replacement without removing mounting screws.
3. Call for aid switches shall be individually connected to the fire alarm system through a monitoring module.
4. The call for aid system shall be powered from a dedicated power supply and not from the fire alarm control panel power supplies. The dedicated power supply shall have the same battery backup requirements as the main fire alarm control panel, 60 hours standby and 10 minutes of alarm.
5. Each call for aid shall be report out to the monitoring service as a distinct entity

O. Key Box:

1. Supply a key lock box as shown on drawings and compatible with the city in which the system is installed.

P. CO Detection:

1. Furnish and install, where shown on plans, a CO detector. CO detector shall be system sensor CO1224 and shall derive power from a dedicated power supply. The dedicated power supply shall have battery backup with the same requirements as the fire alarm control panel, 60 hours standby and 10 minutes of alarm.
2. CO detector shall have an integral sounder and trouble relay. The detector shall have a dual color LED that will blink green during normal operation and turn red under alarm conditions.
3. The CO detector shall have an end of life indicator that will indicate trouble when the detector has reached the end of its lifespan.

2.10 MOLDED CASE CIRCUIT BREAKERS:

- A. General: Circuit breakers shall be two or three pole molded case circuit breakers rated 480V ac, as specified on the Drawings. Breakers shall be standard construction. All circuit breakers shall be UL and CSA listed, IEC 157-1 rated, meet NEMA Standard ABI-1975 and Federal Specification W-C-375B/GEN, when applicable. Breakers covered under this specification shall be installed in existing motor control centers. Circuit breakers shall be Square D, Cutler Hammer or General Electric.
- B. Construction: Molded case circuit breakers shall have over center toggle-type mechanisms, providing quick-make, quick-break action. Breakers shall be calibrated for operation in an ambient temperature of 40°C. Each circuit breaker shall have trip indication by handle position and shall be trip-free. Two and three pole breakers shall be common trip. Each circuit breaker shall have a permanent trip unit containing individual thermal and magnetic trip elements in each pole. Circuit breakers with frame sizes greater than 100 amperes shall have variable trip elements which are set by a single adjustment to assure uniform tripping characteristics in each pole. The circuit breaker shall have reverse connection capability and be suitable for mounting and operating in any position.
- C. Termination: Circuit breakers shall have removable lugs. Lugs shall be UL listed copper conductors only. Breakers shall be UL listed for installation of compression type lugs.

2.11 MOLDED CASE CIRCUIT BREAKERS:

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- C. Termination: Circuit breakers shall have removable lugs. Lugs shall be UL listed copper conductors only. Breakers shall be UL listed for installation of compression type lugs.

2.12 MAIN CIRCUIT BREAKER:

- A. General: Furnish and install the service entrance switches herein specified and shown on the associated electrical drawings. The switchboards shall meet the latest requirements of Underwriters Laboratories Standard #891, NEMA PB2, and the National Electrical Code. The service entrance switch shall be furnished with an Underwriters Laboratories label as manufactured by Square D, General Electric or Cutler Hammer.
- B. Enclosure Construction: The service entrance switch shall be deadfront with front accessibility required. The switchboard frame shall be of formed code gauge steel rigidly welded and bolted together to support all cover plates, bussing and component devices during shipment and installation. Steel base channels shall be bolted to the frame to rigidly support the entire shipping section for moving on rollers and floor mounting. Each switchboard section shall have a barriered bottom and an individually removable top plate for installation and termination of conduit. The switchboard enclosure shall be painted on all exterior and interior surfaces. The paint finish shall be a medium light gray, ANSI #49, applied by the electro-deposition process over an iron phosphate pre-treatment. All front covers shall be screwed on and removable and all doors shall be hinged with removable hinge pins. Top and bottom conduit areas shall be clearly indicated on shop drawings.
- C. Bussing: The switchboard bussing shall be of sufficient cross-sectional area to meet UL Standard 891 temperature rise. Through bus shall be plated copper plated by the ALSTAN 70 or 80 process. The through bus shall have an ampacity as shown in plans and shall be rated to withstand a short circuit current rating equal to or greater than the Utility Company rating at the secondary side of the transformer. The through bus supports, connections and joints are to be bolted with hex-head bolts and Belleville washers to minimize maintenance requirements.
- D. Short Circuit Current Rating: Each switchboard, including the main circuit breaker, as a complete unit, shall be given a single short circuit current rating by the manufacturer. Such ratings shall be established by the actual tests by the manufacturer, in accordance with UL specifications, on equipment constructed similarly to the subject switchboard, and shall be equal to or greater than the utility company rating at the secondary side of the transformer. No series rating.

- E. Main Circuit Breaker: The main service disconnect devices shall be molded case circuit breakers totally front accessible and front connectible.
- F. Metering Compartment: The revenue current transformer compartment shall be located in the service entrance section of the switchboard, connected for cold sequence metering. Provisions for CT meeting the Utility Co. requirements shall be supplied. The compartment shall be barriered and covered with a double-hinged door with sealing provisions.

2.13 CIRCUIT BREAKER DISTRIBUTION BOARDS:

- A. General: Furnish and install the distribution switchboards as herein specified and shown on the associated electrical drawings. The switchboards shall meet the latest requirements of Underwriters Laboratories standard #891, NEMA PB2, and the National Electrical Code. The switchboards shall be furnished with an Underwriters Laboratories label as manufactured by Square D, General Electric or Cutler Hammer.
- B. Enclosure Construction: The switchboards shall be deadfront with front accessibility required. The switchboard frame shall be of formed code gauge steel rigidly welded and bolted together to support all cover plates, bussing and component devices during shipment and installation. Steel base channels shall be bolted to the frame to rigidly support the entire shipping section for moving on rollers and floor mounting. Each switchboard section shall have an open bottom and an individually removable top plate for installation and termination of conduit. The switchboard enclosure shall be painted on all exterior and interior surfaces. The paint finish shall be a medium light gray, ANSI #49, applied by the electro-deposition process over an iron phosphate pre-treatment. All front covers shall be screwed on and removable and all doors shall be hinged with removable hinge pins. Top and bottom conduit areas shall be clearly indicated on shop drawings.
- C. Bussing: The switchboard bussing shall be of sufficient cross-sectional area to meet UL Standard 891 temperature rise. Through bus shall be plated copper plated by the ALSTAN 70 or 80 process. The through bus shall have an ampacity as shown in plans and shall be rated to withstand a short circuit current rating to match the main circuit breaker rating. The through bus supports, connections and joints are to be bolted with hex-head bolts and Belleville washers to minimize maintenance requirements and shall have provisions for the addition of future sections.
- D. Short Circuit Current Rating: Each switchboard, as a complete unit, shall be given a single short circuit current rating by the manufacturer. Such ratings shall be established by the actual tests by the manufacturer, in accordance with UL specifications, on equipment constructed similarly to the subject switchboard.
- E. Branch Circuit Breakers: Group mounted molded case circuit breakers are to be totally front accessible. The circuit breakers are to be mounted in the switchboard to permit installation, maintenance and testing without reaching over any line side bussing. The circuit breakers are to be removable by the disconnection of only the load side cable terminations and all line and lead side connections are to be individual to each circuit breaker. No common mounting brackets or electrical bus connectors will be acceptable. Each circuit breakers shall have a short circuit current rating to match the main circuit breaker rating.

- F. Each circuit breaker is to be furnished with an externally operable mechanical means to trip the circuit breaker, enabling maintenance personnel to verify the ability of the circuit breaker trip mechanism to operate, as well as exercise the circuit breaker operating mechanisms.

2.14 CABLE TELEVISION:

- A Coaxial Cables from Outlets to Termination Points: Furnish and install cable purchased from the local cable company.
- B. Outlets and Boxes: Furnish and install miscellaneous electrical equipment as directed by the local cable company.

2.15 STANDBY GENERATOR AND TRANSFER SWITCH:

- A. Furnish and install stand by Generator and Transfer Switch as described in Contract Documents, and as manufactured by Cummins, Kohler or Caterpillar.
 - 1. The generator set shall be a Cummins model 250DQDAA operating at 1800 rpm and at a voltage of: 120/208 volts AC, three phase, 4-wire, 60 hertz.
 - 2. The complete generator set shall be rated per ISO8528 at 250 kW at 0.8 PF, Standby, rating, based on site conditions of: Altitude 500 feet, ambient temperatures of 40 degrees C, based on temperature measured at the control for indoor installations, and measured at the air inlet closest to the alternator for outdoor equipment.
 - 3. The generator set rating shall be based on emergency/standby service and marked as such per NFPA 110.
 - 4. Provide 720 gallons of fuel at time of completion.
- B. Performance
 - 1. Voltage regulation shall not exceed one percent for any constant load between no load and rated load for both parallel and non-parallel applications. Random voltage variation with any steady load from no load to full load shall not exceed plus or minus 0.5 percent.
 - 2. Frequency regulation shall be isochronous from steady state no load to steady state rated load. Random frequency variation with any steady load from no load to full load shall not exceed plus or minus 0.25%.
 - 3. The diesel engine-generator set shall be capable of single step load pick up of 100% nameplate kW and power factor, less applicable derating factors, with the engine-generator set at operating temperature.

4. Motor starting capability shall be a minimum of 1,372 kVA. The generator set shall be capable of sustaining a minimum of 90% of rated no load voltage with the specified kVA load at near zero power factor applied to the generator set.
5. The alternator shall produce a clean AC voltage waveform, with not more than 5% total harmonic distortion at full linear load, when measured from line to neutral, and with not more than 3% in any single harmonic, and no 3rd order harmonics or their multiples. Telephone influence factor shall be less than 40.
6. The generator set shall be certified by the engine manufacturer to be suitable for use at the installed location and rating, and shall meet all applicable exhaust emission requirements at the time of commissioning.
7. The generator set, complete with sound attenuated enclosure, shall be tested by the generator set manufacturer per ANSI S1.13. Data documenting performance shall be provided with submittal documentation.

C. Engine:

1. The engine shall be certified to Tier 3 EPA Emissions Standards. The engine shall be diesel, 4 cycle, radiator and fan cooled. Minimum displacement shall be 543 cubic inches, with 6 cylinders. The horsepower rating of the engine at its minimum tolerance level shall be sufficient to drive the alternator and all connected accessories. Two cycle engines are not acceptable. Engine accessories and features shall include:
 - a. Skid-mounted radiator and cooling system rated for full load operation in 122 degrees F (50 degrees C) ambient as measured at the generator air inlet. Radiator shall be provided with a duct adapter flange. The cooling system shall be filled with 50/50 ethylene glycol/water mixture by the equipment supplier. Rotating parts shall be guarded against accidental contact per OSHA requirements.
 - b. An electric starter(s) capable of three complete cranking cycles without overheating.
 - c. Positive displacement, mechanical, full pressure, lubrication oil pump.
 - d. Full flow lubrication oil filters with replaceable spin-on canister elements and dipstick oil level indicator.
 - e. An engine driven, mechanical, positive displacement fuel pump. Fuel filter with replaceable spin-on canister element.
 - f. Replaceable dry element air cleaner with restriction indicator.
 - g. Flexible supply and return fuel lines.
 - h. Engine mounted battery charging alternator, 100 ampere minimum, and solid-state voltage regulator.
 - j. Provide a crankcase emission control system that shall remove a minimum of 99% of crankcase emissions. The crankcase emission control system shall reduce Nox, hydrocarbon and oil from the crankcase emissions.

D. AC Generator:

1. The AC generator shall be; synchronous, four pole, 2/3 pitch, revolving field, dripproof construction, single prelubricated sealed bearing, air cooled by a direct drive centrifugal blower fan, and directly connected to the engine with flexible drive disc. All insulation system components shall meet NEMA MG1 temperature limits for Class H insulation system. Actual temperature rise measured by resistance method at full load shall not exceed 80 deg.C.
2. The generator shall be capable of delivering rated output (kVA) at rated frequency and power factor, at any voltage not more than 5 percent above or below rated voltage.

E. Engine-Generator Set Control:

1. The NEMA 1 enclosed control panel shall be mounted on the generator set with vibration isolators. The control shall be vibration isolated and prototype tested to verify the durability of all components in the system under the vibration conditions encountered. The generator set mounted control shall include the following features and functions:
 - a. Three position control switch labeled RUN/OFF/AUTO.RESET switch .PANEL LAMP switch.
 - b. Generator Set AC Output Metering:
 1. Analog AC Voltmeter, dual range, 90 degree scale, 2% accuracy;
Analog AC Ammeter, dual range, 90 degree scale, 2% accuracy;
Analog Frequency/RPM meter, 45-65 Hz, 1350-1950 RPM, 90 degree scale, +/- 0.6 Hz accuracy.
 2. Seven position phase selector switch with OFF position to allow meter display of current and voltage in each generator phase. When supplied with reconnectable generators, the meter panel shall be reconnectable for the voltage specified.
 - c. Generator Set Alarm and Status Display:
 1. The generator set shall be provided with alarm and status indicating lamps to indicate non-automatic generator status, and existing alarm and shutdown conditions. The lamp condition shall be clearly apparent under bright room lighting conditions. The generator set control shall indicate the existence of the following alarm and shutdown conditions on the display panel:
 - low oil pressure (alarm)
 - low oil pressure (shutdown)
 - low coolant temperature (alarm)
 - high coolant temperature (alarm)
 - high coolant temperature (shutdown)
 - low coolant level (shutdown)
 - overcrank (shutdown)
 - overspeed (shutdown)
 - low fuel-subbase (alarm)
 - d. In addition, provisions shall be made for indication of two architecturally approved alarm or shutdown conditions. The non-automatic indicating lamp shall be red, and shall flash to indicate that the generator set is not able to automatically respond to a command to start from a remote location.

- e. Provide a low coolant level shutdown that shall be annunciated as a high engine temperature alarm.
2. Engine Status Monitoring:
- a. The following devices shall be provided on the generator set control:
 - engine oil pressure guage
 - engine coolant temperature gauge
 - engine operation hour gauge
 - number of hours of operation (hours)
 - battery voltage (DC volts)
3. Control Functions:
- a. The control system provided shall include a cycle cranking system, which shall be for 3 cranking periods of 15 seconds each, with 15 second rest period between cranking periods. Fail to start shall be indicated by operation of the overcrank alarm indication lamp.
 - b. The control system shall include an engine governor control, which functions to provide steady state frequency regulation as noted elsewhere in this specification.
4. Alternator Control Functions:
- a. The generator set shall include an automatic voltage regulation system which is matched and prototype tested with the governing system provided.
 - b. It shall be immune from mis-operation due to load-induced voltage waveform distortion and provide a pulse width modulated output to the alternator exciter. The system shall include a torque-matching characteristic, which shall reduce output voltage in proportion to frequency below a threshold of [58-59] HZ.
 - c. Voltage adjusting rheostat, locking screwdriver type, to adjust voltage +/- 5% from rated value.
 - d. Control Interfaces for Remote Monitoring:
 - e. Provide the following features in the control system:
 - 1. Form "C" dry common alarm contact set rated 2A @ 30VDC to indicate existence of any alarm or shutdown condition on the generator set.
 - 2. One set of contacts rated 2A @ 30VDC to indicate generator set is ready to load. The contacts shall operate when voltage and frequency are greater than 90% of rated condition.
 - 3. A fused 10 amp switched 12VDC power supply circuit shall be provided for owner use. DC power shall be available from this circuit whenever the generator set is running.
 - 4. A fused 20 amp 12VDC power supply circuit shall be provided for owner use. DC power shall be available from this circuit at all times from the engine starting/control batteries.
- F. Base: The engine-generator set shall be mounted on a heavy duty steel base to maintain alignment between components. The base shall incorporate a battery tray with hold-down clamps within the rails. Additional seismic vibration isolators shall be provided by the generator supplier, and installed by the contractor.

G. Generator Set Auxiliary Equipment and Accessories:

1. Water Jacket Heater: Engine mounted, thermostatically controlled, water jacket heater for each engine. The heater shall be sized as recommended by the generator set manufacturer. Heater voltage shall be 120 VAC.
2. Exhaust Silencer: A critical grade silencer shall be provided for each engine, size and type as recommended by the generator set manufacturer. The silencer shall be supported such that it's weight is not supported by the engine. The silencer shall be mounted inside the sound attenuated enclosure. Roof mounted silencers are not acceptable.
3. Starting and Control Batteries: Starting battery bank, lead acid type, 24 volt DC, sized as recommended by the generator set manufacturer, shall be supplied for each generator set with battery cables and connectors. A battery disconnect switch shall be included.
4. Generator Set Main Circuit Breakers: Generator circuit breakers: 500 Amps for Fire Pump, 250 Amps for the standby load, set-mounted and wired, UL listed, molded case type with electronic trip unit.
5. Double Wall, UL Listed Basetank: A 720 gallon double wall, UL Listed basetank shall be provided. The tank shall include emergency vents for the tank and rupture basin, mechanical fuel gauge, supply and return lines piped to the engine, and low fuel level and leak detection switches.
6. Quiet Site II, Level 2 Sound Attenuated Enclosure:
 - a. The generator set shall be provided with an outdoor enclosure, with the entire package listed under UL2200. The package shall comply with the requirements of the National Electrical Code for all wiring materials and component spacing. Housing shall provide ample airflow for generator set operation at rated load in an ambient temperature of 100F. The housing shall have hinged access doors as required to maintain easy access for all operating and service functions. All doors shall be lockable, and include retainers to hold the door open during service. Enclosure roof shall be cambered to prevent rainwater accumulation. Openings shall be screened to limit access of rodents into the enclosure. All electrical power and control interconnections shall be made within the perimeter of the enclosure.
 - b. All sheet metal shall be primed for corrosion protection and finish painted with the manufacturers standard color using a two step electrocoating paint process, or equal meeting the performance requirements specified below. All surfaces of all metal parts shall be primed and painted. The painting process shall result in a coating that meets the following requirements:
 - Primer thickness, 0.5-2.0 mils. Top coat thickness, 0.8-1.2 mils.
 - Gloss, per ASTM D523-89, 80% plus or minus 5%. Gloss retention after one year shall exceed 50%.
 - Crosshatch adhesion, per ASTM D3359-93, 4B-5B.
 - Impact resistance, per ASTM D2794-93, 120-160 inch-pounds.

- Salt Spray, per ASTM B117-90, 1000+ hours.
- Humidity, per ASTM D2247-92, 1000+ hours.
- Water Soak, per ASTM D2247-92, 1000+ hours.
- c. Painting of hoses, clamps, wiring harnesses, and other non-metallic service parts shall not be acceptable. Fasteners used shall be corrosion resistant, and designed to minimize marring of the painted surface when removed for normal installation or service work. Enclosure shall be constructed of minimum 12 gauge steel for framework and 14 gauge steel for panels. All hardware and hinges shall be stainless steel. The exhaust shall exit the enclosure through a rain collar and terminate with a rain cap. Exhaust connections to the generator set shall be through seamless flexible connections.
- d. The enclosure shall include the following maintenance provisions:
 - 1. Flexible coolant and lubricating oil drain lines, that extend to the exterior of the enclosure, with internal drain valves.
 - 2. External radiator fill provision.
 - 3. The generator set shall be provided with a sound-attenuated housing which allows the generator set to operate at full rated load in an ambient temperature of up to 100F. The enclosure shall reduce the sound level of the generator set while operating at full rated load to a maximum of 71 dBA at any location 7 meters from the generator set in a free field environment. The enclosure shall be insulated with non-hygroscopic materials.
- 7. Remote Annunciator Panel: Provide remote annunciator panel in compliance with NFPA-110.
- 8. Remote Emergency Stop Switch: Provide a remote emergency stop switch inside the building as directed by the owner.
- H. Automatic Transfer Switch
 - 1. Provide complete factory assembled power transfer equipment with electronic controls designed for designed for fully automatic operation and including: surge voltage isolation, voltage sensors on all phases of the normal source and one phase of the emergency source, positive mechanical and electrical interlocking, and mechanically held contacts for both sources.
 - 2. The generator set manufacturer shall warrant transfer switches to provide a single source of responsibility for all the products provided. Technicians specifically trained to support the product and employed by the generator set supplier shall service the transfer switches.
- J. Codes and Standards
 - 1. The automatic transfer switch shall conform to the requirements of the following codes and standards: UL1008. The transfer switch shall be UL listed and labeled.
 - a. CSA C22.2, No. 14 – M91 Industrial Control Equipment.
 - b. CSA 282, Emergency Electrical Power Supply for Buildings

- c. IEEE Standard C62.41 and C62.45.
 - d. NFPA70 – National Electrical Code. Equipment shall be suitable for use in systems in compliance to Article 700, 701, and 702.
NFPA110 – Emergency and Standby Power Systems. The transfer switch shall meet all requirements for Level 1 systems.
 - e. IEEE446 – Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications.
 - f. NEMA ICS10-1993 – AC Automatic Transfer Switches.
2. The transfer switch manufacturer shall be certified to ISO 9001 International Quality Standard and shall have third party certification verifying quality assurance in design/development, production, installation, and service, in accordance with ISO 9001.
- K. Ratings:
1. Fire Pump ATS: by fire pump vendor.
 2. Standby ATS: 260 Amps, 208V, 3 pole, 4 Wire, NEMA 1 enclosed Cummins/Onan Series OTEC.
 3. Main contacts shall be rated for the operation voltage as installed.
 4. Transfer switches shall be rated to carry 100 percent of rated current continuously in the enclosure supplied, in ambient temperatures of -40 to +60 degrees C, relative humidity up to 95% (non-condensing), and altitudes up to 10,000 feet (3000M).
 5. Transfer switch equipment shall have withstand and closing ratings (WCR) in RMS symmetrical amperes greater than the available fault currents shown on the drawings. The transfer switch and its upstream protection shall be coordinated. The transfer switch shall be third party listed and labeled for use with the specific protective device(s) installed in the application.
- L. Construction:
1. Transfer switches shall be double-throw, electrically and mechanically interlocked, and Mechanically held in the source 1 and source 2 positions.
 2. Transfer switch internal wiring shall be composed of pre-manufactured harnesses that are permanently marked for source and destination. Harnesses shall be connected to the control system by means of locking disconnect plug(s), to allow the control system to be easily disconnected and serviced without disconnecting power from the transfer switch mechanism.
 3. Transfer switch shall be provided with flame retardant transparent covers to allow viewing of switch contact operation but prevent direct contact with line voltage components.

4. Transfer switches shall be 3-pole and shall be provided with a neutral bus and lugs. The neutral bus shall be sized to carry 100% of the current designated on the switch rating.
5. Enclosures shall be UL listed and NEMA 1 rated. The enclosure shall provide NEC wire bend space when both sources and the load are all connected from either the top or bottom of the transfer switch. The cabinet door shall be key-locking.
6. Connections:
 - a. Field control connections shall be made on a common terminal block that is clearly and permanently labeled.
 - b. Transfer switch shall be provided with AL/CU mechanical lugs sized to accept the full output rating of the generator set.
7. Transfer Switch Control:
 - a. Solid-state under voltage sensors shall simultaneously monitor both sources. Pick-up and drop-out settings shall be adjustable. Voltage sensors shall have field calibration of actual supply voltage to nominal system voltage.
 - b. Automatic controls shall signal the engine-generator set to start upon signal from normal source sensor. Solid-state time delay start, adjustable from 0 to 15 seconds (factory set at 2 seconds) shall avoid nuisance start-ups. Battery voltage starting contacts shall be silver, dry type contacts factory wired to a field wiring terminal block.
 - c. The switch shall transfer when the emergency source reaches the set point. Provide a solid-state time delay on transfer, adjustable from 2 to 120 seconds, factory set at 3 seconds.
 - d. The switch shall retransfer the load to the normal source after a time delay retransfer, adjustable from 6 seconds to 30 minutes, factory set at 5 minutes. Retransfer time delay shall be immediately bypassed if the emergency power source fails.
 - e. Controls shall signal the engine-generator set to stop after a time delay, adjustable from 2 seconds to 10 minutes, and factory set at 5 minutes, beginning on return to the normal source.
 - f. The control system shall include field adjustable provisions to control the speed of transfer of the transfer switch.
 - g. Power for transfer operation shall be from the source to which the load is being transferred.
 - h. The control shall include latching diagnostic indicators to pinpoint the last successful step in the sequence of control functions, and to indicate the present status of the control functions in real time, as follows:

Normal Available	Start (Gen Set)	Emergency Available
Transfer Timing	Transfer Complete	Retransfer Timing
Retransfer Complete	Timing for Stop	
8. The transfer switch shall be provided with a battery charger for the generator set starting batteries. The battery charger shall be a float type charger rated 2 amps. The battery charger shall include an ammeter for display of charging current and shall have fused AC inputs and DC outputs.

9. Provide solid state exerciser clock to set the day, time, and duration of generator set exercise/test period. Provide a with/without load selector switch for the exercise period.
10. Front Panel Devices:
 - a. Provide control switches mounted on cabinet front for:
 1. Test - Simulates normal power loss to control for testing of generator set. Controls shall provide for a test with or without load transfer.
 2. Retransfer - Momentary position to override retransfer time delay and cause immediate return to normal source, if available.
 - b. Provide LED-type switch position and source available indicator lamps on the front of the transfer switch cabinet.
11. Control Interface:
 - a. The transfer switch will provide an isolated relay contact for starting of a generator set. The relay shall be normally held open, and close to start the generator set. Output contacts shall be form C, for compatibility with any generator set.
 - b. Provide one set Form C auxiliary contacts on both sides, operated by transfer switch position, rated 10 amps 250 VAC.
12. The transfer switch shall provide relay contacts to indicate the following conditions: source 1 available, load connected to source 1, source 2 available, source 2 connected to load.
 - a. Enclosure:
 1. Enclosures shall be UL listed. The cabinet door shall be key-locking.
 2. Transfer switch equipment shall be provided in a NEMA 1 or better enclosure.
 3. Enclosures shall be the NEMA type specified. The cabinet shall provide code-required wire bend space at point of entry as shown on the drawings. Manual operating handles and all control switches (other than key-operated switches) shall be accessible to authorized personnel only by opening the key-locking cabinet door. Transfer switches with manual operating handles and/or non key-operated control switches located on outside of cabinet do not meet this specification and are not acceptable.

M. OPERATION

1. Open Transition Sequence of Operation:
 - a. Transfer switch normally connects an energized utility power source (source 1) to loads and a generator set (source 2) to the loads when normal source fails. The normal position of the transfer switch is source 1 (connected to the utility), and no start signal is supplied to the genset.
 - b. Generator Set Exercise (Test) With Load Mode. The control system shall be configurable to test the generator set under load. In this mode, the transfer switch shall control the generator set in the following sequence:

- c. Transfer switch shall initiate the exercise sequence at a time indicated in the exercise timer program, or when manually initiated by the operator.
2. When the control systems senses the generator set at rated voltage and frequency, it shall operate to connect the loads to the generator set by opening the normal source contacts, and closing the alternate source contacts a predetermined time period later. The timing sequence for the contact operation shall be programmable in the controller.
 3. The generator set shall operate connected to the load for the duration of the exercise period. If the generator set fails during this period, the transfer switch shall automatically reconnect the generator set to the normal service.
 4. On completion of the exercise period, the transfer switch shall operate to connect the loads to the normal source by opening the alternate source contacts, and closing the normal source contacts a predetermined time period later. The timing sequence for the contact operation shall be programmable in the controller.
 5. The transfer switch shall operate the generator set unloaded for a cooldown period, and then remove the start signal from the generator set. If the normal power fails at any time when the generator set is running, the transfer switch shall immediately connect the system loads to the generator set.
- N. Construction:
1. All switches, lamps, and meters in the control system shall be oil-tight and dust-tight. There shall be no exposed points in the control (with the door open) that operate in excess of 50 volts.
 2. All outdoor equipment shall be enclosed with corrosion-protected materials. Steel components used in enclosures shall be powder coated and baked, and shall provide fade and corrosion resistance in compliance to Dry film thickness shall be shd3363 of 2H+all a minimum of 1.8 Mils, gloss at 60degrees per ASTM D523 of 80+/- 10, pencil hardness per ASTM D3363
- P. Connections:
1. The generator set load connections shall be composed of silver or tin plated copper bus bars, drilled to accept mechanical or compression terminations of the number and type as shown on the drawings. Sufficient lug space shall be provided for use with cables of the number and size as shown on the drawings.
 2. Power connections to auxiliary devices shall be made at the devices, with required protection located at a wall-mounted common distribution panel.
 3. Generator set control interfaces to other system components shall be made on a common, permanently labeled terminal block assembly.

2.16 TELEPHONE

- A. The local Telephone Company will provide all exterior wiring, instruments, and make connection complete for the telephone installation.
- B. Furnish and install all interior cables, outlet boxes, conduit from telephone outlet boxes to terminal boxes and/or terminal board as indicated on the Drawings.
- C. Contractor shall be responsible for the entire service installation.

2.17 APARTMENT INTERCOM SYSTEM

- A. Furnish, install and place in operating condition an apartment intercom system. It shall include but not be limited to suite phones, amplifiers, apartment entry phone, transformers and all wiring as shown on the drawings and specified herein.
- B. All equipment and components shall be new, the system shall be manufactured by Florence/Auth, Tektone, or Aiphone and provided by their authorized dealer.
- C. Catalog numbers and specified manufacturers represent the type, quality and operating characteristics of equipment to be furnished.
- D. Operation: The caller, by pressing the appropriate button on the entrance panel, causes an electronic call tone to be heard in the apartment suite phone being called. The resident may then initiate communication with the caller by activating the suite phone Talk/Listen buttons. Activation of the suite phone door button shall signal the electric door release to open.
- E. Apartment Suite Phone
 - 1. The SUITE PHONES shall have momentary action pushbuttons labeled TALK,LISTEN,& Door operation.
 - 2. The speaker/microphone shall be 31/2" high sensitivity type with voice frequency response.
 - 3. The suite phone shall be constructed of high impact ABS plastic and have screw terminal connections.
 - 4. The suite phone shall be Florence/Auth, Model 3404.
- F. Amplifier
 - 1. Units shall provide amplification, control and power circuits to operate the entire intercom system.
 - 2. The amplifier shall feature integrated circuit amplification, integrated call tone oscillator, adjustable volume and tone volume controls.

3. Units shall provide switch selectable door release timing of 8 to 16 seconds.
4. Provide Florence/Auth Model FMC35L.

G. Entry Phone

1. Entry phone shall be of modular design, flush mounted and finished in anodized brushed aluminum.
2. It shall contain 40 self-wiping momentary pushbuttons and an associated name directory suitable for engraving.
3. Speaker panel shall contain a weather resistant speaker and hands free loud speaking.
4. Provide a flush mounting frame to house the entry phone modular units as needed.
5. Provide Florence/Auth Model SP300-D302-40/DP300 Directory /RF300 recessed frame.

H. Transformer: Provide Florence/Auth Model TR5 as shown on the drawings.

I. Door Strike: Door strike shall be provided by the door hardware supplier and wired by this contractor. Coordinate strike electrical requirements with the supplier.

2.18 VISUAL ALERT SYSTEM

- A.** Furnish and install a low voltage visual alert system for the handicap and visual hearing impaired units to the following specifications to be wired, connected and left in first class operating condition equipment specified is that of housing devices Inc
- B.** The Housing Devices Inc. ADA-121/ADA-121RM shall be installed with the following specification to be wired, connected and left in first class operating conditions.
- C. System Operation**
 1. Pressing the ON/OFF button once will turn on the unit and power LED and then pressing it again will turn off the unit. When activated the unit will sound a 90dbA piezoelectric buzzer.
 2. Illuminate a 110 candela flashing strobe light. Pressing the RESET button will stop the buzzer and strobe and reset the system for the next alarm.
 3. Activation is accomplished by pushing the residence's doorbell, or depressing the appropriate residence intercom button, a telephone entry system, or by dialing the residence telephone number from a standard telephone system.

4. Each time the residence is contacted the ADA 121/ADA 121RM buzzer will sound and the flashing strobe light will illuminate, notifying the unit's resident that someone is trying to contact them. Depressing the "RESET" button on the unit resets the ADA 121.

2.19 DISCONNECT SWITCHES

- A. All disconnect switches shall be heavy duty horsepower rated 100% load breaking with padlocking capability.
- B. Elevator disconnect switches shall be heavy duty horsepower rated; fused with auxillary contacts.

2.20 TRANSIENT VOLTAGE SURGE SUPPRESSION

A. LOCATION

1. Furnish and install transient surge suppression (TVSS) for service entrance and branch circuit panel where shown on the plans.

B. ENVIRONMENTAL

1. No audible noise shall be generated.
2. No appreciable magnetic fields shall be generated. System shall be capable of use directly in computer rooms in any location without danger to disc units, disk packs, or tapes.
3. Operating Conditions:
 - a. 30 - 130 Degrees F
 - b. 15 - 85 Percent Humidity Non-Condensing
4. Enclosure: The unit shall have a heavy duty NEMA 12 dust-tight, drip-tight enclosure unless specified otherwise.

C. SERVICE ENTRANCE TVSS

1. TVSS shall be rated for a [480Y/277] [208Y/120] volt, 60 Hertz, 3-phase, 4-wire system and shall be connected in parallel with the main [switchboard] [low-voltage switchgear] [Distribution Power Panel]. TVSS shall be mounted externally to main service. TVSS integrated to main service will not be accepted.
2. Quality: The manufacturer shall be ISO 9001 certified, demonstrating world-class quality systems for the design and manufacture of the TVSS units.
3. Unit shall be UL 1449, 2nd Edition Listed. A TVSS that is a UL "Recognized" component will not be accepted.

4. Each surge suppression element (MOV) shall be individually fused so that a failure of one element and/or fuse shall not affect other surge suppression elements. TVSS shall have a short-circuit rating of 200kAIC. Devices that accomplish this rating by suggesting or providing additional fusing to the TVSS system will not be accepted.
5. Unit shall include solid-state, long-life externally mounted LED visual status indicators that indicate the on-line status and operational integrity of each phase of the unit.
6. Unit shall have a Form C summary alarm output contact rated for at least 1 amp at 120VAC for remote annunciation of TVSS status.
7. MANUFACTURERS AND SPECIFIC PRODUCT REQUIREMENTS
 - a. Acceptable Manufacturers: Subject to compliance with requirements of the Contract Documents, acceptable manufacturers are as follows:
 - (1) Liebert
 - (2) Current Technology
 - (3) Cutler Hammer
 - b. Unit shall provide maximum UL 1449 2nd Edition Suppressed Voltage Rating (SVR) for 208Y/120 Volt systems as follows:
 - A. L-N = 330V
 - B. L-G = 400V
 - (3) N-G = 400V
 - (4) L-L = 600V
 - c. The TVSS will be modular in design. Separate and replaceable suppression modules will protect each mode (L-N, L-G, and N-G).
 - d. The service entrance TVSS will be capable of surviving 15,000 ANSI/IEEE, Category C3 (10kA) impulses without failure or degradation of original performance characteristics of more than 10%
 - e. Unit shall have a minimum surge current rating of 100,000 amperes L-N, 100,000 amperes L-G, and 100,000 amperes N-G, based on ANSI/IEEE C62.41 standard 8 by 20 microsecond current waveform.
 - f. Unit shall be UL 1283 listed as an electromagnetic interference filter and provide 50 Ohm noise attenuation of at least 40 dB at 100 kHz, 30 dB at 1 MHz, 35 dB at 10 MHz, and 50 dB at 100 MHz.
 - g. Unit shall be provided with an integral, non-fused disconnect switch which causes no interruption to the protected load for testing and maintenance. Disconnect system shall not require removal or replacement for warranty or other repairs.
 - h. Unit shall have an audible alarm with an alarm on/off switch to silence the alarm and a push-to-test switch to test the alarm function.
 - i. A resettable counter shall be provided to totalize transient voltage surges in both the normal and common mode. The readout shall be at least a six-digit LCD located on the unit front cover and provided with a 10-year battery back-up to maintain counts in the event of power loss.
 - j. Warranty: Manufacturer shall provide a product warranty for a period of not less than 10 years from date of installation. Warranty shall cover unlimited replacement of system during warranty period. Any field labor

required to perform repair or replacement work including failure due to lightning warranties that cover only parts and labor shall not be accepted.

2.21 LIGHTING CONTROL SYSTEM:

- A. Furnish and install a Dual Technology Motion Sensing System in according to the following specification to be wired, connected and left in first class operating condition as manufactured by Leviton with a 5 year warranty, Novitas of Watt Stopper number specified refer to Leviton.
- B. Dual Technology Ceiling Mounted Leviton ODC10-MO 4.5" Dia. X 1.5" height made of rugged high-impact injection molded plastic KJB ABS Cyolac flame class rated VV inhibitor with color coded C" leads and white finish.,
- C. Passive infrared technology wall switch: Leviton #ODS10-1D equipped with a push bottom to provide manual on/off switching, sensitivity adjustments and integral sliding blinders. Operating at 120/277 volts and compatible with Electronic and Magnetic Ballasts.
- D. Power Pack: Series Leviton #ODP Series 3.69" Long x 2.33" Wide x 1.36" High made of high impact UL rated 94-5V plastic. Transformer Class II 120/277V primary 24VDC output and 7' wire leads.

PART 3 - EXECUTION

3.01 CONDUIT - RACEWAY AND FITTINGS:

- A. All metal conduit, enclosures and raceways for conductors shall be mechanically joined together to form a continuous electrical continuity and bond and shall be grounded as required by National Electrical Code.
- B. All conduit shall be concealed where possible and so installed so as not to damage or run through structural members.
- C. In unfinished areas, when conduits can not be concealed, exposed conduit shall be run parallel with or at right angles to the walls of the building. Check the structural details and plans so that all conduits can be concealed, except conduits on surface-mounted panels and boxes and other locations as outlined in these specifications.
- D. In finished areas, when conduits can not be concealed, furnish and install surface metal raceway as manufactured by Wiremold. Raceways, elbows, and fittings shall be designed for use together. They shall be sized as approved for the number of wires as indicated. Runs shall be parallel or at right angles to walls or partitions.
- E. All conduit shall be supported by approved hangers, racks, clamps or clips fastened to expansion inserts or lead anchors. Spacing of supports for conduits and raceways shall be in accordance with the National Electrical Code.
- F. All conduit runs in slab shall be separated as much as possible.

- G. Conduits shall be in full lengths wherever possible. All conduits shall be plugged with approved discs during construction and be dry and clean before pulling wires.
- H. All conduits that are laid underground, in concrete floor slabs and in building walls shall be approved by authorized inspectors before they are covered up in any way. Conduits installed in concrete shall be in accordance with standards of the American Concrete Institute. The size of conduit and locations which can be installed in any slab shall be determined by the Structural Engineer's requirements of the amount of concrete over and under the slab reinforcements, allowing a minimum cover of 1" over surface. Check the Structural and Architectural drawings and specifications before time of bidding, to verify all conditions.
- I. The inside and outside of all steel and flexible conduit, including factory-make elbows, and of all boxes and fittings, including bolts and screws, shall be protected against corrosion by an even coating of zinc.
- J. Where raceways are cut in the field, they shall be square cut using approved cutter. The cut ends shall be reamed to remove burrs and sharp edges. Threads cut on conduit in the field shall have the same effective length and the same thread dimensions and taper as the factory-cut conduit threads.
- K. Raceways shall be joined by means of threaded couplings or unions. Joints shall be set up tight. Runs shall be straight and true. Elbows, offsets and bends shall be uniform and symmetrical.
- L. All raceways shall be cleaned, prior to pulling in wire and cable. This cleaning shall remove all foreign matter, including water, from the raceways. All boxes in which the raceway terminates shall be cleaned of all concrete, mortar or other foreign matter and all threads in boxes shall be left clean and true upon completion of the work.
- M. Wiring above ceiling from junction box to lighting fixtures may be run in flexible metal conduit not exceeding 72" length.
- N. Conduits going through expansion joints of the building shall be equipped with expansion fittings as manufactured by O-Z, or approved equal.
- O. Joints shall be set up tight. Couplings, connectors and fittings shall be approved types designed for the purpose.
- P. Furnish and install separate ground wire in all EMT to ground all equipment and devices.

3.02 LIGHTING FIXTURES:

- A. All joints in fixture wiring shall be made with solderless connections.
- B. Fixture wire shall be in strict compliance with the latest National Electrical Code. No fixture wiring shall be smaller than #16 AWG. Wiring shall be protected with tape or tubing at all points where abrasions are likely to occur. All wiring shall be concealed within fixture construction.

- C. All fixture units, when installed, shall be free from warps, dents, etc. They shall be clean of dirt, smudges and all foreign matter, and shall be left highly polished.
- D. Furnish, install and wire a light fixture at every outlet as indicated on the plans. In the event a fixture type designation is omitted from the drawing, furnish and install the type as designated by the Owner or Engineer.
- E. Lighting fixtures shall not be installed until finished coat of paint has been applied to ceilings and walls and allowed to dry thoroughly.
- F. Upon completion of the installation of the lighting fixtures and lighting equipment, they must be in first-class operating condition and in perfect condition as to finish, etc. At time of final inspection, all fixtures and equipment must be complete with lamps, starters and required glassware or reflectors, which must be clean and free from defects. Any fixtures, reflectors or glassware broken prior to the time of final inspection must be restored without cost to the Owner.
- G. Adjustable lighting fixtures shall be focused and adjusted as directed by the Owner or Engineer.
- H. All Lighting fixtures shall be independently supported apart from general ceiling construction.
- I. Verify all ceiling types and construction before ordering lighting fixtures to confirm that final ceilings approved for installation and lighting fixtures are compatible to each other in all respects.
- J. All fixtures shall be supported from the building structure, independent of hung ceiling.
 - 1. Surface mounted luminaries shall be mounted on backboxes which are securely attached to the building structure with a 12 gauge safety wire.
 - 2. Install recessed 2 x 4 luminaries to permit removal from below. Install grid clips to securely fasten fixture to framing members. Luminaries to be supported at each corner individually from the building structure with a 12 gauge safety wire.
 - 3. Each recessed downlight shall be supported with a 12 gauge safety wire from the building structure and supported on the grid using hanger bars and 'T' bar mounting clips.
 - 4. Contractor to ensure height of all lighting fixtures complies with code required egress height requirements. Contractor to revise fixtures quantity and location as required to comply.

3.03 BRANCH CIRCUITS AND FEEDERS:

- A. Furnish and install all conduits, outlets and wiring for all power, lighting, control, equipment and motor circuits as shown on plans and/or as herein specified. Final connections to all equipment shall be made under this Division unless otherwise specifically noted elsewhere.

- B. The Minimum size of wire for light or power shall be as scheduled below for the entire distance of the circuit. (Circuits to have hot leg, neutral and ground unless otherwise noted). Wire sizes #14 through #10 shall be solid except as otherwise indicated. Wire sizes #8 and larger shall be stranded. All sizes called for in the specifications or on the plans are American Wire Gauge sizes.

1. 120V/208V 1P & 3P 20A Circuits:

LENGTH OF BRANCH CIRCUITS	REQUIRED WIRE SIZE
0 - 80'	#12's
81' - 140'	#10's
141' - 225'	#8's
226' - 360'	#6's

NOTES:

1. Wire sizes indicated shall be for the entire length of the circuit (from the circuit breaker in the panel board to the last device connected to the circuit).
 2. Minimum wire size indicated unless otherwise noted on plans.
 3. All other Branch Circuit, panel and equipment wire sizes shall be calculated to maintain a maximum voltage drop of 3% (from the circuit breaker in the panel to the first device connected to the circuit) as recommended by article 220.19(A) FPN No. 4 of the 2005 National Electrical Code. Voltage drop shall be calculated using thermal resistances derived from table 310.16 from the 75 degree column, using the Neher - McGrath equation and using an ambient temperature rating of 30 degree C (86 degree F) with an amperage based on 80% of the branch over current protection device in the panel schedule.
 4. When running more than 3 current carrying conductors in a conduit or raceway. Contractor to ensure all requirements for derating are met per article 310.15(B)(2) using table 310.15(B)(2)(a) of the 2005 National Electrical Code.
- C. All wire shall be factory color-coded with a separate color for phase, switch and neutral used consistently throughout. The neutral wire of all branch circuits shall be white. Green shall be used for equipment grounding conductors. Feeders shall be phase color coded at all access points.
- D. The installation of wires and cables includes all splicing of the wiring and cables to each other and connecting them to panelboards, receptacles, switches, controls, lighting fixtures, motors and all other electrical apparatus.
- E. Branch circuits shall be arranged to balance the loads on the phases of the panelboard feeders. Where 120 volt, three or four wire circuits are indicated, the circuit shall consist of separate phases and a common neutral. (Circuit numbers shown on drawings are for identification only.) Maximum unbalance shall not exceed 10 percent.
- F. All wires and cables shall be continuous from origin to destination without running splices. At the end of these wires and cables a sufficient slack shall be left as may be required for making proper connections.

- G. Flexible conduit shall be installed at all motor connections to prevent transmission of noise and vibration; 24" maximum length.
- H. Starters and controls shall be rigidly secured and installed plumb and level.
- I. Manually operated devices such as pushbuttons and manual starters shall be provided under this Division and shall be located to permit convenient operation and be readily accessible and shall have pilot light for "ON" operation. Furnish engraved plastic nameplates for each control station.
- J. Disconnect devices shall be provided under this Division of the specifications to comply with all requirements of the National Electrical Code. Disconnects shall be horsepower rated, quick-make, quick-break mechanisms with provisions for locking the operating handle in the open position.
- K. Joints, taps, and splices in wires #8 AWG and larger shall be made by solderless pressure lug. Joints, taps and splices in wires #10 AWG or smaller, shall be made by solderless connectors.
- L. Conduits must be swabbed out and made thoroughly dry before pulling wire and cable.
- M. No grease or other compound which contains acids shall be used in pulling wires and cables.
- N. Where solid conductors are to be connected directly to the devices without the use of lugs, such as occurs at lighting switches and plug receptacles, the wire shall be formed into a loop to fit around the screw.

3.04 WIRING DEVICES:

- A. Where more than one switch is shown at one outlet, they shall be installed under one plate in an order appropriate to the location of the outlet controlled.

3.05 GROUNDING AND BONDING:

- A. All non-current carrying metallic parts of electrical equipment, machines, appliances and conduits shall be securely grounded to a common ground bus and ground shall be connected to the water main, with a copper or brass pipe clamp, on the street side of the water service; jumpers shall be installed by-passing all valves.
- B. All grounding conductors shall be made with as few connections as possible. All connections shall be made with an approved type of solderless connector and shall be protected from mechanical injury.
- C. All contact surfaces shall be thoroughly cleaned before connection is made so as to insure a good metal-to-metal contact. Connections shall be readily accessible for inspection.
- D. The ground and bonding systems shall be in strict accordance with the latest edition of the National Electrical Code.

3.06 OUTLET BOXES:

- A. Outlet boxes and fittings shall be installed at each outlet switch or junction point of conduit.
- B. Boxes shall set plumb and true in building surface and furnished with suitable plaster rings where so required.

3.07 LOCATION OF OUTLETS:

- A. Coordinate work with other trades involved so that exact locations may be obtained for all outlets, apparatus, appliances and wiring. The locations shown on the plans are subject to modifications due to conditions arising as construction progresses, such as swing or doors, layout of furnishings, locations of partitions, etc. Such changes shall be observed and executed as part of this contract. Verify all locations shown in accordance with the General Plans before installing work, correcting such discrepancies as they arise during the installation, without additional cost to the Owner.
- B. Dimensions shall be given by the Architect where same are necessary to suit equipment layouts. Verify the locations of work with all other trades previous to installation, and assign space requirements and locations so that there will be no conflicts in space requirements of each trade. The accompanying plans indicate approximately the layout of the work to be done. Exact locations shall be, in all instances, as designed or as centered on the job from measurements given by the Architect. Installation and location of outlets in equipment rooms shall be made after other locations of piping and equipment have been established to avoid interferences.

3.08 SERVICE:

- A. The service shall be as indicated on the Drawings and shall meet all National and Local Codes and the Utility Company's requirements.
- B. The Utility Company will provide overhead facilities, underground primary cables, main transformers, primary protective and disconnect devices, and current metering transformers, all generally as indicated on the plans. The Electrical Contractor shall provide secondary work from main transformer and ground grid. However, this Contractor shall be responsible for the entire service installation and shall include a \$15,000.00 allowance for the local utility company charges, utilization of such charges shall be as directed by the Architect.
- C. Provide metering sockets, current transformer provisions, all in type and style as approved by the Utility Company and located as shown on the drawings.
- D. Secondary service characteristics shall be 120/208 volt, 3 phase, 4 wire.

3.09 FIRE ALARM SYSTEM:

- A. Furnish and install according to the manufacturer's instructions all wiring, conduit and outlet boxes as required for the erection of a complete system as described herein and shown on the Drawings.

- B. Install all wiring in EMT conduit. The wiring shall meet the requirements of all national, state and local electrical codes. The sizes of the wires shall be a minimum of #12 copper. All wires shall be tagged at all junction points and shall test free from grounds or crosses between conductors.
- C. Make final connections between equipment and the wiring system under direct supervision of a representative of the manufacturer.
- D. Completely wire, connect, and leave the entire system in first class operating condition.
- E. In the presence of the manufacturer's representative, test the system as follows:
 - 1. Manually operate each manual station, fixed temperature type thermodetector and area smoke detector.
 - 2. Open each station/thermodetector circuit and each horn circuit in at least two locations to check for the presence of supervisory circuitry.
- F. One half of the testing shall be made on normal power and one half shall be on standby power.
- G. After the testing is completed, set the system into its normal operating mode.
- H. Guarantee: Guarantee all equipment and wiring free from inherent mechanical and electrical defects for a period of one year from the date of final acceptance, or from the date of commencement of beneficial use, whichever comes first.
- I. Maintenance Agreement: Provide the manufacturer's yearly maintenance and testing agreement effective from the date of final acceptance by the local authority having jurisdiction, or from the date of commencement of beneficial use, whichever comes first. The agreement shall include two inspections during the contract year.

3.10 EMERGENCY CALL-FOR-AID AND INTERCOM SYSTEMS:

- A. Wiring: Furnish and install according to the manufacturer's instructions all wiring, conduit and outlet boxes as required for the erection of a complete system as described herein and shown on the drawings. All wiring shall be in conduit. The wiring shall meet the requirements of all national, state and local electrical codes. All wires shall be tagged at all junction points and shall test free from grounds or crosses between conductors.
 - 1. Make final connections between equipment and the wiring system under direct supervision of a representative of the manufacturer.
 - 2. Completely wire, connect, and leave the entire system in first class operating condition.
- B. Testing: In the presence of the manufacturer's representative, test the system as follows:
 - 1. Manually operate each station, checking to ensure proper operation.

2. After the testing is completed, set the system into its normal operating mode.
- C. Guarantees: All equipment and wiring free from inherent mechanical and electrical defects for a period of one year from the date of final acceptance, or from the date of commencement of beneficial use, whichever comes first.

3.11 PANELBOARDS:

- A. Panels shall be surface or recessed mounted with type, size, and number of branch circuit breakers as shown on Plans. All panelboards shall be aligned leveled and securely fastened to the building as recommended by the manufacturer and in accordance with State seismic requirements. Surface mounted panels shall be mounted at least 1" off the wall on suitable backboard which shall not block the vertical flow of air in back of panel. Flush mounted panels shall be installed to align with finished wall surfaces.
- B. Identify panelboards with laminated plastic name plates with engraved letters. Attach with screws.
- C. Typewritten circuit schedules in panelboard shall identify panelboard and each branch breaker.
- D. All new panels replacing existing panels shall be aligned, leveled and securely fastened to the building. Surface mounted panels shall be mounted at least 1" off the wall on suitable backboard which shall not block the vertical flow of air in back of panel. Flush mounted panels shall be installed to align with finished wall surfaces.

3.12 STANDBY GENERATOR AND TRANSFER SWITCH:

- A. The equipment shall be installed as shown on the plans, and in accordance with the manufacturer's recommendations and all applicable codes.
- B. Complete and submit all state and federal emissions forms and permit applications as may be required.
- C. Site Tests: An installation check, start-up, and building load test shall be performed by the manufacturer's local representative. The Architect, regular operators, and the maintenance staff shall be notified of the time and date of the site test. The tests shall include:
 1. Fuel, lubricating oil, and antifreeze (liquid cooled models) shall be checked for conformity to the manufacturer's recommendations under the environmental conditions present and expected.
 2. Accessories that normally function while the set is standing by shall be checked prior to cranking the engine. This shall include: engine heaters, battery charger, generator strip heaters, remote annunciator, etc.
 3. Start-up under test mode to check for exhaust leaks, path of exhaust gases outside the building, cooling air flow, movement during starting and stopping, vibration during running, normal and emergency line-to-line voltage and phase rotation.

4. Automatic start-up by means of simulated power outage to test remote-automatic starting, transfer of the load, and automatic shutdown. Prior to this test, all transfer switch timers shall be adjusted for proper systems coordination. Engine temperature, oil pressure and battery charge level along with generator voltage, amperes, and frequency shall be monitored throughout the test.

3.13 CABLE TELEVISION:

- A. The Electrical Subcontractor shall furnish and install all interior cables, conduit, miscellaneous hardware and boxes as directed by the local cable company as indicated on the drawings and required for a complete distribution system in accordance with Article 820 of the NEC (Cables shall be purchased from the local cable company).
- B. Coaxial cables shall be run in continuous lengths except for terminations and no splices shall be permitted in any run. Cables shall be installed to avoid sharp bends or physical distortion. All cables shall be tagged at each terminating point to describe function and destination.
- C. Do not run any cable exposed. Provide raceway only where required and called for.
- D. The cable company will furnish and install all exterior cables, splicers and amplifiers, etc. necessary for a complete and operational system.
- E. The Electrical Subcontractor shall be responsible for coordinating installation with local cable company including scheduling.
- F. The Electrical Subcontractor shall include a \$5,000.00 allowance for the cable company charges, utilization of such charges as directed by the Architect.

3.14 TELEPHONE CABLES

- A. The Electrical Subcontractor shall furnish and install all interior cables and boxes as directed by the Telephone Company as indicated on the drawings and required for a complete distribution system in accordance with Article 800 of the N.E.C. Include a \$5,000.00 allowance for the telephone company charges, utilization of such charges shall be as directed by the Architect.
- B. Cables shall be run in continuous lengths except for terminations and no splices shall be permitted in any run. Cables shall be installed to avoid sharp bends or physical distortion. All cables shall be tagged at each terminating point to describe function and destination.

3.15 WIRING FOR EQUIPMENT:

- A. Whether specifically indicated or not, furnish and install all wiring and connect to all equipment and controls as required, and in accordance with the shop drawings and diagrams to be provided by other divisions and other manufacturers.

- B. All roughing work shall be installed in accordance with final dimensioned equipment shop drawings.

END OF SECTION 16100

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ADDENDUM A & CLARIFICATION #1

Issued June 27, 2012

Revised September 13, 2012

Steven's Memorial Senior Housing
Ludlow, MA

F O R O W N E R

Steven's Senior Housing of Ludlow, Inc.
c/o HAP Housing, Inc.

PLEASE BE ADVISED OF THE FOLLOWING:

In addition to previously issued contract documents, plans, project manual & technical specifications, this contractor is hereby required to include the following clarifications, changes, modifications & revisions as stipulated here in as part of the contract work.

ALL WORK SHALL CONFORM TO THE STANDARDS SET FORTH ON THE DRAWINGS AND IN THE PROJECT MANUAL AND TECHNICAL SPECIFICATIONS. INFORMATION SHOWN ON ADDENDA IS IN ADDITION TO OR REVISION OF THE INFORMATION SHOWN ON THE ORIGINAL CONTRACT DOCUMENTS DATED [February 18, 2011 with 'Clarification 1' on April 12, 2011.](#)

CLARIFICATION ONE

Dated: March 25, 2011

For Project: **STEVENS MEMORIAL SENIOR HOUSING**

Following Applies to All Architectural 'A' Drawings:

Where 'General Building Deconstruction' and 'General Notes' occur:

Debris: added the following to this note.

See added requirements of the 'Waste Management Specification', 'Owner's Environmental Report' & 'Asbestos Abatement Technical Specifications'.

Where Note 'D01' Occurs: add the following:

Broken lines indicate approximate locations of existing masonry walls scheduled for removal full height.

Where Note 'D04 Existing Pool' Occurs: Delete the existing note, insert the following:

Remove all existing pool construction, apparatus, piping, fixtures, and ladders, including reinforced concrete walls, to at least 18" below the Lower Level finish floor. Break up and remove the existing pool slab, drains and perimeter basement floor slab. Properly terminate or cap all connections and piping as required by the local electrical and plumbing inspector as well as the related utility services. Once the pool floor slab is removed, provide and install new 'structural fill' as required by the technical specifications. Install fill in no more than 12" lifts, compacting and testing each lift in accordance with the project specifications to assure a minimum of 95% compaction.

Where Note 'D10 Remove and Dispose of Existing Concrete Slabs' Occurs: add the following:

Upon completion of Lower Level slab & sub-base soil removal to the required depth for the proposed new work, the contractor shall advise the Architect & Structural Engineer that the base of the Lower Level columns and any exposed footings are now able to be observed prior to covering with new materials specified here-in.

Where Note '11 Masonry Reconstruction' Occurs: add the following:

Where openings exist in existing air and ventilation shafts (2 large shafts on right hand side of floor plan), this contractor will be required to fill in any openings with new 8" thick masonry in all locations. These shafts will also be completely fire stopped at each floor level and at the roof/ceiling level with 2 hr. non-combustible construction. Where piping or other penetrations are required through these existing shafts, the perimeter of all penetrations will be properly sealed with fire-rated materials, see specifications.

Following Applies to All Architectural 'A' Drawings:**Drawing A1.1.1:** add the following in the Boiler Room #009

The contractor shall provide a minimum of 12" thick fiberglass insulation above the Boiler Room finish ceiling.

Drawing A1.1.1: add the following notes:

Drain Tile: plan view

The contractor shall provide and install 4" perimeter drain tile system, pitched to drain into designated catch basin shown on site plans. Drain Tile system shall be installed in a full bed of washed stone and placed near the bottom of the existing lower level floor slab.

Warranted Waterproofing required for Full Lower Level Exterior foundation walls.

The contractor shall provide and install a new waterproofing membrane system with a full ten year warranty. Provide the Architect and Owner with the system details and warranty provisions for approval, prior to starting the work. Apply waterproofing system to fully exposed foundation walls, cleaned water plugged and properly prepared for the new waterproofing system. Apply the membrane system full vertical height of the foundation wall from 4" below fin. grade to bottom of footing or 6" below fin. Lower Level floor slab.

Drawing A1.1 & A4.1, : add the following notes:**HC Accessible Door Operators:**

The contractor shall provide and install new electric strike 'handicap button operated door strikes on the following doors

Door: 015b: mount to exterior masonry wall as directed. Button operates entry door at all time

Door: 015a: mount to interior wall as directed, button operates with tenant key operation only.

Drawing A1.2: add the following notes to unit 108 Bedroom:

Exterior Doors: - The contractor shall permanently secure the existing exterior door after stripping, repairing and refinishing the doors. Provide and install new insulated stud partition with exterior plywood painted black behind the secured doors.

Drawing A1.2: add the following notes**New Floor Framing Require:**

The contractor shall provide all labor, materials and equipment to frame in areas where existing stairs are to be removed. Provide and install new 2 x 12's at 16" o.c. with min 3/4" plywood subflooring - see demolition plans.

New Chain and Sign Require @ Existing Stair @ Unit 108 Location:

The contractor shall provide a galv. metal chain and hardware with a hanging sign to restrict access to the abandoned ext. stair. Letter the sign in accordance with Owner requirements.

HVAC Vents to Exterior: (2 large shafts on right hand side of floor plan)

The contractor shall provide all labor, materials and equipment to install required HVAC vents and intakes from Lower level to Roof Chimney Location. Fire stop at each floor, seal all floor and wall penetrations. Provide all masonry work, lintels etc. for a complete installation include all galv. painted ext. vents and screens.

Typical All H.C. Bathroom: add the following:

The contractor shall provide a floor drain next to the walk-in shower unit as directed by the architect complete with flush drain cover and trap primer. Required in three locations on Lower, Second & Third Levels.

Drawing A1.3, Laundry Room #211: add the following:

The contractor shall provide two floor drains as directed by the architect/engineer complete with flush drain covers, cleanouts and trap primers. Required in this Laundry Rm. on the Second Level.

Drawing A1.4, Laundry Room Exhaust Duct to Roof: add the following:

The contractor shall provide an 8" wall to allow for the incorporation of the Laundry Rm. dryer vent ducts passage to the attic space as directed by the architect/engineer. Provide partitions that comply with fire code and seismic requirements. see sheet A-1.3

Typical Existing Masonry Fireplace Locations: add the following:

The contractor shall provide a solid steel plate fireplace enclosure for each existing fireplace opening in the structure. Each steel plate shall be painted black and secured to the existing masonry with galvanized anchors.

Typical All Windows Locations: add the following clarification:

The contractor shall return the finished drywall and furring with insulation at each masonry opening for each window, this includes all window heads, sills and jambs. Note solid surface materials required for all window sills, see drawings.

At Door 110b Location: add the following:

The contractor shall refinish and remount the existing exterior stair metal handrails to comply with Code requirements. Secure to concrete and masonry as required by Architect.

Drawings A1.2.1, A1.3.1, & A1.4.1. : add the following notes to all 'Legend':**New Icynene & Fiberglass Insulation:**

The contractor shall place full stud thickness insulation in between wood framing members, above ceiling for full and complete exterior wall thermal coverage.

Drawing A1.1, A1.2 & A1.3 : add the following note:**Recessed Fire Extinguisher And Cabinet :**

The contractor shall provide all labor, materials and equipment to install required recessed fire extinguisher and cabinet in locations marked 'FP'. Note min. of two required in each main corridor.

Stair Standpipe System :

The contractor shall provide all labor, materials and equipment to install required fire standpipe system In stair landing locations, see mechanical drawings.

Drawing A1.5 Add Note 16: add the following note:**Interior Attic Ventilation Louvers :**

The contractor shall provide all labor, materials and equipment to install required new masonry opening of 48" sq. in the (2) two interior faces of the existing masonry chimneys facing the main attic areas. Provide one dampered aluminum louver with bird screening, capable of being totally shut in cold weather by manual operation. Also Provide one 3 ½" x 3 ½" x 60" long galv. steel angle for each 4" of masonry to be supported. Install new aluminum attic vent complete with bird screen, secure to existing masonry for attic ventilation, req'd on both masonry chimneys.

Drawing A1.6 Add Note 17: add the following note:**Exterior Attic Ventilation Louvers :**

The contractor shall provide all labor, materials and equipment to install two required new masonry openings of 48" sq. in the (2) two exterior faces of the masonry chimneys facing the main attic areas. Provide one 3 ½" x 3 ½" x 60" long galv. steel angle for each 4" of masonry to be supported. Install new aluminum 'storm-proof' attic vent complete with bird screen, secure to existing masonry for attic ventilation, req'd on both masonry chimneys.

Drawing A1.6 Add Note 18: add the following note:**Exterior Attic Ventilation Louvers :**

The contractor shall also provide all labor, materials and equipment to install required for new aluminum

24" long x 30" deep 'custom low profile' roof ventilators located as directed by the architect in the field. Cut out roof decking, provide new framing and blocking to allow the installation of 13 new roof ventilators. Paint to match roof shingle color.

Drawing A2.2 Add Note 20: add the following note:

Exterior Side and Rear Entry Awning Construction :

The contractor shall also provide all labor, materials and equipment to install required for new roof construction as follows:. Secure new aluminum pipe (truss type) framing to the exterior masonry wall using galv. thru bolts with washers x length as required. Attach and secure to new pipe framing the new fire retardant awning materials as selected by the Owner. Note each awning shall have 6" high lettering indicating the name of the senior housing complex.

Drawing A2.2 Add Note 21: add the following note:

Exterior Side and Rear Entry Railings:

The contractor shall also provide all labor, materials and equipment to install required for new galvanized painted pipe railing along new walkway as shown on the elevations. Secure and set vertical support at least 6" into new concrete walk construction and seal tight with poured 2 part epoxy sealant in all voids.

Drawing A3.1 Add Note 22: add the following note:

Perimeter Drain Tile and Foundation Waterproofing Membrane System (section view):

The contractor shall provide and install 4" perimeter drain tile system, pitched to drain into designated catch basin shown on site plans. Drain Tile system shall be installed in a full bed of washed stone and placed near the bottom of the existing lower level floor slab. Warranties Waterproofing required for Full Lower Level Exterior foundation walls. The contractor shall provide and install a new waterproofing membrane system with a full ten year warranty. Provide the Architect and Owner with the system details and warranty provisions for approval, prior to starting the work. Apply waterproofing system to fully exposed foundation walls, cleaned water plugged and properly prepared for the new waterproofing system. Apply the membrane system full vertical height of the foundation wall from 4" below fin. grade to bottom of footing or 6" below fin. Lower Level floor slab.

Following Applies to All Plumbing & Fire Protection 'PFP' Drawings:

Drawings PFP1.01, PFP1.03, PFP1.04, Typical All H.C. Bathroom: add the following:

The contractor shall provide a floor drain next to the walk-in shower unit as directed by the architect complete with flush drain cover and trap primer. Required in three locations on Lower, Second & Third Levels.

Drawing PFP1.03, Laundry Room #211: add the following:

The contractor shall provide two floor drains as directed by the architect/engineer complete with flush drain covers, cleanouts and trap primers. Required in this Laundry Rm. on the Second Level.

Following Applies to All Electrical 'E' Drawings:

Drawings E1.02: add the following:

The contractor shall provide and install two additional exterior type 'J2' lighting fixtures at the exit door located at stair two #111.

Drawings E2.01: add the following:

The contractor shall provide and install electrical required for exterior HC door operator at the entry and keyed HC operator for the vest door.

ATTACHMENTS:

1. Sketch SKA01 (dated 06-04-12).
2. Sketch SKA02 (dated 06-04-12).
3. Sketch SKA03 (dated 06-04-12).
4. Existing & Proposed Anthropometric Section (dated 05-23-12).

1.) REDUCTION OF ALLOWANCES:

Allowance Carried During Bidding:	Allowance Reduced To:	Savings:
Domestic Water Service \$ 5,000.00	\$ 0,000.00	\$ 5,000.00
Fire Water Service \$ 5,000.00	\$ 0,000.00	\$ 5,000.00
CATV Service \$ 10,000.00	\$ 0,000.00	\$ 10,000.00
Telephone Service \$ 10,000.00	\$ 0,000.00	\$ 10,000.00
Electrical Service \$ 100,000.00	\$ 0,000.00	\$ 100,000.00
Gas Service \$ 20,000.00	\$ 0,000.00	\$ 20,000.00
Landscaping \$ 10,000.00	\$ 0,000.00	\$ 10,000.00
Total Savings		\$ 160,000.00

In the event that the utility connection fee is more than the value carried under the reduced allowance figure, a change order for the difference will be processed, source of funds – project contingency.

2.) VALUE ENGINEERING ITEMS:

NO.	ITEM	CREDIT
01	Reduction of Allowances – see chart above	\$ 160,000.00
02	Delete sound attenuation panels at generator enclosure	
03	Retain existing concrete walk at front (Chestnut St.) of Building	
04	Retain existing retaining wall and sidewalk at side entry. Install new guard rail.	
05	Install new aluminum or insulated metal doors with no transom panels in lieu of the reuse/repair of the Historic Front Entry Doors.	
06	Reduce linear footage of triple pipe snow rails at roof edge. Snow rails will only be required above new entry door locations. Locate snow rails on roof.	
07	Delete exterior surface cleaning.	
08	Install alternate window type in lieu of the Historic profile aluminum windows. (excluding vinyl windows) = Pella Fiberglass	
09	Install poplar window sills in lieu of the solid surface specified.	
10	Install blown-in cellulose insulation in furred out exterior walls (full thickness) and in attic in lieu of the Icynene spray foam specified.	
11	Install fiberglass batts in lieu of the cellulose indicated in Item 10.	
12	Install baked enamel finish on the elevator doors and frames in lieu of the stainless steel specified.	
13	Install hollow core six panel masonite doors in lieu of the solid core doors specified.	
14	Delete the installation of brass kick plates on all interior doors.	
15	Install residential grade hardware in lieu of the AL grade specified.	
16	Delete plastic corner guards.	
17	Delete Unit Entry shelving.	
18	Delete Unit Entry windows.	
19	Delete ceiling soffits at Unit Entries. Extend acoustical tile ceilings into Unit entry recesses.	
20	Install carpet or vinyl base in lieu of wood base specified.	
21	Delete Community Room built-in entertainment center.	
22	Delete wood handrails on one side of Corridors.	
23	Install VCT over new underlayment in lieu of repairing and refinishing existing hardwood floors.	
24	Install new suspended gypsum wallboard and acoustical panel ceilings on third floor in lieu of repairing and refinishing the existing wood ceilings. Same layout as the second floor.	
25	Install VCT in lieu of the MCT specified.	
26	Install alternate manufacture for boilers and A/C units.	
27	Heating and domestic hot water system to be an integrated system utilizing high efficiency gas fired boilers and domestic water storage tanks. (In lieu of hot water heaters)	

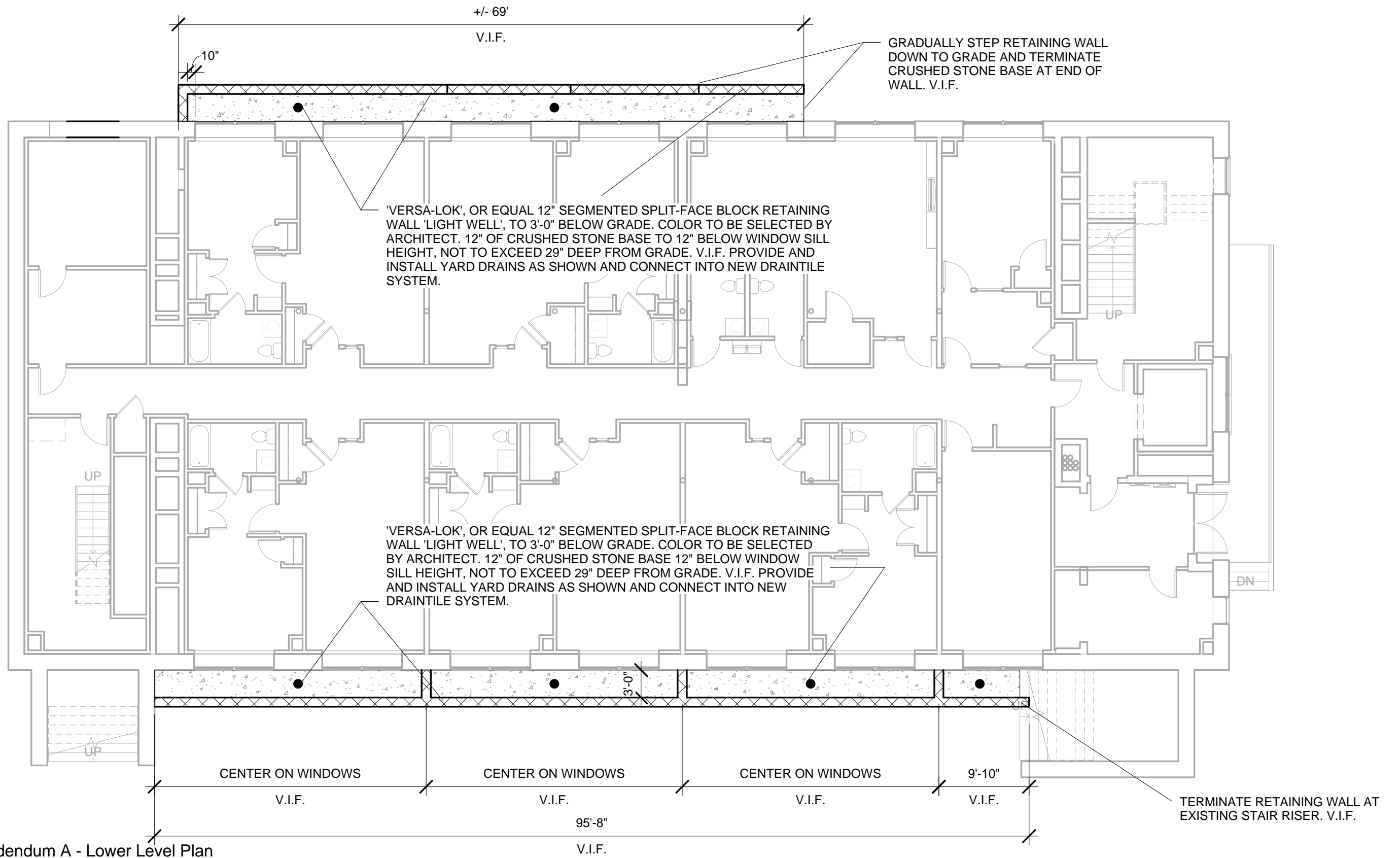
28	Submit alternate Plumbing Fixture Package.	
29	Install CPVC water piping in lieu of copper.	
30	Submit alternate Light Fixture Package.	
	TOTAL VALUE ENGINEERING SAVINGS	

Note: Items regarding substitution of specified fixtures or equipment, it is understood that the quality of the revised fixtures or equipment will be equal to that which is specified. The General Contractor will provide submittals to the engineer for approval.

3.) ALTERNATE ITEMS:

- A. Lower Level Window Sill Heights – The contractor is required to provide all materials and equipment required to lower (11) Eleven Existing Granite sills 12” and provide and install new segmented block window well at both front and rear elevation as indicated on Sketches SKA01, SKA02 & SKA03. Provide & Install new sill flashing and sloped concrete sill where reuse of existing modified granite sills cannot be reused. Window manufacturer to verify new masonry openings.

END OF ADDENDUM



1 Addendum A - Lower Level Plan
3/32" = 1'-0"

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Stevens Memorial Senior Housing

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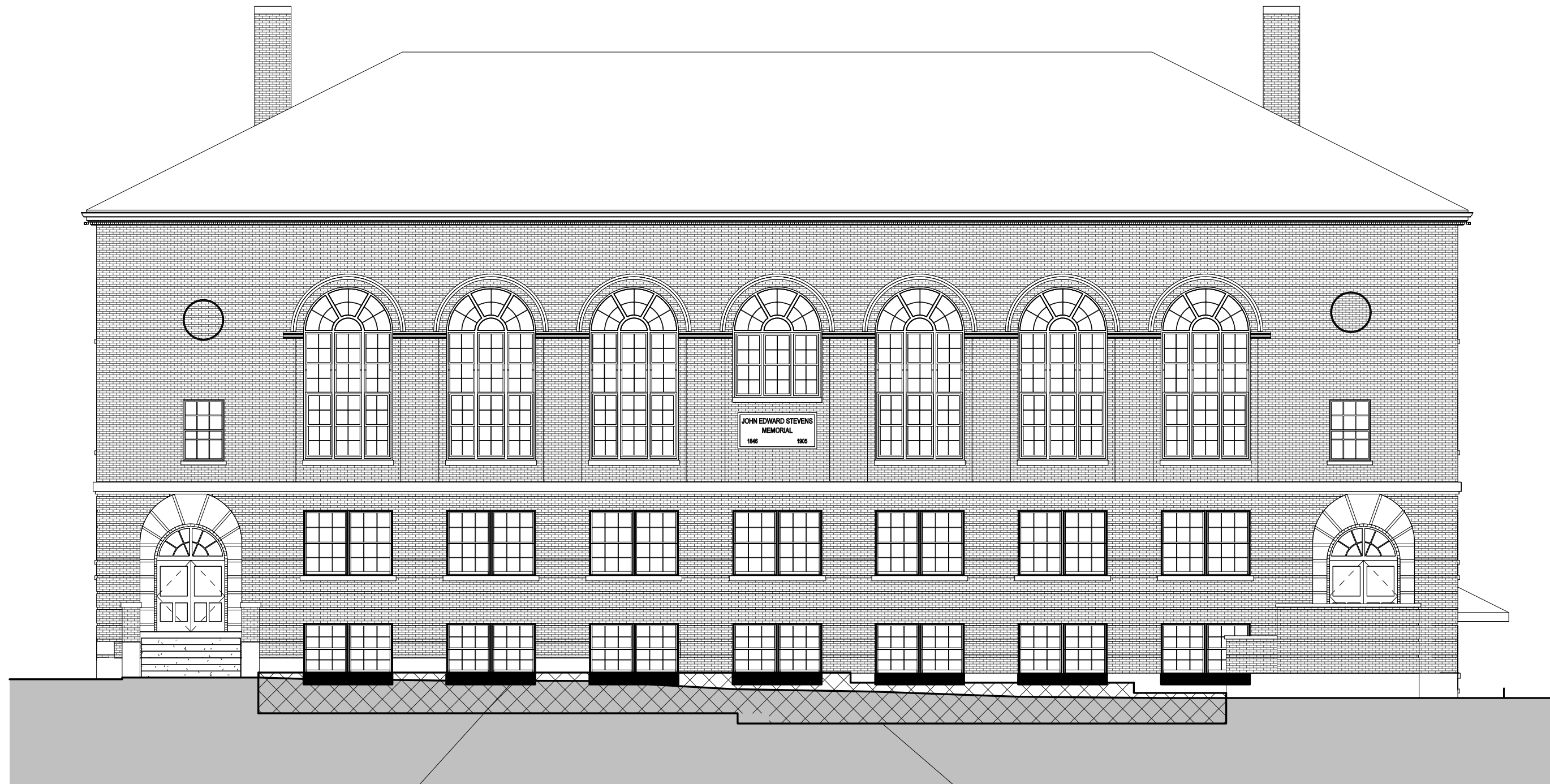
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Addendum A - Lower Level Plan

Project number	2009-1017
Date	June 04, 2012
Drawn by	Author
Checked by	Checker

SKA01

Scale 3/32" = 1'-0"



INDICATES EXISTING GRANITE SILLS TO BE CAREFULLY REMOVED, SAWN TO LOWER SILL 1'-0" AND RE-INSTALLED INTO MASONRY WALL. TOOTH OUT INTERIOR BLOCK AND FORM A CONCRETE INTERIOR SILL AT SAME LEVEL. V.I.F.

'VERSA-LOK', OR EQUAL 12" SEGMENTED SPLIT-FACE BLOCK RETAINING WALL 'LIGHT WELL', TO 3'-0" BELOW GRADE. COLOR TO BE SELECTED BY ARCHITECT. 12" OF CRUSHED STONE BASE 12" BELOW WINDOW SILL HEIGHT, NOT TO EXCEED 29" DEEP FROM GRADE. V.I.F. PROVIDE AND INSTALL YARD DRAINS AS SHOWN AND CONNECT INTO NEW DRAINTILE SYSTEM.

1 Addendum A - West Elevation
3/32" = 1'-0"

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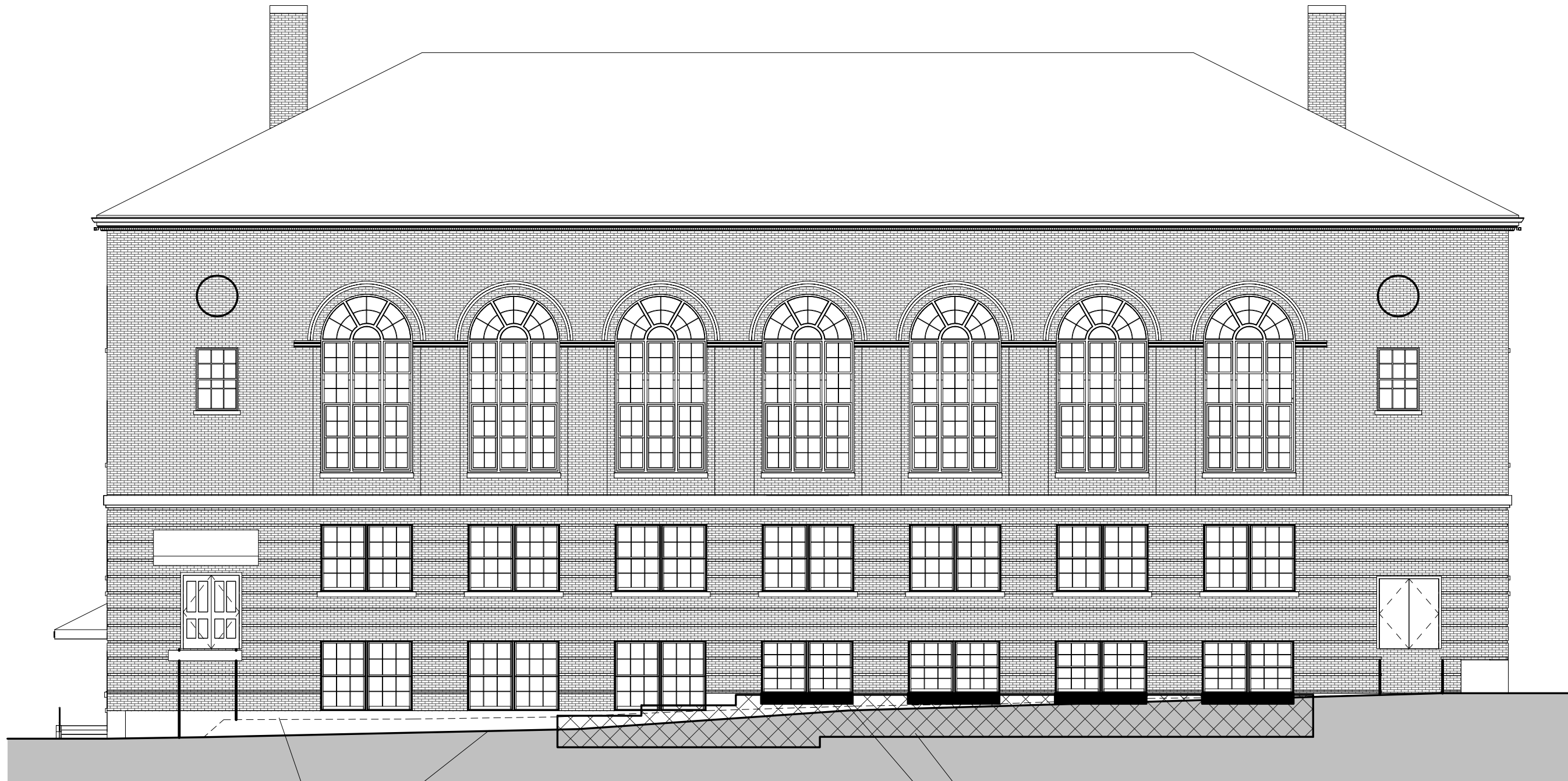
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Addendum A - West Elevation

Project number	2009-1017
Date	June 04, 2012
Drawn by	Author
Checked by	Checker

SKA02

Scale 3/32" = 1'-0"



INDICATES EXISTING GRADE LINE

INDICATES PROPOSED GRADE LINE

INDICATES EXISTING GRANITE SILLS TO BE CAREFULLY REMOVED, SAWN TO LOWER SILL 1'-0" AND RE-INSTALLED INTO MASONRY WALL. TOOTH OUT INTERIOR BLOCK AND FORM A CONCRETE INTERIOR SILL AT SAME LEVEL. V.I.F.

'VERSA-LOK', OR EQUAL 12" SEGMENTED SPLIT-FACE BLOCK RETAINING WALL 'LIGHT WELL', TO 3'-0" BELOW GRADE. COLOR TO BE SELECTED BY ARCHITECT. 12" OF CRUSHED STONE BASE 12" BELOW WINDOW SILL HEIGHT, NOT TO EXCEED 29" DEEP FROM GRADE. V.I.F. PROVIDE AND INSTALL YARD DRAINS AS SHOWN AND CONNECT INTO NEW DRAINTILE SYSTEM.

① Addendum A - East Elevation
3/32" = 1'-0"

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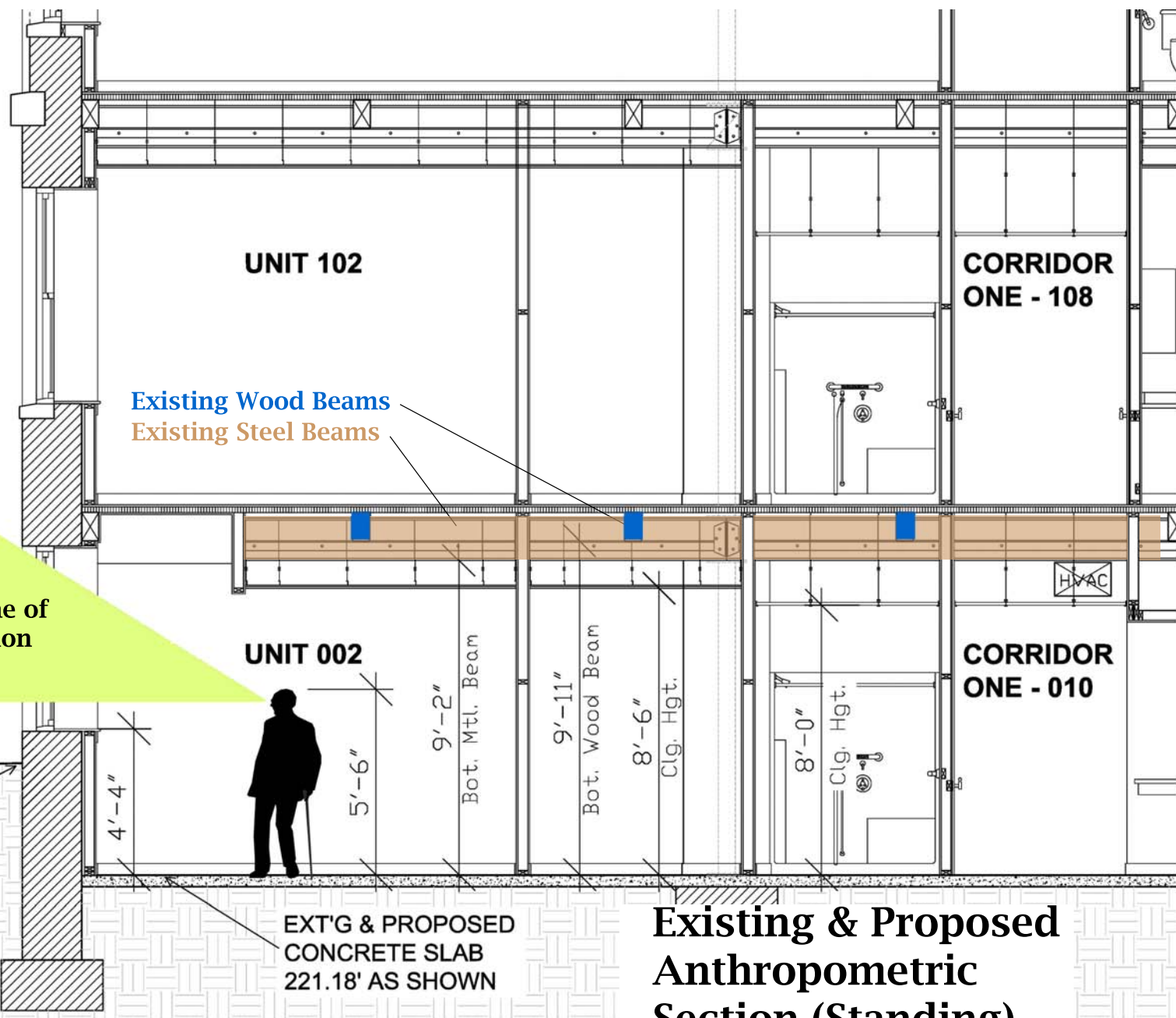
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Addendum A - East Elevation

Project number	2009-1017
Date	June 04, 2012
Drawn by	Author
Checked by	Checker

SKA03

Scale 3/32" = 1'-0"



EXT'G & PROPOSED GRADE VARIES 224.50' AS SHOWN

EXT'G & PROPOSED CONCRETE SLAB 221.18' AS SHOWN

Existing & Proposed Anthropometric Section (Standing)

Revised 05-23-12

BOT. FTNG V.I.F.