SPECIFICATIONS
for

ISLAMIC CENTER EXPANSION - PHASE 1

745 Heim Road
Getzville, New York 14226

APRIL 12, 2019
ARCH. JOB #: 218024

MUSSACHIO ARCHITECTS

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PART I - GENERAL

1.01 INVITATION TO BID

Sealed Bids are requested by the Owner, The Islamic Society of Niagara Frontier, for the Contract defined and listed in Division 1 - General Requirements, Section 01010, 1.02 Contracts and accompanying Construction Documents.

The Owner may consider as informal, and MAY REJECT any bid not prepared and submitted in accordance with the provisions hereof.

Bids will be received at the office of The Islamic Society of Niagara Frontier, 745 Heim Road, Getzville, New York 14068, Attn: Mr. Shahid Ahmad with one of the required copies sent to Mussachio Architects, 30 North Forest Road, Williamsville, New York 14221 on **Monday, April 29, 2019** until **4:00 p.m.**, at which time they will be privately opened. Proposals received after the time and date specified will not be considered. Bid Forms and Breakdowns may be mailed via US Mail or e-mailed to anthony@mussachioarchitects.com and sahmad@buffalo.edu or faxed to (716) 631-0521 Attn: Anthony C. Mussachio, RA. Sender is fully responsible for delivery of Bid to Architect and Owner. Architect and Owner accepts no responsibility for non delivery due to failure of equipment, telephone lines, the internet or technological traffic problems. If Bid is not hand delivered, Bidder must telephone to confirm receipt of Bid prior to due date and time or risk exclusion from the bid process.

Any bid may be withdrawn prior to the above scheduled time for the opening of bids or authorized postponement thereof. No bidder may withdraw his bid within 30 days after the actual date of opening bids thereof.

The Owner reserves the right to waive any informalities in, and to reject, any or all bids.

The Owner, Islamic Society of Niagara Frontier is an exempt organization under the Tax Law and is exempt from payment of sales and compensating use taxes of the State of New York and cities and counties of the State of all materials which are to be incorporated into the project, pursuant to the provisions of the contract. These taxes are **not to be** included in the bid.

1.02 DOCUMENTS

Bona fide bidders may obtain hard copies of Drawings and Specifications from Mussachio Architects, P.C., 30 North Forest Road, Williamsville, New York 14221, (716) 631-9949 on or after Friday, February 15, 2019. A refundable deposit of $200.00 (shipping not included) is required for hard copies. Electronic copies of Drawings and Specifications are also available. They may be purchased for a non refundable fee of $25.00. Make checks payable to Mussachio Architects, P.C. Those who submit bids may obtain refund of deposits (for hard copies of documents only) by returning sets in good condition, that is, any markings placed on the drawings by the bidders must be removed before returning to Architect no more than ten (10) days after Proposals have been opened. Those who do not submit bids will forfeit deposits unless sets are returned in good condition at least five (5) days before Proposals are opened.

1.03 PRE-BID MEETING

A formal pre-bid meeting will not be held. Should a bidder want access to the building you may contact Mr. Shahid Ahmad at sahmad@buffalo.edu or via phone at (716) 909-6417.

1.04 PRE-BID INQUIRIES AND REQUESTS FOR INFORMATION

It is necessary to provide a level playing field for all parties bidding the work of the Project. To allow issuance of responses to all Bidders, formal questions must be received at the office of Mussachio Architects, P.C., 30 North Forest Road, Williamsville, New York 14221, (716) 631-9949 T, (716) 631-0521F no later than 48 hours prior to the bid submission deadline stated in paragraph 1.01 Invitation to Bid. Questions posed after this time may not be answered.

1.05 BID FORM

The Contractor MUST submit his bid on form included herein (photocopies of form are acceptable) along with the Section 00 41 16 BID BREAKDOWN. Three hard copies or one .PDF format file of Bid Documents must be submitted. Bid forms are to be properly signed and enclosed in opaque envelopes, sealed and marked with the name of the project and work bid on, and Bidders name and address. All blanks are to be appropriately filled in.

1.06 BID SECURITY

Each bid must be accompanied by a Certified Check of the bidder or by a Bid Bond, A.I.A. Document No. A-310, current edition, duly executed by the bidder as principal, and having as surety thereon a surety company approved by the Owner, in an amount not less than five percent (5%) of the amount of the base bid. Certified checks will be returned to all except the two lowest formal bidders within three days after the formal opening of bids. Remaining checks will be returned to the two lowest bidders within 48 hours after the Owner and the accepted bidder have executed a contract, or if no contract has been so executed, within 45 days after the date of the opening of bids, upon demand of the bidder at any time thereafter, so long as he has not been notified of the acceptance of his bid. The certified check or Bid Bond mentioned above, shall be made payable to: Islamic Center of Niagara Frontier. Bid Bonds will be returned only if requested by the Bidder.

1.07 LIQUIDATED DAMAGES

A. Bid - The successful bidder, upon his failure or refusal to execute and deliver the contract and bond required, within five (5) days after he has received notice of the acceptance of his (her) bid, shall forfeit to the Owner, as liquidated damages for such failure or refusal, the security deposited, with the bid.

B. Construction - The Owner anticipates inclusion of a Penalty clause in the Contractor's Agreement to enforce scheduled completion date.

1.08 SECURITY FOR FAITHFUL PERFORMANCE AND LABOR AND MATERIAL PAYMENT BOND

A. Performance and Labor and Materiall Payment Bond will not be required or applicable to this Project.

1.09 TIME FOR COMPLETION

Time is of the essence of the contract inasmuch as the Owner has need of the building and the site substantially completed and finished, free from debris, material, equipment, etc. Indicate on Bid Form time of completion as submitted by Contractor.

In the blank space provided on the Bid Form, state the number of consecutive calendar days required for the completion of the project (including Saturdays, Sundays, and Holidays). The project may be awarded on the basis of the lowest bid and/or shortest completion date. See paragraph 1.07 Liquidated Damages.

1.10 PROJECT MILESTONES

A.	April 24	- Issuance of Owner filed for Building Permit.
B.	June 12, 2019	- Construction begins
C.	August 15, 2019	- All work on 2nd floor of School Building must be complete for the start of School.
D.	November 15, 2019	- Substantial Completion of Project.

1.11 CONDITIONS OF WORK

Each bidder must inform himself fully of the conditions relating to the construction and labor under which the work is now or will be performed; failure to do so will not relieve a successful bidder of his obligation to furnish all material and labor necessary to carry out the provisions of the contract documents and to complete the contemplated work for the consideration set forth in his bid.

1.12 QUALIFICATION OF BIDDERS

In determining the qualifications of a bidder, the Owner will consider his record on the performance of any contracts for construction work into which he may have entered with the Owner or with public bodies; and the Owner expressly reserves the right to reject the bid of such bidder if such record discloses that such bidder, in the opinion of the Owner, has not properly performed such contracts or has habitually and without just cause, neglected the payment of bills or has otherwise disregarded his obligations to subcontractors, material-men or employees, or who has delayed in the execution of his part of the work. The Owner may make such investigation as he deems necessary to determine the ability of the bidder to perform the work, and the bidder shall furnish to the Owner all such information and data for this purpose as the Owner may request. The Owner reserves the right to reject any bid if the evidence submitted by or investigation of such bidder shall fail to satisfy the Owner that such bidder is qualified to carry out the obligations of the Contract and to complete the work contemplated herein, conditional bids will not be accepted.

Each bidder agrees to waive any claim it has or may have against the Owner, the Architect/Engineer, and the respective employees, arising out of or in connection with the administration, evaluation, or recommendation of any bid.

1.13 ADDENDA AND INTERPRETATIONS

No interpretations of the meaning of the plans, specifications, or other contract documents will be made to any bidder orally. Every request for such interpretation should be in writing addressed to Mussachio Architects P.C., 30 North Forest Road, Williamsville, New York 14221, and to be given consideration must be received at least five (5) days prior to the date fixed for the opening of bids, and all such interpretations and any supplemental instruction will be in the form of written addenda to the specification, which, if issued, will be mailed to all prospective bidders (at the respective addresses furnished for that purpose) not later than three (3) days prior to the date fixed for the opening of bids. Failure of any bidder to receive any such addendum or interpretation, shall not relieve any bidder from obligation under his bid submitted. All addenda will be numbered and dated, and a list of such addenda may be obtained by contacting the Architect's office. No article, paragraph, or sentence of the Specifications or drawings is omitted, unless expressly so stated in the Addenda or Amendments. It is the contractor’s responsibility to bring any conflict between drawings and, or written notes and specification to the Architect immediately. If not brought to the attention of the Architect in writing it will be assumed that the more expensive of the items is being provided.

1.14 CONTRACT FORM

The Standard Form of Agreement between Owner and Contractor AIA, Document A-101 latest Edition will be submitted by Owner to the successful bidder for proper signatures.

1.15 OBLIGATION OF BIDDER

At the time of the opening of bids, each bidder will be presumed to have inspected the site and to have read and to be thoroughly familiar with the Plans and Contract Documents (including all addenda). The failure or omission of any bidder to receive or examine any form, instrument or document shall in no way relieve any bidder from any obligation in respect of his bid.

1.16 SUBSTITUTION OF MATERIALS

"EQUIVALENTS: Where, in these specifications, one certain kind, type, brand or manufacture of material is named, it shall be regarded as the required standard of quality. Where two or more are named, these are presumed to be equal, and the Contractor may select one of those items. If the Contractor desires to use any kind, type, brand or manufacture of material other than those named in the specifications, he shall indicate on the Substitution Sheet what material, equipment, or method is offered as equal and when requested, submit information describing wherein it differs from base specifications in specific detail and other information as required by the Owner."

The acceptable standard of quality of all equivalent items shall be determined by the Architect with the burden of proof of the equivalency of such items a responsibility of the bidders, and to be submitted through the prime bidder's office, and shall be acceptable to the prime bidder.

1.17 REIMBURSEMENT OF ARCHITECT'S COSTS

In the event substitutions are proposed to the Architect, the Architect will record all time used by him and by his consultant in evaluation of each such proposed substitution. Whether or not the Architect approved a proposed substitution, the Contractor shall, upon receipt of the Architect's billing, promptly reimburse the Architect at the rate of two and one-half times the direct cost of the Architect and his consultants for all time spent by them in the evaluation of the proposed substitution.

1.18 MATERIAL/EQUIPMENT AVAILABILITY REPORT

Instructions: After the Owner and Architect have determined the successful bidder, he will be notified by phone, then in writing. Within 48 hours after notification the successful bidder shall complete a Material/Equipment Availability Report and deliver it to the Architect's office. No mailing accepted. Time is of the essence.

A. This form is to assist the Architect in producing the progress schedule for the project. All items must be filled in, no blank spaces allowed. Fill in "N.A." (non applicable) if item cannot be filled in. This form will be given to all successful Contractors after determining the successful bidder. It will be his responsibility to xerox and distribute this blank form to his subcontractors for processing and resubmitting it back to the Contractor. The Contractor will evaluate it and sign it.

This form will make it possible to commence with the contract, coordinate all trades based on lead times, and terminate the contract on schedule. It is imperative these forms be forwarded to the Construction Manager and/or Architect 48 hours after the Contractor is selected and notified.

B. Required Information: Supplier/Subcontractors Name
Shop Drawing Submittal Date
Material Delivery/Start Date
Completion Date

Note that immediate shop drawings are required and must be submitted as indicated on progress form which will be filled in by the successful Contractor. The Architect will determine if submitted date is appropriate or whether date shall be moved forward. This will be determined by the Architect and when required, the Contractor(s).

C. Contractors and their subcontractors shall not select manufacturers, vendors, suppliers, who cannot perform or deliver supplies, equipment, etc., which will allow the contract to be terminated as indicated on the Bid Form. Contractor shall also confirm his subcontractor will supply required amounts of manpower to perform concurrent operations.

1.19 LIST OF PROPOSED SUBCONTRACTORS

The Bidders, if requested, shall submit a complete list of subcontractors he proposes to use not later than 48 hours after receipt of Proposals. Subcontractor list shall be delivered to the Architect.

Execution of the contract by the Owner without objection to any name on said list shall constitute an acceptance of the same. Should the Owner request that a different subcontractor be proposed for any phase of the work, the Bidder shall comply with such requests until a subcontractor acceptable to the Owner is proposed. No subcontractor approved by the Owner may be replaced unless replacement is approved by the Owner.

1.20 ITEMS PROVIDED BY OWNER AND CONTRACT

See Section 01 11 13 - Summary of Work

- - - END OF SECTION - - -

ALL BIDDERS NOTE: Three signed copies of this bid form must be submitted formally to the Owner listed below. However, follow mailing instruction outlined in Section 00 21 13 INSTRUCTION TO BIDDERS.

TO: Islamic Society of Niagara Frontier
745 Heim Road
Getzville, New York 14068

Attn: Mr. Shahid Ahmad

with one of the required copies to

Mussachio Architects, PC
30 North Forest Rd.
Williamsville, NY 14221

Attn: Mr. Anthony C. Mussachio, R.A.

Pursuant to and in compliance with the Advertisement for Bids and/or the Instructions to Bidders, relating hereto, the undersigned hereby offers to furnish all, labor, materials, supplies, equipment, and other facilities and items necessary and proper for, or incidental to, the Work as required by the plans and specifications as prepared by Mussachio Architects, P.C., and all the following addenda issued by the Architect and faxed and/or mailed to the Undersigned prior to the opening of bids.

The bidder hereby acknowledges receipt of the following addenda:

Addendum No. _____ Dated _____

Addendum No. _____ Dated _____

Addendum No. _____ Dated _____

Base Bid (tax and fees are to be included): _____ ($).

Contractor Firm Name: _____

Preparer's Name (printed): _____

Preparer's Phone No. & Email _____

_____

Date Prepared _____

BID BREAKDOWN:

Your bid, as submitted on this Bid Form, must also be accompanied by the Bid Breakdown; Section 00 41 16 of this Specification Manual.

SUBSTANTIAL COMPLETIONS: The work proposed under this contract will be substantially completed in _____ consecutive calendar days (consecutive calendar days include Saturdays, Sundays, and Holidays) or _____ consecutive calendar weeks, from the date authorization to proceed is granted.

ALTERNATES:

	Description	Add or Deduct
I.	_____	$ _____
2.	_____	$ _____
3.	_____	$ _____
4.	_____	$ _____
5.	_____	$ _____
6.	_____	$ _____

SUBSTITUTIONS:

The following spaces have been allotted for manufacturers' products that are considered equal to the material specified and the Addition or Deduction from the Base Bid. Please note, the Base Bid will contain cost of items written on the Specifications and delineated on Construction Documents including but not limited to drawings, sketches, reports, etc. The substitution items and price quotations listed below may or may not be accepted by the Owner.

Item	Manufacturer	Add/Deduct
I. _____	_____	$_____
2. _____	_____	$_____
3. _____	_____	$_____
4. _____	_____	$_____
5. _____	_____	$_____

UNIT PRICES:

The undersigned proposes unit prices as follows for use in determining cost of work added to or deducted from the Base Contract. Said unit prices shall include all charges for installation, supervision, taxes, insurance and profit. See SECTION 00 43 22 - UNIT PRICES for descriptions.

A.	Excavation - Mass:	$_____
B.	Excavation - Pit and Trench:	$_____
C.	Excavation - Hand:	$_____
D.	Rock Removal:	$_____
E.	Compacted Fill Ordinary:	$_____
F.	Compacted Fill - Select:	$_____
G.	Compacted Fill - Stone:	$_____
H.	Soil Separator:	$_____
I.	Concrete Foundation:	$_____
J.	Concrete Flatwork:	$_____
K.	Concrete Waterproofing:	$_____
L.	Reinforcing Steel:	$_____
M.	Painting:	$_____
N.	Wood Fence:	$_____

If written notice of the acceptance of this Bid is mailed or delivered to the undersigned within thirty (30) days after the opening of Bids, or any time thereafter before this Bid is withdrawn, the undersigned will, within five (5) days after the date of such mailing or delivering of such notice, execute and deliver a Contract in the Standard Form of Agreement of the American Institute of Architects.

By submission of this bid, each Bidder and each person signing on behalf of any Bidder, and in the case of a joint bid each party thereto certifies as to its own organization, under penalty of perjury, that to the best of his knowledge and belief:

(1) The prices in this Bid have been arrived at independently without collusion, consultation, communication or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other Bidder or with a competitor;

(2) Unless otherwise required by law, the prices which have been quoted in this Bid have not been knowingly disclosed by the Bidder, and will not be knowingly disclosed by the Bidder prior to opening, directly or indirectly, to any other Bidder or to any competitor.

(3) No attempt has been made or will be made by the Bidder to induce any person, partnership or corporation to submit or not to submit a Bid for the purpose of restricting competition.

This bid may be withdrawn at any time prior to the scheduled time for the opening of bids or any authorized postponement thereof.

FIRM _____

BY *(signature)* _____

PRINT NAME _____

TITLE _____

ADDRESS _____

_____ _____

(Corporation Seal if Applicable)

If a corporation, give the State of Incorporation using the phrase, "A corporation organized under the laws of the State of New York".

If the partnership, give names of partners, using also the phrase, "Co-partners trading and doing business under the firm name and style of _____.

If an individual, give the individual's name, using also the phrase "An individual doing business under the firm name and style of _____.

- End of Section -

Bid must be broken down by the following categories. The Contents of this Specification Booklet shall be used as a guide to what items belong in respective Sections. Certain Sections requiring additional detail are so indicated. Upon completion of this Form, the total of all items listed shall equal the total Base Bid outlined above. Insert N/A for items not applicable.

Building Addition

1. Foundation footing and walls for addition, minaret, and rear canopy including required sitework for foundations storm drainage and new sprinkler . . . . . $_____
2. Demolition. . . . . $_____
3. Foundation and steel framing beyond foundations for rear canopy, Balcony, dome, roof and balance of misc. metal . . . . . $_____
4. Masonry Shell. . . . . $_____
5. Finishes, Mechanical, Electrical, Plumbing, Sprinklers, restrooms, classroom, stairwells (bldg. NIC items 1-4 above) . . . . . $_____

Sitework

6. Rear Parking lot expansion including pavement, curbs, striping, excavation for lot, new storm drainage and new sprinkler, rear pavement adjustments $_____
7. Front entry driveway expansion including pavement, curbs, striping, and sidewalk. . . . . $_____
8. Retention Pond Expansion. . . . . $_____
9. Landscaping and fencing. . . . . $_____
10. Balance of work not listed under Sitework (items 6-9 above. . . . . $_____
11. Other (specify) . . . . . $_____
12. Other (specify) . . . . . $_____

TOTAL $_____

(*equals base bid*)

PART I - GENERAL

1. 01 GENERAL

A. The General Contractor (GC's) shall record daily the actual quantity of excavation and backfill or fill involved and continually compare quantities called for in the Contract Documents. These records shall be maintained in the GC's office until a date no later than 1 year after Final Payment for the Project.

B. Unless otherwise shown on the drawings, vertical paylines for computing yardage for changes in excavation and backfill will be as follows:
   1. At one foot outside of the edges of footings, walls and piers.
   2. At one foot outside of walls and piers having no footings, the one foot measurement is taken at the bottom of the wall or pier.
   3. Paylines for trench excavation shall be limited to a maximum of 6" below the bottom of the pipe, excluding bells, and 12" clear at each side.

C. Unit prices will be determined by industry standard methodologies. Unit Prices should be coordinated with this Project. When applicable for items such as ceiling tiles, units costs may be rounded up to the next highest deliverable quantities. For example four ceiling tiles may need to be rounded up to a full case.

1. 02 DESCRIPTION OF UNIT PRICES

A. Excavation - Mass: Bulk excavation of unclassified material, per cubic yard, by power equipment including pumping, shoring, and disposal. Trucking included.

B. Excavation - Pit and Trench: Excavation of unclassified material from pits and trenches by power equipment, per cubic yard, including pumping, shoring and disposal. Trucking included.

C. Excavation - Hand: Excavation of unclassified materials by hand, per cubic yard including and pneumatic tools, pumping and disposal.

D. Rock Removal: Removal per cubic yard by power equipment including removal from site. Trucking included.

E. Compacted Fill - Ordinary: The placing and compaction of ordinary fill, per cubic yard, at the interior and exterior perimeters of walls or footings, pits and trenches, as called for in the Project Manual, trucking included.

F. Compacted Fill - Select: The placing and compaction of select fill as approved by a licensed geotechnical Engineer, per cubic yard under load bearing structures at interior floor slabs-on-grade, or exterior perimeters walls or footings as called for in the Project Manual, trucking included.

G. Compacted Fill - Stone: The placing and compaction of stone or gravel fill, per cubic yard, at areas below slabs on grade, to adjust subbase elevation and fill at pavements, pits and trenches as called for in the Project Manual. Trucking included.

H. Soil Separator: Mirafi 600X, Nicolon Mirafi Group (706) 693-2226, or approved equal; weight - 6 oz/sq yd; average thickness - 25 mils. Include cost for one roll and it's placement.

I. Concrete Foundation: 4,000 psi concrete per cubic yard incorporated in a typical section of the foundation of the building up to the level of the underside of the ground floor slab including form work, excavation and reinforcement.

J. Concrete Flatwork: 3,000 psi slab-on-grad concrete, per cubic yard, including w.w.f., placement and finishing.

K. Concrete Waterproofing: cost per square foot applied.

L. Reinforcing Steel: Any bent or straight bar, cost per foot of #3, 4, 5, & #6 rebar.

M. Painting: Provide sq.ft. cost for the cost of labor for painting per Division 9, Section 09900. Paint materials will be additional.

N. Wood Fence: Installation of one additional 8'-0" section of the wood fencing shown on sheet C-103, 9/19/18, Detail #11 along with the supporting post and crushed stone foundation.

- - - END OF SECTION - - -

REFERENCE:

The American Institute of Architects

A.I.A. Document A-201

General Conditions of the Contract for Construction

Latest Edition

is hereby made a part of the Contract Documents

by reference.

****

PART I - GENERAL

1 .01 CONTRACT

The Form of Agreement Between the Owner and Contractor (Stipulated Sum), AIA Document A101, Standard Form of the American Institute of Architects, 2007 edition, pages 1 through 7, shall be used as the contract and shall form a part of these bidding documents.

This document is kept on file in the Architect's office and may be examined upon request by any of the bidders.

1 .02 EXECUTION, CORRELATION, INTENT OF DOCUMENTS

Make no changes from Contract Documents without first receiving written permission from the Architect. Where detailed information is lacking, before proceeding with work, refer matter to Architect for information.

If work is required in manner to make it impossible to produce first class work, or should discrepancies appear among Contract Documents, request interpretation before proceeding with work. If Contractor fails to make such request, no excuse will thereafter be entertained for failure to carry out work in satisfactory manner. Should conflict occur in or between drawings and specifications, interpretation shall be given preference in the following order, with later dates taking precedence over earlier dates:

A. Addenda

B. Amendments (SK Drawings) to the Drawings

C. Amendments to the Specifications

D. Specifications

E. Drawings:
   1. Schedules and piping and wiring diagrams take precedence over other data shown on the drawings.
   2. Notes take precedence over other data shown on the Drawings, except schedules and piping and writing diagrams.
   3. No article, paragraph, or sentence of the Specifications or drawings is omitted, unless expressly so stated in the Addenda or Amendments. It is the contractors responsibility to bring any conflict between drawings and, or written notes and specification to the Architect immediately. If not brought to the attention of the Architect in writing it will be assumed that the more expensive of the items is being provided.
   4. Omissions from the drawings or specification, or the mis-description of details for work which are manifestly necessary to carry out the intent of the drawings and specifications, or which are customarily performed, shall not relieve the Contractor from performing such omitted or mis-described details of the work; but they shall be performed to complete the work as it is intended, without any gaps between the various subdivision of work or between the work of the Contractor and all subcontractors, as if fully and correctly set forth and described in the drawings and specifications.

1 .03 REPRODUCTION OF DOCUMENTS

Contractor/Owner shall compensate Architect for reproduction of Instruments of Service, including electronic copies of drawings produced at Architect's office as follows:

A. Prints, e-files in .dwf & .pdf format 6 sq. ft. = $2.75, 8.75 sq. ft. = $3.75

B. Reproducible Original 6 sq. ft. = $18.50, 8.75 sq. ft. = $23.00

C. Electronic files of individual drawings in .DWG (CAD) format.

1.	1	$150.00
2.	2-5	$150.00 first drawing plus $135.00 each additional drawing
3.	6-10	$850.00 first 5 drawings plus $115.00 each additional drawing
4.	11-20	$1,350.00 first 10 drawings plus $85.00 each additional drawing
5.	>20	$2,115.00 first 20 drawings plus $50.00 each additional drawing

1 .04 SUBCONTRACTORS

(Amend Article 5.2.1 of the General Conditions by the addition of the following):

Within 10 days after awarding of the Contract(s), the prime Contractors shall submit a list of subcontractors he(she) will employ in the construction of the project for approval to the Architect.

1 .05 CHANGES IN THE WORK - Construction Change Directives

(Add the following Subparagraph 7.3.6.1):

7.3.6.1 The allowance for overhead and profit combined in the total cost to the Owner, shall be based on the following schedule:

.1 For the Contractor, for any Work performed by the Contractor's own forces, fifteen percent (15%) of the cost.

.2 For the Contractor, for Work performed by the Contractor's subcontractor, ten percent (10%) of the amount due the subcontractor.

.3 Cost to which overhead and profit is to be applied shall be determined in accordance with Subparagraph 7.3.7.

.4. In order to facilitate checking of quotations for extras or credits, all proposals, except those so minor that their propriety can be seen by inspection, shall be accompanied by a complete itemization of costs, including labor, materials and subcontract. Labor and materials shall be itemized in the manner prescribed above. Where major cost items are subcontracts, they shall be itemized also.

(Amend subpargraph 7.3.7 of the General Conditions by the addition of the following):

In the third sentence change to read ...amount for overhead and profest as set forth in the Agreement or Supplementary General Conditions of the Project Specification, or if not such amount is set for th in the Agreement, a ...

1 .06 PAYMENTS AND COMPLETION

(Amend Article 9.4.1 of the General Conditions by the addition of the following):

Payments will be made on the basis of progress and will be made one monthly. Application for Payment Form shall be submitted to Architect in triplicate on AIA Standard Form Document G702 on or before the first (1st) of each month for payment by the thirtieth (30th) of the month. Progress payments shall be made upon monthly requisitions from the contractor in the amount of ninety percent (90%) of the contract sum allocated to labor and materials for that monthly period.

(Amend Article 9.8.1 of the General Conditions by the addition of the following):

Substantial completion is defined as the point of time when the Owner is able to use the facility in its entirety as intended by the Construction Documents.

1 .07 PROTECTION OF PERSONS AND PROPERTY

(Amend Article 10.1 of the General Conditions by the addition of the following):

All items of work required for the protection of public, workmen, site and construction operation as required by the General Conditions and/or laws or regulations shall be completed before the work is started on the project.

- - - END OF SECTION - - -

PART I - GENERAL

1. 01 GENERAL

This first Phase of the Project consists of the expansion of the existing Islamic Community Center located at 745 Heim Rd., Amherst, NY. Work will include sitework and landscaping, parking lot expansions, a +/- 2,028 s.f. building addition to the Mosque, adding a +/- 2,200 s.f. balcony (mezzanine) to the existing mosque, a dome, a new rear entrance, and new restroom and shoe room on the second floor of the adjoining school. Along with the full, mechanical, electrical, and plumbing, we will be adding a new fire hydrant on the site as well as new fire protection sprinklers to the areas of new construction. All work is to be performed in strict compliance with the 2015 IBC w/New York State amendments.

1. 02 CONTRACTS

A. A single Contract shall be awarded for General Construction including, Plumbing, Heating and Ventilating, Electrical, and all other work called for in the Construction Documents.

B. All contracts shall include the Instructions to Bidders, Form of Bid, General Conditions, and Supplementary Conditions, and General Requirements.

C. All Contractors, General or sub, are directed to cooperate and coordinate their work with each other, especially scheduling which will be the ultimate responsibility of the General Contractor. The lack of such coordination not be an acceptable excuse for delays.

D. Any conflicts between a General Contractor and/or subcontractors which will cause delay in construction, must be brought to the attention of the Architect and Owner, in writing, within twenty-four (24) hours.

E. Extent of Operation: The Contractors shall provide all items, articles, materials, operation or methods listed, indicated, mentioned, or scheduled on the drawings and/or in the specifications, including all labor, materials, equipment and incidentals, necessary and required for their completion and installation in the project

1. 03 EXAMINATION OF SITE, DOCUMENTS, ETC.

Each bidder shall visit the site of the proposed work and fully acquaint himself with the conditions as they exist so that he may fully understand the facilities, difficulties, and restrictions attending the execution of the work under the Contract. See Bidding Requirements, Section 00 21 13 Instructions to Bidders for Pre-bid conference information. Bidders shall also thoroughly examine and be familiar with the drawings and the specifications. The failure or omission of any Bidder to receive or examine any form, instrument, or document, or to visit the site or acquaint himself with conditions there existing shall in no way relieve the Bidder from any obligation with respect to his Bid.

1. 04 PERMITS

The Owner has already submitted for the Building Permit and will be responsible for paying any fees remaining to pull Permit. The General Contractor is responsible for obtaining and paying for all necessary fees including but not limited to including utility fees, connection charges, etc. unless specifically noted in the Bid Form as not being included.

1. 05 REFERENCES

References to known standard specifications shall mean and intend latest edition of such specifications adopted and published at date of invitation to submit proposals.

Reference to technical society, or organization or bodies is made in the specifications in accordance with the following abbreviations:

AA	Aluminum Association
AAMA	Architectural Aluminum Manufacturer's Association
AASHO	American Association of State Highway Official
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
AIA	American Institute of Architects
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
ANSI	American National standard Institute
APA	American Plywood Association
ASA	American Standard Association
ASHRAE	American Society of Heating, Refrigeration and Air-Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWI	American Woodwork Institute
AWPI	American Wood Preservers Institute
AWS	American Welding Society
AWSC	American Welding Society Code
BIA	Brick Institute of America
CRCI	Concrete Reinforcing Steel Institute
CS	Commercial Standards
CSI	Construction Specifications Institute
FGMA	Flat Glass Marketing Association
FM	Factory Mutual System
FS	Federal Specification
IEEE	Institute of Electrical and Electronic Engineers
NBFU	National Board of Fire Underwriters
NBS	National Bureau of Standards
NEC	National Electric Code
NEMA	National Electrical Manufacturer's Association
NFPA	National Fire Protection Association
NYSDOT	New York State Department of Transportation
NYSDPW	New York State Department of Public Works
OSHA	Occupational Safety & Health Administration
PCI	Precast Concrete Institute
PEI	Porcelain Enamel Institute
SAM	Scientific Apparatus Makers Association
SDI	Steel Deck Institute
SJI	Steel Joist Institute
SMACNA	Sheet Metal and Air-Conditioning Contractor's National Association
SSPC	Structural Steel Painting Council
UL	Underwriter's Laboratories

1. 06 ITEMS PROVIDED BY CONTRACTOR AND OWNER

A. Toilet facilities provided by the Owner shall be made available at the Project. However it will be incumbent on the Contractor to maintain and keep restrooms and access to them clean and in the condition they are found. If the Contractor is unwilling or unable to commit to this situation, then Contractor will provide separate, portable restrooms on the site.

B. Water will be provided by Owner and be available at the site.

C. Electrical power will be provided by Owner and be available at the site.

D. The Owner will provide an unsecured space at the existing facility to serve as the Project Construction Office. The Contractor will be responsible for maintaining copies of all Construction Documents at this “office” along with other relevant materials and records relative to the construction work. Contractor will provide all required furnishings and files. Sheds or shanties are prohibited unless Owner pre approved by Architect and Owner.

E. Telephones for the Contractors, workmen and Owners use for business purposes shall be provided by the General Contractor. Telephones must be capable of receiving incoming calls and making outgoing local calls.

F. The Contractor(s) must provide internet service for use by construction personnel and be capable of receiving emails and printing items at a minimum of 8 ½" x 11" at the site without Owner provided wifi service.

1. 07 TEMPORARY FACILITIES

A. Temporary Toilets: see Article 1.06 A of this Section. Should Contractor be required to provide temporary toilets, the Contractor shall provide, install, maintain, and pay for toilet accommodations for all persons employed or engaged in the Project. At completion of the Project, the Contractor is to remove the toilet facility and thoroughly clean and disinfect the area. The toilet shall be of chemical type, placed in a location approved by the Owner, and maintained in sanitary condition at all times.

B. Temporary Heat: The Contractor shall provide temporary heat as required when work under their control is being carried on during cold weather and to prevent damage to the work. Heat shall be furnished when and as directed by the Architect, by means of portable or fixed units. Each Prime Contractor shall provide and pay for all fuel used in the temporary facilities and shall provide proper smoke pipes or other means to prevent smoke or smudge from marking up walls, ceilings, or other parts of equipment.

C. Temporary Light and Power:
   1. The Contractor shall furnish and install all wiring and other equipment within the building for temporary lighting and power as specified below.
   2. All temporary lighting and power shall be installed immediately, as needed as construction proceeds so that service will be available when required by each Contractor. Facilities are to be maintained and kept in good working order by the Contractor for the life of the Project. The wiring, from existing panels in the facility, shall be complete and ready for use, including all feeds, connections, fuses, etc. required for system use.

3. The Contractor shall be responsible for maintaining all temporary wiring for lighting and power, in a safe condition and in accordance with the requirements of the New York State Labor Code, Federal Department of Labor Standards, Contractor's Safety Manual, OSHA, NFPA, Latest Edition of the National Electrical Code, etc. for the life of the project, including replacement of lamps and fuses.
4. The installation shall conform to safe practice and the National Electrical Code. All parts of the system shall be protected and plainly marked as to voltage characteristics. Work installed in such a manner as to interfere with construction of the building shall be relocated as required without extra charges. Consult with other contractors and the Architect/Engineer so as to have minimum of interference and changes, and so as to have the service available as required.
5. Any extension required for switches, panels, or outlets specified shall be at the expense of the contractor requiring same.
6. Wiring for temporary lighting and single power shall in general consist of three-wire, 120/240 volt feeder in the building, with branch circuits of three-wire sized as required. Each branch circuit shall be equipped with lampholders and grounding type outlets for 120 and 240 volt, single phase power. Lampholders shall be approved weatherproof type with lamp guards. The 120 and 240 volt power outlets shall consist of an approved box with weatherproof cover containing "GFI" type outlets as approved or conventional outlets fed from "GFI" breakers in panelboard. The total load of each branch circuit (lighting and power) shall not exceed the load permitted in the N.E.C. for each branch circuit size.
7. A green grounding wire of size as required shall be installed with each feeder and branch circuit. All 120/240 volt power outlets shall be grounded in an approved manner through the equipment grounding wire. The green equipment grounding wire shall be grounded in accordance with National Electrical Code requirements.
8. The Contractor shall furnish and install all lamps and fuses for the temporary lighting and single phase power.
9. Should a change in location of any temporary equipment herein specified be necessary in order for the work to progress properly, the Electrical Contractor shall remove and relocate such equipment as directed without additional cost. When directed by the Architect/Engineer and no longer required, the temporary equipment specified shall be removed.
10. The Contractor shall extend sufficient circuits from temporary panel as required for all construction purposes.

1. 08 FIRE EXTINGUISHERS

The Contractor is to provide a sufficient amount of fire extinguishers in the area of work during construction, to satisfy all applicable laws. They shall be in good operating condition and be easily accessible to the workmen. The General Contractor shall have not less than three.

1. 09 MEASUREMENTS. LINES, LEVELS, AND GRADES

A. The General Contractor shall verify all grades, lines, levels, and dimensions as shown on drawings, and he shall report any errors or inconsistencies in the above to the Architect before commencing work.

B. As the work progresses, the General Contractor shall lay out on the floor the exact location of all partitions and doors as a guide to all grades.

C. All work shall be maintained and completed level, true to line and plumb.

1. 10 EXISTING DRIVES, WALKS, AND FREE AREAS

Contractors may use existing drives, walks, and free areas during process of work; however, they must minimize interference and/or interruption of Owner's operations. Upon completion of work, immediately clear all work materials and refuse from all drives, walks, and free areas. Contractor will be responsible for repairing any damage to existing facilities including but not limited to concrete, curbs, asphalt paving etc. and will be responsible for repairing any damage cause to the same.

1. 11 FIELD MEETINGS

A. Periodic Field meeting are not anticipated. However, occasional field meetings will be held at the site as directed by the Architect and representatives of each Contractor shall attend these meetings and have authority to act for the Contractor in all matters concerning the construction program.

B. Minutes of meetings shall be taken by Architect and all decisions indicated in these minutes shall require compliance by the contractors affected.

C. Subcontractors and/or suppliers shall attend meetings when directed by the Architect.

1. 12 USE OF SITE

A. The Owner shall continuously occupy the building and site during construction and use of areas, scheduling, etc. shall be coordinated with his personnel.

B. The Contractor shall assume responsibility for the Owner's site, structures, and equipment during construction. All damage by the Contractor and not indicated to be repaired or replaced under the Contract Documents shall be returned to conditions existing at start of construction at no cost to Owner.

C. The Contractor shall assume full charge of space for the storage of materials for all trades, allotting same to the various materials in such a manner as will facilitate the work, prevent friction between contractors, and maintain order and tidiness. Allocation of space shall be approved by Architect.

1. 13 STORAGE AND PARKING AREAS

A. The Owner will designate a temporary area at the site suitable for vehicular parking and for the stockpiling and storage of equipment and materials. These facilities shall be for the use of personnel for all trades of the project.

B. The General Contractor shall keep such area free of debris, obstructions, standing water and provide necessary barricades.

C. Construction parking or delivery shall not interfere with or obstruct Owner's use of site. Fire lanes and access shall not be obstructed or restricted.

D. Parking shall be as directed by Owner.

1. 14 GUARANTEES

A. Whenever within one (1) year of beneficial occupancy any of the Contractors is notified in writing by either the Architect or the Owner, that any item of equipment, material and/or workmanship has proved defective or is not in any way meeting the specification requirements, he shall immediately replace, repair or otherwise correct the defect or deficiency without cost to the Owner.

B. The General Contractor's liability for defects in materials and labor shall not be limited to less than the legal limit of liability in accordance with the laws of the State of New York.

C. The Contractor shall submit all guarantees, warranties, bonds and operating manuals to the Architect prior to receipt of final payment for all work, materials and equipment provided under their contract.

1. 15 AVAILABILITY OF MATERIALS

A. The Contractor shall review the availability of the materials specified and/or shown on drawings and must notify the Architect of any materials that will cause any delays in the construction of the project.

B. The delivery times, plus a list of alternate materials proposed including additions or deductions in cost, must be submitted in writing to the Architect for his review within two weeks after the award of the contract.

C. All materials must be provided as specified unless approved equal by the Architect.

1. 16 PROTECTION OF MATERIALS

A. The General Contractor shall bear the sole responsibility for the care and protection of his respective materials and work installed in the building, and materials stored on the site for which payment has been made, and for the restoration of damaged or stolen materials, at no additional cost to the Owner.

B. The Contractor may be responsible for areas in which their work is proceeding and shall erect such guards or fencing as may be required to fully protect his work and to afford reasonable and adequate protection against injury to persons at the site thereof.

C. Contractor shall provide a fence around the construction site.

1. 17 LISTS AND SCHEDULES

The General Contractor shall furnish a list of his subcontractors and a schedule of construction, in accordance with the General and Supplementary General Conditions of these Contract Documents. They shall also provide a shop drawing schedule, indicating the type of shop drawings that will be submitted and the anticipated submission date.

1. 18 REQUIRED INSURANCE

A. Before commencing the work, the General Contractor shall furnish to the Owner a certificate or certificates of insurance in form satisfactory to the Owner, showing that he has complied with the general conditions.

B. The kinds and amounts of insurance are as follows:
   1. Workmen's Compensation Insurance a policy covering the obligations of the Contractor in accordance with the provisions of Chapter 41 as amended in the Workmen's Compensation Law, covering all operations under the contract, whether performed by him or by his subcontractors.
   2. Liability and Property Damage Insurance limits of not less than:
      $ 500,000.00 Each Person
      $1,000,000.00 Each Accident
      $2,000,000.00 Aggregate
      for all damages arising during the policy period, shall be furnished in the following types.
      a. Contractor's Liability Insurance: Issued to and covering the liability for damage imposed by law upon each subcontractor with respect to all work performed by said subcontractor under the contract.
      b. Contractor Protective Liability Insurance: Issued to and covering the liability for damages imposed by law upon the Contractor with respect to all work under the contract performed for the Contractor by subcontractors.
      c. Protective Liability Insurance: Issued to and covering the liability for damages imposed by law upon the Owner.
      d. Completed Operations Liability Insurance: Issued to and covering the liability for damages imposed by law upon the Contractor between the date of final cessation of work and the date of final acceptance thereof.
      e. Automobile Liability Insurance: Covering all vehicles owned and hired in the amount of $500,000.00/
      $1,000,000.00 bodily injury and $1,000,000.00 property damage.
      f. All Risk-Builders Risk Insurance provided in the amount equal to the total amount of the Bid.

1. 19 NON-ASSIGNABILITY OF CONTRACT

Each Contractor is hereby prohibited from assigning, transferring, conveying, subletting or otherwise disposing of this contract, or of his right, title or interest therein, or his power to execute such contract to any other person, company, or corporation, without previous consent in writing of the Owner. If the Contractor shall, without previous written consent herein provided for, assign, transfer, convey, sublet, or otherwise dispose of same, or his right, title, or interest therein, or his power to execute such contract to any other person, company or other corporation, the Owner shall revoke and annul said contract, and the Owner shall thereupon be relieved and discharged from any and all liability and obligations, growing out of this contract to the Contractor and the person, company or other corporation to whom he shall assign, transfer, convey, sublet or otherwise dispose of same, and the Contractor and his assignees, transferees or sublessees, shall forfeit and lose all money theretofore earned under said contract, except so much as may be required to pay his employees; provided that nothing herein contained shall be construed to hinder, prevent, or affect an assignment by the Contractor for the benefit of his creditors made pursuant to the statutes of the State of New York.

1. 20 LAYOUT OF THE WORK

The General Contractor shall verify all lines, levels and dimensions as shown on the drawings and he shall report any errors or inconsistencies to the Architect before commencing work.

1. 21 INQUIRIES

The Owner will not be responsible for any explanations or interpretations of the Construction Documents. All inquiries are to be directed to the office of Mussachio Architects.

1. 22 COMPLIANCE WITH FEDERAL, STATE AND MUNICIPAL ORDINANCES

A. Each and every provision of law and clause required by law to be inserted in this contract shall be deemed to be inserted herein and the Contract shall be read and enforced as though it were included therein, and if through omission or otherwise any such provision is not inserted, or it is not correctly inserted, it shall be physically amended to make such insertion.

B. These Contract Documents, and the joint and several phases of construction hereby contemplated, are to be governed, at all time, by applicable provisions of the Federal law(s), including, but not limited to those statutes referred to elsewhere in this contract and the latest amendments there to.

1. 23 RESPONSIBILITY FOR DAMAGE

A. The General Contractor shall be responsible for all damages to life and property due to his operations. He shall be responsible for all parts of his work, both temporary and permanent, until the work under this contract is accepted by the Owner.

B. The General Contractor shall protect, indemnify, save harmless and defend the Owner and Mussachio Architects, P.C. from suits, actions, damages and costs of every name and description, resulting from the work under this contract, and the Owner may retain sufficient monies from the amount due or to become due the Contractor as may be necessary to satisfy any claim or damages filed against the Owner.

C. The General Contractor shall be responsible for damages to work of other Contractors which are the result of his operations. Should the Contractor believe that the work shown by the drawings or specifications is not calculated when executed to procure safe and substantial results, or if any discrepancy appears, it is his duty to immediately notify the Architect in writing, stop work on same and await the written instructions of the Architect.

1. 24 DEFECTIVE WORK AND MATERIALS

A. Any material or work found on inspection to be defective or not in strict conformance with requirements of drawings and specifications, or defaced or injured through the acts of fire or elements or any other cause shall be removed immediately from the premises and satisfactory materials or work or both, substituted therefore without delay.

B. If the Contractor does not remove such work or materials condemned by the Architect within the time limit fixed by written notice, the Owner may cause the same to be done and may store all materials at the expense of the Contractor. If the Contractor does not pay the expense of such removal within ten (10) days written notice, sell such materials at auction, or at a private sale and shall account for the net proceeds thereof, after deducting all costs and expenses that should have been borne by the Contractor.

C. No previous inspection or certificates of payment shall be held as an acceptance of defective work or materials, or to relieve the Contractor from the obligations to furnish sound materials and perform satisfactory work in accordance with contract requirements.

1. 25 SHORING

Provide as required, shoring, braces, supports, etc. to adequately support construction materials, equipment, etc. until permanent construction is complete.

1. 26 SECURITY

The Contractor shall make provisions to keep the building secure at all times.

1. 27 COOPERATION

The Contractor shall fully cooperate with the other contractors on the site.

1. 28 CERTIFICATE OF SUBSTANTIAL COMPLETION (G704) AND DATE OF FINAL COMPLETION

A. A contract shall be deemed to be "substantially complete" when all work has been satisfactorily completed except for "punch list" items and those of a minor nature which may be, at the present time, beyond the Contractor's control, or delayed in completion with the concurrence of the Owner or Architect.

B. Final Application and Certificate for Payment (G702 & G703) will be issued when punch list items of final inspection are complete, with the exception of items that cannot be completed at once through no fault of the Contractor, his subcontractors or vendors, or when certain pieces of punch list work are held up at Owner's or Architects request. If such items are, in the opinion of the Architect, substantial in nature, an amount sufficient to cover the reasonable cost of their correction as determined by the Architect, may be withheld from payment due under the final Application and Certificate for Payment until they have been corrected and subsequently approved by the Architect. If work delineated on the punch list is not completed within a reasonable time, the Owner may complete that work with his own forces as outlined in AIA A201- General Conditions and deduct the cost thereof from Final Payment to the Contractor.

1. 29 CERTIFICATE OF OCCUPANCY

A. The General Contractor, prior to and before turning the building over to the Owner, shall apply for, and obtain a Certificate of Occupancy.

B. All required inspections for Certification of Occupancy by governmental agency shall be the responsibility of the General Contractor.

1. 30 RIGHT OF OCCUPANCY

The Owner shall have the right to take possession of any portion of the project after the Certificate of Substantial Completion and Certificate of Occupancy by the local building officials have been issued.

1. 31 CLEAN-UP

A. Periodic Cleaning: The subcontractor shall at all times, during construction, keep the site free from the accumulation of waste materials and rubbish, resulting from their respective work. Removal of waste materials and rubbish must be done at least once a week.

B. Final Clean-Up:
   1. Upon completion of the project the subcontractors shall clean the interior and exterior of the building, so all areas are ready for occupancy by the Owner without need for further cleaning.
   2. Provide final cleaning of the work, at time indicated, consisting of cleaning each surface or unit of work to normal "clean" condition expected for a first-class building cleaning and maintenance program. Comply with manufacturer's instruction for cleaning operations. The following are examples, but not by way of limitation, of cleaning levels required:
      a. Remove labels which are not required as permanent labels.
      b. Clean transparent materials, including mirrors and window/door glass, to a polished condition, removing substances which are noticeable as vision-obscuring materials. Replace broken glass and damaged transparent materials.
      c. Clean exposed exterior and interior hard-surfaced finishes, to a dirt-free condition, free of dust, stains, films and similar noticeable distracting substances. Except as otherwise indicated, avoid disturbance of natural weathering of exterior surfaces. Restore reflective surfaces to original reflective condition.
      d. Wipe surfaces of mechanical and electrical equipment clean.
      e. Remove debris and surface dust from limited-access spaces.
      f. Vacuum clean carpeted surfaces and similar soft surfaces.
      g. Clean plumbing fixtures to a sanitary condition, free of stains including those resulting from water exposure.
      h. Clean light fixtures and lamps so as to function with full efficiency.
      i. Clean project site (yard and grounds), including landscape development areas, of litter and foreign substances. Sweep paved areas to a broom-clean condition; remove stains, petrochemical spills and other foreign deposits. Rake grounds which are neither planted nor paved, to a smooth, even textured surface.

C. Damaged Work: Any damages to building materials, finishes or equipment, shall be repaired or replaced by the subcontractor to the satisfaction of the Architect without cost to the Owner.

1. 32 UNLOADING AT SITE

Materials shall be unloaded at the site at the expense of the Contractor furnishing such materials, unless otherwise specified.

1. 33 OBLIGATION OF CONTRACTOR

At the time of awarding contracts, each Contractor will be presumed to have inspected the site and to have read and to be thoroughly familiar with the Plans and Contract Documents (including all addenda). The failure or omission of any Contractor to receive or examine any form, instrument or document shall in no way relieve any Contractor from any obligation in respect of his contract.

1. 34 ACCEPTANCE OF PRECEDING WORK

Before starting any operation, the General Contractor shall examine work performed by others to which their work adjoins or is applied and shall report to the Architect any conditions that will prevent satisfactory accomplishment of their contract. Failure to notify the Architect in writing of deficiencies or fault in preceding work will constitute acceptance thereof and waive any claim of unsuitability.

1. 35 ARCHITECTS IDENTITY SIGN

The General Contractor shall be responsible for the erection and removal of the Architects Identity sign. The Architect shall provide the signage and erection materials and a location map. The General Contractor will be responsible for contacting the Architect and coordinating any required movement of the sign as dictated by sitework. A charge of $500.00 will be billed to the General Contractor should the sign be lost or destroyed. No signs or other advertisements shall be permitted at the project site, except for Architect's and General Contractor’s identification sign.

1. 36 SUB-SURFACE DATA

Sub-surface soil investigations have been made and results are included in Division 2, Section 02010. Data shown is for general information of bidders and is not guaranteed. Bidders are expected to examine the site and record of investigations and then decide for themselves the character of the materials to be encountered.

1. 37 DEMOLITION

A. Furnish all labor and equipment necessary for or incidental to the removal and demolition work required as shown or herein specified.

B. Provide, erect, and maintain all bracing, shoring, warning signs, and guards necessary for protection. Remove protection at completion of work.

C. Provide all temporary enclosures and barriers required for protection against spread of dust and the elements to parts of building not affected by demolition work.

D. Remove excess debris as it accumulates from demolition operations. Do not store or permit debris to accumulate on site.

E. Execute demolition work to insure adjacent property against damages which might occur from falling debris or other causes.

F. Provide temporary shoring, struts bracing, and take all precautions to prevent settlement, movement of walls, floors, or other existing framing of existing structures. Verify locations of existing bearing wall construction.

G. Repair damage done to Owner's property or property of any other person or persons on or off premises by reason of required work without additional cost to the Owner or Construction Manager.

H. Any utility line, cable or pipe damaged during construction shall be repaired and left in complete working condition. Plug or cap any lines no longer required. Any repair to damaged work shall be performed by skilled workmen.

I. All materials removed from existing work in the execution of this contract shall become the property of the Contractor.

J. It shall be the responsibility of the subcontractor to protect from damage and store all items noted to be reused.

K. Strict coordination with building occupants shall be conducted by the subcontractor. Security and maintenance of business shall be coordinated with the building occupants.

- - - END OF SECTION - - -

PART 1 - GENERAL

1.01 GENERAL CONDITIONS

The Drawings, Instructions to Bidders, Form of Proposal, General Conditions, Supplementary General Conditions, and Division 1 are included herein and govern work under this Section.

1.02 EXECUTION

A. Contractor may submit a request for conversion and transmission of a drawing into an electronic CAD file for informational use only. Conversation and transmission of electronic CAD drawing files is contingent upon the Contractor's review and acceptance of the transmission costs and conditions of use outlined in this Specification Section.

B. Conversion and transmission of CAD drawing files in ".DWG" format. Allows the licensee/transferee the ability to open and use A/E CAD Drawing files at their facilities with CAD compatible software.

C. Conversion and transmission of CAD drawing files in ".PDF" format. Allows the licensee/transferee the ability to open, view, and print A/E CAD Drawing files at their facilities.

1.03 SCHEDULE OF FEES

A. Fee Schedule for the conversion and transmission of CAD files in ".DWG" format shall be as follows:

1.	1 sheet	$150
	2-5 sheets	$ 150 first file + $135 ea.
	6-10 sheets	$ 690 first 5 files + $ 115 ea.
	11-20 sheets	$1,350 first 10 files + $85 ea.
	>20	$2,115 first 20 files + $50 ea.

B. Fee Schedule for the conversion and transmission of CAD files in ".PDF" format shall be $2.75 per sheet.

C. Transfer Costs and Payment Requirements for CAD Conversion
1. Fee payment shall be made by certified check, made payable to Mussachio Architects, PC.
2. Transfer costs are based on email transmission.
3. Transfer by any other means shall be at cost plus a 15% administrative fee.

1.04 REQUESTING ELECTRONIC CAD FILES

A. All requests for CAD files must come through the General Contractor by executing a Letter Agreement provided by Architect. Contact Mussachio Architects at (716) 631-9949 or via email to adminassist@mussachioarchitects.com to receive the Letter Agreement for Electronic Transfer.

B. Prepare a list specific drawing sheets being requested.

C. Identify version of Autocad Software along with email address CAD files are to be sent to.

1.05 PROCESSING AND SHIPPING/SENDING

A. Mussachio Architects, PC shall forward an “Electronic Media Agreement” to be completed by requestor.
   1. Requests by businesses shall be signed by an officer of the company.
   2. Requests by individuals shall be signed by that individual

B. Architect reserves the right to receive compensation prior to shipping files.

1.06 CONDITION OF USE OF LICENSE TRANSFER FOR USE OF ELECTRONIC CAD FILES

A. Files shall only be used on the project for which the documents were created. The person(s) or business entity requesting files is solely responsible for their use. The Architect does not accept and is not liable for authorized or unauthorized use of the files transmitted.

B. Mussachio Architects, P.C. ("MA") stands by the accuracy of the sealed drawings represented by these electronically recorded data files. Digital files are not the sealed drawings that constitute MA's work product for which MA takes professional responsibility.

C. Under no circumstances shall transfer of drawings and other instruments of service on electronic media for use by the licensee/transferee be deemed a sale by MA. Digital files are being supplied to the licensee/transferee at the direction of MA’s client. MA retains title, ownership and copyrights of the electronically recorded data files recorded on the original disc copy(ies) and all subsequent copies of the electronically recorded data files or derivative works, regardless of the form or media in or on which the original and other copies may exist.

D. Disclaimer of warranty: except as stated specifically below, MA makes no warranties, express or implied, with respect to the electronically recorded data files or their quality, performance, merchantability or fitness for any particular purpose. The electronically recorded data files are transferred, licensed and delivered "as-is". All warranties of any sort, express or implied are hereby disclaimed; including, but not limited to, fitness for a particular purpose or merchantability.

E. Limitation of liability: in no event will MA be liable for any direct, incidental, indirect, special or consequential damages in connection with or arising out of the existence, furnishing, failure or use of the electronically recorded data files, by anyone even if MA has been advised of the possibility of such damages.

F. The sealed drawings are our work product. Data stored on electronic media can deteriorate or be modified without our knowledge. Therefore, the submitted electronic data files shall be considered accurate as submitted and any use or reuse of these electronic data files and any drawings or information derived therefrom is at the licensee/transferee's full legal responsibility. We cannot assume responsibility or liability for any modifications or reuse by others to such electronic data, digital, or CAD files without our written verification for the specific purpose for a separate consideration. This transfer is not such a written verification.

G. Indemnification: Further, to the fullest extent allowed by law, the licensee/transferee of the data files hereby agrees to indemnify and hold harmless MA, from any damage, liability or cost, including reasonable attorney's fees and costs of defense, arising from; or, claimed to arise from, any use of, changes, additions, or modifications of any type, made by anyone other than MA; or, from any reuse of the "drawings" and data contained in these electronic data files.

H. The licensee/transferee will not use or permit anyone else to use any of the data contained in these electronic data files on any other project than the one identified in the files.

I. Copy Restrictions: the electronically recorded data files and the accompanying written materials are copyrighted. Unauthorized copying is expressly forbidden. You may be held legally responsible for any copyright infringement that is caused or encouraged by your failure to abide by the terms of this license. You may not copy the disk(s), disk contents, or accompanying printed material to sell or distribute to others.

J. Should any of these conditions be found to be unenforceable by a court of competent jurisdiction, all other conditions shall be given effect.

----------END OF SECTION----------

PART I - GENERAL

1. 01 GENERAL

A. All submittals shall be in reference to their applicable specification section. Mussachio Architects, P.C. (MA) makes no provisions as to the subdivision of subcontractors trade(s)/responsibilities. Submittals classified under varying specification sections shall be submitted in accordance with their respective section and include separate cover pages.

B. CAD files of Architect's drawings MUST BE PURCHASED. See Section 00 73 13 - Supplementary General Conditions.

1. 02 DESCRIPTION

A. Subcontractor, fabricators, supplier or distributor, etc. (Subcontractor) shall submit to the General Contractor (GC) or Construction Manager (CM) all shop drawings, product data and samples required by respective Specification Sections for the Architect/Engineer's (A/E) review,

B. Availability of Electronic CAD Drawing Files: Upon Request by the Contractor, Electronic CAD drawing files may be purchased for informational purposes only, in keeping with the requirements indicated under Section 01 22 10 - CAD Conversion and Transmission Fees, .PDF format files are available from GC at no additional cost.

PART II - PRODUCTS

2. 01 PRODUCT DATA

A. Original drawings, prepared by Subcontractor, which illustrate some portion of the work showing fabrication, layout, setting or erection details.
   1. Identify details by reference to sheet and detail numbers shown on shop drawings.
   2. Sheet size, multiple for 8-1/2 by 11 inches, not to exceed size of contract drawings when unfolded.

B. Manufacturer's catalog sheets, brochures, diagrams, schedules, performance charts and other standard descriptive data.
   1. Modify product data to delete information which is not applicable to project.
   2. Supplement standard to provide additional information applicable to project.
   3. Clearly mark each copy to identify applicable materials, products or models.
   4. Show dimensions and clearances required.
   5. Show performance characteristics and capacities.
   6. Show wiring or piping diagrams and controls.

C. Samples: Physical examples to illustrate materials, equipment or workmanship, and to establish standards by which completed work is judged.
   1. Office samples to be of sufficient size and quantity to clearly illustrate:
      (1) Functional characteristics of product or material, with related parts and method of attachment.
      (2) Full range of color samples.
   2. Field Samples and Mock-Ups
      (1) Erect at project site at location acceptable to General Contractor.
      (2) Construct samples or mock-up complete, including work of all trades required in finish work.

2. 02 SUBCONTRACTOR RESPONSIBILITIES

A. Subcontractor is responsible for reviewing each Specification Section and coordinating with GC to determine required submittals.

B. Do not start, fabricate or install work requiring submittals until submittals meeting Contract Requirements have been returned to the Subcontractor via the GC.

C. Review, approve, stamp and sign shop drawings, product data and samples prior to submission. Note all discrepancies from Contract Documents and or items that need clarification.

D. Verify:
1. Field measurements.
2. Field construction criteria.
3. Catalog numbers and other data.

E. Coordinate each submittal with requirements of Work and Contract Documents.

F. Contractors' responsibility for errors and omissions in submittals is not relieved by General Contractor's or Architect/Engineer's review of submittals.

G. Subcontractors' responsibility for deviations in submittals from requirements of Contract Documents is not relieved by GC's or A/E's review of submittals unless A/E gives written acceptance of the specific deviations.

H. Notify GC and A/E in writing, at time of submission of deviations in submittals from requirements of Contract Documents.

I. Make required copies for distribution of shop drawings and product data that have been stamped and signed by the Architect/Engineer.

2. 03 GENERAL CONTRACTOR RESPONSIBILITIES

A. Review all submittals from Subcontractor for compliance with specified products and materials as well as design intent of the Contract Documents. Any and all items that do not comply with drawings and Specification or allowed substitutions in the Specification Booklet or other Contract Documents are to be redlined and rejected or rejected outright prior to submission to the A/E to avoid unnecessary delays.

B. Non Compliant products and materials: GC must obtain prior approval from A/E to forward Submittals that do not comply with Contract Documents.
1. If submitted products or materials are not as Specified, prepare a side-by-side table comparison of the two products highlighted differences.
2. Provide rationale for substitution(s) including, if applicable, cost savings.

C. Verify all dimensions against dimensions provided on Contract Documents and reconcile any differences. If necessary coordinate with A/E as needed to reconcile dimensions.

D. Confirm that all submittal items:
   1. fit in rooms, spaces, wall cavities, chases that they are intended for
   2. maintain warranties of all adjacent products and are approved for use by all materials that the product or material will come in contact with.
   3. are approved by manufacturer for intended use(s)
   4. equal or exceed warranties of specified products or materials

E. After A/E's review look closely for any notes or directives provided by A/E and respond to the same and then distribute copies of submittals to parties requiring the same for coordination of the Work.

F. GC is not responsible for technical aspects of review.

2. 04 A/E RESPONSIBILITY

A. Review design concept of Project.

B. Review of separate items does not constitute review of an assembly in which item functions.

C. Stamp and initial or sign certifying to review of submittal.

D. Explanation of Architect/Engineer's Stamp
   1. NO EXCEPTION TAKEN: No corrections, no marks.
   2. MAKE CORRECTIONS NOTED: Minor amount of corrections; all items can be fabricated at Contractor's risk without further correction; checking is complete and all corrections are obvious without ambiguity.
   3. REVISE AND RESUBMIT: Minor amount of corrections; noted items must not be fabricated without further correction; checking is not complete; details of items noted by checker are to be further clarified; items not noted to be corrected can be fabricated at Contractor's risk under this stamp.
   4. REJECTED: Drawings are rejected as not in accordance with the Contract, too many corrections, or other justifiable reason. The drawing must be corrected and resubmitted. No items are to be fabricated under this stamp.
   5. SUBMIT SPECIFIED ITEM: Item is not as specified. Submit named manufacturer.

E. Return submittals to General Contractor for distribution.

F. A/E will only review specific dimensions requested by GC or Subcontractor and will not review all dimensions.

PART III - EXECUTION

3. 01 SHOP DRAWINGS/SUBMITTALS (hard copies)

A. Contractor shall submit a list of all scheduled shop drawings prior to beginning of construction, for review. This list should also indicate the order of submittal to the Architect.

B. All submissions to Architect shall include the standard Submittal Cover Sheet found at the end of Section 01 33 00 - Submittals, filled out in its entirety. A description of items being submitted along with reference to other related components should be included.

C. Schedule submissions to allow ten (10) working days for review. Architect shall examine shop drawings and issue corrected copies within a minimum of ten (10) working days.

D. After reviewing and marking up any submittals that do not comply with Construction Document intent, the General Contractors shall provide the Architect with copies of all necessary shop drawings and information as may be required for the execution of the work.
   1. Submittals will be in either of the following formats:
      a. Three (3) copies of all architectural submittals that can later be photocopied
      b. Four (4) copies of all items submittals that can later be photocopied related to Mechanical, Electrical, Plumbing or Structural aspects of the Project l submittals
      c. Two (2) originals and one (1) reproducible if the original cannot be photocopied or
      d. Five (5) copies of any submittal that cannot be readily reproduced in a typical office
   2. The Contractor shall submit a minimum of three (3) each non-reproducible submittals, such as color or other physical samples of materials.
   3. Catalog cuts shall be submitted in triplicate.
   4. **FAXED OR COPIES OF FAXED SHOP DRAWINGS/SUBMITTALS ARE NOT ACCEPTABLE.**
   5. Photographic reproductions or copies of contract drawings will not be accepted as shop drawings and will be rejected.
   6. Submittals sent via email or electronic delivery received after the end of normal business hours as determined by MA's date and time stamp(s) shall be processed as "received" the following business day.

E. Shop drawings or submittals that are received without proof of Contractor or Construction Manager's review and edit will be REJECTED and returned to submitter until such documentation accompanies the same. Contractor will bear responsibility for any delays cause by the rejection.

F. Reproductions of Contract Documents for use as shop drawings for materials specified and/or shown, WILL NOT be permitted.

G. Each shipment of drawings/catalog cuts must be accompanied by a letter of transmittal providing:
   1. a detailed explanation of what/why the submittal is being made
   2. giving the name of GC and Sub Contractor
   3. a list of items included in the submission, with each drawing marked with the name and location of project and each series of drawings numbered consecutively.

H. The manufacture or fabrication of any material or the performance of any work prior to approval of shop drawings will be entirely at the risk of the Contractor.

I. The Contractor shall submit to the Architect with such promptness as to cause no delay in his work or in that of any other Contractors employed on this work, copies of all shop or setting drawings/catalog cuts required for the proper execution of the work herein specified

J. All shop drawings and samples shall be thoroughly checked by the Contractor for compliance with the Contract Documents before submitting them to the Architect for approval. The intent of the procedure is to identify and short circuit the processing of submittals that do not comply with the design intent of the Construction Documents, not to simply show that they passed thru the Contractor's office. All shop drawings and submittals shall bear the Contractor's stamp of approval certifying that they have so been reviewed. Any shop drawings submitted without this stamp of approval and certification, and submittals which, in the Architect's opinion, are incomplete contain numerous errors or have not been checked or only checked superficially will be returned unchecked by the Architect for resubmission by the Contractor. In reviewing shop drawings and submittals, the Contractor shall verify all dimensions and field conditions and shall check and coordinate the shop drawings of any Section or trade with the requirements of all other Sections or trades whose work is related thereto, as required for proper and complete installation of the work.

K. Shop drawings shall be submitted in the order and time required for construction. Shop drawings submitted ahead of time required for construction will be held by the Architect for checking in the order as above set forth.

L. Under no condition will any claim for delay in the completion of contracts due to shop drawings being held by the Architect for the necessary and proper time for checking be recognized.

M. If it is found necessary to make changes in shop drawings, one (1) print and the marked reproducible copy will be returned to the Contractor, who, after making correction indicated, shall furnish, without charge, one (1) new reproducible copy plus two (2) new prints. The Contractor shall continue to furnish prints as above mentioned until all prints are satisfactory to the Architect, who, however, will not be responsible for their accuracy.

N. If, during the checking and return of checked reproducible copies, the Contractor makes any additional changes or corrections on the original shop drawings, he shall call attention to each marking on the prints by a letter written to the Architect.

O. It is understood that the term NO EXCEPTION TAKEN of any shop drawings by the Architect in no way relieves the Contractor from assuming the responsibility for the accuracy of same, nor does it relieve the Contractor from any of the required conditions as set forth in these specifications or accompanying drawings.

P. Shop Drawings without the appropriate stamp indicating review by the Architect will not be permitted on the premises. Actual fabrication of the work will not proceed until these shop drawings have received the approved stamp of the Architect.

Q. Shop Drawings shall consist of, but not be limited to, fabrication, erection and setting drawings, schedule drawings, manufacturer's scale drawings, wiring and control diagrams, cuts or entire catalogs, pamphlets, descriptive literature and performance and test data. Prior to submission of shop drawings on mechanical and electrical work, the Contractor shall submit lists of such equipment as required, for approval. Where practical, drawings shall be submitted in the form of a reproducible print, along with one set of white prints.

3. 02 RESUBMISSION REQUIREMENTS

A. Shop Drawings
1. Revise initial drawings as required and resubmit as specified for initial submittal.
2. Indicate on drawings changes which have been made other than those requested by the Architect/Engineer.

B. Product Data and Samples
1. Submit new data and samples as required for initial submittal.

3. 03 ELECTRONIC SUBMITTALS

A. All drawings and data transmitted by Mussachio Architects, P.C. on electronic media or email including but not limited to .PDF, .MSG, .DWG, .DWF files, computer discs, online FTP or other transfer sites and bulletin boards are only for the convenience of the Recipient and any discrepancy between the electronic files and the governing printed Construction Documents is the full responsibility of the Recipient. Recipient shall report any discrepancy between the electronic files and the governing printed Construction Documents shall be reported in writing to Mussachio Architects within ten (10) days of receipt. The recipient agrees to be fully responsible for any differences between this data and final Construction Documents or field conditions and shall hold harmless Mussachio Architects, P.C. for any such differences.

B. Electronic submittals shall be accepted by Mussachio Architects, P.C. (MA) in an Adobe PDF (.pdf) format only and shall be required to adhere to all applicable provisions within this Section without cause.

C. All shop drawing submittals shall be emailed to; adminassist@mussachioarchitects.com Submission to any other source or person(s) does not constitute a successful transmission.
1. Upon receipt of electronic shop drawings the administrator will reply to notify the contractor of successful receipt.
2. If no receipt is received the contractor is responsible for following up with Mussachio Architects to organize a successful submission without impact the project schedule, or processing times.

D. Architect reserves the right to request any submittal(s) in hard copy form in accordance with this Section with no impact to the submittals processing time.
1. Submittal(s) in which hard copies are required will be returned as “Not Reviewed” until such time as the hard copies(s) have been received. Processing times for submittals where hard copies have been requested will commence from date of reception of said hard copies by MA.

E. Electronic packages shall be received as a single packaged .pdf file including the contractors cover page (in accordance with 1.09 of this Section)
1. Mismatched / Loose / Individual files or submittals with or without cover pages will be returned as “Not Reviewed” citing nonconformance with the submittal requirements outlined in this Section.
a. Exception(s) - Samples / Color Selections

F. In embarking in the electronic submittal process the contractor is accepting the provisions made within this Section and general conditions.

G. Samples / Color Selections shall not be permitted as part of the electronic submittal process. Hard copy format(s) only shall be acceptable and shall be in accordance with requirements “1.07 Samples” of this Section.

H. All electronic Submittals shall be required to conform with all provisions within this Specification Section. Omissions of data / required material(s) will result in items not accepted by MA and will be promptly returned citing nonconformance with this Section.

3. 04 CONTINUITY OF DIGITAL VS. HARD COPY DOCUMENTS

Documents submitted in either electronic or hard copies format and their subsequent re-Submittals (if any) are to retain the same submittal format as the original submittal. Electronic responses to hard copy markups, hard copy letters in response to digital review comments, or any provision(s) bridging the two separate processes(es) shall not be accepted by MA and will be returned citing nonconformance with this section.

3. 05 CONTRACTOR'S DISTRIBUTION OF SUBMITTALS

A. Distribute copies of shop drawings and product data which carry the General Contractor and Architect/Engineer stamp to:
1. Contractors’ file.
2. Job site file.
3. Record Document file.
4. Other Contractors, as required for coordination.
5. Subcontractors, as required for coordination.
6. Supplier.
7. Fabricator.

3. 06 CLOSEOUT SUBMITTALS

A. Upon completion of the Work of this Section, Contractor shall submit to the General Contractor all required closeout documents.

B. Contractor shall submit a marked-up set of drawings indicating any changes made during construction to the General Contractor.

C. Upon completion, submit to the General Contractor, a Contractor's Affidavit of Payment of Debts and Claims, and Release of Liens.

D. Refer to General Conditions for additional requirements.

- - - END OF SECTION - - -

SUBMITTAL COVER SHEET

THE CONTRACTOR IS REQUIRED TO FILL OUT ALL PORTIONS OF THIS FORM IN THEIR ENTIRETY. INCLUDE THIS FORM WITH YOUR HARD COPY SUBMITTAL OR INSERT THIS PAGE INTO YOUR DIGITAL SUBMISSION AS THE FIRST PAGE AND EMAIL TO: ADMINASSIST@MUSSACHIOARCHITECTS.COM

PROJECT INFORMATION:

Project Name: _____

Project Location: _____

Arch Project #: _____

Date Issued: _____

(FOR OFFICE USE ONLY)

Submittal #: _____

Date Received: _____

Notes: _____

_____

SUBMITTED BY:

Submitter Name: _____

Company Name: _____

Address: _____

_____

Phone: _____

Email: _____

GENERAL CONTRACTOR (GC) / OWNER:

Project Manager: _____

Construction Manager: _____

Address: _____

_____

Phone: _____

Email: _____

SUBMITTAL INFORMATION:

1) Drawing Title(s): _____

2) Technical Spec Section(s): _____

3) Is the submitted product the specified model/type and manufacturer indicated in the drawings & specs? *(if no, please identify the reason below)*

☐ Yes ☐ No

☐ Cost ☐ GC/Owner Requirement ☐ Availability ☐ Bid Issue ☐ Other (please explain): _____

4) Type of Submittal: *(check all that*

- ☐ Shop Drawing(s)
- ☐ Color Chart(s)/Samples
- ☐ Sample(s)
- ☐ Product Data / MSDS
- ☐ Manufacturer Data
- ☐ Test Reports
- ☐ Record Documents
- ☐ Other (please explain): _____

(FOR OFFICE USE ONLY)

5) Has this submittal been reviewed and approved of by the General Contractor and/or Owner prior to submission?

☐ Yes ☐ No

6) Please indicate the parties having approved of the product specified for this specific project.

☐ Owner ☐ GC

STATEMENT OF SPECIAL INSPECTION

Name of Project: Islamic Center Expansion – Phase 1

Address of Legal Description: 745 Heim Road, Getzville, New York 14068

Owner's Name: Islamic Society of Niagara Frontier

Owner's Address: 745 Heim Road, Getzville, New York 14068

Authority Having Jurisdiction: Town of Amherst, New York

This Statement of special Inspections is submitted as a condition for permit issuance in accordance with the Special Inspections requirements of the Building Code. It includes a Schedule of Special Inspection Services applicable to this project as well as the name of the Special inspector and the identity of other approved agencies intended to be retained for conducting these inspections.

The Special inspector shall keep records of all inspections and shall furnish inspection reports to the building Official, Structural Engineer and Architect of Record. Discovered discrepancies shall be brought to the immediate attention of the Contractor for correction. If such discrepancies are not corrected, the discrepancies shall be brought to the attention of the Building Official, Structural Engineer and Architect of Record. The Special Inspection program does not relieve the Contractor of his or her responsibilities.

Interim reports shall be submitted to the Building Official, Structural Engineer and Architect of Record.

Job Safety and means and methods of construction are solely the responsibility of the Contractor.

Interim Report Frequency: **On a weekly basis.**

I, as the owner, or agent of the owner (contractors may not employ the special inspector), certify that I, or the architect/engineer of record, will be responsible for employing the special inspector(s) as required by Building Code Section 1704 for the construction project located at the site listed above.

Signed: _____

I, as the **Architect of Record**, certify that I have prepared the following special inspection program as required by Building Code Section 1704 for the construction project located at the site listed above.

Printed Name: _____

Design Professional Seal

SCHEDULE OF SPECIAL INSPECTION SERVICES

List of work required special inspection:

- ☒ Soils Compliance Prior to Foundation Inspection
- ☒ Structural Concrete Over 2500 PSI
- ☒ Structural Masonry (LBW)
- ☒ Structural Steel
- ☒ Spray Fire Resistant Materials
- ☐ Wood Construction
- ☒ Exterior Insulation & Finish System
- ☐ Smoke Control
- ☐ Wall Panels and Veneers
- ☐ Special Cases

Name(s) of individual(s) or Firm(s) responsible for special inspections listed above (Subject to Approval by the Code Enforcement Official):

A. Atlantic Testing or

B. Barron & Associates or

C. SJB-Empire Geotechnical

DUTIES OF SPECIAL INSPECTIORS

SOIL COMPLIANCE:

1. **Site preparation:** Prior to placement of the prepared fill, the special inspector shall determine that the site has been prepared in accordance with the approved soils report.
2. **During fill placement:** During placement and compaction of the fill material, the special inspector shall determine that the material being used and the maximum lift thickness comply with the approved report, as specified in §1803.4.
3. **Evaluation of in-place density:** The special inspector shall determine, at the approved frequency that the in-place dry density of the compacted fill complies with the approved report.

STRUCTURAL CONCRETE:

1. Periodic inspection of reinforcing steel, including pre-stressing tendons, and placement.
2. Continuous inspections of bolts to be installed in concrete prior to and during placement of concrete where allowable loads have been increased.
3. Periodic verification of use of required design mix.
4. Continuous sampling fresh concrete & performing slump, air content & determining the temp of fresh concrete at the time of making specimens for strength test.
5. Continuous inspection of concrete placement for proper application techniques.
6. Periodic inspection for maintenance of specified curing temperature and technique.
7. Periodic inspection of erection of pre-cast concrete members.

STRUCTURAL MASONRY:

1. Periodic inspection to ensure compliance of proportions of site-prepares mortar.
2. Periodic inspection to ensure compliance of construction of mortar joints.
3. Periodic verification of size and location of structural elements.
4. Periodic verification of type, size and location of anchors, including other details of anchorage of masonry to structural members, frames or other construction.
5. Periodic verification of specified size, grade and type of reinforcement.

6. Periodic verification of protection of masonry during cold weather (temps. <40°F) or hot weather (temps. >90°F)
7. Periodic verification for compliance with required inspection provisions of the construction documents and approved submittals.

STRUCTURAL STEEL:

1. Periodic material verification of high-strength bolts, nuts and washers.
2. Continuous inspection of slip-critical high-strength bolting connections.
3. Continuous inspection of complete and partial penetration groove welds in structural steel.
4. Continuous inspection of multi-pass fillet welds in structural steel.
5. Continuous inspection of single-pass fillet welds greater than 5/16" in structural steel.
6. Periodic inspection of floor and deck welds in structural steel.
7. Periodic verification of weld-ability of reinforcing steel other than ASTM A 706
8. Continuous inspection of reinforcing steel-resisting flexural and axial forces in intermediate and special moment frames, and boundary elements of special reinforced concrete shear walls and shear reinforcement.
9. Continuous inspections of reinforcing steel shear reinforcements.
10. Periodic inspection of other reinforcing steel.
11. Periodic inspection of steel frame joint details for compliance with approved construction documents.

SPRAYED FIRE-RESISTANT MATERIALS:

1. The prepared surface of structural members to be sprayed shall be inspected before the application of the sprayed fire-resistant material.
2. Coverage and depth of material is to be inspected, to meet requirements of specification.

EXTERIOR INSULATION AND FINISH SYSTEM:

1. Special inspections shall be required for all EIFS applications.
2. Inspection of all flashing systems related to the EIFS
3. Special coatings.

EXCEPTIONS:

1. Special inspections shall not be required for EIFS applications installed over a water-resistive barrier with a means of draining moisture to the exterior.
2. Special inspections shall not be required for EIFS applications installed over masonry or concrete walls.

SPECIAL CASES:

1. Special inspectors shall contact the Code Enforcement Official and present their credentials for approval Prior To beginning work on the job site.

SPECIAL INSPECTIONS CHECKLIST- Islamic Center Expansion-Phase 1 ARCH. JOB#: 218024

MATERIAL/ACTIVITY	TYPE OF INSPECTION	REQ'D THIS PROJ?	REFERENCE	INSPECTION / TEST BY			
				A/E	OWNER'S PROJ INSP	OWNER'S TEST LAB	CONTRACTOR / SUPPLIER
QUALITY ASSURANCE							
Seismic	Quality Assurance Plan		1705				
Wind	Quality Assurance Plan		1706				
FOUNDATIONS							
Soil	Compaction of Fill Materials	X	Specs, 1704.7		X	X	
Soil	Bearing at bottom of footing excavations	X	Specs		X		
Soil / Rock	Bottom of Caissons or Pile		1809				
Caison/ Pile	Driving records, tip & cutoff elevations		1704.8, 1807,1808				
Caison/ Pile	Load Test		Specs, 1807.2.8.3				
Reinf. Bars	Size & placement in foundations	X	ACI, Specs		X		
Piers	Size & placement of Reinf. Bars	X	1704.9		X		
CONCRETE CONSTRUCTION							
Concrete	Ready-mix Plant quality control		Specs				
Concrete	Mix design tests and certificates	X	Specs, 1704.4.1	X			
Reinf. Steel	Shop drawings of reinforcing steel	X	Specs	X			
Reinf. Steel	Placement of reinforcing steel	X	1704.4		X		
Reinf. Steel	Welding	X	1704.4		X		
Formwork	Design, placement & shoring	X	1906.1				X
Formwork	Removal and reshoring	X	1906.2				X
Concrete	Test cylinders	X	1704.4, 1905.6		X		
Concrete	Mix proportions & Mix on Delivery Tickets	X	1704.4		X		X
Concrete	Slump test	X	1704.4		X		X
Concrete	Placement procedures	X	1905.9, 1905.10		X		X
Concrete	Curing temperatures & techniques	X	1905.11		X		
Prestressed	Prestressing procedures & forces		1704.4				
Prestressed	Shop drawings of prestressed units		Specs				
Precast	Quality control of manufacturer		1704.2				
Precast	Shop drawings of precast	X	Specs	X			
Precast	Erection of precast		1704.4				
Precast	Inspection of Connections		1704.4				
Anchors	Anchors cast in concrete	X	1912.5		X		
Vapor Barrier	Placement of material and thickness	X			X		

SPECIAL INSPECTIONS CHECKLIST- Islamic Center Expansion-Phase 1 ARCH. JOB#: 218024

MATERIAL/ACTIVITY	TYPE OF INSPECTION	REQ'D THIS PROJ?	REFERENCE	INSPECTION / TEST BY			
				A/E	OWNER'S PROJ INSP	OWNER'S TEST LAB	CONTRACTOR / SUPPLIER
MASONRY CONSTRUCTION							
Inspection Level	Indicate Level of Inspection Required (1, 2, na)		1704.5.2, 1704.5.3				
Quality Assurance	Indicate Level of Quality Assurance Required (1, 2, 3, na)		1708.1				
Clay Masonry	Certificates, Tests & technical data		1704.5, 1708.1				
Concrete Masonry	Certificates, Tests & technical data	X	1704.5, 1708.1	X			
Reinf. Steel	Shop Drawings	X	Specs	X			
Reinf. Steel	Condition, Size, Location, Spacing of Reinf Steel	X	1704.5		X		
Anchors	Manufacturer's Data		1704.5				
Accessories	Manufacturer's Data		Specs				
Mortar & Grout	Mix design and data	X	1704.5	X			
Masonry Panel	Masonry Strength		1708.1				
Mortar & Grout	Field samples and testing		1704.5		X	X	
Foundations	Tolerance inspection	X	Specs		X		
Masonry	Placement of units, mortar & accessories	X	1704.5		X		
Masonry	Protection of masonry work	X	1704.5				X
Anchorage	Placement of devices		1704.5				
Seismic	Reinforcing (Seismic Design Category "C")		1708.2, 1708.3				
STEEL CONSTRUCTION							
Fabricator	Quality control inspection of shop	X	1704.2				X
Fasteners	Mfr's Certificate of Compliance		1704.3				
Struct. Steel	Mfr's Certificate of Compliance		1704.3				
Weld Matl's	Mfr's Certificate of Compliance		1704.3				
Details	Shop drawings review	X	Specs	X			
Erection	Installation of High-strength Bolts		1704.3.3				
Erection	Welding	X	1704.3.1, 1707.2		X		
Erection	Steel Framing and Connections	X	1704.3.2		X		
Seismic	Structural Steel		1707.2, 1708.4				
Seismic	Cold-formed Framing - Connections		1707.4				
ADDITIONAL SEISMIC INSPECTIONS							
Components	Storage Racks & Access Floors (SDC = D)		1707.5				
Components	Architectural Exterior Cladding (SDC = D)		1707.6				
Components	Mechanical & Electrical - Anchorage (SDC = C)		1707.7				

SPECIAL INSPECTIONS CHECKLIST- Islamic Center Expansion-Phase 1 ARCH. JOB#: 218024

MATERIAL/ACTIVITY	TYPE OF INSPECTION	REQ'D THIS PROJ?	REFERENCE	INSPECTION / TEST BY			
				A/E	OWNER'S PROJ INSP	OWNER'S TEST LAB	CONTRACTOR / SUPPLIER
WOOD CONSTRUCTION							
Fabrication	Quality control inspection of shop		1704.2				
Wood	Grade stamp		Specs				
Wood	Fastening per code and drawings		Specs				
Trusses	Shop drawings		Specs				
Trusses	Truss placement & fastening and anchorage		Specs				
Laminates/ lintels	Shop drawings		Specs				
Laminates/ lintels	Identification per shop drawings		Specs				
Plywood	Grade stamp		Specs				
Construction	fastening of seismic/ shear force resisting system		1707.3				
FIREPROOFING							
Spray-on	Manufacturer's data	X	Specs	X			
Spray-on	Surface Conditions	X	1704.11.1				X
Spray-on	Application		1704.11.2				
Spray-on	Thickness	X	1704.11.3		X		
Spray-on	Density		1704.11.4				
Spray-on	Bond Strength		1704.11.5				
GWB Fireproof	Manufacturer's data		Specs				
GWB Fireproof	Placement of materials		Specs				
Firewall Ass'y	Manufacturer's data		Specs				
Firewall Ass'y	Placement of materials		Specs				
EXTERIOR INSULATION and FINISH SYSTEMS (EIFS)							
Materials	Manufacturer's data	X	Specs	X			
Preparation	Condition of substrate	X	Specs		X		
Application	Methods, proportions & thickness of installation	X	Specs		X		
Vapor/Air Barrier	Methods, proportions & thickness of installation	X	Specs		X		

SPECIAL INSPECTIONS CHECKLIST- Islamic Center Expansion-Phase 1 ARCH. JOB#: 218024

MATERIAL/ACTIVITY	TYPE OF INSPECTION	REQ'D THIS PROJ?	REFERENCE	INSPECTION / TEST BY			
				A/E	OWNER'S PROJ INSP	OWNER'S TEST LAB	CONTRACTOR / SUPPLIER
WATERPROOFING							
Material	Manufacturer's data		Specs				
Preparation	Condition of Substrate		Specs				
Application	Methods, proportions & thickness of installation		Specs				

NOTES:

1. Fabricator, supplier, ready-mixed plant or other production plants shall provide certificates from an approved independent inspection, testing or quality assurance agency attesting that the plant meets at least one of the following criteria:

   a. The plant is a certified production plant meeting the quality assurance standards of a recognized national standards organization for that product.

   b. The plant maintains an agreement with an independent inspection or quality assurance agency to conduct periodic in-plant quality assurance inspections. The frequency of these inspections shall not be less than one every six months.

   c. The plant has an in-shop quality assurance inspection program by an independent testing or quality assurance agency for the work/product to be provided on this project.

2. A/E shall review fabricator/supplier/producer certificates for conformance with appropriate standards of practice and quality assurance.

3. Contractor/supplier shall submit manufacturer's certificates of compliance for the materials/products.

4. Reviews records and test results for conformance with requirements.

5. Observes placement and erection of materials during jobsite visits.

6. Special Inspection firm shall have expertise in fire protection engineering, mechanical engineering, and certification as an air balancer.

PART I - GENERAL

1. 01 GENERAL

The Drawings, Instructions to Bidders, Form of Proposal, General Conditions, Supplementary General Conditions, and Division 1 are included herein and govern work under this section.

1. 02 SCOPE OF WORK

A. Dewatering consists of performing all work necessary to remove surface water and/or control the groundwater levels and hydrostatic pressures in order to permit all excavation and construction under this Contract to be performed in the dry. The control of all ice and snow shall be considered as part of the work under this item.

B. Installation, operation, maintenance, supervision, supply, dismantling, and removal from the site of the dewatering equipment.

C. The Contractor must familiarize himself with the potential for excessive rainfall, the site conditions, and the groundwater conditions.

D. Drainage of the Site: At all times the Contractor shall maintain and operate adequate surface and subsurface drainage methods to the satisfaction of the Architect in order to keep the construction site dry and in such condition that placement and compaction of fill may proceed unhindered by saturation of the area. During construction, the surface of the backfill area shall be left in such condition that precipitation and/or surface water will run off without ponding.

PART II - PRODUCTS

Not Applicable

PART III - EXECUTION

3. 01 METHOD

A. The control of all surface and subsurface water, ice, and snow are part of the dewatering requirements. Maintain adequate control so that the stability of excavated and construction slopes is not adversely affected by water, that erosion is controlled, and the flooding of excavations or damage to structures does not occur. Drain surface water away from the excavation.

B. Dispose of all water removed from the excavation in a manner that will not endanger public health, property, or portions of the work under construction or completed. Dispose of water in a manner that will cause no inconvenience whatsoever to the Owner or the others engaged in work at the site.

C. Dewatering systems shall be so designed as to prevent removal of soil fines from the site during the dewatering operation.

3. 02 DEWATERING REQUIREMENTS

A. The bottom of the excavation shall be in a suitable condition to the extent required to maintain the subgrade in a stable condition.

B. If excavation encounters the ground water table, the Contractor must lower the ground water table, prior to excavation, a minimum of two (2) feet below the final subgrade using a method approved by the Architect. The Contractor must submit his proposed dewatering method for approval prior to performing any dewatering work.

- - - END OF SECTION - - -

PART I - GENERAL

1. 01 GENERAL

The Drawings, Instructions to Bidders, Form of Proposal, General Conditions, Supplementary General Conditions, and Division 1 are included herein and govern work under this Section.

1. 02 DESCRIPTION OF WORK

A. Furnish all labor, materials, and equipment to complete the earthwork as shown and/or herein specified.
   1. Excavation
   2. Filling and Backfilling
   3. Rough grading
   4. Geotextile Fabric
   5. Geotextile Fabric for Soil Stabilization/Separation
   6. Testing

1. 03 RELATED WORK SPECIFIED ELSEWHERE

A. Section - Geotechnical Report

B. Section - Dewatering

C. Section - Earth Retainage

D. Section - Asphalt Paving

E. Section - Concrete Paving and Curbs

F. Section - Topsoil

G. Division 16 - Electrical

PART II - PRODUCTS

2. 01 MATERIALS

A. Earth: Approved, free from frost, trash, stumps, trees, roots, sod, heavy mud, etc. If excavated material is insufficient to meet fill requirements, furnish approved earth at Contractor's expense, subject to approval by the Geotechnical Engineer.

B. Crusher Run Stone:
   1. Conform to NYSDOT Section 304 Item 304.05.
      a. Clean, hard, sound, durable, uniform in quality and free of any detrimental quantity of soft, friable, thin, elongated or laminated pieces, disintegrated material, organic matter, oil alkali or other deleterious substances.
      b. Sizes: 100 percent passing 2" sieve, 30-65 percent passing 1/4" sieve, 5-40 percent passing No. 40 sieve, 0-10 percent passing No. 200 sieve.

C. Gravel: (Contractor's Option)
   1. Comply with NYSDOT, Section 304, Item 304.02 or 304.05.
   2. Clean, hard, sound, durable, uniform in quality and free of any detrimental quantity of soft, friable, thin, elongated or laminated pieces, disintegrated material, organic matter, oil alkali or other deleterious substances.
      a. Type 1, size: 100 percent passing 3" sieve, 30-65 percent passing a 1/4" sieve, 5-40 percent passing No. 40 sieve, 0-10 percent passing No. 200 sieve.

D. Concrete Sand:
   1. Comply with NYSDOT, Section 703-07.
   2. Clean, sharp sand, free from clay, 100 percent passing 3/8" sieve, 90-100 percent passing No. 4 sieve, 75-100 percent passing No. 8 sieve, 50-85 percent passing No. 16 sieve, 25-60 percent passing No. 30 sieve, 10-30 percent passing No. 50 sieve, 1-10 percent passing No. 100 sieve 0-3 percent passing No. 200 sieve.

E. Stone Rip-Rap: Shall be round carbonate stone or fragmented carbonate rock, dense, sound and durable. Minimum size permitted, approximate weight 50 lbs.; maximum size permitted, approximate weight, 75 lbs. An allowance of 15% by weight for inclusion of quarry spalls will be permitted.

F. Geotextile Fabric: As manufactured by Tensar Manufacturing in accordance with manufacturer's recommendations, and in compliance with ASSHTO M-288-96, minimum 24 mil. Verify and coordinate fabric required with Section - Geotechnical Report and any recommendations shown therein by the soils engineer.

G. Geotextile Fabric for Soil Stabilization/Separation: As manufactured by TenCate equal to Mirafil 500X high tenacity polypropylene yarns woven into a stable network such that the yarns retain their relative position. Textile shall be inert to biological degradation and resistant to naturally encountered chemicals, alkalis and acids. Verify and coordinate fabric required with Section 02010 Geotechnical Report and any recommendations shown therein by the soils engineer.

H. Fine Stone Fill:
   1. Comply with NYSDOT, Section 620, Item 620.02.
   2. Clean, free from clay 90-100 percent smaller than 200 mm, 50-100 percent larger than 75 mm, 0-10 percent smaller than 2.0 mm.

PART III - EXECUTION

3. 01 INSPECTION AND QUALITY CONTROL

A. A testing agency will be employed by the Owner and approved by the Architect to inspect and test all backfill and sub-grade preparation.

B. The service of this testing agency is intended for the Owner's verification and shall in no way relieve the Contractor of his responsibility to be in compliance with the requirements of the Contract Documents and to provide his own inspection and quality.

C. The Architect shall have the testing laboratory make such tests as deemed necessary.

D. The following minimum tests shall be made. ASTM Designations specified refer to the latest publication.
   1. Grain Size Analysis 9 ASTM C117.
   2. Maximum Density and Optimum Moisture Content (9 ASTM D1557) or other appropriate test determined by the Geotechnical Engineer where material gradation does not permit use of ASTM D1557.
   3. Soundness Test (9 ASTM C88).
   4. Plasticity Index (ASTM D423 and ASTM D424).
   5. Elongated particles (NYSDOT Standard Specifications, January 2, l981, Section 304-2. 02).
   6. In place density (ASTM D1556 or ASTM D2922).
   7. Moisture Content.

E. Tests 1 - 5 shall be performed before acceptance and delivery of fill to the site. Any change in the source of material or change of quality of the material will require a new series of tests of determined acceptability.

F. Delivery and compaction of fill material shall be made during the presence of the Geotechnical Engineer's representative and shall be subject to his approval. This inspection by no means absolves the Contractor from responsibility of compaction as specified.

G. Acceptance and rejection of fill placed in accordance with 95% and 90% (as specified) of maximum density attainable by the Modified Proctor Method of Compaction (ASTM D1557) shall be based upon the following in place density test result requirements for each lift, and all other requirements as stated in these Specifications.
   1. Requirements for 95% of Maximum Density (ASTM D1557): The results of all in place density tests must meet the following requirements.
      a. The average of any three consecutive tests shall be equal to, or greater than 95% of the maximum density.
      b. No more than one in four consecutive tests shall be less than 95% of the maximum density.
      c. No test result shall be less than 94.0% of the maximum density.
   2. Requirements for 90% of the Maximum Density (ASTM D1557): The results of all in place density tests must be greater than or equal to 90% of the maximum density.

H. An alternative appropriate density test procedure shall be determined by the Geotechnical Engineer to obtain the maximum density where material gradations do not permit use of ASTM D1557 to determine the maximum density requirement will be based.

I. All earthwork shall be performed by personnel experienced in these operations. It is the responsibility of the Contractor to provide such personnel.

3. 02 LAYOUT

A. Employ licensed engineer or surveyor to stake out both horizontal and vertical control for all work prior to commencing any work operations. Accurately locate and maintain location of all structures, paved areas, feature, etc. Advise Architect of any discrepancies, prior to commencing work.

B. Maintain benchmarks, monuments and other reference points. Re-establish benchmarks if disturbed or destroyed at no cost to Owner.

3. 03 PROTECTION

A. Stockpile building materials away from trees. Do not run heavy equipment over root systems. Maintain minimum trench widths near root systems to avoid unnecessary injury. Provide staked snow fence around trees noted to be protected with fence to follow vegetation drip line or as dimensioned on drawings.

B. Contractor shall take measures as required to protect excavation against frost and freezing until concrete work can be performed.

C. Adjacent building, pavements, utilities, and grades shall be protected by sheeting and/or shoring and bracing during excavation as required or as shown on drawings.

D. Protect existing structures and site features noted to remain, against damage from equipment and vehicular traffic as required.

E. Protect all aerial or underground utility lines to ensure uninterrupted service. Repair any damage incurred by Contractor.

3. 04 UNCLASSIFIED EXCAVATION

A. All excavation shall be unclassified. This shall be understood to mean that provided soil testing is performed, this Contractor is responsible for the excavation and removal of any and all materials or items encountered during excavation, including but not limited to rock, boulders, hidden foundation, etc. Without soil testing, the Owner shall be responsible for unclassified excavation beyond that shown on Construction Documents.

B. The Contractor shall report any unsatisfactory bearing conditions or any other unusual conditions to the Architect, and perform all additional excavation as directed by the Architect, at no additional cost to the Owner.

C. If for any reason, excavation is carried below the required levels, either as a result of Geotechnical Engineer's directive, or through error, the Contractor shall provide lean concrete or engineered fill under foundations and footings and suitable fill under slab on grade, to the indicated levels as directed and approved by the Geotechnical Engineer, in order to ensure proper bearing. This shall be at no additional cost to the Owner.

D. Cut to exact elevations and grade. Remove excavated materials from site.

3. 05 COMPACTION OF GRADE PRIOR TO FILLING

The surface within the proposed building area and all areas to receive asphalt paving, shall be thoroughly compacted, using a pneumatic-tired roller weighing at least 25 tons, a depth of at least 8" below stripped grade and to a dry density. This compaction requirement may be waived, if in the judgement of the Geotechnical Engineer, such compaction will disturb otherwise acceptable foundation soils. Any subgrade soils which weave excessively under the weight of the compaction equipment, shall, at the direction of the Geotechnical Engineer, be removed and replaced with compacted clean granular fill as specified below.

3. 06 FILLING AND BACKFILLING

A. Preparation:
   1. All sub-grades must be approved by the Geotechnical Engineer before placing fill and/or backfill. Do not backfill against foundation wall until examined and approved by the Geotechnical Engineer.
   2. Remove all debris from excavations before placing fill and/or backfill.
   3. Place Geotech fabric after proof rolling in all building areas prior to filling, per manufacturer's recommendations.

B. Materials:
   1. Earth:
      a. Fill and backfill exterior side of site structures to subgrade where no slab on grade, no pavement, and no foundation drains occur.
      b. Site fill where no pavement occurs.
      c. Fill and backfill to subgrade at site trenches where no slab on grade or pavement occurs.
      d. Fill and backfill in areas not specifically specified.
   2. Crusher Run Stone (Engineered Fill):
      a. All footings shall bear on suitable bearing or engineered fill.
      b. and backfill beneath foundations (minimum of 6" required) or substitution of a lean concrete "mud" mat as approved by the Architect, or his representative.
      c. Fill and backfill beneath porous base material specified for slab-on-grade construction and pavement.
      d. Underslab porous base material if demonstrated porous, as stated.
      e. At site trenches where pavement occurs.
      f. Fill and backfill to subgrade where demolition is required; place in 8" lifts and compact to 95% maximum dry density.
   3. Gravel (Contractor's Option):
      a. Fill and backfill beneath porous base material specified for slab on grade construction and pavement. Material to extend 24" beyond edge of asphalt pavement and 6" beyond edge of concrete pavement.
      b. Backfill at site trenches where pavement occurs.
   4. Bedding Sand: Bedding as detailed for mechanical and electrical utility trenches shall be concrete sand (2.01D).
   5. The Contractor may propose alternate materials with similar engineering properties for consideration by the Geotechnical Engineer. Such materials shall be proposed only where substitution results in a credit to the Owner.
   6. Placement of fill materials: Place after areas have been examined and approved by Geotechnical Engineer or his representative.
   7. Frost: No fill material shall be placed when either the fill material or the previous lift or subgrade on which it is to be placed is frozen. In the event that any fill which has been placed or the subgrade shall become frozen, it shall be scarified to break up all frozen material and recompacted, or removed to the satisfaction of the Geotechnical Engineer or his representative before the next lift is placed. Any soft areas resulting from frost shall be removed or recompacted to the satisfaction of the Geotechnical Engineer before new fill is placed over the area.
   8. Open Areas: The fill shall be spread evenly by mechanical or manual means, in approximately horizontal layers of six (6) to eight (8) inches maximum loose thickness.
   9. Limited Access: Where large compaction equipment cannot work, the fill material shall be placed in nearly horizontal layers, having a maximum loose thickness of four (4) to six (6) inches.

10. Underslab fill and backfill shall be placed and compacted before installation of under-floor mechanical lines. Underslab porous base material shall be installed after underslab mechanical lines have been led, backfilled, and compacted.
11. Moisture Control: At the time of compaction, the material in each layer of fill shall have a moisture content within +/-2 percent of optimum moisture content for compaction, as determined by ASTM D1557 procedure for determining the moisture density relationship of the fill material. If, in the opinion of the Geotechnical Engineer or his representative, the fill material is too wet, it shall be dried by a method approved by the Geotechnical Engineer prior to commencing or continuing the compaction operation. Likewise, if, in the opinion of the Geotechnical Engineer, the fill material is too dry for proper compaction, the fill shall be moistened by a method approved by the Geotechnical Engineer prior to commencing or continuing the compaction operation. The Geotechnical Engineer, at his discretion, may permit a larger variation of moisture content then +/-2 percent, if the fill can be placed properly within the new limits, or may require a smaller variation of moisture content than +/-2 percent, if it is necessary to properly control the fill.
12. The Contractor will avoid routing of heavy construction equipment including loaded trucks over subgrade areas or compacted fill areas on the site to avoid adverse affects under the load of such equipment. Should routing of heavy equipment occur over such areas, the Contractor shall be responsible for any adverse effects incurred.

C. Compaction of Fill:
1. Uniformly spread each layer, moisten or dry as required for optimum moisture content, and then compact so density of the compacted material meets or exceeds the specified percentage below the maximum dry density as determined in the laboratory and as approved by the Geotechnical Engineer in accordance with the Modified Proctor Method of Compaction, ASTM designation D1557.

Percentage of Maximum Dry Density	Location
95	Beneath all foundations, above foundations, and below slab on grade construction (inside and outside buildings) and pavement areas.
90	Non-loaded grassed areas, as shown.

2. Any lift, or portion thereof, which is not compacted in accordance with the Specifications shall be recompacted or removed and replaced to the satisfaction of the Geotechnical Engineer. The degree of compaction of each lift shall be checked by the Geotechnical Engineer or his representative, and each successive lift shall not be placed, or compacted until the previous lift is inspected, tested, and approved by the Architect. This fill is to be compacted to the lines and grades specified, and the slopes shall at all times be maintained by the Contractor.

3. 07 ROUGH GRADING

A. Sub-grade: Depth below finished grade as required for topsoil or pavement.

B. Accuracy: Set grade stakes where spot elevations shown, at breaks in grade, along drainage "swales" and as otherwise required to correctly grade the area according to elevations shown on plans.

C. Completion of Rough Grading: Obtain Architect's approval before spreading topsoil or preparing pavement sub-grade.

D. Sub-grade Rolling: All paved areas. In areas inaccessible to roller, use mechanical tamps.

3. 08 TIMING

Install drainage system prior to or concurrent with building excavation to prevent flooding of the building excavation, to allow trench settlement and general fill settlement through course of job, and to allow installation of base materials for construction.

- - END OF SECTION - -

BUFFALO DRILLING COMPANY
INC.
955 NIAGARA STREET
BUFFALO, NEW YORK
14213
(716) 886-0375

June 16, 1989 JOB NO: 89-121

Dr. K. Qazi
6343 Transit Road
Depew, New York 14043

ATTN: Dr. K. Qazi

RE: Subsurface Explorations and
Geotechnical Engineering Services for
Proposed East Amherst Church Project.

Gentlemen:

This report presents the findings of the subsurface exploration program and geotechnical engineering conclusions and recommendations for the above referenced project. In summary, five test borings were field located and drilled by Buffalo Drilling Company, Inc. (BDC) between May 15 and 17, 1989. These efforts coupled with laboratory testing and engineering evaluations conclude that a properly constructed shallow foundation system will provide adequate building support.

DISCUSSION OF METHODS

A track mounted Mobile B-47 rotary drill rig was used to drill the test borings to depths ranging from 21 to 34 feet below ground surface. Drilling operations were done using 3-3/4 inch inside diameter (ID), continuous flight hollow-stem augers. Soil samples were recovered by driving a standard split-spoon sampler (2 foot long by 1-3/8 inch inside

diameter) 24 inches with a 140 pound hammer falling 30 inches each blow (ASTM D1586). The number of blows for 12 inches of penetration is defined as the Standard Penetration Test (SPT) N-value. Relatively undisturbed soil samples were recovered by hydraulically pushing and retrieving thin-walled tubes (ASTM D1587) which were immediately sealed with wax and capped for transportation to the laboratory.

Retrieved soil samples were classified in the field and a portion of each split-spoon sample was placed and sealed in a glass jar. The boring logs, included as Appendix A, were prepared based on the field log and a second classification of the retained sample in the laboratory. Classification of soil samples as noted on the logs is based on the Unified Soil Classification System. Refer to Figure No. 2 entitled "Geotechnical Reference Standards" for an exploration of the terminology used for soil descriptions.

Laboratory soil testing was undertaken on three thin-walled tube samples and on several split spoon samples. A summary of test methods used is presented below.

- Particle Size Analysis of Soils - ASTM D422
- Liquid Limit and Plasticity Index of Soils - ASTM D4313
- Water Content Determination - ASTM D2216
- Unconfined Compressive Strength - ASTM D2166

Refer to Table No. 1 for tabulated results and Appendix B for graphical presentations of laboratory testing efforts

undertaken by BDC.

DISCUSSION OF SUBSURFACE CONDITIONS

The proposed development site is located in a vacant, lightly wooded area that is bordered on the north by Heim Road, on the south by Cimarand Road, and on the east and west by residential structures. In general, subsurface conditions beneath an upper topsoil veneer consist of naturally deposited silty sand, clay, and glacial till.

The natural deposited clay layer extends from beneath the thin sandy silt layer to an approximate depth of 24 feet which corresponds to elevation 478 feet. This thick clay unit is separated into an upper very stiff to stiff, low plasticity material to a depth of about twelve feet. SPT N-valves for these materials range between fifteen and thirty blows per foot of sample spoon penetration with a moisture content generally noted as moist. Due to desication and other geologic conditions, the upper stiff clay layer is concluded to be moderately to heavily over consolidated. This implies that the clay materials have previously experienced substantially heavier loads than are now present.

A soft to very soft clay layer underlies the upper stiff material and extends to the top of glacial till. These clay materials are wet and plastic with natural moisture contents near the liquid limit and SPT N-valves generally between one and five blows per foot of penetration. As determined through previous laboratory consolidation testing efforts on

similar materials, the soft clay is preliminarily concluded to be lightly overconsolidated.

Glacial till was recovered below the clay unit and extended to the full depth drilled. The glacial till material exhibits both granular and cohesive textures with the granular proportion increasing with depth. Consistencies range from soft to hard and densities vary between dense and very dense for cohesive and granular glacial till compositions, respectively. Moisture content is noted to range between moist and wet.

DISCUSSION OF FOUNDATION DESIGN AND CONSTRUCTION RECOMMENDATIONS

This section will present and discuss recommendations on foundation design and construction, placement and testing controlled fills, and subgrade and subbase requirements for paved roadway and parking areas. In summary, either conventional shallow foundation or mat foundation systems are concluded to be viable options with allowable soil bearing pressure not exceeding 1750 pounds per square foot of foundation area. Settlement of shallow foundations is considered not to be a significant problem as a result of the stiff upper clay material and the slight to moderately overconsolidated condition of the underlying softer clay. A deep foundation system consisting of large diameter caissons is also an applicable option with an allowable total load of about 180 kips per pier.

Detailed topographic information and final site grades were not available during preparation of this report. Elevations taken at the test boring locations identify a flat lying ground surface with an estimated average elevation of 502 feet.

Final design details of the proposed structure have not been determined at this time. The proposed church building is expected to be a single-story structure with a total first floor area of about 20000 square feet. The structure will most likely be constructed with interior and exterior steel columns and exterior curtain walls. The preferred method of support for the first floor slab is assumed to be bearing on grade.

General site preparation will include removing topsoil and all other unsuitable material to a depth where firm sandy silt is encountered. Following the stripping of unsuitable material, proofrolling areas of proposed use is recommended to determine the presence of soft and severely disturbed zones. All soft and disturbed zones should be undercut and stabilized with granular fill placed in compacted lifts prior to fill placement above. Refer to Appendix D entitled "General Earthwork Specification" for definition of fill types and gradation, recommended minimum compaction requirements for various site developments, and placement and compaction methods. All fills within load bearing areas should be placed in maximum loose lift thicknesses not

exceeding eight inches and uniformly compacted to a minimum 95 percent of the maximum dry density as determined by the Modified Proctor Method of Compaction (ASTM D1557).

A conventional shallow spread footing foundation system will provide adequate building support if foundation loads do not exceed 1750 pounds per square foot of area. The maximum recommended footing size is ten feet square which would support a total load of 175 kips. Settlement of a single footing as computated on sheets 5 through 8 in Appendix C is theoretically determined to be about one inch. Lastly, it is concluded that a conventional shallow foundation system will only be applicable if individual footings can be properly spaced to minimize deep overlapping foundation pressures. Superpositioning foundation pressure bulbs will result with increased differential and total building settlements.

A partially compensated mat foundation system will also provide adequate building support with minimal settlement. Evaluation of this foundation option is presented on computation sheets 9 and 10 of Appendix C. The mat foundation is recommended to be founded on natural deposited stiff clay or correspondingly at elevation 500 feet. Placement of the mat foundation at the recommended bearing elevation will result with an estimated net bearing pressure less than 100 pounds per square foot of area. The relatively low net foundation bearing pressure is somewhat insignificant in comparison with the conventional shallow foundation value.

As such, it is concluded that a properly designed and constructed mat foundation system will experience only minor and probably not even measurable amounts of settlement.

Large diameter drilled shaft foundations extending to and bearing on top of bedrock with a reinforced concrete grade beam is recommended as the most economical deep foundation system. The recommended allowable bearing pressure of a single large diameter shaft foundation or caisson with a minimum three foot diameter is presented on engineering computation sheets 11 and 12. Based on test boring results and known bedrock conditions, the total allowable load on a single three foot diameter caisson foundation is recommended not to exceed 180 kips. This evaluation includes a factor of safety of three and does not require caissons to be socketed into bedrock. Increased caisson loads can be achieved by larger diameter shafts and provision to bear at a depth of two or three feet below top of bedrock. It is further noted that if substantially increased foundation loads are required, a more detailed investigation of bedrock conditions is strongly recommended.

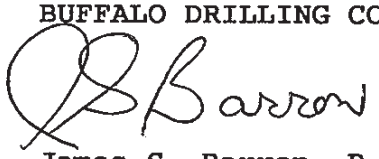
The characteristics of the upper sandy silt material and the known frost penetration depth in Western New York requires that specific attention is provided to the design and construction of paved roadway and parking areas. It is recommended that the subgrade surface is adequately graded and/or underdrains are installed to prevent water

accumulation. Above the approved subgrade surface, a minimum six inch thick crushed stone layer is recommended as the subbase coarse for light travel roadway and parking areas. A subbase course between ten and twelve inches thick is recommended for all truck routes and heavily traveled roadways. The top and binder course layers are recommended to be designed and constructed in accordance with New York State Department of Transportation, Standard Specification.

Modification regarding proposed building location and other site developments can result in changes to provided recommendations. It is recommended that the geotechnical engineer be provided the opportunity to generally review the final detailed design and contract specifications. Required earthwork and foundation construction should be done under the supervision of experienced construction personnel and in a manner consistent with proven methods. All site work should be carefully monitored and tested by experienced geotechnical personnel to assure compliance with earthwork and foundation construction specifications.

Thank you for the opportunity to assist on this project. Please call at your earliest convenience, if questions should arise.

Very truly yours,
BUFFALO DRILLING COMPANY, INC.



James S. Barron, P.E.
President

JSB:cg

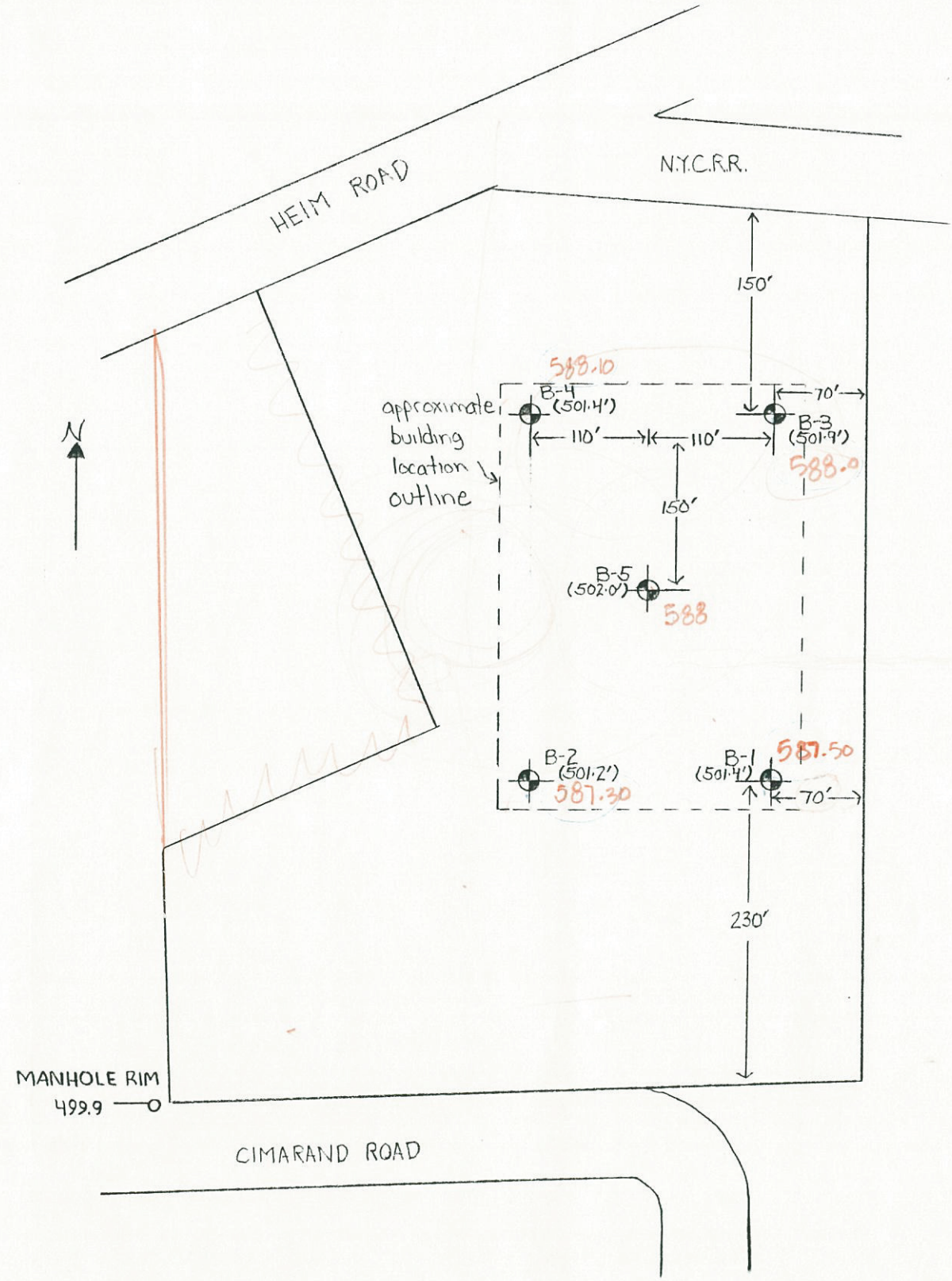
Encls.

APPENDIX B

LABORATORY TEST RESULTS

LABORATORY TEST RESULTS
SUMMARY
TABLE NO. 1

Boring No.	Sample No.	Depth (ft.)	Moisture Content (%)	Atterberg Limits			Grain Size Analysis				Unconfined Compressive Strength (psf)	Soil Description
				LL (%)	PL (%)	PI (%)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)		
B-1	S-3+4	4-8	25.8	41	21	20	0	4	23	73	-	Brn. CLAY, some Silt, mod.plastic, moist (CL)
B-1	S-7+8	14-21	42.5	51	19	32	0	3	19	78	-	Brn. CLAY, little Silt, plastic, wet (CH)
B-2	U-1	14-16	49.4	-	-	-	0	-	-		510	Brn. CLAY, little Silt, plastic, wet (CH)
B-2	U-2	19-21	47.8	-	-	-	0	-	-		250	Brn. CLAY, little Silt, plastic, wet (CH)
B-3	U-1	14-16	48.5	52	21	31	0	-	-		348	Brn. CLAY, little Silt, plastic, wet (CH)
B-4	S-3+4	4-8	29.4	49	25	24	0	-	-		-	Brn. CLAY, some Silt, mod.plastic, moist (CL)
B-5	S-3+4	4-8	27.6	41	22	19	0	-	-		-	Brn. CLAY, some Silt, mod.plastic, moist (CL)
B-5	S-8+9	14-21	49.2	53	26	27	0	-	-		-	Brn. CLAY, little Silt, plastic, wet (CH)



LEGEND

Boring Location

Scale: as dimensioned

BUFFALO DRILLING CO. INC.

K. Qazi

Proposed Church Structure

East Amherst, New York

BORING LOCATION PLAN

DATE:	JOB NO.	FIGURE NO:
5-24-89	89-121	1

TERMINOLOGY USED FOR SOIL DESCRIPTIONS

Key to Density & Consistency Description of Granular & Cohesive Soils

Number of Blows per ft., N	Relative Density	Number of Blows per ft., N	Consistency
		Below 2	Very soft
0-4	Very loose	2-4	Soft
4-10	Loose	4-8	Medium
10-30	Medium	8-15	Stiff
30-50	Dense	15-30	Very stiff
Over 50	Very dense	Over 30	Hard

Description of Percentage or Proportions Used in Soil Sample Classification		Abbreviations Used in Soil Sample Classification	
Trace	0-10%	f - fine	v - very
Little	10-20%	m - medium	gr - gray
Some	20-35%	c - coarse	bn - brown
And	35-50%	f/m - fine to medium	yel - yellow
		f/c - fine to coarse	

Notes:

1. Description and classifications are based on visual inspection of samples and boring operations.
2. The stratum lines shown on the boring logs are based upon interpretation and may not represent precise subsurface conditions.
3. Water level readings have been made in the drill holes at times and under conditions stated on the boring logs. Fluctuations in the groundwater level may occur due to other factors than those present at the time measurements were made.
4. The Standard Penetration Test N-value, as specified by ASTM D-1586, is defined as the number of blows required by a 140-pound hammer falling 30 inches each blow to drive a 2-inch outside diameter split spoon sampler 12 inches.

SOIL CLASSIFICATION CHART
(Unified Soil Classification System)

MAJOR DIVISIONS			GRAPH SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTIONS
COARSE-GRAINED SOILS More than 50% of material larger than No. 200 sieve	GRAVELS More than 50% of coarse fraction larger than No. 4	Clean Gravels (little or no fines)		GW	Well-graded gravels, gravel-sand mixtures, little or no fines
				GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines
		Gravels with appreciable amounts of fines		GM	Silty gravels, gravel-sand-silt mixtures
				GC	Clayey gravels, gravel-sand-clay mixtures
	SANDS Less than 50% of coarse fraction larger than No. 4 sieve	Clean Sands (little or no fines)		SW	Well-graded sands, gravelly sands, little or no fines
				SP	Poorly-graded sands, gravelly sands, little or no fines
		Sands with appreciable amounts of fines		SM	Silty sands, sand-silt mixtures
				SC	Clayey sands, sand-clay mixtures
FINE GRAINED SOILS Less than 50% of material larger than No. 200 sieve	SILTS AND CLAYS Low plasticity Liquid Limit < 50%			ML	Inorganic silts and very fine sands, rock floor, silty or clayey fine sands or clayey silts with slight plasticity
				CL	Inorganic clays of low to medium plasticity gravelly clays, sandy clays, silty clays, lean clays
				OL	Organic silts and organic silty clays of low plasticity
	SILTS AND CLAYS High Plasticity Liquid Limit >50%			MH	Inorganic silts, micaceous or diatomaceous fine sand or silty soils
				CH	Inorganic clays or high plasticity, fat clays
				OH	Organic clays or medium to high plasticity, organic silts
	Highly Organic Soils			Pt	Peat, humus, swamp soils with organic contents
	Miscellaneous Fill			FILL	Miscellaneous fill may belong in any division but is identified as FILL

GEOTECHNICAL REFERANCE STANDARDS

APPENDIX A

BORING LOGS

FIELD BORING LOG

BUFFALO DRILLING COMPANY, INC.
955 Niagara Street
Buffalo, New York 14213

Client: Qazi
Project: Proposed Church Structure
File No.: 89-121 Boring No.: B-1

Driller: Charles Nicometi
Type of Drill Rig: Mobile B-47
Sampling Method: ASTM D1586
Size and Type of Bit: 3-3/4 inch ID augers

Surface Elevation: (587.50) 501.4 ft.
Datum: Highest Point of Manhole
Location: Refer to boring location plan
Date Started: 05/15/89 Completed: 05/15/89

Overburden Samples: Disturbed: 8 Undist.:
Total Depth of Hole: 21.0 ft.
Depth Drilled into Rock: 0 ft.

Top of Rock Elevation:
Bottom of Hole Elevation: 480.4 ft.
Ground Water Depth: No water at completion

Depth (ft.)	Blows per .5 ft.		Sample No.	N	% Rec (RQD)	SOIL AND ROCK DESCRIPTION	REMARKS
						Topsoil	
1	1	2	S-1	6	25		S-1:0-2'
	4	8					
	3	3	S-2	8	35	Lt.brown, loose f.SAND, some Silt, tr.Clay, wet (SM)	S-2:2-4'
	5	6					
5	3	6	S-3	15	70	Brown, stiff CLAY, some Silt, mod.plastic, moist (CL)	S-3:4-6'
	9	10					
	4	8	S-4	18	80	...grade: very stiff	S-4:6-8'
	10	12					
	4	6	S-5	14	100	...grade: stiff, little Silt, wet	S-5:8-10'
10	8	9					
	1	1	S-6	3	100	...grade: soft, plastic(CH)	S-6:10-12'
	2	3					
15	1	1	S-7	2	100	Same as S-6	S-7:14-16'
	1	1					
	WR	WR	S-8	0	100	...grade: very soft	S-8:19-21'
21	WR	WR					

Notes:

Bottom of Hole 21.0 ft.

FIELD BORING LOG

BUFFALO DRILLING COMPANY, INC.
955 Niagara Street
Buffalo, New York 14213

Client: Oasi
Project: Proposed Church Structure
File No.: 89-121 Boring No.: B-2

Driller: Keith Danser
Type of Drill Rig: Mobile B-47
Sampling Method: ASTM D1586
Size and Type of Bit: 3-3/4 inch ID augers

Surface Elevation: (587.3) 501.2 ft.
Datum: Highest point of Manhole
Location: Refer to boring location plan
Date Started: 5/17/89 Completed: 5/17/89

Overburden Samples: Disturbed 9 Undist. 2
Total Depth of Hole: 31.0 ft.
Depth Drilled into Rock: 0 ft.

Top of Rock Elevation:
Bottom of Hole Elevation: 470.2 ft.
Ground Water Depth: No water at completion

Depth (ft.)	Blows per .5 ft.		Sample No.	N	% Rec (RQD)	SOIL AND ROCK DESCRIPTION	REMARKS
1	3	3	S-1	7	60	Topsoil Brown, loose f. SAND, some Silt, little Clay, moist (SM)	S-1: 0-2'
	4	5					
	4	9	S-2	24	40	Brown, v. stiff CLAY, some Silt, some f. Sand, mod. plastic, moist (CL)	S-2: 2-4'
	15	14					
5	5	7	S-3	19	40	...grade: tr. f. Sand	S-3: 4-6'
	12	17					
	4	9	S-4	20	90	Same as S-3	S-4: 6-8'
	11	13					
	3	5	S-5	12	100	...grade: stiff, little Silt	S-5: 8-10'
	7	8					
10	2	2	S-6	4	50	...grade: soft	S-6: 10-12'
	2	3					
	1	1	S-7	2	80	...grade: wet	S-7: 12-14'
	1	1					
15			U-1		100	...grade: plastic (CH)	U-1: 14-16'
			U-2		100	Same as U-1	U-2: 19-21'
21							

Notes:

FIELD BORING LOG

BUFFALO DRILLING COMPANY, INC.
955 Niagara Street
Buffalo, New York 14213

Client Qazi
Project Proposed Church Structure
File No. 89-121 Boring No. B-2

Depth (ft.)	Blows per .5 ft.		Sample No.	N	% Rec (RQD)	SOIL AND ROCK DESCRIPTION	REMARKS
22							
	WH	WH	S-8	WH	100	Brown, v.soft CLAY, some Silt, little f/c Sand, sl.plastic, wet (Till)	S-8: 24-26'
25	WH	WH					
	13	19	S-9	41	100	Brown/grey, dense f/c SAND and Gravel, tr.Silt, tr.Clay, wet (Till)	S-9: 29-31'
30	22	21					
						Bottom of Hole 31.0 ft.	
35							

Notes:

FIELD BORING LOG

BUFFALO DRILLING COMPANY, INC.
955 Niagara Street
Buffalo, New York 14213

Client Oasi
Project Proposed Church Structure
File No. 89-121 Boring No. B-3

Driller Kenneth Huebert
Type of Drill Rig Mobile B-47
Sampling Method ASTM D1586
Size and Type of Bit 3-3/4 inch ID augers

Surface Elevation (588.00) 501.9 ft.
Datum Highest Point of Manhole
Location Refer to boring location plan
Date Started 05/16/89 Completed 05/16/89

Overburden Samples: Disturbed 9 Undist. 2
Total Depth of Hole 34.0 ft.
Depth Drilled into Rock 0 ft.

Top of Rock Elevation
Bottom of Hole Elevation 467.9 ft.
Ground Water Depth 11.6 ft at completion

Depth (ft.)	Blows per .5 ft.		Sample No.	N	% Rec (RQD)	SOIL AND ROCK DESCRIPTION	REMARKS
1	3	5	S-1	10	80	Topsoil Brown,stiff SILT,little f. Sand,little Clay, non-plastic, moist (ML)	S-1:0-2'
	5	6					
	1	3	S-2	9	60	Brown,stiff CLAY,some Silt, mod.plastic, moist (CL)	S-2:2-4'
	6	8					
5	5	9	S-3	24	70	...grade: v.stiff	S-3:4-6'
	15	20					
	3	6	S-4	13	80	...grade: stiff	S-4:6-8'
	7	7					
	2	2	S-5	5	100	...grade: med.stiff,little Silt	S-5:8-10'
10	3	2					
15			U-1		100	...grade: plastic, wet (CH)	U-1:14-16'
	WR	WH	S-6	1	100	...grade: v.soft, wet	S-6:16-18'
	1	2					
21							

Notes:

FIELD BORING LOG

BUFFALO DRILLING COMPANY, INC.
95 Niagara Street
Buffalo, New York 14213

Client Qazi
Project Proposed Church Structure
File No. 89-121 Boring No. B-3

Depth (ft.)	Blows per .5 ft.		Sample No.	N	% Rec (RQD)	SOIL AND ROCK DESCRIPTION	REMARKS
22							
25			U-2		100		U-2:24-25'
	25	50/2"	S-7	100+	60	Brown/grey,v.dense f/c SAND and Gravel,tr.Silt,tr.Clay, wet (Till)	S-7:25-25.7'
30	50/4'		S-8	100+	5	Same as S-7	S-8:29-29.3'
			S-9	100+	0		S-9:34.0' No recovery
35	25/0'					Bottom of Hole 34.0 ft.	auger refusal

Notes:

FIELD BORING LOG

BUFFALO DRILLING COMPANY, INC.
955 Niagara Street
Buffalo, New York 14213

Client Oazi
Project Proposed Church Structure
File No. 89-121 Boring No. B-4

Driller Kenneth Huebert
Type of Drill Rig Mobile B-47
Sampling Method ASTM D1586
Size and Type of Bit 3-3/4 inch ID augers

Surface Elevation (583.10) 502.0 ft.
Datum Highest Point of Manhole
Location Refer to boring location plan
Date Started 05/17/89 Completed 05/17/89

Overburden Samples: Disturbed 9 Undist.
Total Depth of Hole 21.0 ft.
Depth Drilled into Rock 0 ft.

Top of Rock Elevation
Bottom of Hole Elevation 481.0 ft.
Ground Water Depth No water at completion

Depth (ft.)	Blows per .5 ft.		Sample No.	N	% Rec (RQD)	SOIL AND ROCK DESCRIPTION	REMARKS
1	1	2	S-1	4	40	Topsoil Brown, loose f.SAND, some Silt, little Clay, moist (SM)	S-1:0-2'
	2	3					
	3	4	S-2	16	80	Brown, stiff CLAY, some Silt, mod. plastic, moist (CL)	S-2:2-4'
	12	14					
5	6	15	S-3	36	90	...grade: hard	S-3:4-6'
	21	20					
	5	7	S-4	15	90	...grade: stiff, little Silt	S-4:6-8'
	8	8					
	2	4	S-5	7	100	...grade: med.stiff	S-5:8-10'
	3	4					
10	1	1	S-6	3	80	...grade: soft, wet	S-6:10-12'
	2	3					
	1	1	S-7	3	80	...grade: plastic (CH)	S-7:12-14'
	2	2					
15	1	2	S-8	5	60	...grade: med.stiff	S-8:14-16'
	3	2					
	WH	1	S-9	2	100	...grade: soft	S-9:19-21'
21	1	1					

Notes:

Bottom of Hole 21.0 ft. Sheet No. 1 of 1

FIELD BORING LOG

BUFFALO DRILLING COMPANY, INC.
955 Niagara Street
Buffalo, New York 14213

Client: Qazi
Project: Proposed Church Structure
File No.: 89-121 Boring No.: B-5

Driller: Kenneth Huebert
Type of Drill Rig: Mobile B-47
Sampling Method: ASTM D1586
Size and Type of Bit: 3-3/4 inch ID augers

Surface Elevation: (533.00) 502.0 ft.
Datum: Highest Point of Manhole
Location: Refer to boring location plan
Date Started: 05/17/89 Completed: 05/17/89

Overburden Samples: Disturbed 9 Undist. ____
Total Depth of Hole: 21.0 ft.
Depth Drilled into Rock: 0 ft.

Top of Rock Elevation: ____
Bottom of Hole Elevation: 481.0 ft.
Ground Water Depth: No water at completion

Depth (ft.)	Blows per .5 ft.		Sample No.	N	% Rec (RQD)	SOIL AND ROCK DESCRIPTION	REMARKS
	2	2				Topsoil	
1	2	2	S-1	4	30	Brown, loose f. SAND, some Silt, little Clay, moist (SM)	S-1: 0-2'
	7	7					
	9	18	S-2	16	100	Brown, v. stiff CLAY, some Silt, mod. plastic, moist (CL)	S-2: 2-4'
	5	7					
5	12	18	S-3	19	90	Same as S-2	S-3: 4-6'
	5	10					
	14	14	S-4	24	40	Same as S-2	S-4: 6-8'
	2	5					
	7	10	S-5	12	100	...grade: stiff	S-5: 8-10'
10	2	2					
	2	2	S-6	4	100	...grade: soft, little Silt, wet	S-6: 10-12'
	1	2					
	2	2	S-7	4	100	...grade: plastic (CH)	S-7: 12-14'
	1	2					
15	2	1	S-8	4	100	Same as S-7	S-8: 14-16'
	WH	1					
21	1	2	S-9	2	100	Same as S-7	S-9: 19-21'

Notes:

Bottom of Hole 21.0 ft.

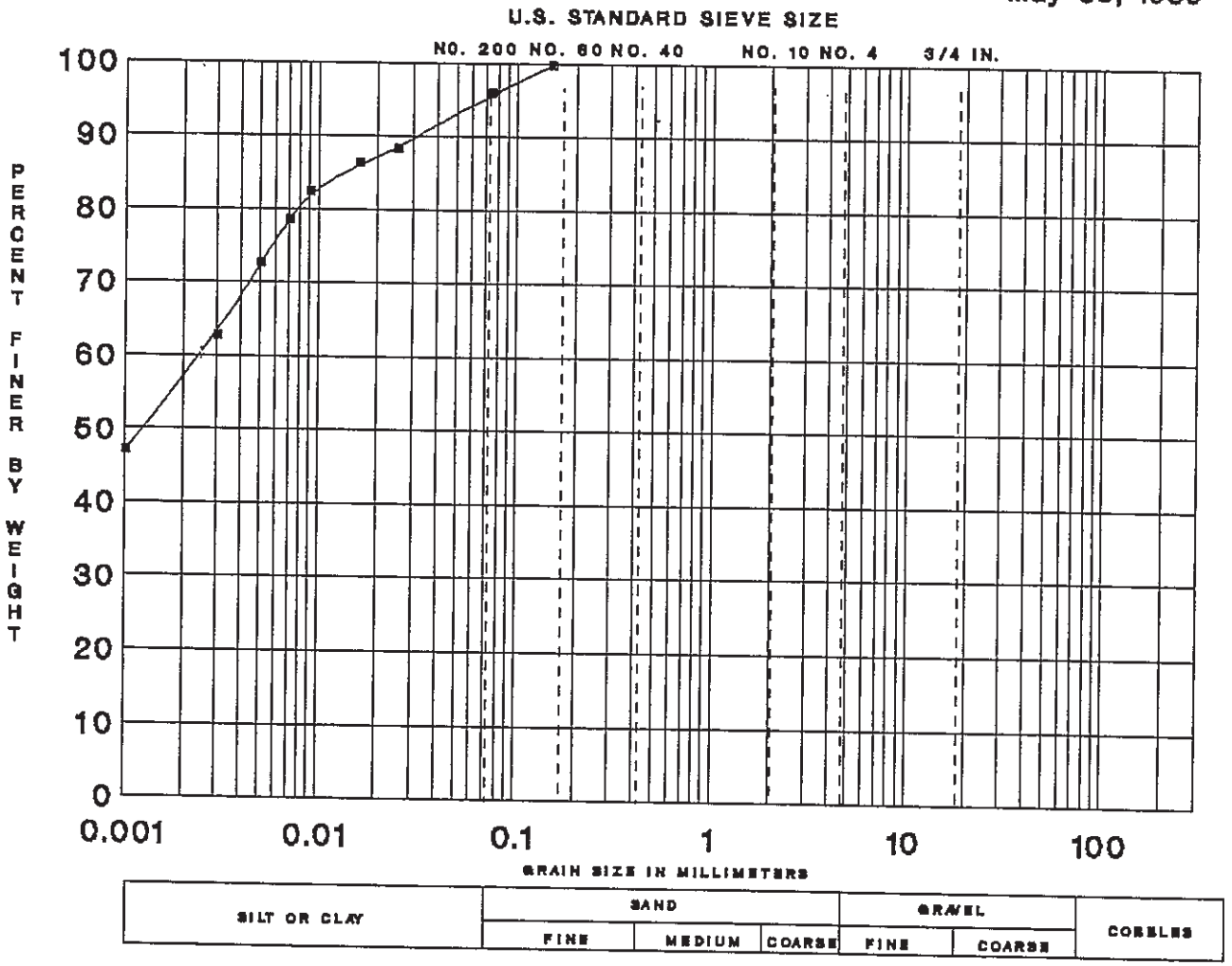
APPENDIX B.1

GRADATION CURVES

BUFFALO DRILLING COMPANY, INC.

GRAIN SIZE ANALYSIS

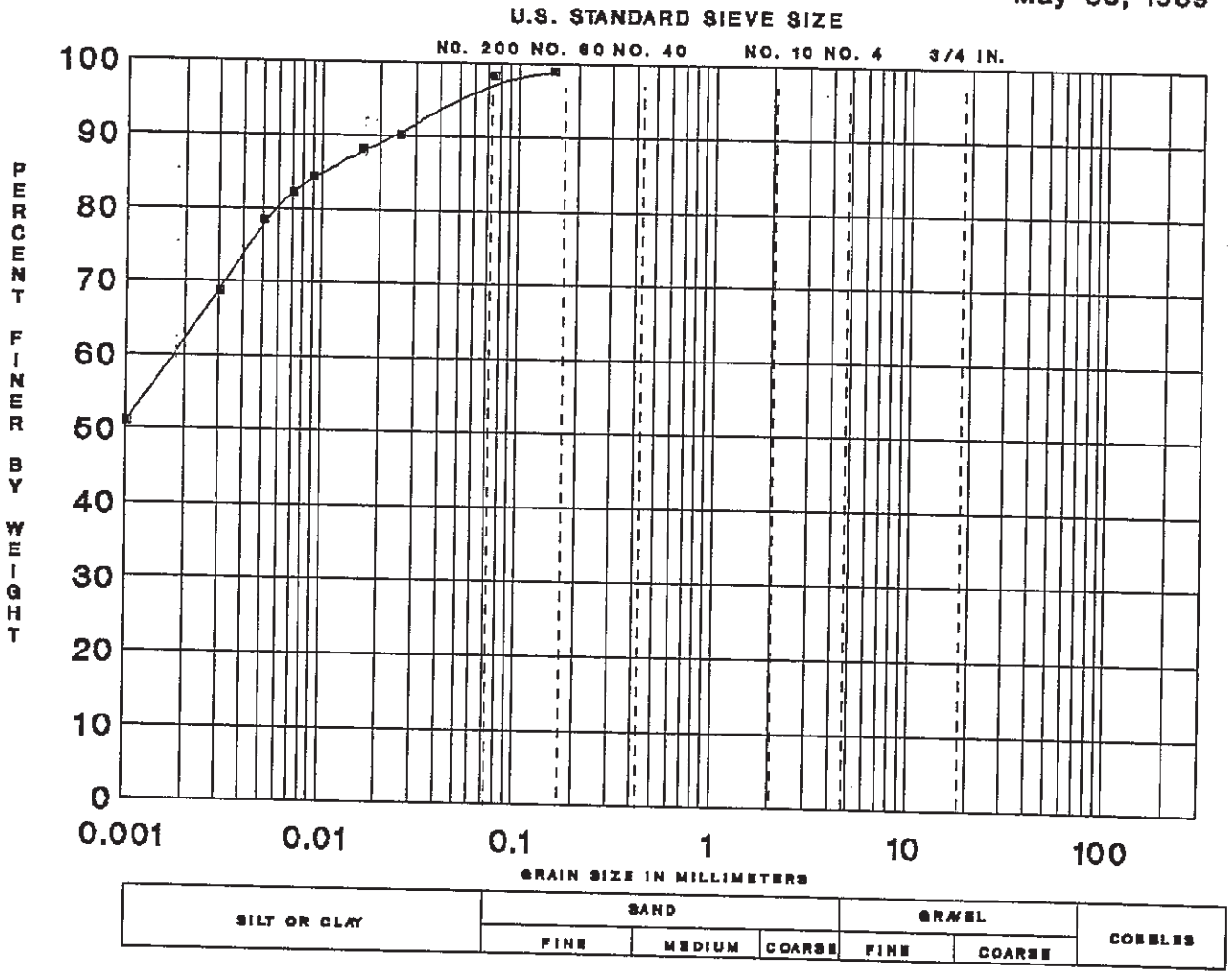
Boring No.: B-1 Sample No: S-3,4
May 30, 1989



BUFFALO DRILLING COMPANY, INC.

GRAIN SIZE ANALYSIS

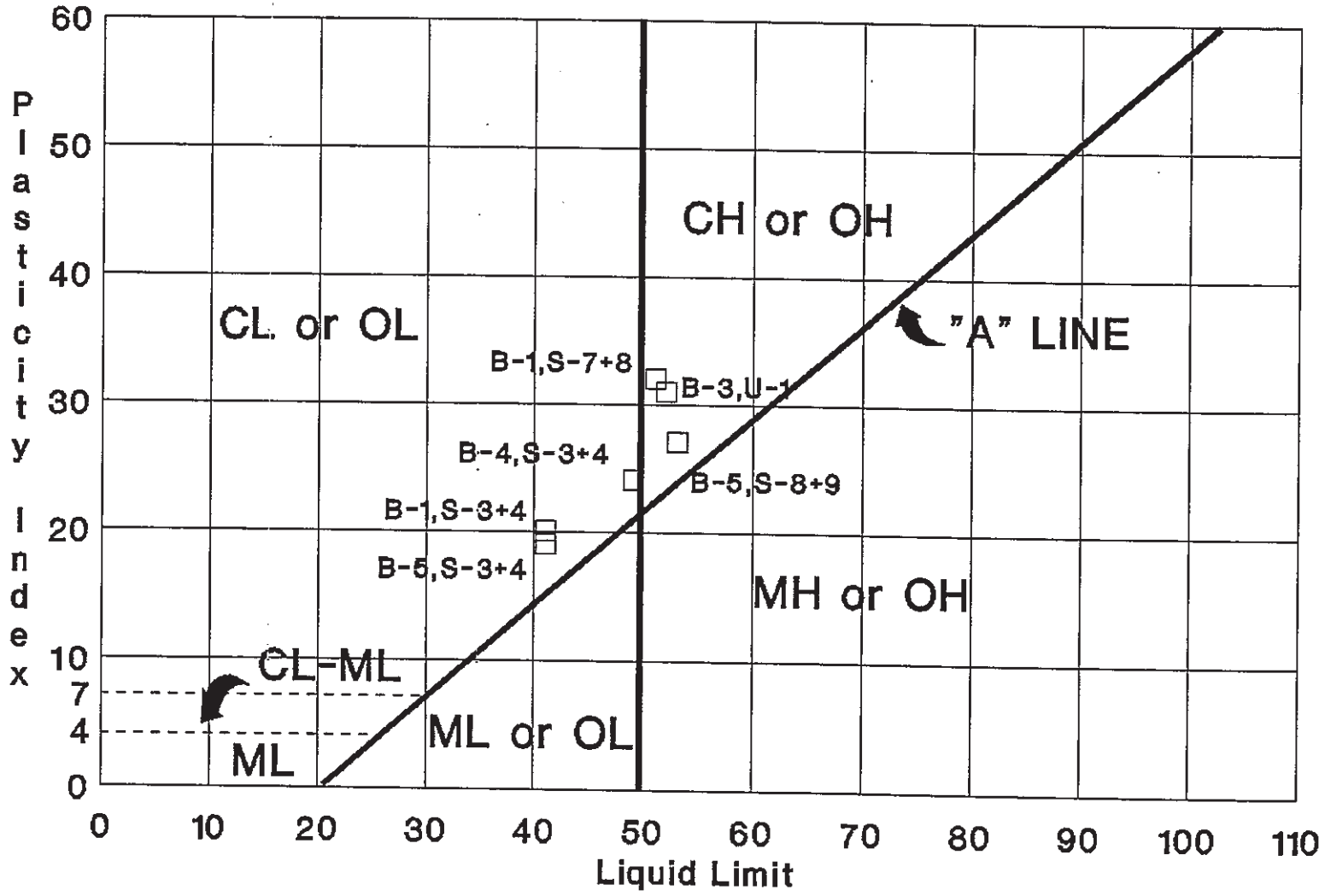
Boring No.: B-1 Sample No: S-7,8
May 30, 1989



APPENDIX B.2

PLASTICITY CHART

Plasticity Chart



APPENDIX B.3

UNCONFINED COMPRESSIVE STRENGTH TEST

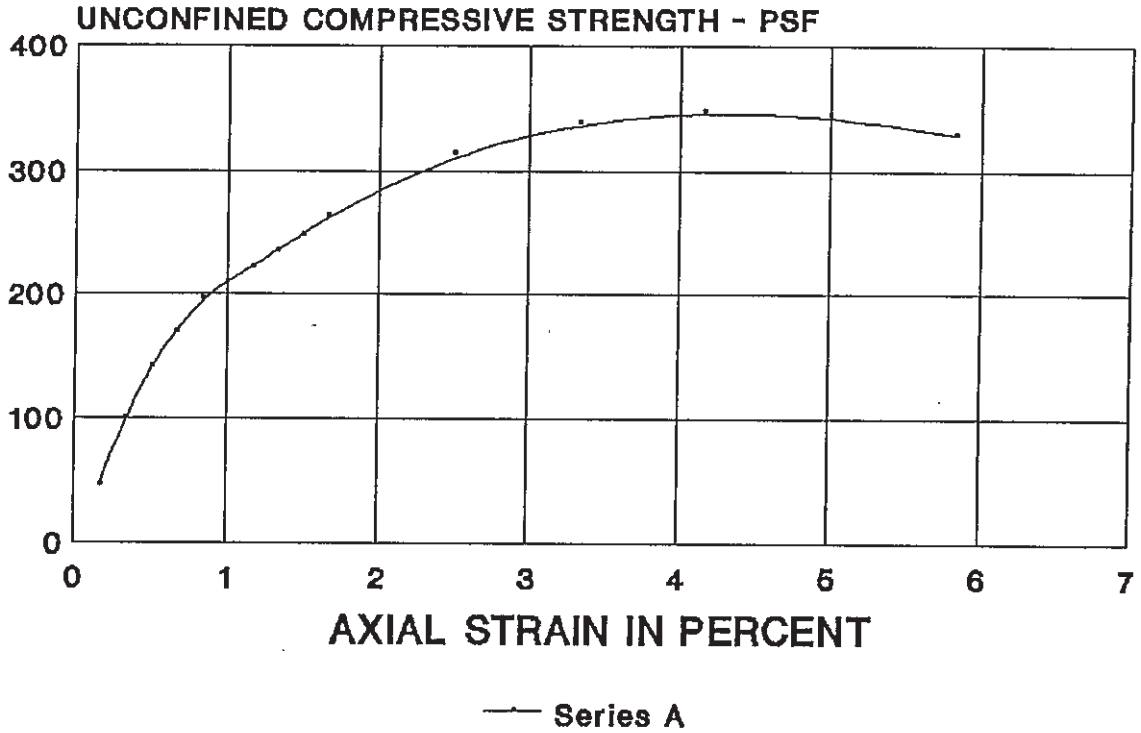
UNCONFINED COMPRESSIVE STRENGTH TEST
ASTM D2166

CLIENT: K. Qazi
PROJECT: Proposed Church
FILE NO: 89-121

BORING NO: B-3
SAMPLE: U-1
DEPTH: 14-16 ft
DATE: 23 May 1989

INITIAL WATER CONTENT (%): 48.5
INITIAL DRY WEIGHT (pcf): 68.0
SAMPLE HEIGHT (in.): 6.014
SAMPLE DIAMETER (in.): 2.839
RATE OF STRAIN (%/min.): 2.5

SOIL CLASSIFICATION: CL
LIQUID LIMIT (%): 52
PLASTIC LIMIT (%): 21
SAMPLING METHOD: ASTM D1587
MAX. COMPRESSIVE STRENGTH (psf): 348



SKETCH AT FAILURE

BUFFALO DRILLING COMPANY, INC.

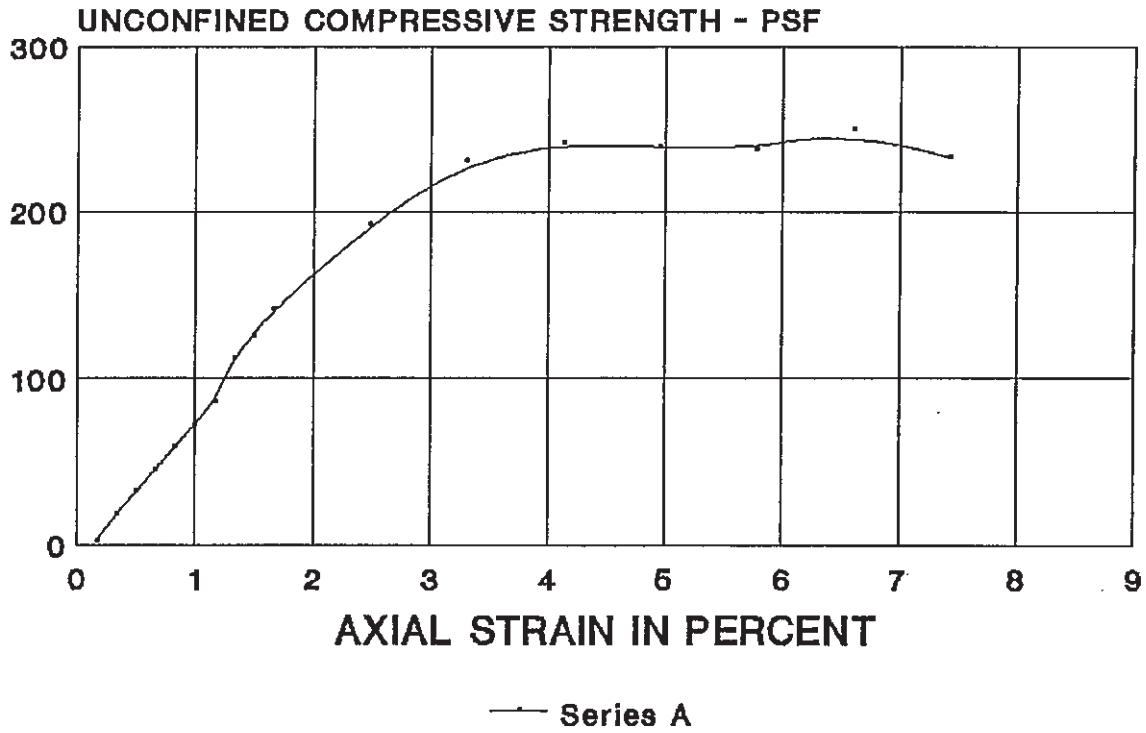
UNCONFINED COMPRESSIVE STRENGTH TEST
ASTM D2166

CLIENT: K. Qazi
PROJECT: Proposed Church
FILE NO: 89-121

BORING NO: B-2
SAMPLE: U-2
DEPTH: 19-21 ft
DATE: 23 May 1989

INITIAL WATER CONTENT (%): 47.8
INITIAL DRY WEIGHT (pcf): 73.4
SAMPLE HEIGHT (In.): 6.065
SAMPLE DIAMETER (In.): 2.842
RATE OF STRAIN (%/min.): 1.4

SOIL CLASSIFICATION: CL
LIQUID LIMIT (%):
PLASTIC LIMIT (%):
SAMPLING METHOD: ASTM D1587
MAX. COMPRESSIVE STRENGTH (psf): 250.2



SKETCH AT FAILURE

BUFFALO DRILLING COMPANY, INC.

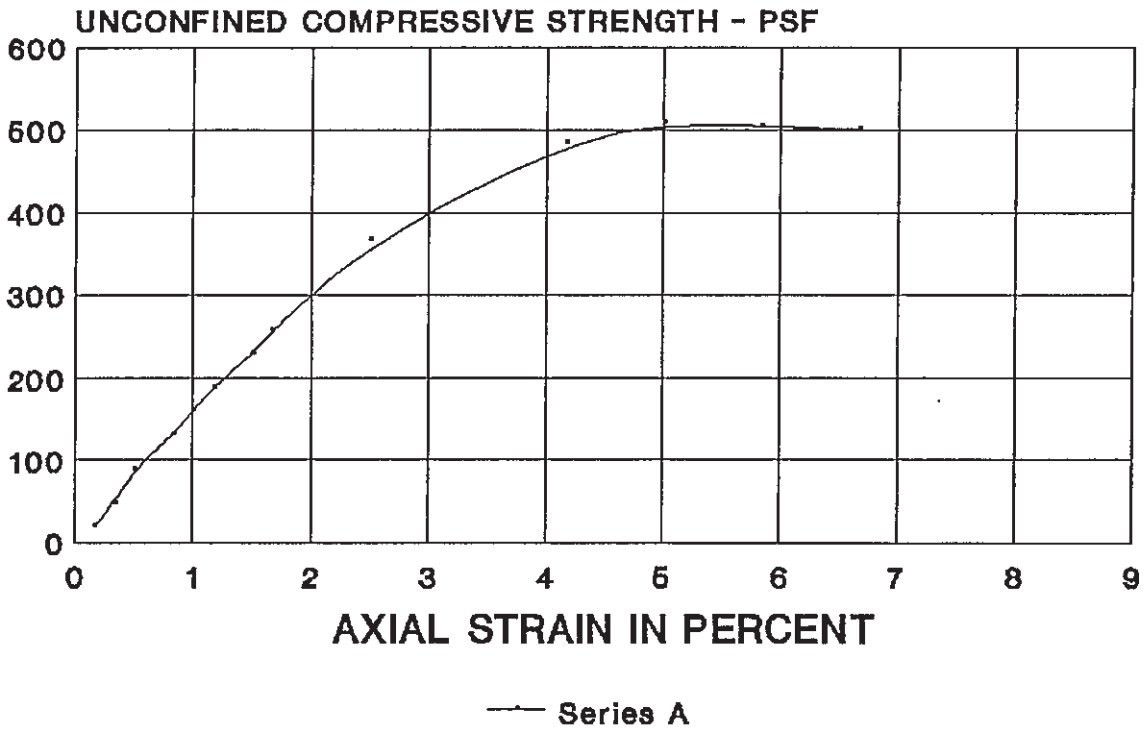
UNCONFINED COMPRESSIVE STRENGTH TEST
ASTM D2166

CLIENT: K. Qazi
PROJECT: Proposed Church
FILE NO: 89-121

BORING NO: B-2
SAMPLE: U-1
DEPTH: 14-16 ft
DATE: 23 May 1989

INITIAL WATER CONTENT (%): 49.4
INITIAL DRY WEIGHT (pcf): 73.1
SAMPLE HEIGHT (in.): 6.002
SAMPLE DIAMETER (in.): 2.795
RATE OF STRAIN (%/min.): 1.8

SOIL CLASSIFICATION: CL
LIQUID LIMIT (%):
PLASTIC LIMIT (%):
SAMPLING METHOD: ASTM D1587
MAX. COMPRESSIVE STRENGTH (psf): 510



SKETCH AT FAILURE

BUFFALO DRILLING COMPANY, INC.

APPENDIX C

ENGINEERING COMPUTATIONS

Project: East Amherst Church Project.

Client: Dr. Qazi

Job No: 89-121

By: JSB

Date: 6-12-89

Introduction

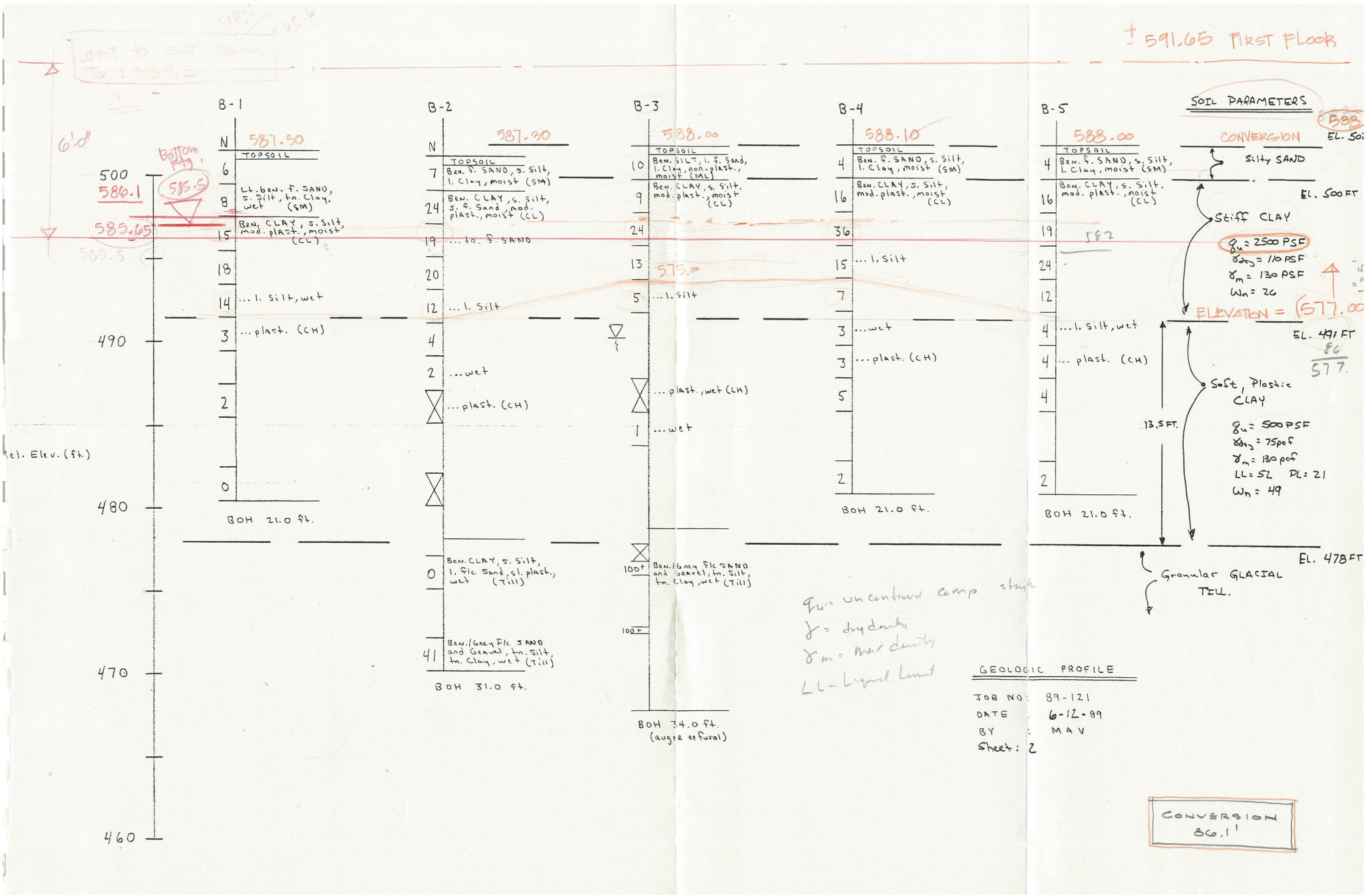
Evaluation of shallow and deep foundation options are presented in the following computations. Proposed site developments are understood to consist of a single story church building with an estimate floor area of about 20,000 square feet. Other site developments will include infrastructures and paved parking and roadway areas.

The primary intent of the following computations is to determine the feasibility of conventional shallow spread footings and a shallow, partially compensated mat foundation system. It is noted that the conventional shallow spread footing foundation system is only viable if total and differential settlements can be maintained within tolerable limits.

NOTE: A deep foundation option consisting of large diameter caissons founded on top of bedrock is presented on sheet 11 of these computations

Discussion of Subsurface Conditions

As shown on the boring logs included as Appendix A and the geologic profile on sheet no. 2 of these computations, overburden conditions were found to consist of an upper veneer of sandy silt underlain by stiff and soft clay and very dense glacial till. The natural deposited clay layer consist of an upper, approximately 8 foot thick, stiff to very stiff, clay and silt layer underlain by a 15 foot thick, soft to very soft, plastic clay.


591.65 First Floor
Want to set down To ± 589.5
6'd
Bottom Pig
585.5
585.65
585.5
500
490
480
470
460
Rel. Elev. (ft.)
B-1
N 587.50
TOPSOIL
6
Lt. brn. f. SAND, s. Silt, tr. Clay, wet (SM)
8
Brn. CLAY, s. Silt, mod. plast., moist (CL)
15
18
14 ... l. Silt, wet
3 ... plast. (CH)
2
2
0
BOH 21.0 ft.
B-2
587.30
N
TOPSOIL
7
Brn. f. SAND, s. Silt, l. Clay, moist (SM)
24
Brn. CLAY, s. Silt, s. f. Sand, mod. plast., moist (CL)
19 ... to. f. SAND
20
12 ... l. Silt
4
2 ... wet
... plast. (CH)
0
Brn./Grey f/c SAND and Gravel, tr. Silt, tr. Clay, wet (Till)
41
BOH 31.0 ft.
B-3
588.00
TOPSOIL
10
Brn. SILT, l. f. Sand, l. Clay, non-plast., moist (ML)
9
Brn. CLAY, s. Silt, mod. plast., moist (CL)
24
13
575.00
5 ... l. Silt
... plast., wet (CH)
1 ... wet
100+
Brn./Grey f/c SAND and Gravel, tr. Silt, tr. Clay, wet (Till)
100+
BOH 74.0 ft. (auger refusal)
B-4
588.10
TOPSOIL
4
Brn. f. SAND, s. Silt, l. Clay, moist (SM)
16
Brn. CLAY, s. Silt, mod. plast., moist (CL)
36
15 ... l. Silt
7
3 ... wet
3 ... plast. (CH)
5
2
BOH 21.0 ft.
B-5
588.00
TOPSOIL
4
Brn. f. SAND, s. Silt, l. Clay, moist (SM)
16
Brn. CLAY, s. Silt, mod. plast., moist (CL)
19
24
12
4 ... l. Silt, wet
4 ... plast. (CH)
4
2
BOH 21.0 ft.
SOIL PARAMETERS
588
CONVERSION
EL. 591
Silty SAND
EL. 500 FT
Stiff CLAY
q_u = 2500 PSF
γ_{dry} = 110 PSF
γ_m = 130 PSF
w_n = 26
ELEVATION = (577.00
EL. 491 FT
13.5 FT.
Soft, Plastic CLAY
q_u = 500 PSF
γ_{dry} = 75pcf
γ_m = 130 pcf
LL = 52 PL = 21
w_n = 49
EL. 478 FT
Granular GLACIAL TILL.
q_u = unconfined comp. strength
γ = dry density
γ_m = moist density
LL = Liquid Limit
GEOLOGIC PROFILE
JOB NO: 89-121
DATE: 6-12-89
BY: MAV
Sheet: 2
CONVERSION
860.1'

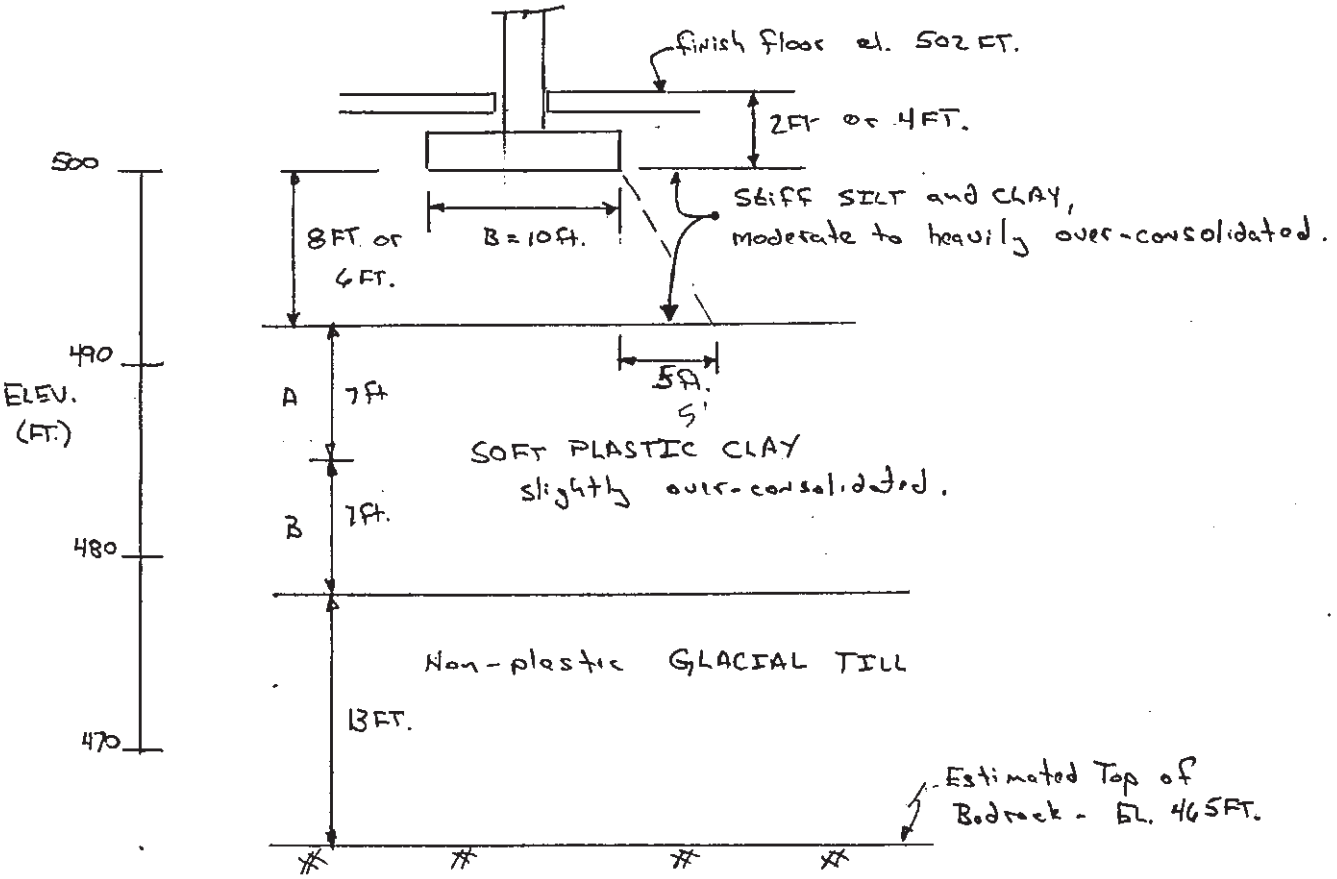
Job No: 89-121
By: JSB
Date: 6.12.89
Sheet: 3

Evaluation of Allowable Bearing Capacity and Resulting Settlement of Conventional Shallow Spread Footing Foundation.

Design Criteria

a.) Single story church building
b.) interior column foundation are assumed to have heaviest loads ranging between 150 and 250 kips.
c.) recommended foundation bearing elevation.
exterior: 498 FT
interior: 500 FT

Schematic of Proposed Shallow Spread Footing Foundation for Interior or Exterior Column Foundations.



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By: JSB
Date: 6.12.89
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Net Allowable Soil Pressure for $\phi = 0$ (L internal footing)

A. Upper stiff Silt and Clay Layer

• column footing bearing at el 498 FT.

$q_{a\,allow} = c\,N_c / F.S.$ where: c = undrained shear strength

$q_u = 2c$ unconfined compressive strength

N_c = bearing capacity factor for $\phi = 0$ condition

F.S. = 3 factor of safety

for: B = 10 ft. } from fig. below
D_f = 4 ft. }

$D_f/B = \frac{4}{10} = .4$

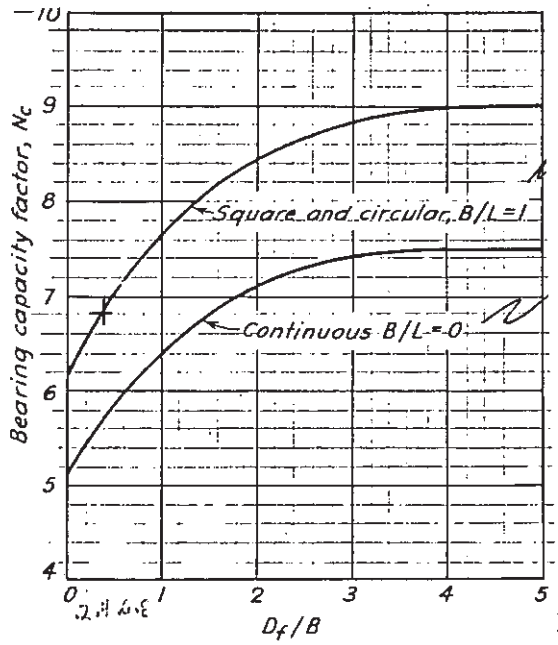
$N_c = 6.8$

$q_u = 2500$ psf

$q_a = q_u N_c / 6$

$q_a = (2500)(6.8)/6$

$q_a = 2833$ psf



Ratio of depth of surcharge, D_f, to width of footing, B

FIGURE 18.2. Bearing capacity factors for foundations on clay under $\phi = 0$ conditions (after Skempton, 1951).

B. Check Allowable Soil Pressure for lower Soft Clay Layer

$B_t = B + 2(3.5) = 17$ FT.

D = 4 + 6 = 10 FT

N_c = 7.2

q_u = 500 PSF

$q_a = (500)(7.2)/6 = 600$ PSF.

$q_{act} = (2800\text{PSF})(B^2) / B_t^2$

$q_{act} = (2800)(10^2)/(17^2) = 969$ PSF

$q_{act} > q_a$ for lower clay ⇒ reduce Qa to 1750 PSF

Taken from Fdn. Eng. by PH&T.

USE: Maximum Allowable Soil Pressure = Q_a = 1750 PSF

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By: JSB
Date: 6-12-89
Sheet: 5

Evaluation of Theoretical Settlement of Conventional Shallow Spread Footing Foundation.

The total theoretical settlement for a shallow interior or exterior square column foundation is evaluated based on conventional consolidation theory and laboratory test results.

Criteria for evaluation

1.) maximum recommended foundation bearing pressure of 1750 PSF

2.) fdn. bearing elev.: exterior 498 FT.; interior 500 FT.

3.) two layer overburden

- upper stiff, moderately to heavily over-consolidated silt and clay, non-plastic, moist from elev. 500 to 491 FT
- lower soft, slightly over-consolidated clay, plastic, moist to wet from elev. 491 to 478 FT

4.) results of one-dimension laboratory consolidation test undertaken by Goldberg Zoino and Associates of New York for a project site with similar subsurface conditions located within 2 miles of the proposed church site.

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By: JSB
Date: 6.12.89
Sheet: 6

Reduction of Consolidation Test Results

- test done by GZA for nearby project with similar subsurface conditions.

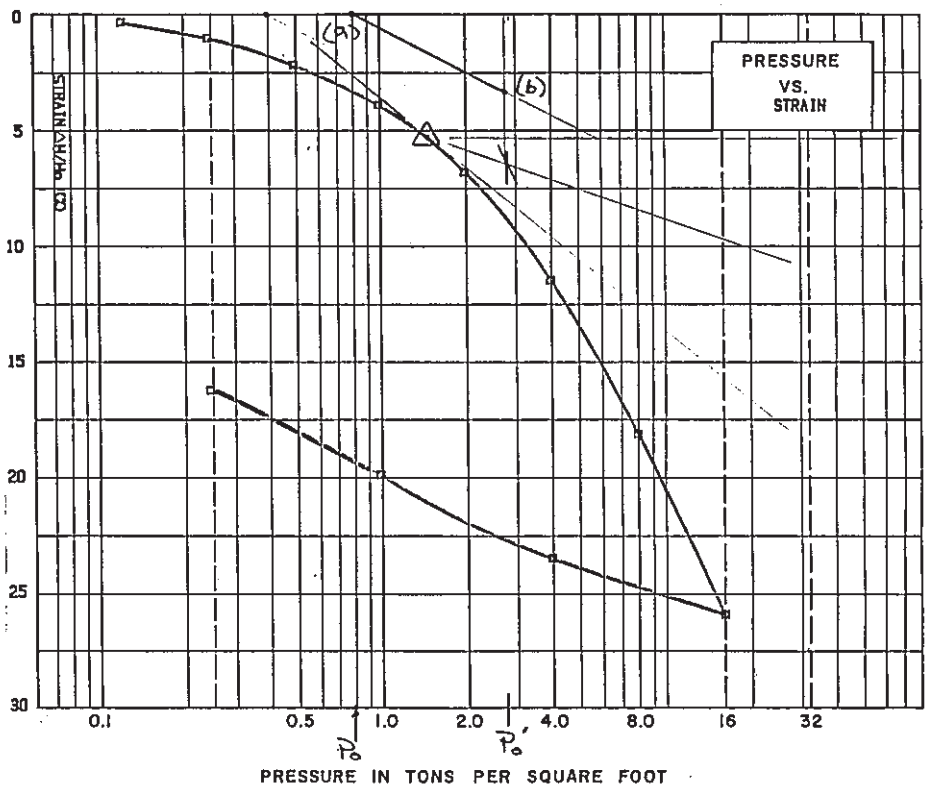
SOIL DESCRIPTION: Brown Silty CLAY

SAMPLE DIAM. 2.5 IN. LIQUID LIMIT 55 % PLASTIC LIMIT 20% SPECIFIC GRAVITY 2.70

	WATER CONTENT, %	DRY UNIT WEIGHT, pcf.	VOID RATIO	SATURATION, %	SAMPLE HEIGHT, INCH
INITIAL	45.90	74.55			0.80
FINAL	38.70	89.15			0.67

ONE TOWNE CENTRE PHASE III
CONSOLIDATION TEST

BORING NO. B2 TEST SERIES
SAMPLE U2 NO. CL 1
DEPTH 15.0-15.2' DATE 2/13/89
TECH. MCM/HSI



- effective pressure at $d = 12$ ft.
  P_o = 15 (130 pcf) = 1950 psf = .98 tsf 1¼/sq
  P_o' = max. past pressure = 2.8 tsf.
- OCR = P_o'/P_o = 2.8/.98 = 2.8
- Modified re-compression index: $C_{re} = \Delta\varepsilon / \log \sigma_a'/\sigma_b'$

$$C_{re} = 3.5\% / \log 2.8/.98 = .077$$

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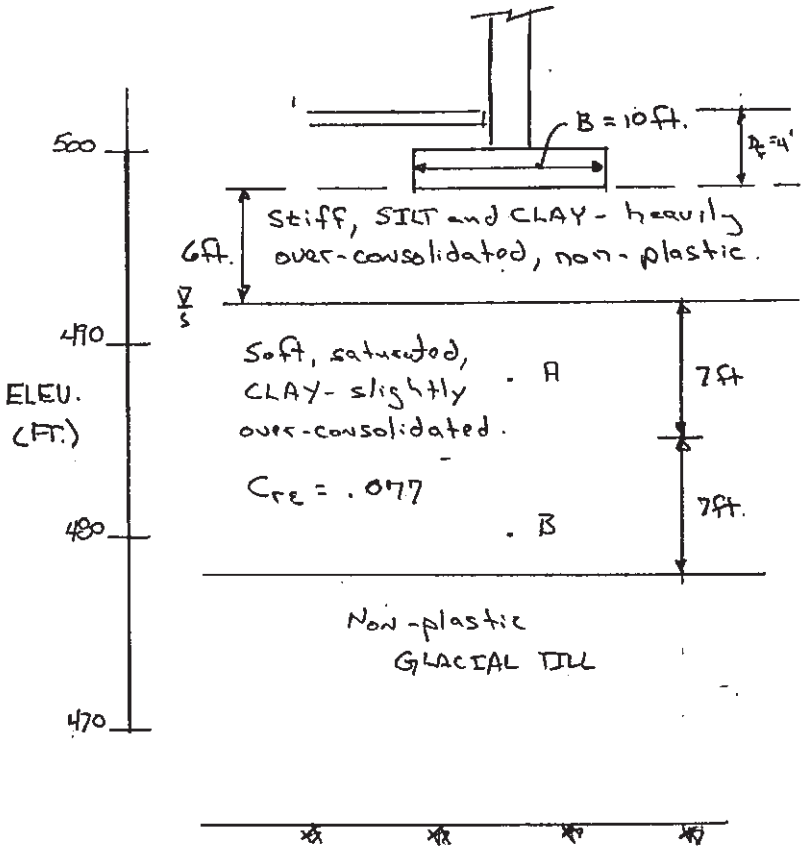
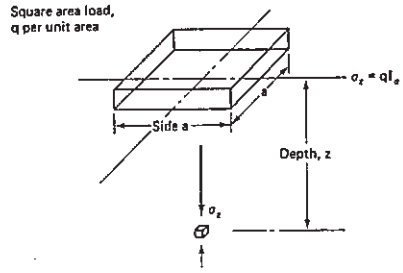
Sheet 7

Settlement Estimate Beneath Square Exterior Column Foundation.



Evaluation of increased stress due to 1750 PSF footing loads on square column foundation.

TABLE 8-4 Influence Values for Vertical Stress Under the Center of a Square Uniformly Loaded Area*



a/z	I_σ Boussinesq	I_σ Westergaard
∞	1.0000	1.0000
20	0.9992	0.9365
16	0.9984	0.9199
12	0.9968	0.8944
10	0.9944	0.8734
8	0.9892	0.8435
6	0.9756	0.7926
5	0.9604	0.7525
4	0.9300	0.6971
3.6	0.9096	0.6659
3.2	0.8812	0.6309
2.8	0.8408	0.5863
2.4	0.7832	0.5328
2.0	0.7008	0.4647
1.8	0.6476	0.4246
1.6	0.5844	0.3794
1.4	0.5108	0.3291
1.2	0.4276	0.2858
1.0	0.3360	0.2165
0.8	0.2410	0.1560
0.6	0.1494	0.0999
0.4	0.0716	0.0477
0.2	0.0188	0.0127
0	0.0000	0.0000

from Geo. Eng by Holtz and Kovacs (use Westergaard method)

1.) No significant consolidation of stiff, silt and clay layer due to heavy over-consolidated condition.

2.) Pt. A $a/z = 10/6+3.5 = 1 \Rightarrow I = .216$

$\therefore \Delta q_A = .216\ (1.75 ksf) = 378$ PSF

$\sigma_{v_A} = 10\ (130) + 3.5(80 - 62.4) = 1300 + 236.6 = 1537$ PSF

$S_A = (.077)\ (7ft) \log\left(\frac{1537 + 378}{1537}\right) = .05ft = .6$ inches.

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Settlement of Conventional Shallow Spread Footing - cont.

3.) Ft. B. - $a/z = 10/6+7+3.5 = .6 \Rightarrow I = .099$

$\Delta q_B = .099(1750) = 173$ PSF

$\sigma_{v_B} = 10(130) + 10.5(130 - 62.4) = 1300 + 710 = 2010$ PSF

$S_B = (.077)(7)\log\left(\frac{2010+173}{2010}\right) = .02$ ft $= .23$ inches

$S_{TOTAL} = S_A + S_B = .6 + .23 = .83$ inches.

$S_{TOTAL} = .8$ inches

NOTE: A ten foot square column foundation bearing at elev. 498 with a total load not exceeding 1750 PSF will respond with an estimated total settlement of about one inch.

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By: JSB
Date: 6·12·89
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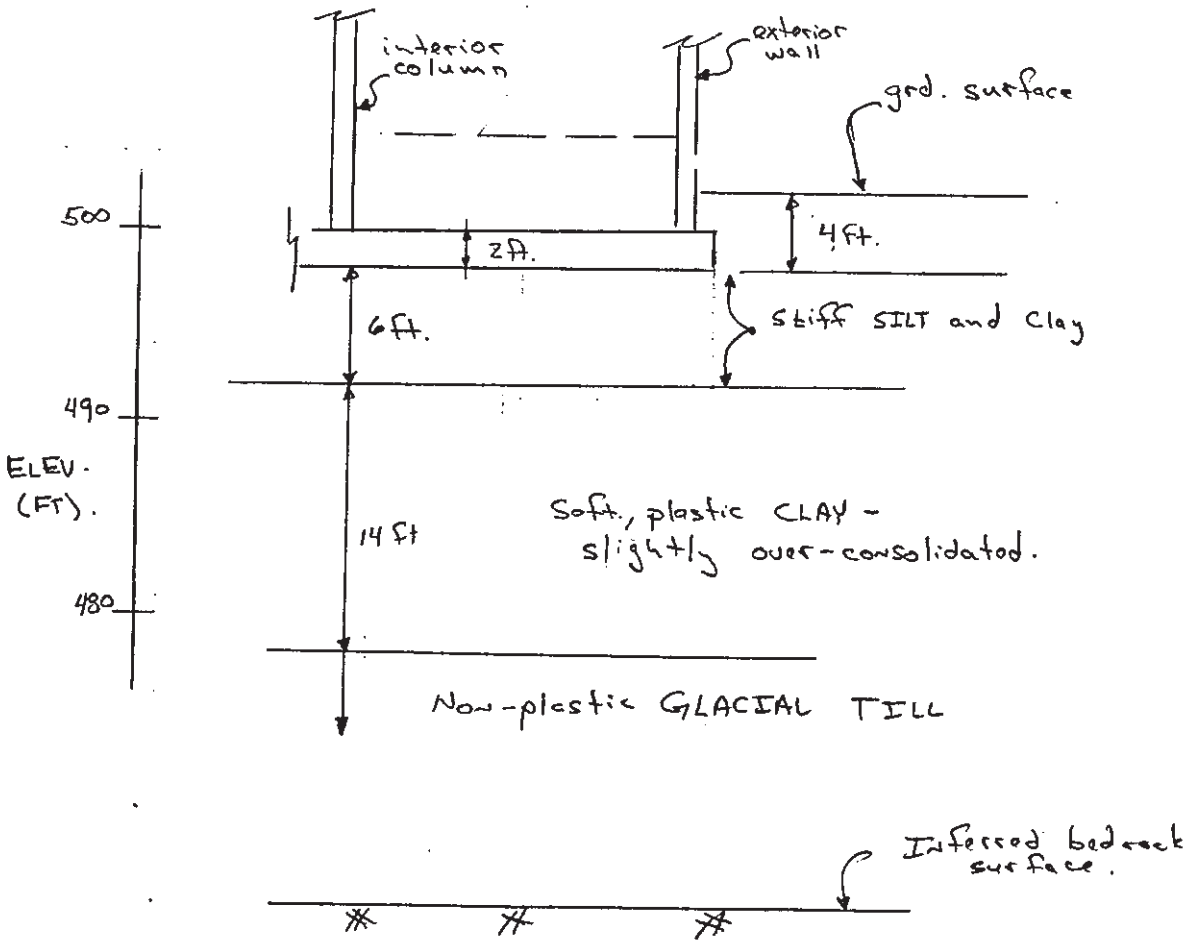
Evaluation of Allowable Bearing Capacity and Theoretical Settlement of a Partially Compensated Mat Foundation.

Design Criteria

a.) single story church building with an estimated total mat foundation load not exceeding 500 PSF
b.) reinforced concrete mat foundation bearing at a depth of 4 feet below existing ground surface which corresponds to elevation 498 feet.

Schematic of Proposed Compensated Mat Foundation.



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Net Allowable Soil Bearing Pressure, for $\phi = 0$

$q_a = c\, N_c\, F_{cs}\, F_{cd} / F.S.$ where: $N_c = 5.14$

F_{cs} = shape factor = $1 + .195\frac{B}{L}$

F_{cd} = depth factor = $1 + .4\left(\frac{D_f}{B}\right)$

$c = 2500\ PSF/2 = 1250\ PSF$

$B = L = 100\ FT$

$D_f = 4\ FT$ $\quad F.S. = 3$

$$q_a = (1250\,psf)(5.14)\left(1 + .195\frac{(100)}{100}\right)\left(1 + .4\left(\frac{4}{100}\right)\right)/3$$

$$q_a = (1250)(5.14)(1.195)(1.02)/3 = \underline{2610\ PSF}$$

Evaluation of Net Pressure Applied to Mat Foundation

$$Q_{net} = \frac{\text{Total Load on Mat}}{\text{Area of Mat}} - \text{wt. of excavated material}$$

$Q_{net} = 500\,PSF - \gamma_m D_f$ where: γ_m = unit wt. of fill = 125 PCF

$Q_{net} = 500\,PSF - 125(4) = 0\ PSF$ $\quad D_f = 4\ ft.$

SINCE: $Q_{net} \ll Q_{allow} \Rightarrow$ bearing capacity is concluded not to be a problem.

Settlement:

If Q_{net} is maintained at a pressure less than 100 PSF, settlement of the mat due to consolidation of underlying soft clay will be minimal. This conclusion is supported by consolidation test results identifing the clay to be slight to moderately over-consolidated.

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By: JSB
Date: 6-12-89
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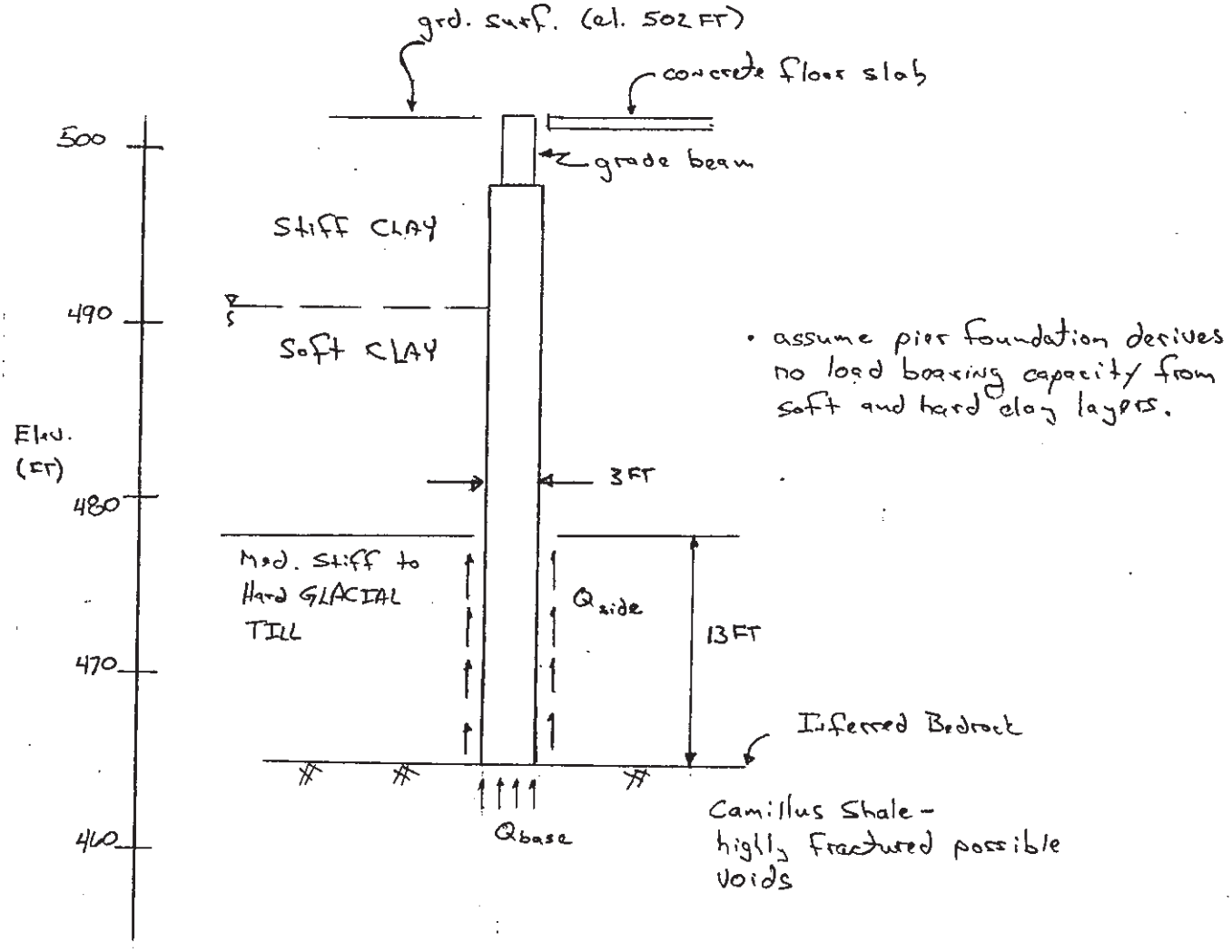
Evaluation of Allowable Bearing Pressure for Deep Founded, Large Diameter Drilled Piers (Caissons).

Note: Bedrock cores were not taken for this study. The bedrock type is known from nearby studies to be Camillus Shale, highly fractured, and possibly containing voids from gypsum solutioning. The depth to top of bedrock is estimated to range between 35 and 40 feet below ground surface.

Profile of Caisson Foundation



- assume pier foundation derives no load bearing capacity from soft and hard clay layers.

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By: JSB
Date: 6.12.89
Sheet: 12

Evaluation of Allowable Bearing Pressure for Deep Founded, Large Diameter Drilled Pier Foundations.

NOTE: Evaluation based on assumed granular and drained conditions below elev.

$Q_{ult} = Q_{side} + Q_{tip} - W_{pier}$ where:

W_{pier} = wt. of caisson $\simeq A_{pier}(\bar{P}_b)$

$Q_{side} = (K_s \bar{P}_1 \tan\delta) A_s$

$Q_{tip} = A_b q_{ult} = A_b(\bar{P}_b \times (N_q - 1))$

where: $P_b = \gamma D_f$

$Q_{side} = (K_s \bar{P} \tan\delta) A_s$

$K_s = .5$

$\delta = 20°$

$\bar{P} = 11.(130) + (13+6.5)60 = 1430 + 1170 = 2.6 K/FT^2$

$A_s = 2\pi r \times L = 2\pi(1.5FT) \times 13FT = 122.5 FT^2$

$Q_{side} = (.5(2.6\ k/ft^2)\ \tan 20°)\ 122FT^2 = 57.7$ kips SAY: $Q_{side} = 50$ kips

$Q_{tip} = A_b \times q_{ult}$

$q_{ult} = 2.6\ k/ft^2\ (30-1) = 75.2\ k/ft^2$

$A_b = \pi r^2 = \pi(1.5FT)^2 = 7.07\ FT^2$

$Q_{tip} = 7FT^2 \times 75k/FT^2 = 525$ kips

$W_{pier} = \pi r^2 \times L \times \gamma_{concrete} = 7.07FT^2 \times 35FT \times 125lb/ft^3 = 30.9$ kips

$Q_{ULT} = (Q_s + Q_t - W_p) = 50 + 525 - 31 = 544$

$Q_{ALLOW} = Q_{ULT}/F.S. = 544/3 = 181$ kips

SAY: $Q_{ALLOW} \simeq 180$ kips $= 90$ tons for 3FT. diameter caisson foundation.

APPENDIX D

GENERAL EARTHWORK SPECIFICATIONS

GENERAL EARTHWORK SPECIFICATION

I. MATERIALS

A. Ordinary Fill shall be friable soil containing no stone greater than two-thirds loose lift thickness. The material shall be essentially free of trash, ice, snow, tree stumps, roots, and organic materials.

B. Granular Fill shall be free from ice and snow, roots, sod, rubbish, and other deleterious or organic matter. Granular fill shall conform to the following gradation requirements:

Sieve Size	Percent Finer by Weight Granular Fill
2/3 of the loose lift thickness	100
No. 10	30-95
No. 40	10-70
No. 200	0-15

C. Sand-Gravel shall consist of hard, durable sand and gravel, and shall be free from ice and snow, roots, sods, rubbish, and other deleterious or organic matter. It shall conform to the following gradation requirements:

Sieve Size	Percent Finer by Weight Sand-Gravel
*	100
1/2 inch	50-85
No. 4	40-75
No. 10	---
No. 40	10-35
No. 100	---
No. 200	0-8

D. Crushed Stone shall consist of durable crushed rock or durable crushed gravel stone free from ice and snow, sand clay, loam, or other deleterious material. The crushed stone shall be uniformly blended and conform to the following requirements:

Sieve Size	Percent Passing	
	3/4" stone	1-1/4" stone
1-1/2"	---	100%
1-1/4"	---	85-100
1"	100%	---
3/4"	90-100	10-40
5/8"	---	---
1/2"	10-50	0-8
3/8"	0-20	---
#4	0-5	---

II. EXCAVATING OF TOPSOIL AND OTHER UNSUITABLE MATERIAL

A. General: Within the site limits indicated on the drawings, the contractor shall excavate all unsuitable material to firm natural ground in the manner specified below. Unsuitable material is here classified as brown, organic topsoil and underlying soft pockets of organic or severly disturbed silt and sand.

The contractor shall follow a construction procedure permits visual identification of firm natural ground. In the event that groundwater is encountered, the engineer may require that the size of the open excavation be limited to that which can be handled be open pumping and allow visual inspection of the bottom and backfill in the dry.

Limits of excavation are such that all unsuitable material will be removed to a distance of 5 feet beyond the building lines or within the area defined by a one horizontal to one vertical line slopping down from outside bottom edge or exterior footings to firm natural ground, whichever is greater.

The contractor shall excavate in such a manner as to minimize disturbance of the underlying natural ground. I judged necessary, the contractor will be required to alte his construction procedures to alter his construction procedures to reduce subgrade disturbance. Areas which have been excessively disturbed shall be excavated to firm ground and backfilled with properly compacted granular fill.

B. Disturbed Subgrade: If requested by the engineer, the contractor shall be required to palce a 6" to 12" layer of sand and gravel or crushed stone over the natural underlying soil to stabilize areas which may become disturbed due to groundwater seepage pressures and to expedite pumping. Particular areas of concern are beneath foundations.

C. Proofrolling: Prior to placement of the initial layer of fill over the natural ground, proofroll the exposed natural ground, above the groundwater table elevation, by making two (2) passes with a fully loaded 20-wheel truck. Any unstable area detected shall be excavated and replaced with compacted granular fill.

III. PLACEMENT AND COMPACTION OF FILL

A. Requirements: Allow the engineer sufficient time to make necessary observations and tests. The degree o compaction shall be based on a maximum dry density as determined by ASTM test D1557. The degree of compaction for fill placed in various areas shall be as follows:

AREAS		Minimum Degree of Compaction
1.	Below foundation	95%
2.	Pavement and building subbase and base courses	95%
3.	Below building slab base course and above bottom of foundation	92%
4.	Below pavement subbase and base courses	90%
5.	Trench backfill outside of building area	90%
6.	Trench backfill inside of building shall be compacted to the degree stated for the areas above	---
7.	Ordinary fill within five feet of grade	90%
8.	In grass areas below five feet from grade	85%

Fill used within the building area shall meet or exceed the requirements of granular fill stated above.

B. Methods: The compaction alternatives given below are stated to provide minimum compaction standards only and in no way relieved the contractor of his obligation to achieve the above specified degree of compaction by whatever additional effort is necessary. Place fill in accordance with the criteria given below:

Compaction Method	Maximum Stone Size	Maximum Loose Lift Thickness		Minimum No. of Passes	
		Below Structure and Pavements	Less Critical Areas	Below Structures and Pavements	Less Critical Areas
Hand operated vibratory plate or light roller in confined areas	3	4"	4"	4	4
Hand operated vibratory drum rollers weighing at least 1000# in confined areas	4	6"	8"	4	4
Loaded 10-wheel truck or D-8 crawler	6	10"	12"	4	2
Light vibratory drum roller min. wgt. at drum 8000# min. dynamic force 10000#	8	12"	12"	6	2
Medium vibratory drum min. wgt. at drum 10000# , min. dynamic force 20000#	8	18"	18"	6	4

1. Protect fill area by grading to drain and providing a smooth surface which will readily shed water. Grade the surface of the areas in such a manner as to prevent ponding of surface run-of water in areas to receive compacted fill.

2. To the extent that it is practicable, each layer of fill shall be compacted to the specified density the same day it is placed.

3. Fill that is too wet for propoer compaction shall be disced, harrowed, or otherwise dried to proper moisture content for compaction to the required density.

4. Fill that is too dry for proper compaction shall receive water uniformly applied over the surface o the loose layer. Sufficient water shall be added to allow compaction to the required density.

5. Fill shall be placed in horizontal layers. Where the horizontal layers meets a natural rising slope, the layer shall be keyed into the slope by cutting a bench.

IV. DEWATERING

The contractor shall provide adequate pumping and drainage facilities to keep the excavated area sufficiently dry from groundwater and/or surface run-of so as not to adversely affect construction procedures or cause excessive disturbance or underlying natural ground. The drainage of all water resulting from pumping shall be arranged so as not to cause damage to adjacent property.

V. TESTING

A. The owner shall retain a soil engineer to perform on-site observation and testing during this phase of the construction operations. The services of the soil engineer shall include, but not be limited to, the following:

1. Observation during excavation and dewatering of building and controlled fill areas.

2. Observation during backfilling and compacting operations within that area defined as building area or controlled fill area.

3. Laboratory testing and analysis of fill material specified as required.

4. The soil engineer will observe construction and perform water content, gradation, and compaction tests at a frequency and at locations which he shall select. The results of these tests will be submitted to the Owner, copy to the Contractor, on a timely basis so that the Contractor can take such action as is required to remedy indicated deficiencies. During the course of construction, the soil engineer will advise the Owner in writing with copy to the Contractor if at any tiem in his opinion the work is not in conformity to the palns and specifications.

5. The soil engineer presence does not include supervisions or direction of the actual work by the contractor, his employee or agents. Neither the presence of the soil engineer, nor any observations and testing performed by him shall excuse the contractor from defects discovered in his work.

1 .01 SUB-SURFACE DATA

A. A number of test borings were taken in the vicinity of the Project. The locations of these borings are indicated on the Drawings or in the following Geotechnical Report.

B. Logs of the Test Borings referred to herein are included in the Contract Documents; but are not part of the Contract Documents. The availability of these borings is not intended to relieve Bidders of their obligation to make a thorough investigation of conditions below the surface of the ground and neither additional payment nor an extension of time will be made to the contractor because of borings referred to above that do not accurately represent the true nature of the subsurface conditions.

C. Bidders and prospective Bidders are hereby advised and put on notice that the borings referred to above were made for design purposes only. They were not made for the purpose of informing bidders as to subsurface conditions in the area of the work covered by this Contract and are not, in the opinion of the Architect/Engineer, sufficient or extensive enough to provide any accurate or reliable indication of subsurface conditions which might be encountered in the performance of the Contract.

D. Neither the Owner nor the Architect/Engineer has made any investigation of subsurface conditions in the area covered by the work to be performed under this Contract other than the borings referred to above, and in bidding on this contract, each Bidder acknowledges that he has made whatever investigation of subsurface conditions he had deemed necessary for the purpose of bidding. Permission for making borings of subsurface conditions will be arranged for by the Architect upon receipt of a written request therefore.

E. Refer to individual boring logs for dates borings were taken.

- - - END OF SECTION - - -

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section describes the following:
   1. Demolition and removal of selected interior portions of building or structure.
   2. Salvage of existing items to be reused.

1.2 REFERENCES

A. ANSI: American National Standards Institute
   1. ANSI/ A10.6: Safety Requirements for Demolition Operations

B. CRI: Carpet and Rug Institute

C. NFPA: National Fire Protection Association
   1. NFPA 241: Standard for Safeguarding Construction, Alteration, and Demolition Operations

D. RFCI: Resilient Floor Covering Institute

1.3 SUBMITTALS

A. Schedule of Selective Demolition Activities. Indicate the following:
   1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity.
   2. Interruption of utility services. Indicate how long utility services will be interrupted.
   3. Coordination for shutoff, capping, and continuation of utility services.
   4. Use of elevator and stairs.
   5. Locations of proposed dust- and noise-control temporary partitions and means of egress.
   6. Coordination of continuing occupancy of portions of existing building and of partial occupancy of completed work so that operations continue uninterrupted.
   7. Means of protection for items to remain and items in path of waste removal from building.

B. Inventory: After selective demolition is complete, submit a list of items that have been removed and salvaged.

C. Pre-Demolition Photographs or Videotapes: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by selective demolition operations. Submit before work begins.

1.4 QUALITY ASSURANCE

A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this project.

B. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

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-Demolition Meeting: Conduct meeting at project site to review methods and procedures related to selective demolition including, but not limited to, the following:
   1. Inspect and discuss condition of construction to be selectively demolished.
   2. Review structural load limitations of existing structure.
   3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
   4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
   5. Review areas where existing construction is to remain and requires protection.

1.5 PROJECT CONDITIONS

A. The areas of selective demolition are within an existing building with ongoing occupant activities. Conduct selective demolition so ongoing operations will not be disrupted.

B. Conditions existing at time of inspection for bidding purpose will be maintained by the building occupants as far as practical.
   1. Before selective demolition, the Owner shall provide the Contractor:
      a. A list of all items to be removed by the Owner and stored by them.
      b. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged

C. Provide notification of discrepancies between existing conditions and drawings before proceeding with selective demolition.

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the work.

E. Storage or sale of removed items or materials on-site is not permitted.

F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
   1. Maintain fire-protection facilities in service during selective demolition operations.

1.6 PROTECTION OF EXISTING WARRANTIES

A. Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped.

B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.

D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report.

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 demolition operations.

F. Perform surveys as the work progresses to detect hazards resulting from selective demolition activities.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems: Maintain services/systems indicated to remain and protect them against damage during selective demolition operations.

B. Service/System Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
   1. The Port will arrange to shut off indicated services/systems when requested by the Contractor.
   2. Arrange to shut off indicated utilities with utility companies.
   3. If services/systems are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
   4. 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.
      a. Where entire wall is to be removed, existing services/systems may be removed with removal of the wall.

3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. See Sections 210500, Common Work Results for Fire Suppression; 220500, Common Work Results for Plumbing; 230500, Common Work Results for HVAC; and 260500, Common Work Results for Electrical, for services/systems demolition requirements.

3.4 PREPARATION

A. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent areas to remain.
   1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
   2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
   3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
   4. Cover and protect furniture, furnishings, and equipment that have not been removed.
   5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified elsewhere.

B. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
   1. Strengthen or add new supports when required during progress of selective demolition.

3.5 GENERAL SELECTIVE DEMOLITION

A. Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the work within limitations of governing regulations and as follows:
   1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
   2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
   3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
   4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. See Division 1 for fire suppression requirements and for welding, cutting, and burning permit.
   5. Maintain adequate ventilation when using cutting torches.
   6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
   7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
   8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
   9. Dispose of demolished items and materials promptly. Comply with requirements in Division 1 regarding solid waste management and construction waste management.

B. Reuse of Building Elements: Do not demolish building elements beyond what is indicated on drawings without approval.

C. Removed and Reinstalled Items:
   1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
   2. Pack or crate items after cleaning and repairing. Identify contents of containers.
   3. Protect items from damage during transport and storage.
   4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted, items may be removed to a suitable, protected storage location during selective demolition, cleaned, and reinstalled in their original locations after selective demolition operations are complete.

3.6 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish 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 demolition. Neatly trim openings to dimensions indicated.

B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.

C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.

D. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in CRI, RFCI-WP, and the RFCI-WP Addendum.
   1. Remove residual adhesive and prepare substrate for new floor coverings by one of the methods recommended by CRI and RFCI.

E. Air-Conditioning Equipment: Remove equipment without releasing refrigerants.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

A. Except for items or materials indicated to be recycled, reused, salvaged, or reinstalled, remove demolished materials from project site and legally dispose of them in an EPA-approved landfill.
   1. Do not allow demolished materials to accumulate on-site.
   2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
   3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

3.8 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION

PART I - GENERAL

1 .01 GENERAL

The Drawings, Instructions to Bidders, Form of Proposal, General Conditions, Supplementary General Conditions, and Division 1 are included herein and govern work under this section.

1 .02 SCOPE

A. The work under this Section shall include all labor, materials and equipment necessary to complete the demolition work shown on the drawings and/or specified herein. In general, the items of work to be performed under this Section shall include:
   1. Existing buildings
   2. Existing underground utilities
   3. Existing paving

1 .03 DESCRIPTION

A. Obtain and pay all permit fees.

B. Protect, erect, and maintain all bracing, shoring, warning signs and guards necessary for protection.

C. Remove protection at completion of work.

D. Remove all existing walls, partitions, windows, floors, and other materials required for the execution and installation of the new work as described on drawings.

E. Provide all temporary enclosures and barriers required for protection against spread of dust and the elements to parts of building not affected by demolition work.

F. Remove excess debris as it accumulates from demolition operations. Do not store or permit debris to accumulate on site.

G. Execute demolition work to insure adjacent property against damages which might occur from falling debris or other causes.

H. Provide temporary shoring, struts, bracing and take all precautions to prevent settlement, movement of walls, floors or other existing framing of existing structures. Verify location of existing bearing wall construction.

I. Repair damage done to Owner's property or property of any other person or persons on or off premises by reason of required work without additional cost to Owner.

J. Any utility line, cable or pipe damaged during construction shall be repaired and left in complete working condition. Plug or cap any lines no longer required. Any damaged work repaired, shall be performed by skilled workmen.

K. All materials removed from existing work in the execution of this contract shall become the property of the Contractor.

L. It shall be the responsibility of the Contractor to protect from damage and store all items noted to be reused.

M. Strict coordination with building occupants shall be conducted by the Contractor. Security and maintenance of business shall be coordinated with the building occupants.

PART II - PRODUCTS

Not applicable

PART III - EXECUTION

3 .01 EXISTING BUILDINGS

A. When buildings are shown on drawings to be demolished, they shall be removed from the site and legally disposed of including the structure above grade and foundations below grade.

B. Existing foundations shall be removed to 18" below finish grade, or removed completely, whenever they occur under new building foundation footings or new building column footings.

3 .02 EXISTING UNDERGROUND UTILITIES

A. "Utilities" shall include: All existing sewers, both sanitary and storm and water lines. (Gas, Electric and Telephone Service demolition).

B. Where underground utilities are noted on plans to be abandoned, the Contractor may at his option, either remove said utilities or leave them capped and buried where they lie, with the following exceptions:
   1. Existing underground utilities must be removed entirely:
      a. Where they occur beneath new foundation or new column footing.
      b. Where they conflict with any new underground utilities.

C. All work shall be done in accordance with the Town of Amherst, New York. Construction Specifications regarding Sanitary and Storm sewers and Water Lines.

3 .03 EXISTING PAVEMENT

A. Existing pavement on site must be removed including its subbase. Pavement (binder and wearing surface) may not be used as new fill, and must be legally disposed of off site.

B. Subbase stone may be used as required fill if it complies with test requirements for fill specified in Section 3.05 thru 3.07 of Section 02 20 00.

- - - END OF SECTION - - -

PART I - GENERAL

1. 01 RELATED DOCUMENTS

Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1. 02 SCOPE

A. This Section is subject to applicable requirements of the Contract Documents.

B. Work includes all Concrete Formwork required by the Contract, and, in general, includes the following items:
   1. Formwork for cast-in-place concrete.
   2. Build in sleeves, angles, anchors, bolts inserts, channel frames, and all items furnished under other Sections and by other Divisions which are to be built into the concrete.
   3. Hand excavation required for placing forms and concrete.
   4. Install and grout all steel leveling plates and install anchor bolts for structural steel framing. Plates and bolts are furnished under the Section for Structural Steel.

1. 03 RELATED SECTIONS
A. Section - Summary of Work
B. Section - Rough & Finish Carpentry
C. Section - Cast-in-Place Concrete

1. 04 SUBMITTALS

A. Product Data: For each type of manufactured material and product indicated.

B. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork. Design and engineering of formwork are Contractor's responsibility.

1. 05 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed concrete Work 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. 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 formwork and shoring and reshoring installations that are similar to those indicated for this Project in material, design, and extent.

1. 06 PRODUCT HANDLING

A. Store materials properly to prevent damage and defacing of form surfaces. Damaged or defaced form materials are not acceptable, and shall be removed from site.

1. 07 APPLICABLE CODES, STANDARDS AND SPECIFICATIONS

A. Work under this Section shall conform to the following, except as modified herein.
   1. American Concrete Institute, ACI 318, Building Code Requirements for Reinforced Concrete, and ACI 347, Recommended Practice for Concrete Form work.
   2. American Society for Testing and Materials (ASTM), Standard Specifications and Methods of Testing.

PART II - PRODUCTS

2. 01 MATERIALS

A. Forms for concrete.
   1. 3/4" or 5/8" plywood, Product Standard PS 1-83, Exterior BB Concrete Form, Class 1, APA grade trademarked.
   2. Form liner, 1/4" hard pressed fiberboard treated for concrete Form work.
   3. Studs, wales, braces, 2" x 4" minimum, S4S, No. 2 or better Southern Pine, Douglas Fir.
   4. Steel or other form system, used only upon prior review of Engineer.

B. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch (19 by 19 mm), minimum.

C. Ties at waterproofing surfaces. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

D. Form ties, minimum working stress 3,000 pounds, no metal left closer than 1" from the finished concrete surface, Dayton-Superior "Snap-tie", Richmond "Snap-ty" for light walls. For heavy walls Richmond "Tyscru", Dayton-Superior "Coil Tie".

E. Form release agent, form free of Anti-Hydro, cast-off of Sonneborn-Contech, Inc., Durograd of W.R. Meadows.

F. Non-shrink grout, Masterflow 713 grout of Master Builders Co., Axpandcrete-S Hi-Flo of A-H Products, Sonogrout of Sonneborn-Contech.

PART III - EXECUTION

3. 01 PREPARATION

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until concrete structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
   1. Class A, 1/8 inch (3 mm).
   2. Class B, 1/4 inch (6 mm).
   3. Class C, ½ inch (13 mm).
   4. Class D, 1 inch (25 mm).

D. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical. Kerf wood inserts for forming keyways, reglets, recesses, and the like, for easy removal.
   1. Do not use rust-stained steel form-facing material.

E. Re-tighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

F. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

G. Layout, lines and levels, are to be located from property monuments and bench marks.

H. Erect batter boards, secure them against movement or displacement and protect them from damage.

I. Perform all hand excavation required to trim excavations and trenches for placing forms and concrete.
   1. Bearing surfaces, clean, solid, true to line and grade, level or stepped as required, free from loose earth, debris and water.
   2. Foundations and footings to bear on undisturbed soil or prepared subgrade.
   3. Excess excavation under foundations, fill with concrete at no extra cost to Owner
   4. Protect sides of excavations where necessary to prevent sliding or caving of banks.
   5. Maintain excavations free of water from any source at all times.
   6. The payment or credit for added or omitted hand excavation shall be based on the unit price quoted. If no unit price is quoted, the payment or credit shall be as enumerated in the supplementary general conditions.

3. 02 ERECTION

A. All form materials shall be new when first used on the project and may be reused if the surfaces are undamaged and properly cleaned and oiled.

B. Construct suitable and adequate forms, conforming to the shapes, lines, grades and dimensions required by drawings.
   1. The responsibility for safety, strength and stiffness rests solely with the Contractor.
   2. All forms are to be inspected prior to placing concrete, by the Contractor for construction, alignment, cleanliness and conformity with drawings and specifications.

C. Erect forms plumb, level, true to line, braced, mortar tight, tied and supported to maintain proper position and shape during and after placing concrete.
   1. Fabricate forms to assure proper placing of reinforcing.
   2. Provide temporary openings for inspection of forms and removal of chips, debris and trash.
   3. Brace all forms adequately to prevent movement, bulging, or deformation during and after placing concrete.
   4. All exposed edges of pilasters in occupied rooms and spaces, chamfered 3/4" or rounded to 1" radius.

D. Construct footing forms of the materials specified, braced, clamped, tied and staked to maintain dimensions. Stakes shall be located and driven to prevent disturbing footing bearing.

E. Construct wall forms of material specified with wales not less than double 2" x 4", spaced not over 24" on center. Secure specified form ties to wales, spaced not over 27" on center vertically.

3. 03 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use Setting Drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. Install anchor bolts, accurately located, to elevations required.
2. Install dovetail anchor slots in concrete structures as indicated.

3. 04 BUILT-IN WORK

A. Construct all chases, wall pockets and openings shown, specified and required to be provided in concrete work. Place and secure in exact position all anchors, hangers, inserts, lintels, frames, bolts, sleeves, etc., required to be built in as part of the work of this Section.

B. Notify all Contractors and Subcontractors to place and secure all items specified or required to be built into the concrete work.

C. Install built-in work in strict accordance with the directions of the manufacturer of the items, instructions of the Contractor furnishing items, details shown on drawings, and approved shop drawings.
1. Install anchor bolts, accurately located, to elevations required.
2. Install dovetail anchors slots in concrete structure as indicated.
3. After all items are placed and secured in the forms by the respective Contractors and Subcontractors, the General Contractor shall be responsible for any displacement of such items and for any rebuilding made necessary by the displacement, except for items omitted or improperly located.

3. 05 REMOVING AND REUSING FORMS

A. All forms left in place for not less than the following periods of time. These periods are the cumulative number of days which the temperature of the concrete is above 50 degrees F and are not necessarily consecutive.
1. Walls 3 days
2. Pilasters 3 days
3. Other parts 3 days

B. General: Formwork, for sides of beams, walls, columns, and similar parts of the Work, that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete provided concrete is hard enough to not be damaged by form-removal operations and provided curing and protection operations are maintained.

C. Leave formwork, for beam soffits, joists, slabs, and other structural elements, that supports weight of concrete in place until concrete has achieved the following:
   1. 28-day design compressive strength.
   2. At least 70 percent of 28-day design compressive strength.
   3. Determine compressive strength of in-place concrete by testing representative field or laboratory-cured test specimens according to ACI 301.
   4. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

D. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

E. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3. 06 SHORES AND RE-SHORES

A. Comply with ACI 318 (ACI 318M), ACI 301, and recommendations in ACI 347R for design, installation, and removal of shoring and re-shoring.

B. Plan sequence of removal of shores and re-shore to avoid damage to concrete. Locate and provide adequate re-shoring to support construction without excessive stress or deflection.

3. 07 SETTING LEVELING PLATES

A. Set leveling plates and anchor bolts furnished and delivered under Section for Structural Steel, including steel shims.
   1. Leveling plates shall be set to exact elevation, line, and level upon steel shims, then grouted with non-shrink grout, mixed and placed in strict accordance with printed directions of manufacturer.
   2. Anchor bolts are to be set and held to line and elevation with templates.
   3. Where concrete or grout is supporting structural steel, the concrete or grout shall have obtained its full strength prior to steel erection.

- - - END OF SECTION - - -

PART 1 - GENERAL

1. 01 GENERAL

The Drawings, Instructions to Bidders, Form of Proposal, General Conditions, Supplementary General Conditions, and Division 1 are included herein and govern work under this section.

1. 02 SUMMARY

A. The following items are specifically included without limiting the generality implied by these specifications and the drawings.
   1. Furnishing, bending, and installing reinforcing as described in Contract Documents.

1. 03 SUBMITTALS

A. See Section 01 11 13, Summary of Work.

B. Provide mill certificate upon Architect's request.

1. 04 QUALITY ASSURANCE

Fabricate and place reinforcing steel according to "ACI Detailing Manual," Latest Edition, and details on drawings.

1. 05 DELIVERY, STORAGE AND HANDLING

A. Reinforcing steel shall be free of rust, scale, or other coating at time of delivery and placing.

B. Deliver bars separated by size and tagged with manufacturer's heat or test identification number.

C. Properly protect rebar on site after delivery.

PART II - PRODUCTS

2. 01 MATERIALS

A. Reinforcing Steel:
   1. Rebars shall have grade identification marks and conform to ASTM A615-89, "Specification for Deformed and Plain Billet Steel Bars for Concrete Reinforcement".
      a. Grade 60 minimum, except dowels which are to be field bent Grade 40 minimum.
      b. Bars shall be deformed type.
      c. Bars shall be free of rust, scale, or other bond-reducing coatings.

B. Rebar Spacing Blocks:
   1. Approved types and manufacturers:
      a. Single cover block with wire by Frank Co., Humbolt, Texas.
      b. Equal as approved by Architect prior to bidding.

PART III - EXECUTION

3. 01 INSTALLATION

A. Tolerances:
   1. Provide following minimum concrete cover for reinforcement.
      a. Concrete cast against and permanently exposed to earth.
         i. Exterior slabs on grade (where shown - 2").
         ii. Interior slabs on grade - 2".
         iii. Sections other than slabs - 3".
      b. Concrete exposed to weather:
         i. #6 and larger bars - 2".
         ii. #5 and smaller bars - 1-1/2".
      c. Concrete not exposed to weather or in contact with ground:
         i. Slabs, walls and joints - 3/4".
         ii. Beams and columns: Primary reinforcement, ties, stirrups and spirals - 1-1/2".

B. Bend bars cold.

C. Accurately place and support with chairs, bar supports, spaces, or hangers as recommended by ACI Detailing Manual, except slabs on grade work. Support bars in slabs on grade and footings with rebar spacer blocks or plain concrete blocks (no wood or wire) to maintain specified concrete cover.

D. Dowel vertical reinforcement for columns or walls out of footing or structure below with rebar of same size and spacing required above.

E. Securely anchor and tie reinforcing bars and dowels prior to placing concrete.

F. Avoid splice of reinforcing bars at points of maximum stress. Lap bars 40 bar diameters minimum.

G. Steel reinforcing bars shall run continuous through cold joints

- - - END OF SECTION - - -

PART I - GENERAL

1. 01 GENERAL

The Drawings, Instructions to Bidders, Form of Proposal, General Conditions, Supplementary General Conditions, and Division 1 are included herein and govern work under this section.

1. 02 SUMMARY

Products furnished but not installed under this Section: Furnish PVC Waterstops for foundation footings and walls as described in Contract Documents.

1. 03 SUBMITTALS

Submit manufacturer's product literature and installation recommendations for each item.

PART II - PRODUCTS

2. 01 MATERIALS

Extruded from elastomeric polyvinychloride to meet requirements of U.S. Corps. of Engineers Specification C-572-63.

2. 02 APPROVED MANUFACTURERS

A. A-H PVC Waterstop by Anti-Hydro Co., Newark, New Jersey.

B. Durajoint by Electrovert, Inc., Mt. Vernon, New York.

C. Plastigrip by Progress Unlimited, Inc., New York, New York.

D. Vinylex Waterstop by Vinylex Corp., Knoxville, Tennessee.

E. Sealtight by W.R. Meadows, Inc., Elgin, Illinois.

- - - END OF SECTION - - -

PART I - GENERAL

1.01 GENERAL

The Drawings, Instructions to Bidders, Form of Proposal, General Conditions, Supplementary General Conditions, and Division 1 are included herein and govern work under this section.

1.02 SCOPE

A. This Section is subject to applicable requirements of the Contract Documents.

B. Work includes all Cast In Place Concrete required by the Contract, and, in general, includes the following items:

1. Cast-in-place concrete for the building, plain and reinforced, as shown, indicated and specified
2. Minor hand excavation, trimming, cleaning and tamping required for setting forms and placing concrete.
3. Build into concrete items furnished under other sections.
4. Concrete recess at refrigerator units as shown.
5. Formwork.
6. Miscellaneous concrete.
7. Concrete floor topping.
8. Non-slip aggregate concrete surfaces.
9. Submittals.
10. Vapor retarder

C. Related Work:
1. Machine excavation, under the Section for Earthwork.
2. Hand excavation, under the Section for Concrete Formwork.
3. Concrete curbs and walks, under Division 2.
4. Concrete foundations for mechanical equipment, under Division 15 or 16, unless specified under Scope above.
5. Leveling plates and anchor bolts for structural steel framing, furnished under the section for structural steel, installed under the Section for Concrete Formwork.
6. Perimeter insulation furnished and installed under Section for Building Insulation.

1.03 SUBMITTALS

A. Test reports of all test specified to be transmitted to Engineer, with copies to the Owner.
B. Concrete mix designs for each type of concrete to be used including special mixes for concrete to be pumped.
C. Certified sieve analysis of fine and each class of coarse aggregate submitted to Engineer for review prior to use. All cost at the expense of the Contractor.

1.04 TESTING OF CONCRETE & DESIGN MIXES

A. During the progress of the work, compression test specimens shall be made and cured by a Testing Laboratory, selected by the Contractor and approved by the Owner in accordance with the "Standard Method of Making and Curing Compression and Flexure Test Specimens in the Field" (ASTM C31). Not less than four (4) specimens, two (2) for seven day and two (2) for twenty-eight day tests, shall be made for each test, nor less than one (1) test for 50 cubic yards of concrete of each class or fraction thereof placed in one (1) day.

B. Specimens shall be cured under laboratory conditions except that when, in the opinion of the Architect, there is a possibility of the surrounding air temperatures falling below 40 degrees F. and may require additional specimens to be cured under job conditions.

C. Specimens shall be tested in accordance with the Standard Method of Test for Compressive Strength of Molded Cylinders (ASTM C39).

D. Slump tests and entrained air tests shall be conducted by the General Contractor for every truck load and/or as frequently as may be required to assure that no concrete shall have more that the specified slump and contain the specified allowable air content. All tests shall be conducted in the presence of the Architect or his representative and each test shall be made by the same representative of the Contractor.

E. All cylinders, air content tests and slump tests shall be made by qualified personnel acceptable to the Architect.

F. The standard age test shall be 28 days, but day tests may be used provided that the relation between seven (7) day and twenty-eight (28) day strengths of the concrete is established by tests for the materials and proportions used.

G. If the average strength of the laboratory cured field cylinder for any portion of the structure falls below the compressive strengths called for on the plans, the Architect shall have the right to require conditions of temperatures and moisture necessary to secure the required strength and may require tests in accordance with "Standard Methods of Securing Pre-Strengths" (ASTM C42) or order load tests to be made on the portions of the building so affected.

H. If the average strength of the laboratory cured field cylinders falls below the compressive strength called for, the concrete covered by these tests shall be assumed as inadequate for the structures and the Architect may require that load tests be placed on the member of the structure in question. Loading shall be in accordance with Section 228.1R-89 of the ACI Building Code. Requirements for reinforced concrete and the method of loading and conducting the test shall be submitted in advance to the Architect for his approval. If the tested portion of the structure does not fulfill the requirements of the test, it shall be deemed to have failed and shall be removed and replaced. The Architect reserves the right to reject substandard concrete work as indicated by hardened concrete field cylinders regardless of the results of the load tests.

I. When job cylinders have been required by the Architect and the average strength of the job cured cylinders falls below the required strength, the Architect shall have the right to require conditions of temperature and moisture necessary to secure the required strength and may require tests in accordance with the "Standard Methods of Securing, Preparing and Testing Specimens of Hardened Concrete for Compressive Flexural Strengths" (ASTM C42) or order load tests to be made on the portions of the building so affected.

J. All costs of all concrete testing, load tests and core tests shall be borne by this Contractor whether or not the portion tested meets the test requirements.

K. The laboratory shall furnish copies of all tests as follows:

Architect's Office	2 copies
Architect's Structural Engineer	1 copy
General Contractor	2 copies
Concrete Supplier	1 copy

L. At the end of each week, the Contractor shall submit to the Architect, a record showing the results of all slump and air tests made during the previous week. This record shall indicate the location in the project where this particular concrete was used

1.04 PRODUCT HANDLING

A. Store materials properly to prevent damage, deterioration, and inclusion of foreign matter. Aggregate shall be stockpiled in a well-drained location. Separate each gradation and pile to prevent segregation of sizes within gradation.

B. Packaged materials shall be delivered in original unopened containers and stored in a weatherproof enclosure.

C. Damaged or deteriorated materials are not acceptable and shall be removed from site.

1.05 JOB CONDITIONS

A. No concrete shall be placed when the temperature is below 40 degrees F except to complete a pour already begun, unless protection is provided as specified for cold weather protection.

1.06 APPLICABLE CODES, STANDARDS AND SPECIFICATIONS

A. Work under this Section shall conform to following, except as modified herein:
1. American Concrete Institute, ACI 318, Building Code Requirements for Reinforced Concrete.
2. American Society for Testing and Materials (ASTM), Standard Specifications and Method of Testing.
3. Specifications for Structural Concrete, ACI 301.
4. Specifications for hot weather concreting, ACI 305R.
5. Specifications for cold weather concreting, ACI 306R.

PART II - PRODUCTS

2.01 MATERIALS

A. Portland cement, approved standard brand, ASTM C150, Type I. Specified cement shall conform to all tests.
1. All cement for site mixing is to be delivered to the site in sacks bearing name and brand of the manufacturer.
2. One brand and color of cement is to be used for all concrete work exposed in the structure.

B. Air entraining admixture, ASTM C260.

C. Fine aggregate is to be clean, sharp, uncoated grains of natural sand, free from loam, clay, organic impurities, frozen material, in compliance with ASTM C 33. After approved, no change is to be made in source of supply without written approval of Engineer. Grading as follows:

Passing 3/8" Sieve	100%
Passing No. 4 Sieve	95 to 100%
Passing No. 8 Sieve	80 to 100%
Passing No. 16 Sieve	50 to 85%
Passing No. 30 Sieve	25 to 60%
Passing No. 50 Sieve	10 to 30%
Passing No. 100 Sieve	2 to 10%

D. Coarse aggregate is to be hard, clean, crushed limestone, free from adherent coatings, friable pieces, organic impurities, in compliance with ASTM C 33. After approval, no change in source of supply without written approval of Engineer. Gravel meeting above specifications is acceptable. Grading as follows:

Nom.Size	2"	1-1/2"	1"	3/4"	1/2"	3/8"	No.4	No.8
1-1/2"	100	95-100			35-70	10-30		0-5
3/4"	100	90-100			20-55	0-10		0-5
1/2"	100	90-100			40-70	0-15		0-5

E. Abrasive aggregate for non-slip finish, A-H Emery Grits of A-H Products, Non-slip Aggregate of Euclid Chemical Co., Frictex of Sonneborn-Comtech.

F. Water shall be potable, clean, free from oil, acids, vegetable matter, alkalies, salts or other injurious substances.

G. Surface hardener and dustproofing compound shall be Lapidolith of Sonneborn, Armortop of A-H Products, Saniseal of Master Builders.

H. Joint filler shall be remolded, resilient non-extruding type, 1" thick unless shown otherwise, full depth of concrete section, in compliance with ASTM D994.

I. Paper for concrete curing and protection shall comply with ASTM C171.

J. Curing compound, clear or translucent with fugitive dye, ASTM C309, Type 1. The compound of type shall not stain or discolor finish concrete surfaces or make surface unsatisfactory for paint finish or resilient floor adhesion. Kure-N-Seal of Sonneborn-Comtech, 3-way Sealer of Anti-Hydro, Masterseal of Master Builders.

K. Leveling material for leveling concrete slabs shall be latex based, No. 180 Chemical Set Underlayment Cement of Armstrong Cork co., Levelite-Latex of Selby Battersby & Co., Dependable Crack Filler of Dependable Chemical Co.

2.02 PROPORTIONS OF CONCRETE

A. Concrete shall be composed of standard Portland cement, fine aggregate, coarse aggregate, water and approved admixtures.

B. Required specified strength (f'c) at 28 days as follows:

Class	Maximum Agg. Size	f'c
1	1-1/2"	3,000 psi
2	3/4"	3,000 psi
3	3/4”	4,000 psi
4	1/2”	3,000 psi
5	¾”	5,000 psi

C. Proportions of concrete ingredients shall be established on basis of C1, C2, or C3 as follows:

1. Selection of Concrete Proportions by Field Experience. Where the concrete production facilities has a record, based on at least 30 consecutive strength tests representing similar materials and conditions to those expected, the strength used as the basis for selecting proportions shall exceed the required f'c by at least:

   400 psi if the standard deviation is less than 300 psi
   550 psi if the standard deviation is 300 to 400 psi
   700 psi if the standard deviation is 400 to 500 psi
   900 psi if the standard deviation is 500 to 600 psi

   Strength data for determining standard deviation shall be considered to comply with the foregoing stipulations if they represent either a group of at least 30 consecutive tests or the statistical average for two groups totaling 30 or more tests. The tests used to establish standard deviation shall represent concrete produced to meet a specified strength or strengths within 1,000 psi of that specified for the proposed work. Changes in materials and proportions within the population of background tests shall not have been more closely restricted than they will be for the proposed work. If the standard deviation exceeds 600 psi or if a suitable record of strength test performance is not available, proportions shall be selected to produce an average strength at least 1200 psi greater than the required f'c.

2. Selection of Concrete Proportions by Laboratory Trial Batches.
Laboratory trial batches may be used as a basis for selecting concrete proportions provided a water cement compressive strength curve is established with at least three points representing batches which produce strengths above and below that required. Each point on the curve shall represent the average of at least three specimens tested at 28 days or an earlier age when approved by the Engineer. The slump and air content of the batches shall be the maximums permitted by this specification.

3. Maximum Permissible Water Cement Ratios for Concrete
(when strength data from trial batches or field experience are not available)

Specified Compressive Strength Concrete f'c, psi	Maximum Permissible Water-Cement Ratio			
	Non-Air Entrained Concrete		Air Entrained Concrete	
	Absolute Ratio by Weight	U.S. gal. Per 94 lb. bag of cement	Absolute Ratio By Weight	U.S. gal. Per 94 lb. bag of cement
3000	0.58	6.6	0.46	5.2
4000	0.44	5.0	0.35	4.0
5000	0.42	4.7	0.32	3.8

4. Cement content, except as specified under paragraph for "Admixtures", as follows:
   a. 3,000 psi concrete, not less than 5-1/2 sacks or 517 pounds of cement.
   b. 4,000 psi concrete, not less than 6 sacks or 564 pounds of cement.
   c. 5,000 psi concrete, not less than 6-1/2 sacks or 611 pounds of cement.

5. Cement at a temperature in excess of 140 degrees F shall not be used in mixing concrete.
   a. Slump of concrete mixes as follows:

Type of Construction	Maximum Slump	Minimum Slump
Reinforced foundation wall and footings	4"	2"
Slabs	4"	3"
Topping	3”	2”

   b. For pumped concrete, the specified slumps above are to be measured at the discharge end.

2.03 TRIAL MIXES

A. Trial mix batches, made by Contractor, all costs at expense of Contractor.
   1. Two test cylinders shall be made from each mix and broken at seven days. No concrete shall be placed on job until tests have shown 70 percent of design strength at seven days.
   2. No changes allowed on received mix design. Re-submittals are required for any changes.

2.04 MIXING CONCRETE

A. Measurements of cement, fine and coarse aggregate, shall be made separated by weight, upon suitable devices, accurate to 1% of net load being weighed. Weighing equipment shall be arranged to permit making compensation for changes required due to moisture contained in aggregate.
   1. Water shall be measured by a device, accurate to 1% plus or minus, of the total amount of water required per batch.
   2. Water in the aggregate shall be included in quantity specified and subtracted from the amount added to the mixture. Moisture determinations shall be made on representative samples at least once each day and when appearance of aggregate or mixed concrete indicates a change.
   3. Volumetric measurement of aggregate is not permitted except for small amount of concrete.

B. Machine mix all concrete at site, conforming to ASTM C 94.
   1. The Contractor is responsible for production of concrete having the specified slump for each pour. Concrete failing to conform to this requirement shall be rejected.
   2. Concrete showing any evidence of setting up in the mixer or rotating container shall be rejected.
   3. Water used for washing out the truck mixer after unloading, must be discharged and is not permitted for use in wetting next batch.

C. Rejected concrete may not be reworked and must be removed from the site.

D. Site mixed concrete by a batch mixer not smaller than one cubic yard capacity, mixed not less than one minute after all materials are in the drum.
   1. Rotation of the drum shall be between 190 and 210 peripheral feet per minute. Speeding up the rotation of the drum is not acceptable for a reduction in time.
   2. Raw materials are not permitted to enter drum until preceding batch has been entirely discharged.

E. Ready-mixed concrete shall be completely discharged within 1-1/2 hours, or before the drum has revolved 300 revolutions, whichever comes first. The starting time shall be considered to be the time at which the mixing water is introduced to the cement aggregate mixer.
   1. In hot weather or under conditions contributing to quick stiffening of the concrete, prevent premature drying in accordance with ACI Standard 305.
   2. When a truck mixer is used for complete mixing of concrete, mixer operation shall begin within 30 minutes after cement intermingled with aggregate.

2.05 ADMIXTURES

A. An air entraining admixture shall be included for all concrete used for walls, piers and footings. All concrete which is exposed to the weather shall also be air entrained including slabs and stairs. Mix in proportions as recommended by manufacturer.
   1. The air entraining admixture, where specified or approved for use, shall produce a total entrained air content between 4% and 6% by volume, as determined by direct measurement or by test method ASTM C 138.

B. Admixtures for plasticizing and densifying, may be used provided the concrete shall have a compressive strength at seven and twenty eight days not less than those specified and also provided it complies with water-cement ratio requirements. If admixtures are used, they shall be included in the mix design.
   1. Admixture shall conform to ASTM C 494. Plastiment of Sika Chemical Corp., Pozzolith of Master Builders.
   2. The cement content of concrete having the admixture, except for integral waterproofed concrete may be reduced as follows:
      a. 3,000 psi concrete, from 5-1/2 to 5 sacks of cement.
      b. 4,000 psi concrete, from 6 to 5-1/2 sacks of cement.
      c. 5,000 psi concrete, from 6-1/2 to 6 sacks of cement.
   3. Submit acceptable documentary data with the material submitted for review, with evidence that the admixture increases the durability of concrete when subject to freezing, thawing, and corrosion, and that the admixture has been used in similar work for not less than five years.

2.06 AUXILIARY MATERIALS

A. Expansion Joint Filler: Thermosetting plastic with closed cell construction of thickness shown on plans.

B. Expansion Joint Sealer: One component elastomeric butyl caulking compound.

C. Vapor Retarder: Vapor Block low perm as manufactured by Raven Industries, Inc., (800) 635-3456.
   a. VaporBlock 10:
      1. Thickness: nominal: 10 mils (0.25 mm).
      2. Weight: 49 pounds per thousand square feet (249 grams per square meter).
      3. Classification (ASTM E1745): Class A.
      4. Tensile Strength, average of machine direction and transverse direction:
         a) New Material (ASTM E154): 52 pounds per inch (91 N/cm).
         b) After Soaking (ASTM E154): 53 pounds per inch (93 N/cm).
      5. Puncture Resistance (ASTM D1709): > 2600 grams.
      6. Permeance (ASTM E96, ASTM E154) new material: 0.0146 U.S. perms (0.0096 metric perms).
   b. Seaming Tape: VaporBond Tape by Raven Industries or other 4” tape approved by vapor retarder manufacturer.
   c. Pipe Boot Kits: Raven VaporBoot System or other approved Manufacturer’s supplied pipe boot system.

D. Floor Weatherproofing: Apply to new and existing concrete slab. Penetrating Sealer #40 V.O.C. as manufactured by L. Sonneborn & Sons, Inc.

E. Crack Sealer: Epolith-P as manufactured by L. Sonneborn Building products.

F. Spauling Concrete: Sono-Patch as manufactured by Sonneborn Building Products.

G. All products are to be installed per manufacturers recommendation and be verified that each is compatible with material it will be in contact with.

PART III – EXECUTION

3.01 INSPECTION

A. Forms and reinforcing inspected by the Contractor prior to placing any concrete.

3.02 PREPARATION

A. All equipment shall be thoroughly cleaned before each run. Discharge the wash water outside of the forms.

B. Before placing any concrete, check the reinforcing, accessories and sleeves, for position. Forms shall be properly oiled and free of debris and water.

3.03 PLACING CONCRETE

A. Convey, transport and place the concrete as rapidly as practical, without segregation or loss of ingredients and without unnecessary handling, to produce a monolithic structure free from pits, honeycombed areas and visible lines of juncture.
   1. The formwork is to be free of ice and snow.
   2. Deposit the concrete continuously in horizontal lifts not over 18" deep in a manner to prevent displacement of reinforcing. Avoid accumulating concrete on the reinforcing and forms above the level of fresh concrete.
   3. Place each section of concrete in a single, complete and continuous pour.
   4. Use chutes and trunks of sufficient number and variable lengths so that concrete does not free fall over 4'-0". Keep the surface of the concrete practically level at all times. Flow the concrete over 4'-0" from the point of deposit.
   5. Vibrate concrete for slabs and floors to a solid mass and screed to carefully leveled grounds using a straight edge. Place concrete in order to allow finishing in daylight.
   6. Spade and work coarse aggregate away from forms, work concrete around reinforcing to avoid air pockets, voids and honeycomb sections.
   7. The use of a vibrator is recommended, applied directly to concrete, to cause the concrete to settle into place. Duration of vibration, not excessive to cause segregation of mix. Flowing the concrete more than four feet with a vibrator is prohibited. Supplement vibration by hand spading in corners and angles of forms and along form surfaces.

B. Use Class I concrete for footings and mass concrete, formed and reinforced as shown. Check the setting of anchor bolts for base plates. The anchor bolts shall be accurately set and held in place with templates. Hold the top surface of concrete 1" below the bottom of the base plate for grout.

C. Use Class 2 concrete for walls including under walls and slabs on ground. The top surface is to be true, uniform and level, without pockets, depressions, lumps, ridges or waves.
1. Slabs on grade are to have 6 mil. or greater vapor retarder with 6” lap joints. Place vapor retarder on sand bead to reduce risk of vapor retarder penetration.
2. Concrete slabs which are supported on steel beams and joists, place and screed to a level and true finished elevation compensating for dead load deflection of supporting steel members or forms. Contact Engineer for approximate dead load deflection of the floor system.
3. Pitched slabs evenly to floor drains where indicated.
4. Accurately set screeds and remove before the initial set.
5. Slabs which are to receive ceramic tile, terrazzo or concrete topping shall be screeded to level surface.
6. Slabs which are to receive wood floor finish shall be wood floated to smooth level finish within tolerance of 1/8" in a 10'-0" radius. All discrepancies in level shall be corrected by grinding or other methods.
7. Finish concrete floors in spaces and areas indicated on Room Finish Schedule to be concrete, resilient tile, carpeting or thin set ceramic tile by mechanically floating and trowelling as specified for Concrete Floor Finishes.
8. Each pour of slabs on grade shall be limited to approximately 900 square feet and not more than 35'-0" in the longest dimension. Try to locate joints in slabs under partitions.
9. Do not sprinkle dry cement or a mixture of dry cement and sand on the surface to absorb moisture and to stiffen the mix.

D. Use Class 3 concrete for outside ramps and platforms and where indicated on drawings.

E. Use Class 4 concrete for topping of slabs.
1. Clean the slab surfaces thoroughly of all dust and dirt immediately before placing the topping. Slush all surfaces with neat Portland cement grout to insure good bond.
2. Tamp and spade topping to a solid mass. Screed the top surface to carefully leveled grounds, finish as specified for Concrete Floor Finish.

3.04 FIELD QUALITY CONTROL

A. Provide for test cylinders, from each pour of 50 cubic yards or less, and more frequently if required by the Owner.
1. For each set of four cylinders, two shall be broken at 7 days and two at 28 days.
2. The sampling method shall be in compliance with ASTM C 172.
3. The marking and curing of specimens shall be in compliance with ASTM C 31.
4. The testing method shall be in compliance with ASTM C 39.
5. Laboratory tests will be reviewed by the Engineer. All costs will be borne by the Owner.

B. If any of test cylinders show low results, cored samples will be required for retesting. All costs for removal, replacement, and testing of the faulty work shall be borne by the Contractor with no additional cost to the Owner.

3.05 CONSTRUCTION AND CONTROL JOINTS

A. Place the concrete so as to minimize the number of construction joints. The type, number and location of construction joints in each member, unit or section of the structure are subject to the review of the Engineer prior to placing the concrete.
1. No horizontal construction joints will be permitted except at top of the footings.
2. Construction joints shall be made watertight, poured with a key, and caulked or where detailed provide water stops. Water stops shall be spliced and installed as recommended by manufacturer.
3. Reinforcing shall be as shown or specified, continuous through all construction joints.
4. Construction joints in slabs, beams, or girders shall be located near the center of the span. For girders receiving beams near the center of span, the construction joint shall be located a distance equal to twice the beam width.
5. Prior to continuing placing concrete at joints, the concrete shall be roughened, thoroughly cleaned, wetted, and spread with neat Portland cement grout.

B. Control joints shall be provided where required by drawings, consisting of V-shaped moldings secured to forms each face to provide V-notch in concrete wall.

C. Construction Joints: Located by contractor with Architect's approval, except where specifically located on plans.
1. No horizontal joints in walls.
2. Before continuing a pour at a joint, remove all laitance, thoroughly soak old concrete, and slush with 1.1 grout.
3. Reinforcing continuous across joint.
4. Provide keyways in all construction joints.

D. Maximum length of pour between construction joints:
Slabs on ground 40 feet
Slabs above grade 40 feet

E. Expansion Joints: As located and shown on drawings, 30 ft. maximum length of pour between expansion joints.
1. Use Burke Keyed Kold Joint (or Architect approved equal) installed per manufacturer's recommendation.
2. Caulk using expansion joint sealer in accordance with manufacturer's instructions.

F. Control Joints: Maximum distance between joints:
Slabs on ground 20 feet, either direction
Slabs above grade 20 feet, either direction
Control joints may be tooled (or saw cut) one quarter of slab depth.

3.06 CONCRETE FLOOR FINISHES

A. Float all floor slabs which require finishing while the concrete is still green but hardened sufficiently to bear the finisher's weight using a metal disc power machine.
   1. No floating will be permitted while surface is wet, soft or sloppy.
   2. Care shall be exercised and the operation of the machine controlled to prevent overworking the finish and drawing excess mortar and water to surface.
   3. The finishing machine shall be used for compaction and elimination of any voids. Repeated operation over a given area other than to secure the necessary compaction is to be avoided.
   4. For areas of slabs which cannot be mechanically floated, use wood or cork hand float.
   5. Finish float surfaces to true uniform plane. Test the surface with a straight edge to detect high and low spots which shall be eliminated.

B. After floating, steel trowel the concrete to a smooth hard surface.
   1. Provide second and subsequent trowellings as required to bring the surface to a smooth, hard, and impervious surface free from marks and blemishes.

C. For exterior slabs, platforms and where indicated, provide a broom finish.
   1. Trowel the slab before broom finishing. Draw the broom across slab surface, slightly overlapping previous passes. Corrugations in concrete shall be uniform and not over 1/8" deep.
   2. Use a push broom or floor broom, at least 18" wide, with good quality fiber or rattan bristles at least 4" long. The broom handle shall be longer than 1/2 width of the slab.
   3. Brooming shall be completed before the initial set of the concrete to prevent tearing or undue roughening of the surface.

D. Unless horizontal exposed edges and corners are indicated to have a curb bar nosing, finish them with edging tool to form smooth rounded surface.
   1. After floating and finishing slabs and platforms and before the concrete has reached its initial set, tool all edges at forms, joints and corners. Finish to smooth true line free from tool marks.

E. Apply a minimum of three coats of hardener and dustproofing compound specified to exposed concrete floors, applied as recommended by the manufacturer of compound used. The completed application shall be guaranteed to remain hard and dustproof for a period of three years after application.

F. Finish all concrete floors to a true, smooth and level surface or pitched to drains as required. The surfaces shall be true to the designed datum plane within a tolerance of 1/8" in 10 ft. as determined by a 10 ft. straight-edge placed anywhere on the slab in any direction. All variations below this tolerance shall be leveled with latex cement as specified, mixed and installed in strict accordance with manufacturer's directions.

G. For concrete floors which will receive a waterproofing membrane, float finish to a true and level or sloped surface as required.

H. Provide non-slip aggregate concrete floor surfaces for ramps, stair treads, landings, and where indicated. Apply abrasive aggregate in the amount of 25 lbs. Per 100 square feet of surface area. Apply as directed by manufacturer of aggregate.

3.07 CONCRETE FINISHES OTHER THAN FLOOR SLABS

A. Unexposed vertical concrete surfaces shall have all metal ties removed back from the surface at least 1". Depressions left from removed ties, fins, holes, water and air pockets, and honeycomb, etc., shall be pointed and patched with mortar of proportion to match the color of the concrete, but shall not be richer than one part Portland cement to three parts of sand.

B. Exposed vertical concrete surfaces in occupied areas shall have all metal ties removed. Depressions shall be pointed and patched as specified above.
   1. As soon as pointing and patching has set sufficiently, and not more than 24 hours after the removal of the forms, exposed exterior surfaces shall be thoroughly wet and rubbed with No. 16 carborundum brick or other abrasive to provide smooth, even, uniform surface. Rub to final finish with No. 30 carborundum brick. No plastering or other coating will be allowed.
   2. Exposed interior surfaces shall be pointed and patched as specified above, no rubbing required.
   3. Concrete slabs other than finish floor slabs shall be screeded and floated to a smooth level or pitched surface as indicated.

C. Interior surfaces of the concrete swimming pool tank shall receive a medium rough bushhammer finish.

3.08 EXTERIOR CONCRETE

A. Install all curbs, slabs and sidewalks in accordance with the drawings.

B. Repair and replace all curbs, sidewalks, slabs and other concrete work damaged in the execution of this contract. All to be done to match the existing or adjacent materials unless otherwise indicated on the drawings.

C. All Concrete Work:
   1. Thoroughly set subgrade before placing concrete.
   2. Base course (where required): Place and compact. Thoroughly wet before placing concrete.
   3. "Re-tamping" of mix not permitted.
   4. Cure as soon as practical after finishing. Place curing paper and secure by weighing down with overlapping joints. Cure for five (5) days minimum.
   5. Install no concrete after October l5 or before April unless other approved by Architect.

D. Concrete Walks:
   1. Place concrete over subgrade to exact finish grades shown.
   2. Concrete slabs shall be minimum 4" unless specified elsewhere.
   3. Expansion joints at 30 feet on center maximum: Install expansion joint filler between concrete walk and building, walls and curbing. Top of filler shall be 1/2" below finish surface of walk with expansion joint sealer filling remainder of joint flush with walk surface.

4. Control joints: Install saw cut (or tooled) joints one-quarter of slab depth (for slabs up to 4" deep. All control joints shall extend from edge to edge of concrete or to the face of all structures.
5. Finish: Screed to grade with wood float. Edge all sides. Broom finish in one direction.

3.09 PROTECTION AND CURING

A. Protect the concrete from injurious action of sun, rain, flowing water, frost, mechanical injury and premature drying.

B. Cure all surfaces to prevent early loss of moisture in the mixture and to develop the full anticipated strength and durability of the concrete.
1. The horizontal surfaces of floors, slabs, platforms, etc., covered completely with waterproof paper, joints lapped and sealed. Apply in strict accordance with directions of manufacturer of the waterproof paper used. The paper is to remain in place for seven days minimum.

2. Vertical surfaces shall be completely coated with the curing compound specified.

C. Cold weather protection shall be provided by the Contractor for any concrete placed during freezing weather.
1. Provide all necessary equipment for heating and protecting the concrete during freezing and near freezing weather.
2. No frozen materials or materials containing ice or frost will be used.
3. The temperature of the concrete when deposited shall not be less than 50 degrees F nor above 70 degrees F.
4. The temperature of the concrete shall be maintained above 50 degrees F for not less than five days after placing. For slabs, maintain heat for seven days after placing.
5. Keep the housing, covering and other protection in place for twenty four hours after the heating is discontinued.
6. Salt, chemicals, or other materials shall not be allowed to be mixed with the concrete to prevent freezing.
7. Methods of heating and protection shall conform to ACI 306R.
8. When concrete is placed in severe cold weather, the Engineer may require job stored test cylinders cured under identical conditions be tested before supporting forms and shores are remove, in accordance with ACI Standard 306.

D. Hot weather protection which is provided by the Contractor for concrete placed during hot, dry weather shall be in accordance with ACI Standard 305.

E. Repairing and Patching:
1. Concrete not properly formed, showing defective surfaces when forms are removed, or otherwise not in conformance with the drawings and specifications shall be entirely replaced or repaired. Plastering over the defects will not be allowed. Defective areas must be chipped out. The Architect shall decide whether to repair or replace, and shall be the judge as to whether or not repairs are satisfactory.

2. Remove bulges and projections by chipping or grinding. Honeycombed and other defective areas must be chipped out to solid concrete, the edges cut as straight as possible and at right angles to the surface or slightly undercut to provide a key at the edges of the patch.
3. Fill shallow patches with non-shrinking mortar of a type which will not rust or stain. Finish to match the surrounding concrete by floating, rubbing or tooling, or on formed surfaces, by pressing the form material against the patch while the mortar is still plastic.
4. Large deep patches may be filled with concrete held in place by forms. Such patches shall be reinforced and dowelled to the hardened concrete.
5. Provide an approved bonding compound in holes before filling with mortar or concrete.
6. Cure patches well, starting as soon as possible to avoid early drying. Prop wet burlap against the patch for retention of water of hydration in the patch. Continuously moist cure all patches for seven (7) days minimum.

3.10 EXTRA CONCRETE WORK

A. For concrete work added or concrete work omitted, Contract Price will be adjusted up or down using the unit prices quoted or as specified in Contract Documents.

3.11 CLEAN UP

A. Upon completion of work under this Section, remove all equipment, tools, excess materials, rubbish and debris from site.

- END OF SECTION -

PART I - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Work includes all Concrete Reinforcing required by the Contract, and, in general, includes the following items:
1. Reinforcing and accessories for cast-in-place concrete.
2. Submittals.

B. Related Sections (the following Sections contain requirements that relate to this Section)
1. Division 2 Section "Cement Concrete Pavement" for concrete pavement and walks.

1.03 SUBMITTALS

A. Steel Reinforcement Shop Drawings: Details of fabrication, bending, and placement, prepared according to ACI 315, "Details and Detailing of Concrete Reinforcement." Include material, grade, bar schedules, stirrup spacing, bent bar diagrams, arrangement, and supports of concrete reinforcement. Include special reinforcement required for openings through concrete structures.

B. Welding Certificates: Copies of certificates for welding procedures and personnel.

C. Material Data: Signed by manufacturers certifying that each of the following items complies with requirements:
1. Steel reinforcement and reinforcement accessories.

1.04 APPLICABLE CODES, STANDARDS AND SPECIFICATIONS

A. Work under this Section shall conform to the following, except as modified herein.
1. American Concrete Institute, ACI 318, Building Code Requirements for Reinforced Concrete, Details and Detailing of Concrete Reinforcement.
2. Concrete Reinforcing Steel Institute (CRSI), Manual of Standard Practice.
3. American Society for Testing and Materials (ASTM), Standard Specifications and Methods for Testing.
4. Specifications for Structural Concrete, ACI 301.

B. Welding: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code--Reinforcing Steel."

PART II - PRODUCTS

2.01 MATERIALS

A. Steel bar reinforcing, deformed billet steel bars conforming to ASTM A 615 Grade 60, or of the grade indicated on the drawings.

B. Steel mesh reinforcing, welded fabric of cold drawn steel wire, ASTM A 185.

C. Reinforcing accessories, of suitable types and adequate size to support reinforcing and prevent displacement during concrete placing.
   1. Reinforcing accessories including chairs, high chairs, slab bolsters, spacers, screeds, etc., which are in contact with form surfaces where the concrete will be exposed or painted, shall be all plastic or have preformed plastic tips of a color compatible with the color of the concrete. Richmond Screw Anchor Corp., Dayton-Superior.

D. Wire for tying, not less than 16 gauge annealed cold drawn, ASTM A82. Galvanized for pours at exterior locations.

E. Steel cross wire clips, welded to 2 continuous longitudinal tie wires, for wrapping structural steel flanges. Reed Clips #040 rigid type by Richmond Screw Anchor Corp. or equal.

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

PART III - EXECUTION

3.01 REINFORCING INSTALLATION

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
   1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
   1. Shop- or field-weld reinforcement according to AWS D1.4, where indicated.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire fabric in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing.

F. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

G. Steel reinforcement is to be formed and installed as shown, specified or required. Straightening or rebending at the site is prohibited.
   1. Position reinforcement accurately and secure rigidly against displacement.
   2. Support reinforcement to keep away from exposed surfaces of the concrete.
   3. Furnish and properly place all bolsters, ties, spacers, chairs, supports and all other required devices and accessories.

H. The minimum concrete covering reinforcing is to be as specified in ACI Building Code. Requirements for Reinforced Concrete as follows:
   1. Footings and structural members in which concrete is deposited against the ground, not less than 3".
   2. Concrete surfaces exposed to weather or in contact with the ground, not less than 2" for bars larger than No. 5, and 1-1/2" for No. 5 and smaller bars.
   3. Concrete surfaces not exposed directly to weather or in contact with ground, not less than 3/4" for slabs and walls not less than 1-1/2" for beams, girders and columns.

I. The minimum clear distance between parallel bars except in columns, shall not be less than the nominal diameter of bar, 1-1/3 times maximum size of aggregate or 1".

J. Splices to conform to ACI 318.
   1. The minimum lap splice lengths as per appropriate CRSI latest issue of Reinforcing Bar Splices.
   2. Fabric lapped splices shall be made so that the overlap measured between outer most cross wires of each fabric sheet is not less than the spacing of the cross wires plus 2 inches.
   3. All splices securely wire tied.

K. Dowels from walls to slabs may be installed straight and field bent provided ACI bend radius is maintained. Straightening and rebending of dowels is prohibited.

L. Reinforcing reviewed by this Contractor prior to placing concrete.

M. Electrical conduit which has to be placed in concrete slabs shall be installed after and above bottom reinforcing, but before and under the top reinforcing.
   1. Cross-over of conduit, where necessary, locate so that reinforcing is not displaced from its specified position.
   2. Conduit or outlet boxes shall not be placed in concrete columns.

N. Slabs and topping, unless otherwise shown on drawings, shall be reinforced with not less than 6 x 6 - W1.4 x W1.4 welded wire mesh.

- - - END OF SECTION - - -

PART I - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of each prime contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:
1. Concrete unit masonry.
2. Reinforced unit masonry.
3. Insulation in unit masonry walls.
4. Masonry waste disposal.

B. Related Sections: The following Sections contain requirements that relate to this Section:
1. Division-3 Section "CAST-IN-PLACE CONCRETE”
2. Division-7 Section "BUILDING INSULATION”
3. Division 7 Section "FLASHING AND SHEET METAL".
4. Division 7 Section "JOINT SEALANTS".

C. Products furnished but not installed under this Section include the following:
1. Dovetail slots for masonry anchors installed under Division 3 SECTION "CAST-IN-PLACE CONCRETE."

D. Products installed but not furnished under this Section include the following:
1. Steel lintels for unit masonry specified in Division 5 Section "METAL FABRICATIONS."
2. Wood nailers and blocking built into unit masonry specified in Division 6 Section "ROUGH CARPENTRY."
3. Composite Sheet Waterproofing over masonry units is specified in Division-7.
4. Manufactured reglets in masonry joints for metal flashing specified in Division 7 Section "FLASHING AND SHEET METAL."
5. Hollow metal frames in unit masonry openings specified in Division 8 Section "STEEL DOORS AND FRAMES."

1.03 PERFORMANCE REQUIREMENTS

A. Provide unit masonry that develops the following installed compressive strengths (f'm) at 8 days.
1. For Concrete Unit Masonry: As follows, based on net area:
a. f'm = 1500 psi.

1.04 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division-1 specification Sections.

B. Product data for each different masonry unit, accessory, and other manufactured product indicated.

C. Shop drawings for reinforcing detailing fabrication, bending, and placement of unit masonry reinforcing bars. Comply with ACI 315 "Details and Detailing of Concrete reinforcing" and ACI 530 showing bar schedules, stirrup spacing, diagrams of bent bars and arrangement of masonry reinforcement.

D. Material certificates for the following signed by manufacturer and Contractor certifying that each material complies with requirements.
   1. Each different cement product required for mortar and grout including name of manufacturer, brand, type and weight slips at time of delivery.
   2. Each material and grade indicated for reinforcing bars.
   3. Each type and size of joint reinforcement.
   4. Each type and size of anchors, ties and metal accessories.

E. Cold or Hot weather construction procedures evidencing compliance with requirements specified in referenced "Unit Masonry Standard".

F. Results from tests and inspections performed by testing agency will be reported promptly and in writing to Owner and Architect/Engineers. Tests include but are not necessarily limited to:
   1. Compressive strength.
   2. Modulus of rupture.
   3. Twenty-four hour cold water absorption.
   4. Five hour boiling water absorption.
   5. Saturation coefficient.
   6. Initial rate of absorption.
   7. Efflorescence.
   8. Weather classification.

1.05 QUALITY ASSURANCE

A. Unit Masonry Standard: Comply with ACI 530.1/ASCE 6 "Specifications for Masonry Structures", except as otherwise indicated.

B. Inspecting Laboratory Qualifications: To qualify for employment in performing tests and inspection specified in this Section, an independent testing laboratory must demonstrate to Architect/Engineers' satisfaction, based on evaluation of laboratory-submitted criteria conforming to ASTM C 1093, that it has the experience and capability to conduct satisfactorily the testing indicated without delaying the progress of the work.

C. Fire Performance Characteristics: Where required by the Construction Documents prepared by the Architect and previously approved by the Owner, provide materials and construction identical to those of assemblies whose fire resistance has been determined per ASTM E 119 by a testing and inspecting organization, by equivalent concrete masonry thickness, or by another means, as acceptable to authorities having jurisdiction.

D. Single-Source Responsibility for Masonry Units: Obtain exposed masonry units of uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from one manufacturer for each different product required for each continuous surface or visually related surfaces.

E. Single-Source Responsibility for Mortar Materials: Obtain mortar ingredients of uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source and producer for each aggregate. Obtain standard mortars from a single manufacturer and different colored mortar from a single manufacturer.

F. Special Inspection: This project shall be subjected to Special Inspection. The Contractor shall give three days advance notice to schedule the special inspections.
   1. The following items shall be inspected continuously:
      a. From the beginning of masonry construction, the following shall be verified to ensure compliance:

i. Grout space prior to grouting.
ii. Placement of grout.

b. The inspection program shall verify:
i. Type, size and location of anchors, including other details of anchorage of masonry to structural member frames or other construction.
ii. Protection of masonry during cold weather (temperature below 40 degrees F) or hot weather (temperature above 90 degrees F).

c. Preparation of any required grout specimens, mortar specimens and/or prisms shall be observed.

2. The following items shall be inspected periodically:

a. From the beginning of masonry construction, the following shall be verified to ensure compliance:
i. Proportions of site-mixed mortar and grout.
ii. Placement of masonry units and construction of mortar joints.
iii. Placement of reinforcement and connectors.

b. The inspection program shall verify:
i. Size and location of structural elements.
ii. Specified size, grade and type of reinforcement.

c. Compliance with required inspection provisions of the construction documents and the approved submittals shall be verified.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver masonry materials to project in undamaged condition.

B. Store and handle masonry units off the ground, under cover, and in a dry location to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion and other causes. If units become wet, do not place until units are in an air – dried condition.

C. Store cementitious materials off the ground, under cover and in dry location.

D. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

E. Store masonry accessories including metal items to prevent corrosion and accumulation of dirt and oil.

1.07 PROJECT CONDITIONS

A. Protection of Masonry: During erection, 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. 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 three (3) days and concentrated loads for at least seven (7) 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. Remove immediately any grout, mortar and soil that come in contact with such masonry.
1. Protect base of walls from rain-splashed mud and mortar splatter by means of 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.

D. Cold-Weather Construction: Comply with referenced unit masonry standard for cold-weather construction and the following:
   1. Do not lay masonry units that are wet or frozen.
   2. Remove masonry damaged by freezing conditions.
   3. Perform the following construction procedures while the work is progressing. Temperature ranges indicated below apply to air temperatures existing at time of installation except for grout. For grout, temperature ranges apply to anticipated minimum night temperatures. In heating mortar and grout materials, maintain mixing temperature selected within 10°F (6°C).
      a. 40°F (4°C) to 32°F (0°C):
         i. Mortar: Heat mixing water to produce mortar temperature between 40°F (4°C) and 120°F (49°C).
         ii. Grout: Follow normal masonry procedures.
      b. 32°F (0°C) to 25°F (-4°C):
         i. Mortar: Heat mixing water and sand to produce mortar temperatures between 40°F (4°C) and 120°F (49°C); maintain temperature of mortar on boards above freezing.
         ii. Grout: Heat grout materials to 90°F (32°C) to produce in place grout temperature of 70°F (21°C) at end of work day.
      c. 25°F (-4°C) to 20°F (-7°C):
         i. Mortar: Heat mixing water and sand to produce mortar temperatures between 40°F (4°C) and 120°F (49°C); maintain temperature of mortar on boards above freezing.
         ii. Grout: Heat grout materials to 90°F (32°C) to produce in place grout temperature of 70°F (21°C) at end of work day.
         iii. Heat: both sides of walls under construction using salamanders or other heat sources.
         iv. Use windbreaks or enclosures when wind is in excess of 15 mph.
      d. 20°F (-7°C) and below:
         i. Mortar: Heat mixing water and sand to produce mortar temperatures between 40°F (4°C) and 120°F (49°C).
         ii. Grout: Heat grout materials to 90°F (32°C) to produce in place grout temperature of 70°F (21°C) at end of work day.
         iii. Masonry Units: Heat masonry units so that they are above 20°F (-7°C) at time of laying.
         iv. Provide enclosure and auxiliary heat to maintain an air temperature of at least 40°F (4°C) for 24 hours after laying units.
         v. Do not heat water for mortar and grout to above 160°F (71°C).
   4. Protect completed masonry and masonry not being worked on in the following manner. Temperature ranges indicated apply to mean daily air temperatures except for grouted masonry. For grouted masonry, temperature ranges apply to anticipated minimum night temperatures.
      a. 40°F (4°C) to 32°F (0°C): Protect masonry from rain or snow for at least twenty-four (24) hours by covering with plastic sheets or other weather-resistive membrane.
      b. 32°F (0°C) to 25°F (-4°C): Completely cover masonry with weather-resistive membrane for at least twenty-four (24) hours.
      c. 25°F (-4°C) to 20°F (-7°C): Completely cover masonry with weather-resistive insulating blankets or similar protection for at least twenty-four (24) hours, and cover for at least forty-eight (48) hours for grouted masonry.
      d. 20°F (-7°C) and below: Maintain masonry temperature above 32°F (0°C) for twenty-four (24) hours using enclosures and supplementary heat, electric heating blankets, infrared lamps or other methods proven to be satisfactory.
      e. For grouted masonry maintain heated enclosure (using similar methods) to 40°F (4°C) for forty-eight (48) hours.

5. 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 out, but not less than 7 days after completion of cleaning.

E. Hot-Weather Construction: Comply with referenced unit masonry standard and standard industry practice for masonry construction in extreme hot weather.

PART II - PRODUCTS

2.01 MATERIALS, GENERAL

A. Comply with referenced "Unit Masonry Standard" and other requirements specified in this Section applicable to each material indicated.

2.02 CONCRETE MASONRY UNITS

A. General: Comply with referenced standards and requirements indicated below applicable to each form of concrete masonry unit required by the Construction Documents prepared by the Architect and previously approved by the Owner.
1. Provide special shapes as follows:
2. For lintels, corners, jambs, sash, control joints, headers, bonding, and other special conditions.
3. Where indicated, provide bullnose units for outside corners at all interior locations. Provide double bullnose units for ends of walls and unframed openings.
4. Square-edged units for outside corners at exterior locations, except where indicated as bullnose.
5. Special angled blocks for 45° corners and other angled conditions. Do not cut blocks in the field for installation in non-right angle corners; provide blocks manufactured with the special angle.
6. Provide block finished on two sides (front and side) for special type units (e.g. ground face block, split face block, etc.) at outside corner locations; do not provide factory- or field-cut mitered units.
7. Size: Provide concrete masonry units manufactured to specified dimensions of 3/8" less than nominal widths by nominal heights by nominal lengths indicated on drawings, unless noted otherwise. Provide blocks nominal 8" x 16" long (7-5/8" x 15-5/8" actual) x nominal thickness indicated, unless noted otherwise.
8. Provide Type I, moisture-controlled units.
9. Exposed Faces: Submit color samples for review in accordance with Division 1 section “SUBMITTALS”.

B. Concrete Masonry Units: ASTM C 90 and as follows:

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength indicated below:
a. 1900 psi (13.1 MPa).

2. Weight Classification: Normal weight.

3. Provide Type I, moisture-controlled units.

4. Exposed Faces: Exposed faces matching color, pattern, and texture of samples previously approved by the Architect:
a. “Buckskin” Split Face Block. Manufactured by A. Duchini Inc., 2550 McKinley Avenue, Erie PA 16514-0005, (814) 456-7027.

C. Integral Water Repellent: Exterior concrete masonry units exposed to the exterior or installed in contact with earth or soils provide units produced 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. **Do Not Provide Integral Water Repellent when an Exterior Vapor Barrier is being provided or if CMU is being provided for an interior location, such as elevator shafts.**

1. Acceptable Products include, but are not limited to, units made with "Dry-Block" by W.R. Grace & Co.

For below grade line, block shall be Grade "A" standard loadbearing hollow units with sand and gravel aggregate conforming to current ASTM Specs. Furnish all shapes and sizes as required.

Load bearing, hollow units for walls above grade shall be a lightweight aggregate concrete block, conforming to ASTM C90_66. Furnish shapes required for corners, jambs, etc. Furnish face type as indicated on drawings.

Lightweight aggregate shall be "Waylite", "Haydite" approved with medium fine texture, conforming to Fed. Spec. No. SS-C-621 and ASTM C331_64T for all block except that below grade and the following weights (adjust weights for l2" and Split Face Units units):

4 x 8 x l6 solid	24#
4 x 8 x l6 regular	20#
6 x 8 x l6	21#
8 x 8 x l6	31#
10 x 8 x l6	41#
Split Face -	Refer to mfg.

D. Fire-rated block to be used in firewalls shall be normal weight semi-solid units conforming to ASTM C33.

E. Non-load bearing hollow units for interior walls and partitions shall conform to ASTM C129-64-T.

F. Moisture content of blocks before laying shall be not more than 40% of total absorption average of face blocks.

G. No cinder block shall be allowed.

H. Curing: All masonry units to be adequately cured before delivery to insure uniform color and strength.

I. Color: As selected by Architect .

J. Provide Masonry sealer when using Arch. Block exposed to exterior.

2.03 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 color(s) as previously approved by the Owner in accordance with Division 1, Section "SUBMITTALS".

B. Masonry Cement: ASTM C 91.

C. Mortar Cement: U.B.C. Standard No. 21-14.

D. Hydrated Lime: ASTM C 207, Type S.

E. 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.

F. Aggregate for Mortar: ASTM C 144; except for joints less than 1/4 inch, use aggregate graded with 100 percent passing the No. 16 sieve.

G. Aggregate for Grout: ASTM C 404.

H. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortars.

I. Ready-Mixed Mortar: Cementitious materials, water, and aggregate complying with requirements specified in this Article; combined with set-controlling admixtures to produce a ready-mixed mortar complying with ASTM C 1142.

J. 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.

K. Water-Repellent Admixture (for exterior mortar and mortar in contact with the earth or soils): Liquid water-repellent mortar admixture intended for use with CMU, containing integral water repellent by same manufacturer.

L. Water: Potable.

M. Mortar and Grout Mixes:
   1. General: Do not add admixtures including coloring pigments, air-entraining agents, accelerators, retarders, water repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated above. Do not use calcium chloride in mortar or grout.
   2. Mortar for Unit Masonry: Comply with ASTM C270, Proportion Specification, for types of mortar indicated below:
      a. Limit cementitious materials in mortar to Portland cement-lime.
      b. Use Type S for below-grade masonry, for masonry in contact with earth.
      c. For exterior, above-grade load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions, and for other applications where another type is not indicated, use Type N.

2.04 REINFORCING STEEL

A. General: Provide reinforcing steel complying with requirements of referenced unit masonry standard and this article.

B. Steel Reinforcing Bars: Billet steel complying with ASTM A 615 and Grade 60.

2.05 JOINT REINFORCEMENT

A. Provide joint reinforcement complying with requirements of referenced masonry standard and this Section, formed from hot-dipped galvanized carbon steel wire, coating class as required by referenced masonry standard for application indicated.

B. Description: Welded-wire units prefabricated with deformed continuous side rods and plain cross rods into straight lengths of not less than 10'-0", with prefabricated corner and tee units, and complying with requirements indicated below:
1. Wire Diameter for Side Rods: 0.1483" (9 gauge).
2. Wire Diameter for Cross Rods: 0.1483" (9 gauge).
3. For single-wythe masonry provide ladder design type with single pair of side rods and with perpendicular cross rods spaced at 8” on center for walls to be grouted unless otherwise noted on the drawings (1’-4” max. on center spacing).
4. For multiwythe masonry provide type as follows:
   a. Ladder design with perpendicular cross rods spaced at 8” on center for walls to be grouted unless otherwise noted on the drawings (1’-4” max. on center spacing) and number of side rods as follows:
   b. Number of Side Rods for Multiwythe Concrete Masonry: One side rod for each face shell of hollow masonry units more than 4" in nominal width plus one side rod for each wythe of masonry 4" or less in nominal width.
   c. Tab design with single pair of side rods and rectangular box-type cross ties spaced at least 1'-4"; with side rods spaced for embodiment within each face shell of backup wythe and ties extended to engage the outer wythe by at least 1-1/2". Duro-O-Eye adjustable

C. Coating requirements per ASCE/ACI 530.1 are as follows:

APPLICATION	ASTM REQUIREMENT
Joint reinforcement, interior walls	ASTM A 641 Class 1 (.40 oz. per sq. ft.)
Wire ties or anchors in exterior walls completely embedded in mortar or grout	ASTM A 641 Class 3 (80 oz. per sq. ft.)
Wire ties or anchors in exterior walls not completely embedded in mortar or grout.	ASTM A 153 Class B2 (1.50 oz. per sq. ft.)
Joint reinforcement in exterior walls or interior walls exposed to moist environments (e.g. natatoria and food processing	ASTM A 153 Class B2 (1.50 oz. per sq. ft.)
Sheet metal ties or anchors exposed to weather	ASTM A 153 Class B2 (1.50 oz. per sq. ft.)
Sheet metal ties or anchors completely embedded in mortar or grout	ASTM A 525 Class G60 (.60 oz. per sq. ft.)

2.06 TIES AND ANCHORS, GENERAL

A. General: Provide ties and anchors specified in subsequent articles that comply with requirements for metal and size of referenced unit masonry standard and of this article.

B. Galvanized Carbon Steel Wire: ASTM A 82, coating class as required by referenced unit masonry standards.

C. Metal Mesh Ties: Minimum 3" x 12" x 16 gauge hot dipped galvanized mesh ties. Equal to Dur-O-Wal D/A WMT.

D. Type for Masonry Where Coursing Between Wythes Align: Unit ties bent from one piece of wire.

E. Dur-o-eye adjustable ties at CMU walls with masonry veneer.

2.07 RIGID ANCHORS

A. Provide straps of form and length indicated, fabricated from metal strips of following minimum width and thickness:
1. 1-1/2" wide by 1/4" thick.

2.08 MISCELLANEOUS ANCHORS

A. Anchor Bolts: Provide steel bolts with hex nuts and flat washers complying with ASTM A 307, Grade A, hot-dip galvanized to comply with ASTM C 153, Class C in sizes and configurations indicted.

2.09 EMBEDDED FLASHING MATERIALS

A. Copper/Paper Flashing: 3-oz. copper sheet laminated between two (2) sheets of bituminous impregnated creped Kraft paper or saturated fabric.
1. Products: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
a. Afco Products, Inc.; "Cop-A-Bond Duplex".
b. Phoenix Building Products; "Duplex Cop-R Flash".
c. York Manufacturing, Inc.; "Cop-R-Tex Duplex".
d. Sandell Manufacturing Co.; "Copper Fabric Flashing"

B. Application: Use where flashing is fully concealed in masonry.

2.10 MISCELLANEOUS MASONRY ACCESSORIES

A. Nonmetallic Expansion Joint Strips: Premolded filler strips complying with ASTM D 1056, Type 2 (closed cell), Class A (cellular rubber and rubber-like materials with specific resistance to petroleum base oils), Grade 1 (compression-deflection range of 2-5 psi), compressible up to 35%, of width and thickness indicated, formulated from the following material:
1. Polyvinyl

B. Preformed Control Joint Gaskets: Material as indicated below, designed to fit standard sash block and to maintain lateral stability in masonry wall.

C. Polyvinyl Chloride: ASTM D 2287, General Purpose Grade, Type PVC-65406.

D. Bond Breaker Strips: Asphalt-saturated organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

E. Weep Hole: Rectangular Plastic Tubing: Clear butyrate, 3/8 by 1-1/2 by 3-1/2 inches.

2.11 MASONRY CLEANERS

A. Job-Mixed Detergent Solution: Solution of trisodium phosphate (1/2- cup dry measure) and laundry detergent (1/2-cup dry measure) dissolved in one gallon of water.

2.12 MORTAR AND GROUT MIXES

A. General: Do not add admixtures including coloring 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.

B. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification, for types of mortar indicated below:
   1. Limit cementitious materials in mortar to Portland cement-lime.
   2. All mortar to be Type S.

C. Colored Pigmented Mortar: Select and proportion pigments with other ingredients to produce color to match adjacent masonry.
   1. Color 1 – Match CMU (Color 1)
   2. Color 2 – Match CMU (Color 2)

D. Grout for Unit Masonry: Comply with ASTM C 476. Use grout of consistency indicated or, if not otherwise indicated, of consistency (fine or coarse) at time of placement that will completely fill spaces intended to receive grout.
   1. Use fine grout in grout spaces less than 2 inches in horizontal dimension.
   2. Use coarse grout in grout spaces 2 inches or more in least horizontal dimension.

2.13 SOURCE QUALITY CONTROL

A. Concrete Masonry Unit Tests: For each type, class, and grade of concrete masonry unit indicated, units will be tested by qualified independent testing laboratory for strength, absorption, and moisture content per ASTM C 140.

2.14 CMU INSULATION

A. Provide Perlite loose fill insulation for block size indicated. Per reference standards ASTM C549, C520, C1363. Installed in all exterior and interior cores of hollow masonry units. Installed per manufacturers recommendations. The loose filled perlite must remain dry, suitable means should be used as the work progresses to insure that the insulation is protected from inclement weather.

PART III - EXECUTION

3.01 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other specific conditions, and other conditions affecting performance of unit masonry.

B. Examine rough-in and built-in construction to verify actual locations of piping connections prior to installation.

C. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

A. Comply with referenced "Unit Masonry Standard" and other requirements indicated applicable to each type of installation included in Project.

B. Thickness: Build cavity and composite walls and other masonry construction to the full thickness shown. Build single-wythe walls to the actual thickness of the masonry units, using units of nominal thickness indicated.

C. Build chases and recesses as shown or required to accommodate items specified in this and other Sections of the Specifications. Provide not less than 8" of masonry between chase or recess and jamb of openings and between adjacent chases and recesses.

D. Leave openings for equipment to be installed before completion of masonry. After installation of equipment, complete masonry to match construction immediately adjacent to the opening.

E. Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide continuous pattern and to fit adjoining construction. Use full-size units without cutting where possible.

3.03 CONSTRUCTION TOLERANCES

A. Variation from Plumb: For vertical lines and surfaces of columns, walls, and arises, do not exceed 1/4 inch in 10 feet, nor 3/8 inch in 20 feet, nor 1/2 inch in 40 feet or more. For external corners, expansion joints, control joints, and other conspicuous lines, do not exceed 1/4 inch in 20 feet, nor 1/2 inch in 40 feet or more. For vertical alignment of head joints, do not exceed plus or minus 1/4 inch in 10 feet, nor 1/2 inch maximum.

B. Variation from Level: For bed joints and lines of exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines, do not exceed 1/4 inch in 20 feet, nor 1/2 inch in 40 feet or more. For top surface of bearing walls, do not exceed 1/8 inch in 10 feet, nor 1/16 inch within width of a single unit.

C. Variation of Linear Building Line: For position shown in plan and related portion of columns, walls, and partitions, do not exceed 1/2 inch in 20 feet, nor 3/4 inch in 40 feet or more.

D. Variation in Cross-Sectional Dimensions: For columns and thickness of walls, from dimensions shown, do not exceed minus 1/4 inch nor plus 1/2 inch.

E. Variation in Mortar-Joint Thickness: Do not vary from bed-joint thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch. Do not vary bed-joint thickness from bed-joint thickness of adjacent course by more than 1/8 inch. Do not vary from head-joint thickness indicated by more than plus or minus 1/8 inch. Do not vary head-joint thickness from adjacent head-joint thickness by more than 1/8 inch. Do not vary from collar-joint thickness indicated by more than minus 1/4 inch or plus 3/8 inch.

3.04 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint widths and for accurate locating of openings, movement-type joints, returns, and offsets. Avoid the use of less-than-half-size units.

B. Lay up walls to comply with specified construction tolerances, with courses accurately spaced and coordinated with other construction.

C. Bond Pattern for Exposed Masonry: Lay exposed masonry in running bond pattern; do not use units with less that nominal 4" horizontal face dimensions at corners or jambs.

D. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2". Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4" horizontal face dimensions at corners or jambs.

E. Stopping and Resuming Work: In each course, rake 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 units and mortar prior to laying fresh masonry.

F. Built-In Work: As construction progresses, build-in items specified under this and other specification Sections. Fill in solidly with masonry around built-in items.
1. Fill space between hollow metal frames and masonry solidly with mortar.
2. Fill cores in hollow concrete masonry units with grout 3 courses (24") under bearing plates, beams, lintels, posts, and similar items.

G. Intersecting Load-Bearing Walls: If carried up separately, provide rigid steel anchors at not more than 2'-0" o.c. vertically. Form anchors of galvanized steel not less than 1-1/4" x 1/8" x 2'-0" long with ends turned up not less than 2" or with cross pins. If used with hollow masonry units, embed ends in mortar-filled cores.

H. Security Walls: Follow requirements of intersecting load-bearing walls.

3.05 MORTAR BEDDING AND JOINTING

A. Lay hollow concrete 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.
4. Cut joints flush for masonry walls to be concealed or to be covered by other materials. Cut joints concave for exposed masonry.

B.. Mortar Beds:
1. Lay units with full mortar coverage on horizontal and vertical joints in all courses.
2. Provide sufficient mortar on ends of units to fill head joints.
3. Rock closures into place with head joints thrown against two adjacent units in place.
4. Do not pound corners or jambs to fit stretcher units after setting in place.
5. Where adjustment to corners or jambs must be made after mortar has started to set, remove mortar and replace with fresh mortar.

C.. Joint Types: Tooled.
1. All exterior horizontal and vertical joints - concave.
2. All interior horizontal and vertical joints - flush.

D.. Sealant Joints: Retain sealant joints around outside perimeters of exterior doors, window frames, and other wall openings.
1. Uniform depth: 3/4"
1. 2. Uniform width: 3/8"

3.06 STRUCTURAL BONDING OF MULTIWYTHE MASONRY

A. Use continuous horizontal joint reinforcement installed in horizontal mortar joints for bond tie between wythes.

B. Corners: Provide interlocking masonry unit bond in each course at corners, unless otherwise shown.

C. Provide continuity with horizontal joint reinforcement at corners using prefabricated 'L' units, in addition to masonry bonding.

D. Intersecting and Abutting Walls: Unless vertical expansion or control joints are shown at juncture, provide same type of bonding specified for structural bonding between wythes and space as follows:
1. Provide individual metal ties.
2. Provide continuity with horizontal joint reinforcement using prefabricated 'T' units.

E. Nonbearing Interior Partitions: Build full height of story to underside of solid floor or roof structure above and install pressure-relieving joint filler in joint between top of partition and underside of structure above.

F. Shear wall (stair enclosure): Build full height of story to the underside of floor, provide horizontal and vertical reinforcement at spacing not more than 48in spacing(horizontal and vertical). Connect masonry to the structure above with dowels and grout.

3.07 CAVITIES/AIR SPACES

A. Keep cavities/air spaces clean of mortar droppings and other materials during construction. Strike joints facing cavities/air spaces flush.

B. Tie exterior wythe to backup with continuous horizontal joint reinforcing.

C. Install vents in vertical head joints at the top of each continuous cavity/air space. Space vents and close off cavities/air spaces vertically and horizontally with blocking in manner indicated.

D. Install dampproofing on the outside face of the interior wythe of all exterior cavity walls, full height, as per manufacturers' recommendations.

3.08 HORIZONTAL JOINT REINFORCEMENT

A. General: Provide continuous horizontal joint reinforcement as indicated. Install longitudinal side rods in mortar for their entire length with a minimum cover of 5/8" on exterior side of walls, 1/2" elsewhere. Lap reinforcing a minimum of 6".

B. Cut or interrupt joint reinforcement at control and expansion joints.

C. Provide continuity at corners and wall intersections by use of prefabricated 'L' and 'T' sections. Cut and bend reinforcement units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures and similar conditions.

3.09 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" 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 2'-0" vertically and 3'-0" o/c. horizontally.

3.10 MOVEMENT (CONTROL AND EXPANSION) JOINTS

A. General: Install control and expansion joints in unit masonry where indicated. Build in related items as the 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. Provide vertical masonry control joints where and as indicated. Joints shall carry from top of foundation continuously to top of wall. Stop reinforcing each side of control joints and install breaker paper vertically. Fill with mortar to form key as indicated. Space control joints maximum of 30 ft. apart in continuous exterior walls.

B. Form control joints in concrete masonry by installing preformed control joint gaskets designed to fit standard sash block.

C. Form expansion joints in brick made from clay or shale as follows:
   1. Build flanges of metal expansion strips into masonry. Lap each joint 4" in direction of water flow. Seal joints below grade and at junctures with horizontal expansion joints, if any.
   2. Build flanges of factory-fabricated expansion joint units into masonry.
   3. Build in joint fillers where indicated.
   4. Form open joint of width indicated but not less than 3/8" for installation of sealant and backer rod specified in Division-7 Section "JOINT SEALANTS". Maintain joints free and clear of mortar.

D. Build in horizontal pressure-relieving joints; construct joints by either leaving an air space or inserting nonmetallic 50% compressible joint filler of width required to permit installation of sealant and backer rod specified in Division-7 Section "JOINT SEALANTS". Locate horizontal pressure-relieving joints beneath shelf angles supporting masonry veneer and attached to structure behind masonry veneer.

3.11 FLASHING/WEEP HOLES

A. General: Install embedded flashing and weep holes in masonry at lintels, ledges, other obstructions to the flow of water in the wall and where indicated.

B. Prepare masonry surfaces so that they are smooth and free from projections that could puncture flashing. Place through-wall flashing on sloping bed of mortar and cover with mortar. Seal penetrations in flashing with adhesive/sealant/tape as recommended by flashing manufacturer before covering with mortar.

C. Install flashings as follows:
   1. At lintels, extend flashing a minimum of 4" into masonry at each end. Extend flashing from exterior face of outer wythe of masonry, through the outer wythe, turned up a minimum of 4", and through the inner wythe to within 1/2" of the interior face of the wall in exposed masonry. Where interior surface of inner wythe is concealed by furring, carry flashing completely through the inner wythe and turn up approximately 2”.

2. At heads and sills, extend flashing as specified above unless otherwise indicated but turn up ends not less than 2" to form a pan.
3. Install flashing in veneer walls as specified but carry flashing up face of sheathing at least 8" and behind air infiltration barrier/building paper.
4. Interlock end joints of ribbed sheet metal flashings by overlapping ribs at least 1-1/2" or as recommended by flashing manufacturer and seal lap with elastomeric sealant complying with requirements of Division-7 Section "JOINT SEALANTS".
5. Turn down sheet metal flashings at exterior face of masonry to form drip.
6. Cut off flashing flush with wall face after masonry construction is completed.

D. Install weep holes in the head joints in exterior wythes of the first course of masonry immediately above embedded flashings and as follows:
1. Form weep holes with product specified in Part 2 of this Section.
2. Form weep holes by keeping head joints free and clear of mortar.
3. Space weep holes 16" o/c.

E. Install reglets and nailers for flashing and other related construction where shown to be built into masonry.

3.12 INSTALLATION OF REINFORCED UNIT MASONRY

A. General: Install reinforced unit masonry to comply with requirements of referenced unit masonry standard.

B. Temporary Formwork and Shores: Construct formwork and shores to support reinforced masonry elements during construction.
1. Construct formwork to conform to shape, line, and dimensions shown. Make sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.

C. Grouting: Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist grout pressure.
1. Do not exceed the following pour heights for fine grout:
   a. For minimum widths of grout spaces of 3/4 inch or for minimum grout space of hollow unit cells of 1-1/2 by 2 inches, pour height of 12 inches.
   b. For minimum widths of grout spaces of 2 inches or for minimum grout space of hollow unit cells of 2 by 3 inches, pour height of 60 inches.
   c. For minimum widths of grout spaces of 2-1/2 inches or for minimum grout space of hollow unit cells of 2-1/2 by 3 inches, pour height of 12 feet.
   d. For minimum widths of grout spaces of 3 inches or for minimum grout space of hollow unit cells of 3 by 3 inches, pour height of 24 feet.
2. Do not exceed the following pour heights for coarse grout:
   a. For minimum widths of grout spaces of 1-1/2 inches or for minimum grout space of hollow unit cells of 1-1/2 by 3 inches, pour height of 12 inches.
   b. For minimum widths of grout spaces of 2 inches or for minimum grout space of hollow unit cells of 2-1/2 by 3 inches, pour height of 60 inches.
   c. For minimum widths of grout spaces of 2-1/2 inches or for minimum grout space of hollow unit cells of 3 by 3 inches, pour height of 12 feet.
   d. For minimum widths of grout spaces of 3 inches or for minimum grout space of hollow unit cells of 3 by 4 inches, pour height of 24 feet.
3. Provide cleanout holes at least 3 inches in least dimension for grout pours over 60 inches in height.
   a. Provide cleanout holes at each vertical reinforcing bar.

b. At solid grouted masonry, provide cleanout holes at not more than 32 inches o.c.

3.13 LINTELS

A. Provide minimum bearing of 8" at each opening. Minimum masonry dimension between openings is 16". Where a 16" masonry separation cannot be obtained between openings, the opening shall be considered a single opening to the point where bearing requirements mentioned above can be met.

3.14 FIELD QUALITY CONTROL

A. Testing Frequency: Tests and evaluations listed in this article will be performed during construction for each 5000 sq. ft. of wall area or portion thereof.
1. Mortar composition and properties will be evaluated per ASTM C 780.
2. Grout compressive strength will be sampled and tested per ASTM C 1019.

B. Evaluation of Quality Control Tests: In absence of other indications of noncompliance with requirements, masonry will be considered satisfactory if results from construction quality control tests comply with minimum requirements indicated.

3.15 REPAIRING, POINTING, AND CLEANING

A. Remove and replace loose, chipped, broken, stained or otherwise damaged masonry units and units that do not match adjoining units. Install new units to match adjoining units and in fresh mortar or grout, pointed to eliminate evidence of replacement.

B. Pointing: During the joint tooling, enlarge voids or holes, except weep holes, and totally fill with mortar. Point-up all joints including corners, openings, and adjacent construction to provide a neat, uniform appearance, prepared for sealant application.

C. Final Cleaning: After mortar is fully set and cured, clean 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 half of the panel uncleaned for comparison purposes. Obtain Architect/Engineer’s approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
4. Wet wall surfaces with water prior to application of cleaners; remove cleaners promptly by rinsing thoroughly with clear water.
5. Clean brick by means of bucket and brush hand-cleaning method described in BIA "Technical Note No. 20 Revised" using a job-mixed detergent solution.
6. Clean concrete masonry by means of cleaning method indicated in NCMA TEK 45 applicable to type of stain present on exposed surfaces.

D. Protection: Provide final protection and maintain conditions, in a manner acceptable to Installer, that ensure unit masonry is without damage and deterioration at time of Substantial Completion.

3.16 MASONRY WASTE DISPOSAL

A. Recycling: Undamaged, excess masonry materials are the contractor’s property and shall be removed from the Project site for his use.

B. Disposal as Fill Material: Dispose of clean masonry waste, including broken masonry units, waste mortar, and excess or soil-contaminated sand, by crushing and mixing with fill material as fill is placed.
   1. Crush masonry waste to less than 4 inches in greatest dimension.
   2. Mix masonry waste with at least 2 parts specified fill material for each part masonry waste. Fill material is specified in Division 2 Section "EARTHWORK."
   3. Do not dispose of masonry waste as fill within 18 inches of finished grade.

C. Excess Masonry Waste: Remove excess, clean masonry waste that cannot be used as fill, as described above, and other masonry waste and legally dispose of off Owner's property.

- - - END OF SECTION - - -

PART I - GENERAL

1. 01 GENERAL

The Drawings, Instructions to Bidders, Form of Proposal, General Conditions, Supplementary General Conditions, and Division 1 are included herein and govern work under this section.

1. 01 SCOPE OF WORK

A. Furnish all labor, materials, etc. necessary to complete the structural steel work as shown on the drawings and/or specified herein.

B. The following items are specifically included without limiting the generality implied by these specifications and the drawings:
   1. Furnish and erect structural steel and angle framing at fascia.
   2. Anchor bolts and leveling plates.
   3. Shop painting and field touch-up.
   4. Shop drawings.

C. Related Work in Other Sections:
   1. Field painting, except touch-up.
   2. Setting of anchor bolts and leveling plates.

1. 02 CODES, STANDARDS AND SPECIFICATIONS

A. All work under this section shall conform to applicable codes, standards and specifications of current issue, as amended to date, unless otherwise specified or required.

B. American Society for Testing and Materials (ASTM) "Standard Specifications and Methods".

C. American Institute of Steel Construction (AISC):
   1. "Specifications for Design, Fabrication and Erection of Structural Steel for Buildings".
   2. "Manual of Steel Construction", hereinafter referred to as the AISC Manual.

D. American Welding Society (AWS), "Code for Arc and Gas Welding in Building Construction", hereinafter referred to as the AWS Code. All welding shall be performed by welders certified in accordance with the AWS Code.

1. 03 SHOP DRAWINGS

Contractor shall submit checked erection plans and detail shop drawings for review. Shop drawings of connection details shall bear the seal of a professional engineer licensed in New York State. Reproductions of contract drawings are not to be substituted for erection drawings. Revise as necessary. Provide Three (3) prints of each drawing for the architect's review. Provide field prints as necessary. Review of shop drawings does not relieve fabricator of responsibility for proper fit or detail design of connections, or for supplying all necessary material.

PART II - PRODUCTS

2. 01 STRUCTURAL STEEL SHAPES

A. ASTM A572, grade 50ksi for wide flange sections. ASTM A36, 36ksi for other shapes. No second-hand material permitted.

B. Structural Steel Tubing: ASTM A500, Grade B, minimum yield stress of 46 ksi.

2. 02 ACCESSORIES

A. Welding Rods: For manual shielded arc-welding conforming to E60 or E70 Series of ASTM A233 suitable to the positions and conditions of intended use.

B. Common Machine Bolts & anchor rods: ASTM A307 for anchor rods, Grade A High tensile bolts - A325 or A490, 3/4" diameter.

2. 03 SHOP PAINT FOR STRUCTURAL STEEL

Cheeseman Elliott Co. #I5 Primox, or Tnemac No. 99 Red Metal Primer, or Zinc Chromate. Thickness to match 10 year warranty.

PART III - EXECUTION

3. 01 CONNECTIONS

A. Shop connections: Welded.

B. Field connections:
1. Bolted - high tensile A325 or A490 bolts(as required for connections) - 3/4" diameter.
2. Field welded - as noted on drawing.

3. 02 FABRICATION

A. Substitution of shapes must be approved by the architect.

B. Mill bearing surfaces to true planes. Fit abutting surfaces closely. Maintain architectural clearances.

C. All Welded Shop Connections: Properly designed for standard end loads of the member connected; performed by operators who have been qualified previously by tests as per American Welding Society "Standard Qualification Procedure" to perform type of work required. Use equipment supplying proper current, electrodes suitable for positions, other conditions of intended use. Appearance, quality of welds made, methods of correcting defective work - American Welding Society "Code for Arc-Welding in Building Construction".

D. Details of lintels, other steel requiring accurate alignment shall provide for slotted holes and/or washers for truing up steel as required for alignment.

E. Bring assembled members into close contact; use drift pins, only for bringing members into position, not to enlarge or distort holes.

F. Provide for any special details shown on the plans. Provide bearing plates and government anchors for all beams bearing on masonry.

G. Punch as required for nailers; check locations where punching is required by referring to architectural details.

H. Architectural clearances must be maintained.

I. Minimum bolt or rivet size - 3/4" diameter.

J. All exposed shop and field welds shall be ground smooth.

K. Provide erection seats on two-sided connections.

3. 03 SHOP PAINT

A. General: Have paint delivered to shop in original sealed containers marked with manufacturer's name, brand identification. Use paint as prepared by the manufacturer without thinning or other admixture.

B. Execute painting on dry surfaces, free from rust, scale, grease; do not paint in temperatures lower than 45 degrees F. Clean surfaces in contact by effective means but do not paint. Paint contact surfaces of exposed exterior steel.

C. Apply one coat of shop paint specified above under "Products". Do not omit shop coat at piece marks. Thickness of paint system to give 10 year warranty.

3. 04 SHIPMENT, DELIVERY AND STORAGE

A. All members shall be unloaded with a crane. Dumping of members from truck prohibited.

B. Sorting and piling at site done with care to prevent bending of members or abrasion of shop paint.

C. Members shall be stored in a manner to prevent direct contact with the ground, prevent injury from deflection and to avoid accumulations of dirt or other foreign matter. Members shall be protected from rust or corrosion. Damaged members shall be replaced at no cost to owner.

3. 05 ERECTION

A. Provide adequate equipment to perform work without damage to construction, and provide complete safety for public, personnel, and property.

B. Replace damaged members at no cost to owner.

C. Before erecting any structural steel, the structural steel fabricator shall make an accurate field check of the position, alignment and elevations of all anchor bolts and leveling plates which have been set by the general contractor. The fabricator shall notify the architect and the general contractor of any anchor bolts or plates which are incorrectly located. Otherwise, he shall assume the complete responsibility of the plumbness and accurate fit of all steel framing.

D. Field burning of holes in members is strictly prohibited. Correction of holes by drilling and reaming only.

E. Field weld all slotted lintel or fascia connections after final adjustment.

3. 06 FIELD INSPECTION

An independent testing laboratory shall approve the erection of the structural steel. The testing laboratory shall be selected by the Architect and be approved by the Owner. All costs incurred by the structural inspection shall be borne by the Owner. Provide testing laboratory with complete set of shop drawings.

3. 07 FIELD PAINTING

A. Spot and touch-up bolts, welds, and erection marks. Use same paint as shop coat.

B. Final field coat, where structure is exposed, is specified under Painting.

- - - END OF SECTION - - -

PART I - GENERAL

1. 01 GENERAL

The Drawings, Instructions to Bidders, Form of Proposal, General Conditions, Supplementary General Conditions, and Division 1 are included herein and govern work under this section.

1. 01 SCOPE

A. The following items are specifically included without limiting the generality implied by these specifications and the drawings:
   1. Furnish and install open web steel joists as indicated on the drawings.
   2. Bridging, extensions, headers for openings, horizontal bracing, etc. as required and/or shown on the drawings.
   3. Shop painting and field touch-up.
   4. Shop drawings.

1. 02 CODES, STANDARDS AND SPECIFICATIONS

A. All work under this section to conform to applicable codes, standards and specifications of current issue as amended to date, unless otherwise specified or required.

B. Steel Joist Institute (SJI), "Standard Specifications".

C. American Institute of Steel Construction (AISC), "Specifications for Design, Fabrication and Erection of Structural Steel for Buildings".

D. American Welding Society (AWS), "Code for Arc and Gas Welding in Building Construction".

E. American Society for Testing and Materials (ASTM).

1. 03 ERECTION DRAWINGS (Shop Drawings)

Contractor shall submit checked erection drawings for review. Erection drawings shall include all standard and special details for bridging, etc. Provide Architect with two (2) prints and one (1) sepia reproducible and contractors with field prints as necessary. Review of shop drawings does not relieve contractor of responsibility for supplying all required materials with proper fit. Provide web reinforcement (for 1.0 kips) at connections of support beams for mechanical units on roof.

1. 04 TESTS AND INSPECTION

A. The Contractor shall furnish the Architect with duplicate copies of mill tests made by the manufacturer for the steel used.

B. Quality control of all shop and field work shall be maintained by the Contractor.

C. Testing and inspection of erected steel joists and girders, and welding shall be done by a testing laboratory, engaged by and paid for by the Owner. The Contractor shall furnish the testing laboratory the following:
   1. A complete set of approved erection drawings and shop drawings.
   2. Cutting lists, order sheets, material bills and shipping bills.

3. Information as to time and place of all rolling and shipment of material to shops.
4. Representative sample pieces requested for testing.
5. Full and ample means and assistance for testing all material and proper facilities, including scaffolding, temporary work platforms, etc. for inspection of the work in the mills, shop and in the field.

PART II - PRODUCTS

2. 01 MATERIALS

A. Standard welded or expanded trusses, sizes, type and spacings specified.

B. Conform to Steel Joist Institute Specifications and the following.

C. Provide special end extensions as required.

D. Shop Paint: One complete coat, manufacturer's standards.

E. Bridging: Two continuous horizontal steel members, one attached to the top chord and the other attached to the bottom chord. Attachment to the joists by welding capable of resisting a horizontal force of not less than 500 lbs. l/r of bridging member shall not exceed 300, minimum bar diameter 1/2". Cross bridging also occurs. See Drawings.

F. Ceiling Extension Bars: Required in all areas where contact ceilings are shown. Provide extension supported at the outer end by a vertical member to the top chord of the joist.

PART III - EXECUTION

3. 01 ERECTION

A. In accordance with SJI specifications and the best practice in the trade. Provide minimum joist bearing of 2-1/2" on steel, 4" on concrete and 6" on masonry, for "K" series. Each joist bearing on structural steel shall be welded thereto with two (2) 1/4" x 1" long fillet welds. Provide joist seats per SJI specifications for LH series joist. Bearing detail on masonry to distribute the reactions.

B. Joist Bridging: Continuous rows of bridging of types previously specified. Rows to be spaced in accordance with SJI Specifications, and shall be rigidly anchored to steel or masonry at each end. Field weld or bolt bridging to each joist and tie beam.

C. Heating and air-conditioning ducts may be run in the joist spaces. Use care in the spacing and positioning of joists so that location does not vary more than 1/4" from approved shop drawings and all openings in diagonal chords line up for the entire group of joists of the same span.

D. All work is to be erected and installed from approved shop drawings having actual stamp on the sheets being used.

E. All special details shall be given special care in erection and installation.

F. Drilling or punching holes in joist chord shall not be permitted.

G. Any piping or light fixtures hung from the joist shall be supported at the panel points.

3. 02 FIELD INSPECTION

An independent testing laboratory shall approve the erection of the steel joists and girders. The testing laboratory shall be selected by the Architect and be approved by the Owner. All costs incurred by the structural inspection shall be borne by the Owner.

3. 03 PAINTING

A. Steel joists and joist girders shall be thoroughly cleaned and shop painted one (1) coat of either:
   1. Steel structures painting Council Specification l5-68T, Type 1 (red oxide).
   2. Federal Specification TT-P-636 (red oxide).

3. 04 FIELD PAINTING

Touch-up all weld, bolts or abrasions with the same paint used as shop coat. Paint shall be provided by the joist fabricators.

- - - END OF SECTION - - -

PART I - GENERAL

1. 01 GENERAL

The drawings, Instructions to Bidders, Form of Proposal, General Conditions, Supplementary General Conditions, and Division 1 are included herein and govern work under this section.

1. 02 SCOPE

A. The following items are specifically included, without limiting the generality implied by these specifications and the drawings:
   1. Furnish and erect metal roof deck.
   2. Furnish and erect steel form deck.
   3. All accessories as required.
   4. Molded rubber fillers (flutes).
   5. Shop drawings.
   6. Field paint touch-up.

B. Related Work in Other Sections:
   1. Structural Steel Section 05 12 23.
   2. Steel Joists and Girders - Section 05 21 53.

1. 03 DESIGN

Sections and calculations of their properties shall conform to AISI "Specifications for the Design of Light Gauge Cold Formed Steel Structural Members" and Steel Deck Institute (SDI), "Code of Recommended Standard Practice".

1. 04 SHOP DRAWINGS

Submit checked erection plans and details for review. Review does not relieve the contractor of responsibility for fit or for supplying all necessary materials. Show all erection details and instructions.

PART II - PRODUCTS

2. 01 ROOF DECK

A. Roof deck shall be of sheet steel conforming to ASTM A245, Grade C, or ASTM A-446, Grade A. Standard intermediate rib deck of gauge shown on drawings, but of sufficient gauge to support all design live and dead loads. Depth: 1-1/2". Deflections not to exceed 1/240 span under live load. Flexural stress not to exceed 20,000 psi under total load. Deck shall be as supplied by Roof Deck Inc., United Steel Deck, Wheeling Corrugating Co., Roll-Form Products or Epic Metals Corporation.

B. Shop Finish: Deck shall be thoroughly cleaned and phosphatized and shall receive manufacturer's standard protection paint coat.

C. Sound barriers shall be soft, rubber-like material formed to fit tightly in the deck rib voids. Same width as partition or wall below.

D. Deck shall be continuous over at least three joist spaces whenever possible.

2. 02 STEEL FORM DECK

A. Steel form deck shall be Wheeling Corrugating Co., tensilform Type 50 - 9/16" roll form products or Epic Metals Corporation, base steel conforming to ASTM A446 minimum yield strength shall be 80 ksi.

B. Galvanized coating shall conform to ASTM A525 and Fed Spec QQ-S-775.

C. The section properties of the steel form deck shall be computed in accordance with the American Iron and Steel Institute Specification for the Design of Cold Formed Steel Structural Members.

D. The maximum design stress shall not exceed 36 ksi under total load.

E. Sheets shall extend over three or more supports wherever possible.

F. Steel form deck shall be galvanized, gauge and depth as noted on drawings.

PART III - EXECUTION

3. 01 ERECTION

A. Roof deck welded directly through bottom of the rib to all structural supports and in strict accordance with the manufacturer's printed instructions. In exposed deck area, welding of deck at edges of supporting steel shall be avoided in order to minimize touch-up of welds and underside of deck. Crimp or spot weld seams of deck at midspan of joist supports. Minimum weld l/2" diameter fusion weld, l2" o.c. maximum. All welding by competent welders. Touch-up top surface of weld with an approved paint. In exposed deck areas, touch-up all abrasions and underside of all welds that show through.

B. Form Deck:
   1. Each deck unit shall be placed on supporting steel framework with edges up and ends lapped to a minimum of 2".
   2. End laps shall occur over supports.
   3. Sheets shall be attached to supports by welding through welding washers. Minimum welding requirements are as follows:
      a. End Laps - Each lap is fastened using a welding washer at each side lap plus one intermediate weld (3 welds per sheet).
      b. Intermediate Supports - Weld sheet at side laps only at each intermediate support for spans up to 4'-6", for spans from 4'-6" - 8'-0", weld at side laps and one weld at mid sheet.
      c. All Supports - If spans exceed 8'-0", weld should be placed so the average spacing (at all support) is not more than 15" on center.

3. 02 STORAGE

A. Store metal deck a minimum of 6" off ground.

B. Elevate one end, 2" higher than other.

C. Cover deck with nonasphaltic material. Cover shall allow movement of air and guard against formation of condensation.

3. 03 FIELD INSPECTION

An independent testing laboratory shall approve the erection of the metal deck. The testing laboratory shall be selected by the Contractor and be approved by the Architect. All costs incurred by the structural inspection shall be borne by the contractor.

- - - END OF SECTION - - -

PART I - GENERAL

1.01 GENERAL

The Drawings, Instructions to Bidders, Form of Proposal, General Conditions, Supplementary General Conditions, and Division 1 are included herein and govern work under this section.

1.02 DESCRIPTION OF WORK

Furnish all labor and materials to complete metal stud, ceiling suspension, and metal furring work indicated on drawings and specified herein.

PART II - PRODUCTS

2.01 MATERIALS

A. Materials herein are those of U.S. Gypsum Co. unless otherwise stated and shall be deemed as minimum requirements, and in no way bar equal or superior products of other approved manufacturers. **Structural Drawings Supercede All Stud and Gauge Sizes in this Section.**

B. Interior Materials:

1. Furring members shall be narrow flange Z-furring members, hot dipped galvanized, and be of size to accommodate rigid insulation indicated on drawings. Metal furring channels and 1-1/2" cold rolled channels for suspended ceiling areas. Hang wire shall be 8 gauge, spaced at 4'-0" oc. and tie wire 18 gauge.
2. All metal studs extending to underside of metal roof deck and over 12'-0" in height shall be 20 gauge, and anything over 16'-0" must be 6" wide. Partitions under 12'-0" in height shall be 25 gauge except as noted otherwise on the plans or in these specifications. All studs shall be rolled formed from galvanized steel with matching sill and plate runners. Studs shall be 16" o.c. in sizes as shown on drawings. (Or, if noted otherwise.)
3. Ceiling Support Materials and Systems:
   a. General: Size ceiling support components to comply with ASTM C 754 unless otherwise indicated.
   b. Main Runners: Steel channels with rust inhibitive paint finish, hot or cold rolled.
   c. Hangers: Hangers, except as otherwise specified, shall be No. 9 gauge galvanized, spaced not to exceed 4'0" on center. Hangers for suspension of light grid suspension system shall be 1" x 3/16" flat mild steel bars spaced to not exceed 3'0" on center.
   d. Hanger Anchorage Devices: Screws, clips, bolts, cast-in-place concrete inserts or other devices applicable to the indicated method of structural anchorage for ceiling hangers and whose suitability for use intended has been proven through standard construction practices or by certified test data. Size devices for 3x calculated load supported except size direct pull-out concrete inserts for 5x calculated loads.
   e. Furring Members: Steel furring channels shall be 25 gauge electro-galvanized with an approximate face width of 1-3/8" and a depth of 7/8" spaced not to exceed 16" on center.
   f. Furring Anchorage: 16-gage galvanized wire ties, manufacturer's standard wire-type clips, bolts, nails or screws as recommended by furring manufacturer and complying with C754.
   g. Resilient clip & Channels :
      i. Clips: Sound isolation clips specified shall be designed and Manufactured by Kinetics Noise Control, Dublin, Ohio. Product shall be Model Iso-Max Sound Isolation Clips. Vertical Load capacity shall have sufficient capacity to support wall or ceiling weights as constructed. Per manufactures specifications. Design Load capacity shall minimum

2.5 times the allowable maximum Design Load. Isolation clips shall consist of a rubber element into which a standard galvanized steel furring channel, 7/8 in. x minimum 25 gauge, is captured. Used as specified on drawings or at separation on wall & ceiling from increased noise areas such as pool, laundry and mechanical rooms to sleeping rooms.

ii. Channel Resilient Furring Channels: 1/2-inch (12.7 mm) deep members designed to reduce sound transmission. RC-1 Asymmetrical shape as manufactured by Marinoware. Meet ASTM 645 20 gauge 50 ksi thick G40 steel.

h. Shaft Wall Supports:

i. Conform to ASTM A446, Grade A, with G40 hot-dip galvanized coating per ASTM A525.

ii. Studs: Shape: "CH", "J" or "E" or as standard with manufacturer. Gage: As required to fulfill performance criteria, minimum 25 gage. Provide 20 gage for jamb and lintel components.

iii. J runners: 24 gage, size as required for coordination with studs. Jamb struts: 20 gage with 3 inch back leg for use at elevator frames.

C. Exterior Materials:

1. Exterior metal stud assembly shall be minimum 20 gauge unless supporting masonry then minimum 6", 18 gauge sections. Studs shall be roll formed from galvanized steel with matching sill and plate members. Exterior metal stud assembly shall be spaced at 16" o.c. Metal studs should be anchored to foundations with anchor bolts 10" long at 48" on center with hooks.

PART III - EXECUTION

3.01 INSTALLATION

A. Install framing, wallboard panels, and accessories in accordance with current manufacturer's directions.

B. Control joints as follows:(or as per manufactures recommendations)
1. Max 30' -Interior Partitions
2. Max 50'- Ceiling interior with perimeter relief.
3. Max 30'- Ceiling interior without perimeter relief

C. Use power drill attachment to assure firm, positive anchorage of drywall to studs.

D. Place panels vertically at right angles to framing position all ends over framing members in vertical application. Use maximum practical lengths to minimize end joints on opposite sides of partitions on different studs. Drive fasteners in field of panel first, working toward ends and edges. Space perimeter fasteners at least 3/8" from ends and edges. Drive heads home with head slightly below surface of panels to provide a uniform dimple; avoid breaking face paper.

E. Joint and Fastener Concealment: Embedding compound shall be applied in a thin, uniform layer to all joints and corners. Reinforcing tape shall be applied immediately, centering over the joint and seated into the compound. A skim coat shall immediately follow tape embedment. After this treatment has dried, a second coat of embedding compound shall be applied to tape. Treated areas shall be sanded to eliminate ridges and high points. A coat of finishing compound shall be applied to joints. Feather out coat of finishing compound. After thoroughly dry, sand to smooth surface taking precautions not to scuff the paper from adjacent wallboard.

F. Z-Furring members in exterior walls shall be positioned vertically 24" on center and be secured to walls with suitable concrete fasteners in accordance with fastener manufacturer's specifications. At interior corners, second channel shall be spaced no more than l2" from corner. At exterior corners, wide flange of Z-Furring member shall be secured to wall with short flange extended beyond corner. Starting from this short flange, install a minimum 3" strip of insulation.

G. Exterior gypsum sheathing shall be applied in strict accordance with manufacturers' instructions and recommendations. Exposed surfaces shall be free from broken corners and surface defects. All exposed edges shall be finished smooth with casing bead "J" trim.

H. Ceiling Support Suspension Systems:
   1. Secure hangers to structural support by connecting directly to structure where possible, otherwise connect to inserts, clips or other anchorage devices or fasteners as indicated.
   2. Space main runners 4'-0" o.c. and space hangers 4'-0" along runners, except as otherwise shown.
   3. Level main runners to a tolerance of 1/4" in 12'-0", measured both lengthwise on each runner and transversely between parallel runners.
   4. Wire-tie or clip furring members to main runners and to other structural supports as indicated.
   5. Space furring member 16" o.c., except as otherwise indicated.
   6. Install auxiliary framing at termination of drywall work, and at openings for light fixtures and similar work, as required for support of both the drywall construction and other work indicated for support thereon.

I. Resilient Clip & Channel (Follow UL design requirements)
   1. The isolation clip is attached to the wall/ceiling framing or other structural substrate through galvanized steel brackets on each side of the rubber isolation element. The brackets shall be of sufficient strength to carry the wall or ceiling weight without bending or failure.
   2. RC-1 Channel installation on wall fasten with 3/8" Type S pan head to steel studs and 1-1/4" type W screw to wood stud. Locate channel 2" max from floor & 6" from ceiling, not more than 24" O.C. Splice channel at studs. On Ceiling attach channels at right angles to joist. Attached with fasteners per UL design . Max. spacing 24" O.C. or 16" if joist are 16" O.C.

3.02 MISCELLANEOUS

A. Where chase walls are required at partitions larger than standard, provide 2-l/2" metal stud, cross braces, screw attached to chase wall studs.

B. Provide double studs at door jambs and openings.

C. Stiffen all partitions with one layer of horizontal bridging at center using 2-l/2" metal stud as cross brace.

D. Provide components, i.e., Reflection Track and/or Slide Clip (WSC-1500) as manufactured by Marino/Ware at locations as shown or required to accommodate potential primary structural frame movement. Components shall accommodate a vertical displacement of 1" minimum.

E. Reinforce all partitions to support superimposed loads, such as toilet room accessories.

F. Where indicated on drawings, provide sound insulation (attenuating) blankets in walls. Sound insulation (attenuating) blankets shall run full height of partition and to underside of deck. Provide complete closure at corrugation of deck, between top of wall and deck (light tight).

G. For all Interior walls and partitions constructed within a building as categorized as a Seismic Category D, E or F:
   1. Partitions that are tied to the ceiling and all partitions greater than 6 feet in height shall be laterally braced to the building structure. This bracing shall be independent of any splay bracing.

- - - END OF SECTION - - -

PART 1 - GENERAL

1.01 GENERAL

The Drawings, Instructions to Bidders, Form of Proposal, General Conditions, Supplementary General Conditions, and Division 1 are included herein and govern work under this section.

1.02 DESCRIPTION OF WORK

Furnish all labor and materials to complete gypsum drywall and gypsum sheathing work indicated on drawings and specified herein.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Materials shall be as manufactured by the U.S. Gypsum Co., National Gypsum Co., or Georgia Pacific Co. Materials herein are those of U.S. Gypsum Co., unless otherwise stated, and shall be deemed as minimum requirements, and in no way bar equal or superior products of other approved manufacturers.

B. Interior Materials:
1. Gypsum wallboard shall conform to Federal Spec. SS-L-30C and ASTM C36, tapered edge. Wallboard shall be applied in thickness indicated, ½" unless otherwise noted, in 48" widths to avoid a minimum of joints.
2. Gypsum wallboard applied to ceilings shall be 5/8" thick sag-resistant gypsum ceiling board, and shall comply with ASTM C36 or as noted on drawings.
3. Gypsum wallboard applied to interior surface or exterior walls shall be ½" “Dense Armor Interior Guard” as manufactured by Georgia Pacific Company or approved equal, and shall comply with ASTM C36 and ASTM C1177.
4. Type “X” fire shield wallboard, 5/8" thick. Provide where indicated (fire resistive). Wallboard shall bear UL label.
5. Moisture & Mold Resistant , regular type except where Type X fire-resistant type is indicated or required to meet UL assembly types.5/8 inch. Sheetrock® brand Mold Tough™ Firecode (Type X), Firecode® C Core or ULTRACODE® Core gypsum panels by USG
6. Shaftwall, ASTM C442, Type SLX., 1 inch thick . Equivalent to SHEETROCK® gypsum liner panels by USG
   a. Face boards Type X. 5/8 [½] inch, unless otherwise indicated. Equivalent to SHEETROCK® FIRECODE® C Core and FIRECODE® Core gypsum panels by USG.
7. Fasteners shall be 2" Type S bugle head screws.
8. Metal trim for standard wallboard shall be formed from galvanized steel not lighter than 26 gauge. Sizes to correspond to wallboard thickness.
   a. Casing beads for exposed edges of all wallboard and where wallboard meets dissimilar material shall be HO.200-A metal trim.
9. Joint tape shall be High Tensil, roughened surface paper fiber tape with taping joint compound as embedding material and topping or all purpose joint compound as finish material. Apply variable coats with sanding between coats as specified for the respective product used.

10. Ceramic tile backer for floor and wall tile shall be 5/8" Durorock (ANSI, A-1 18.9-1992 and ANSI 108.11.)

C. Exterior Material: Exterior sheathing shall be “Fiberock” with “Aqua Tough” as manufactured by US Gypsum Company or approved equal, and applied in strict accordance with manufacturer’s instructions and recommendations. Exposed surfaces shall be free from broken corners and surface defects. All exposed edges shall be finished smooth with casing beat “J” trim.

2.02 CONTROL JOINTS

A. Install control joints at junction of gypsum board partitions with walls or partitions of other finished material.

B. Install control joints within long runs of partitions, ceilings, or soffits at approximately 30’-0” on center or as indicated.

C. Where gypsum board is vertically continuous, as at stairwells, provide horizontal control joints at each floor level.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install wallboard panels, and accessories in accordance with current manufacturer’s directions.

B. Use power drill attachment to assure firm, positive anchorage of drywall to studs.

C. Place panels horizontally at right angles to framing position all ends over framing members in vertical application. Use maximum practical lengths to minimize end joints on opposite sides of partitions on different studs. Drive fasteners in field of panel first, working toward ends and edges. Space perimeter fasteners at least 3/8" from ends and edges. Drive heads home with head slightly below surface of panels to provide a uniform dimple; avoid breaking face paper.

D. Joint and Fastener Concealment: Embedding compound shall be applied in a thin, uniform layer to all joints and corners. Reinforcing tape shall be applied immediately, centering over the joint and seated into the compound. A skim coat shall immediately follow tape embedment. After this treatment has dried, a second coat of embedding compound shall be applied to tape. Treated areas shall be sanded to eliminate ridges and high points. A coat of finishing compound shall be applied to joints. Feather out coat of finishing compound. After thoroughly dry, sand to smooth surface taking precautions not to scuff the paper from adjacent wallboard.

E. Z-Furring members in exterior walls shall be positioned vertically 24" on center and be secured to walls with suitable concrete fasteners in accordance with fastener manufacturer's specifications. At interior corners, second channel shall be spaced no more than 12" from corner. At exterior corners, wide flange of Z-Furring member shall be secured to wall with short flange extended beyond corner. Starting from this short flange, install a minimum 3" strip of insulation.

3.02 MISCELLANEOUS

A. Where indicated on drawings, provide sound insulation blankets in walls. 3" Thermafiber insulation blankets shall run full height of partition and to underside of deck.

- END OF SECTION -

PART I - GENERAL

1.01 GENERAL

The Drawings, Instructions to Bidders, Form of Proposal, General Conditions, Supplementary General Conditions, and Division 1 are included herein and govern work under this section.

1.02 SCOPE OF WORK

A. Furnish labor and materials necessary to complete all rough and finish carpentry work as indicated on drawings, and specified herein, or both, and as required to install and secure finish materials of other divisions. Wood treatment as specified in this section.

B. Provide all rough and finish lumber, decking, millwork, cabinets, grounds, nailer strips, furring and rough hardware (if applicable), including nails, screws, bolts, anchors, hangers and other miscellaneous metal work, etc. necessary for securing wood members in place.

C. Installation shall include, but not be limited to all rough and finish lumber, decking, nailer strips, furrings, millwork items, rough hardware, doors, insulation, trim, miscellaneous equipment, and other items not requiring installation under their respective section.

D. Provide adequate temporary wood runways over completed roof surfaces, where required, to protect same from damage by concentrated loads or traffic during construction. This is in addition to temporary protection provided under the roofing section.

1.03 QUALITY ASSURANCE

A. Lumber and plywood shall bear the grade and trademark of the association under whose rules it was produced and a mark of mill identification.

B. Perform finish carpentry work in accordance with AWI Quality Standards, Custom Grade.

C. Fire-Test-Response Characteristics: Provide glass-reinforced gypsum fabrications with the following surface-burning characteristics as determined by testing identical products per ASTM E84 by UL or another independent testing and inspecting agency acceptable to authorities having jurisdiction:

(a)Flame Spread: 25 or less.

(b)Smoke Developed: 450 or less.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. The woodwork manufacturer and the Contractor shall be jointly responsible to make certain that woodwork is not delivered until the building and storage areas are sufficiently dry so that the woodwork will not be damaged by excessive changes in moisture content.

B. Immediately upon delivery to job site, place material in area protected from weather.

C. Store materials a minimum of 6" above ground on framework or blocking and cover with protective waterproof covering with adequate air circulation or ventilation.

E. Do not store seasoned materials in wet or damp portions of building.

1.05 SHOP DRAWINGS

A. Submit shop drawings and product data in accordance with General Conditions.

1.06 PROJECT CONDITIONS

A. Conditioning: Installer shall advise Contractor of temperature and humidity requirements for finish carpentry installation areas.

B. 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 will maintain temperature and relative humidity at occupancy levels throughout the remainder of construction period.

C. Maintain temperature and humidity in installation area as required to maintain moisture content of installed finish carpentry within a 1.0 percent tolerance of optimum moisture content, from date of installation through remainder of construction period. The fabricator of woodwork shall determine optimum moisture content and required temperature and humidity.

D. Weather Limitations: Proceed with installing exterior finish carpentry only when existing and forecasted weather conditions will permit work to be performed according to manufacturer's recommendations and warranty requirements and at least one coat of specified finish to be applied without exposure to rain, snow, or dampness.

PART II - PRODUCTS

2.01 MATERIALS

A. As indicated on drawings

2.02 GRADING STANDARDS

A. American Softwood Lumber Standards PS 20-70; Southern Pine Inspection Bureau; Western Wood Products Association; D245-6.

2.03 PLYWOOD

A. Comply with PS 1-74 except as otherwise noted herein.

B. Exposed Plywood (Exterior): Provide exterior type plywood with Grade A exposed face and Grade C concealed.

C. Exposed Plywood (Interior): Provide interior type with Grade A exposed face and Grade D concealed, (l/2" thickness).

D. Where plywood is to be concealed, use interior type plywood - C-D plugged grade. If finishes are applied provide Type “B” grade smooth finish on side with applied material.

E. Sheathing: Structural requirements supersede these requirements

F. Panel Veneer Plywood: Provide interior cabinet grade plywood AWI Grade AA with Grade A exposed face and Grade B concealed and fibercore center with Red Oak Plain Sawn book matched Veneer. Where possible, provide vertical joint at vertical trim location and provide bisquets at these joints to tie sheet of plywood together.

2.04 CASEWORK

A. Countertops with high pressure laminate finish.
1. Construction: See Details.
2. Exposed surfaces (Acceptable Manufacturers)
a. Formica Corporation
b. Nevamar
c. Wilsonart
3. Colors and patterns: As selected from any decorator colors or finishes.
4. Backing sheet: Clear.
5. Thickness: Horizontal surfaces 1/l6" vertical surfaces l/32"
6. Adhesive: Contact type as recommended by the laminated plastic manufacturer.
7. Semi-exposed surfaces: As required by AWI quality grade.

B. Particleboard Core:
1. Medium density conforming to CS236, type 1-B2.
2. Particleboard shall not be used for shelves.

2.05 WOOD TREATMENTS

A. Preservative Treated Lumber: Structural framing lumber, decking, wood blocking, plywood, cant nailers, plates, and ground buried in concrete slabs or set in or on exterior concrete or masonry or within 1'-0" of the exterior including all blocking in connection with roofing work shall be pressure treated with water borne preservative complying with American Wood Preservers Bureau LP-2. After treatment, kiln dry to a maximum moisture content of l5%. Mark each treated item to comply with the AWPB quality. Mark requirements for the specified requirements. Wood in contact with roofing products shall not be treated with creosote or pentachlorophenol. Nails, bolts and other fasteners used in connection with treated wood shall be galvanized. Submit certification by treating plant. Provide for all wood items where called for as such on the drawings and for new exterior wood deck.

B. Fire Retardant Treatment: All, wood located above the roof line, shall be fire retardant, and shall be treated to comply with the AWPA Standards for pressure impregnation with fire retardant chemicals to achieve a flame spread rating of not more than 25 when tested in accordance with UL Test 723, or ASTM E84. Kiln dried treat items to a maximum moisture content of l9%. Submit certification by treating plant.

2.06 BLOCKING, GROUNDS AND FRAMING

A. Shall be of thickness required for intended purpose.

B. Framing: Frame, fit closely, set framing accurately to required lines, levels, secure rigidly in place. Provide special framing or construction not indicated or specified, as required to complete work in best workmanlike manner. Do nailing, and fastening in a thorough manner; use nails and fasteners of ample size; l6d spikes where practicable.

C. Provide dressed wood grounds and furring where required and herein described.

D. Set grounds rigidly, in perfect alignment, true up with long straight edge.

E. Fastening: To concrete and solid masonry with expansion bolts. Fasten to hollow masonry with toggle bolts or with nails in metal wall plugs. Fasten to metal with stove bolts and fasten to metal lath with wire. The use of wood plugs will not be permitted.

F. Install rough wood blocking, rough hardware metal fastenings for proper installation of finish work and accessories.

G. Install furring as indicated.

2.07 MOLDED RUBBER SEALS

Shall be provided to close space between top plates and/or masonry partitions and roof deck of all interior walls which go to roof deck, to prevent air movement. Rubber seals are provided under Section 05300 and installed under this section.

2.08 FINISH HARDWARE

A. Shall be delivered from Division 8 for installation after painting.

B. Install hardware in accordance with manufacturer's instructions. Fit accurately, apply securely and adjust carefully.

C. Check hardware manufacturer's shipping list; store hardware in locked areas set aside in building. Examine hardware at work completion. Test, oil, grease, ease, adjust hardware for perfect operation. Handle hardware items carefully. Keep free from scratches, dents, and other defacements during progress of work by covering as necessary.

PART III - EXECUTION

3.01 GENERAL

A. All work shall be erected, plumb, true, square and in accord with manufacturer's specifications.

B. All members shall be in as long pieces as practical with joints arranged to be inconspicuous as possible and so as to allow for shrinkage.

C. All work well nailed and exposed nail set.

D. Finish work to be blind nailed.

E. All corners carefully mitered.

F. Work shall be assembled at the mill insofar as practical, delivered ready for erection.

3.02 LAMINATED PLASTIC

A. Furnish all laminated plastic countertops as called for on particle board core, backbanded with clear plastic.

B. Countertops shall include all back and end splash pieces.

C. Cut out counters where sinks occur. Sink rings are furnished in Division l5. Coordinate for size of sink opening required.

3.03 WORKMANSHIP

A. All millwork shall be done by craftsmen skilled in their trade, all work secured and rigidly fastened to withstand the action intended of same.

B. All joints to be close fitting, tongued or rabbeted together so as to conceal any shrinkage. Joints shall be glued and clamped together.

C. All internal angles of continuous members shall be coped and external corners mitered.

D. All doors and drawers shall be properly fitted so as to open freely without binding and shall contact wood stops on all points.

- - - END OF SECTION - - -

PART I - GENERAL

1.01 GENERAL

The Drawings, Instructions to Bidders, Form of Proposal, General Conditions, Supplementary General Conditions, and Division 1 are included herein and govern work under this section.

1.02 DESCRIPTION OF WORK

A. This section subject to applicable requirements of the bidding information and Division 1.

B. Furnish all architectural woodwork shown on drawings and specified herein. Architectural woodwork includes all woodwork exposed to view in finished building, except as exempted in paragraph C below; and includes, but not necessarily limited to:
   1. Plywood
   2. Standing and running trim
   3. Counterwork
   4. Millwork
   5. Wood columns
   6. Wood paneling
   7. High pressure laminates

C. Work Specified in Other Sections:
   1. Rough carpentry
   2. Finish carpentry
   3. Pressure treated wood
   4. Fire retardant treated wood

D. Furnish all mill-built woodwork assembled as practical for shipment, ready for installation, all as called for on the plans and as specified herein, complete with all hardware.

1.03 QUALITY ASSURANCE

A. Comply with applicable provisions for "Custom Grade" work of the "Architectural Woodwork Quality Standards Illustrated" of the American Woodwork Institute (AWI) except as otherwise specified.

B. Mark each assembled unit of architectural woodwork with manufacturer's identification and grade mark evidencing compliance with indicated AWI quality grade. Locate mark on surface which will not be exposed to view after installation.

C. The approved woodwork manufacturer shall have a reputation for completing work on time and shall have successfully completed comparable work.

D. Lumber and plywood shall bear the grade and trademark of the association under whose rules it was produced and a mark of mill identification.

E. The Architect reserves the right to approve the woodwork manufacturer selected to furnish all of the woodwork.

1.04 SUBMITTALS

A. See Division 1 - General Requirements for directions on remission of submittals.

B. Submit Melton Classics literature and shop drawings for customer approval.

C. Submit samples of Wood column shaft.

D. Submit manufacturers descriptive literature of specialty items not manufactured by the architectural woodworker.

1.05 FIELD DIMENSIONS

A. The woodwork manufacturer is responsible for details and dimensions not controlled by job conditions and shall show on his shop drawings all required field measurements beyond his control.

B. The General Contractor and the woodwork manufacturer shall cooperate to establish and maintain these field dimensions.

1.06 WORKMANSHIP

A. All millwork shall be done by craftsmen skilled in their trade, all work secured and rigidly fastened to withstand the action intended of same.

B. All joints to be close fitting, tongued or rabbeted together so as to conceal any shrinkage. Joints shall be glued and clamped together.

C. All internal angles of continuous members shall be coped and external corners mitered.

1.07 DELIVERY AND HANDLING

A. The woodwork manufacturer and the contractor shall be jointly responsible to make certain that woodwork is not delivered until the building and storage areas are sufficiently dry so that the woodwork will not be damaged by excessive changes in moisture content.

B. Deliver units to job site, protected from damage and elements.

C. Storage and installation of shafts, capitals and bases shall be according to manufacturer-supplied instructions.

D. Columns must be stored in dry, well-ventilated area that is not exposed to heat or sunlight.

1.08 WARRANTY

A. Manufacturer shall furnish a ten-year warranty that its Cedar or Clear All Heart Redwood columns with fiberglass capitals, bases and plinths will be free of manufacturing defects, joint separation and rotting.

B. Manufacturer shall furnish a one year warranty on all other wood species against manufacturing defects.

PART II - PRODUCTS

2.01 MATERIALS

A. Exposed solid wood for transparent finish: Red Oak.

B. Solid wood for semi-exposed members: Same as exposed members.

C. Solid wood for concealed members: Mill option hardwood.

D. Exposed plywood for transparent finish: Select Red Oak.

E. Semi-exposed plywood: Same as exposed plywood.

F. Concealed plywood: At option of mill.

G. Particleboard: ANSI A 108.1, grade 1-M-1. or melamine

H. Adhesive: Type II, CS 35. No heat transfer iron-on laminate will be accepted.

I. Plastic Laminate: Comply with NEMA LD-3 for type and thickness. Color, pattern and finish as selected by Architect as manufactured by Formica, Standard Series [Wilson art, Nevamar, MOZ] manufacturer's decorator series products.

2.02 MILLWORK

A. Millwork shall include the following, but not be limited to: Minrab Minbar, Bench, Shelves, Cubbies, Oak Seat, Railing Cap Stools and Trim.

1. Miscellaneous Millwork:
   a. Red oak veneer paneling, molding and trim.
2. Bench, Cubbies and Shelves:
   a. Provide 3/4" Plywood shelving (12" wide) with plastic laminate facing on all exposed surfaces.
   b. Provide No. KV 1194 series commercial adjustable heavy duty closet rod and shelf bracket as manufactured by Knape and Vogt Manufacturing Co. or approved equal.

2.03 CASEWORK

A. Casework shall include the following:
1. Vanity Counters:
   a. Provide sizes and configuration as shown on drawings and specified herein (field measure and scribe to walls). All counters to receive plastic laminate finish.
   b. Provide for sink cut-outs.
   c. Provide all hardware required. Hardware for millwork is not included in hardware Section 8.
   d. Provide all necessary blocking and brackets for support and attachment to walls.
   e. Plastic laminate shall be applied to 3/4" particle board in strict accordance with laminate manufacturer’s instructions and recommendations.

f. Plastic laminate shall be as manufactured by those listed. Colors and patterns to be as selected by Architect.

2. Plastic Laminate Window Stools:
   a. Plastic laminate shall be applied to 3/4" particle board in strict accordance with laminate manufacturer's instructions and recommendations.
   b. Plastic laminate shall be as manufactured by Formica Corporation. Colors and patterns to be as selected by Architect. Thickness: horizontal surfaces 1/16", vertical surfaces 1/32". Adhesive: Contact type as recommended by the laminated plastic manufacturer. Semi-exposed surfaces: As required by AWI quality grade.

2.04 PREFABRICATED DECORATIVE WOOD COLUMNS

A. ACCEPTABLE MANUFACTURER
   1. Melton Classics, Inc. P.O. Box 465020, Lawrenceville, GA 30042-5020. (770) 963-3060, 1-800-963-3060. Fax (770) 962-6988. WWW.MeltonClassics.com Sales@MeltonClassics.com

B. GENERAL PRODUCT DESCRIPTION
   1. Column Shafts shall be standard tongue and groove construction by Melton Classics according to **Design No. 330TOW** .
   2. Column will have the correct proportions based on Orders of Architecture.
   3. Lumber species shall be **Red Oak**
   4. All glue joints shall be glued under pressure using Type I waterproof glue and allowed to cure for a minimum of twenty-four hours.
   5. Plinths shall be made of wood.
   6. Column shafts shall be manufactured from standard nominal thickness lumber stock.

2.05 CLOSET UNITS AND SHELVES

A. AWI quality grade: Custom.

2.06 PANEL MOLDING, AND CROWN MOLDING

A. AWI quality grade: Custom, continuous rail, red oak.

PART III - EXECUTION

3.01 GENERAL

A. All work shall be erected plum, true, square and in accordance with manufacturer's specifications.

B. All members shall be in as long as possible and so as to allow for shrinkage.

C. All work well nailed and exposed nails set.

D. Finish work to be blind nailed.

E. All corners carefully mitered.

F. Work shall be assembled at the mill insofar as practical, delivered ready erection under Section 06 20 13 - Rough & Finish Carpentry.

3.02 STANDING AND RUNNING TRIM

A. Fabricate to dimension, profile and detail shown. Back out reverse side of trim applied to flat surface
B. At existing conditions, infill to match profiles, species and finish.

3.03 LAMINATED PLASTIC

A. Counters shall include all back and end splash pieces as detailed. Provide end splash at wall returns.

B. Provide scribing allowance to adjoining walls.

C. Laminate to be applied using specified contact cement, no heat transfer iron-on laminate will be accepted.

3.04 INSTALLATION

A. Install cabinets plumb and level without distortion.

B. Shim as necessary with concealed shims.

C. Accurately scribe and closely fit all face plates, filler strips and trim strips to irregularities of adjacent surfaces.

D. Follow manufacturer’s detailed installation guidelines.

- - - END OF SECTION - - -

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings, conditions of the contract and Division 1 Specifications sections, apply to work of this section.

1.2 SUMMARY

A. Section Includes: Architectural Fiberglass Reinforced Polymer (FRP) Decorative Self-Supporting Dome for exterior application. *(Insert interior dome if applicable.)*

1.3 RELATED SECTIONS

A. Section 05 12 13 – Structural Steel: Attachment framing for architectural fiberglass dome.
B. Section 06 20 13 – Rough & Finish Carpentry: Framing of opening and blocking.
C. Section 07 92 13 – Caulking Sealants Joint sealants and field applied sealants.
D. Section 07 21 13 – Spray Applied Insulation.

1.4 DESIGN REQUIREMENTS

A. Architectural fiberglass dome shall be designed as a self-supporting fiberglass structure with integral framing system. No additional skeleton structural framing shall be required to support the fiberglass dome.
B. Installed architectural fiberglass dome and fastening systems shall be designed, engineered, fabricated, and installed to conform to the state codes, local codes, and the Architect's design.

1.5 SUBMITTALS

A. Shop Drawings: Include plans, elevations, sections, profiles, and details of dome sections. Illustrate dimensions, adjacent construction, materials, thickness, fabrications details, required clearances, field jointing, colors, finishes, methods of support, attachments, anchorage to substrates, integration of components, and list of part numbers that coordinate with labeled architectural fiberglass parts.
B. Submit current valid third party product Listing and Labeling from International Code Council (ICC)-sanctioned authority to be affixed to all products manufactured and delivered to the jobsite as required per the 2009 International Building Code (IBC). ICC–sanctioned Listing and Labeling Program shall be in place at bid time and state compliance with Flame Spread Index requirements stipulated in the 2009 IBC, section 2612. Manufactured products without Listing and Labeling Program at bid time will not be considered.
C. Professional Engineering, if required, shall include calculations and stamped drawings by P.E. registered in the state of dome installation, to meet all state and local codes.
D. Provide a list of dome projects demonstrating the capability of manufacturing domes comparable in size, scope, and complexity as indicated.
E. Submit Manufacturer's current valid certification with the Certified Composites Technician (CCT) program created by the American Composites Manufacturers Association (ACMA).
F. Submit Manufacturer's internal Quality Control & Assurance Procedures based upon provisions published in the "Guidelines and Recommended Practices for Fiberglass Reinforced Plastic Architectural Products" upon request.
G. Product Data: Submit Manufacturer's product data and installation instructions.
H. Product Samples: Submit minimum 3-inch x 5-inch samples in specified color, texture and finish when applicable.

1.6 QUALITY ASSURANCE

A. Obtain architectural fiberglass dome from a single source manufacturer that has the ability and resources to comply with the requirements and schedule of the project.

B. Manufacturer's ICC–sanctioned Listing and Labeling Program shall include site visits to manufacturing facility by third party testing authority witnessing compliance with manufacturing procedures and Listing and Labeling Program.

C. Manufacturer to comply with Quality Control & Assurance Procedures and fabricate architectural fiberglass based upon provisions published in the "Guidelines and Recommended Practices for Fiberglass Reinforced Plastic Architectural Products".

D. Inspect each molded dome section to ensure that it complies with specified requirements, including nominal dimensions.

1.7 MANUFACTURER'S QUALIFICATIONS

A. Manufacturer: Provide products manufactured by a firm specializing in the manufacture of fiberglass architectural domes, in the United States with a minimum of ten (10) years experience.

B. All products manufactured shall carry ICC–sanctioned Listing and Labeling per 2009 IBC.

C. Manufacturer shall demonstrate current valid certification and participation in the CCT program and fabricate material based upon provisions published in the "Guidelines and Recommended Practices for Fiberglass Reinforced Plastic Architectural Products".

D. Provide verification that architectural fiberglass dome meets or exceeds products specified.

1.8 DELIVERY, STORAGE AND HANDLING

A. Handle, store and transport architectural fiberglass dome according to Manufacturer's recommendations and in a manner that prevents damage.

B. Protect architectural fiberglass from damage by retaining any shipping protection and store in a secure place until installation.

C. Damage Responsibility: Except for damage caused by others, the installer is responsible for chipping, cracking, or other damage to fiberglass fabrications, after delivery to the jobsite and until installation is completed and inspected and approved by the Architect or Owner's representative.

1.9 WARRANTY

A. Warrant architectural fiberglass dome to be free from defect due to materials and workmanship for one year.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURER

Plasterform, Inc.
1180 Lakeshore Road East, Mississauga,, OOntario L5E1E9
800-268-4534, 905-891-2232 (Fax)

2.2 FABRICATION PATTERNS/MOLDS

A. Custom Pattern/Mockup: Patterns and mockups shall be hand-carved and/or CNC machined by skilled pattern makers with minimum of ten (10) years experience with architectural elements. Patterns and mockups shall be available at manufacturing facility for Architect's inspection and approval before molds are produced.

B. Custom Molds: Molds shall be produced with ample layers of tooling resin, tooling gel-coat, glass fibers and/or flexible rubber by skilled mold makers with minimum of ten (10) years experience with architectural elements. Produced molds shall have rigidity and thickness to prevent distortion and deflection of molded architectural fiberglass.

2.3 MATERIALS CHARACTERISTICS

A. MOLDED EXTERIOR SURFACE: U-V inhibited, NPG-ISO polyester gel coat, 18 to 22 mils thick. Color to match in texture and finish of sample supplied by Architect.

B. BARRIER COAT: Specifically formulated backup polyester surface veil 18-20 mils thick to prevent glass print through and ultimate Class A finish.

C. BACK UP LAMINATE:

1. Resin: Polyester resin shall be fire retardant and meet Class 1 flame spread rating of 25 or less and smoke density under 450 without the use of antimony trioxide as characterized by the ASTM E-84 tunnel test at typical 1/8" glass mat laminate. General purpose resin will not be permitted.
2. Filler: Functional filler to be added to resin matrix to minimize shrinkage, add stiffness, control opacity, add fire retardance, improve surface finish, minimize crazing, and control dimensional stability from weather extremes.
3. Fiberglass Reinforcement: Type "E" fiberglass, glass cloth, matt and/or random chopped glass fibers. Glass content approximately 20% to 30%.
4. Laminate Thickness: Nominal laminate shall be minimum 3/16" thickness. Larger dome sections shall be manufactured with additional core reinforcements and/or sandwich structure added as required for rigidity and structural integrity.

2.4 FABRICATION

A. Dome shall be fabricated with integral framing system without the need for additional skeleton framing after assembly.

B. Dome sections shall be formed with assembly bolting flanges with sufficient depth to provide structural integrity and to accommodate gaskets, fasteners, and sealant.

C. Dome sections shall be manufactured for proper panel-to-panel alignment and for weather-tight installation.

D. Dome sections shall be manufactured as a single unit spanning entire profile from base of dome to top of dome.

E. Connection flanges shall be reinforced with polywood or other treated rot-proof material for connection to building substrate.

F. Dome sections shall be factory pre-drilled, labeled, and pre-assembled for field reassembly.

2.5 AVERAGE MECHANICAL PROPERTIES:

PROPERTY	VALUE	TEST METHOD
Tensile Strength	12,000 PSI	ASTM D638
Flexural Strength	20,000 PSI	ASTM D790
Flexural Modulus	0.9×10^6 PSI	ASTM D790
Compressive Strength	17,000 PSI	ASTM D695
Bearing Strength	9,000 PSI	ASTM D638
Thermal Expansion	10×10^{-6} (°F)	
Specific Gravity	1.5	

2.6 FINISH

A. Dome shall be finished with colored gel coat or Sherwin Williams Polane S Plus Polyurethane Enamel Coating as selected by Architect or Owner's representative. Surface texture / exposed side shall be smooth or textured based upon approved sample.

2.7 TOLERANCES

A. Part Thickness: + or – 1/8 inch.

B. Gel Coat Thickness: + or – 2.5 mils.

C. Length: + or – 1/8.

D. Variation from Square: 1/8 inch.

E. Hardware Location Variation: + or – 1/4 inch.

2.8 IDENTIFICATION

A. Identify each architectural fiberglass dome section to coordinate with shop drawings.
B. Number dome sections showing sequence of assembly.

2.9 CURING AND CLEANING

A. Cure and clean components prior to shipment and remove material which may be:
   1. Toxic to plant or animal life.
   2. Incompatible with adjacent building material.

2.10 ANCHORS AND FASTENERS

A. Contractor to provide anchors, fasteners, gaskets, and other accessories for proper installation of architectural fiberglass dome as recommended and approved by fiberglass fabrication manufacturer. Dome manufacturer to specify the above accessories.

PART 3 – EXECUTION

3.1 PRE-INSTALLATION EXAMINATION

A. Carefully observe and verify field conditions that substrates are ready for installation of architectural fiberglass dome. Contractor shall verify on-site dimensions with shop drawings and assume full responsibility for fitting the components to the structure.
B. Verify that bearing surfaces are true and level.
C. Verify that dome connection framing has been constructed to allow accurate placement, alignment and connection of architectural fiberglass dome to structure.
D. Report discrepancies between design dimensions and field dimensions, which could adversely affect the dome installation, to the Architect and/or Owner's representative.
E. Do not proceed with installation of dome until discrepancies are corrected, or until installation requirements are modified and approved by the Architect and/or Owner's representative.
F. Beginning of installation means acceptance of existing conditions and fiberglass materials.

3.2 INSTALLATION

A. Install architectural fiberglass dome in accordance with Manufacturer's instructions and approved shop drawings.
B. Apply continuous run of sealant and expandable cellular foam gasket as recommended per Manufacturer's instructions and approved shop drawings to the bolting flanges of all sections for weather-tight installation.
C. Dome to be assembled on level surface and raised into place.
D. Exterior dome shall be field insulated for water tightness and to prevent condensation when installed on unfinished roof or when interior fiberglass dome is required. Field applied spray insulation to be sprayed on interior surface of exterior dome. Insulation shall be sprayed and encapsulate entire surface including attachment flanges, anchor bolts, assembly bolts, and perimeter bolting flange.
E. Flashing shall be installed around the perimeter of the dome structure per Manufacturer's instructions and approved shop drawings.
F. Exterior dome shall receive final sealant application on the exterior joints after installation.
G. Interior dome joints (when applicable) shall be finished with polyester body filler and fiberglass mesh tape. Joints to be filled, sanded, primed and painted for monolithic appearance.

3.3 ALLOWABLE TOLERANCES FOR INSTALLED UNITS

A. Maximum Offset from True Alignment: 1/4 inch in 20 feet.

B. Maximum Variation from True Position: 1/2 inch in 20 feet.

3.4 CLEANING

A. Clean installed architectural fiberglass dome using cleaning methods and material approved by Manufacturer.

3.5 PROTECTION OF INSTALLED FABRICATIONS

A. Comply with Manufacturer's recommendations and instructions for protecting installed dome during construction activities.

END OF SECTION

PART I - GENERAL

1.01 GENERAL

The Drawings, Instructions to Bidders, Form of Proposal, General Conditions, Supplementary General Conditions, and Division 1 are included herein and govern work under this section.

1.02 DESCRIPTION OF WORK

A. Provide all labor, material, and equipment necessary for or incidental to the repair of existing roofing membrane or necessary to provide a satisfactory weather tight condition.

B. Repair of roofing may result in some roof deck and insulation repair or replacement. In replacing roof deck, deck must span existing supports and be attached thereto.

C. The following items are specifically included without limiting the generality implied by these specifications. Refer to the Drawings for the complete scope of work:
1. Relocation of roof top mechanical equipment.
2. New or relocated vent ducts.
3. New or relocated plumbing vents.
4. Patching or replacing wall flashings.
5. New or repaired fascia and copings.

PART II - PRODUCTS

2.01 MATERIALS

Provide and install materials for patching and repairing the same type and quality as used in the original system.

PART III - EXECUTION

3.01 WORKMANSHIP

A. Workmanship shall result in the same finished product that would be employed in an original installation.

B. All roof repair shall be accomplished by an authorized manufacturers applicator of the material being repaired so as not to affect the existing roofing membrane warranty in any manner.

- - - END OF SECTION - - -

PART I - GENERAL

1.01 GENERAL

The Drawings, Instructions to Bidders, Form of Proposal, General Conditions, Supplementary General Conditions, and Division 1 are included herein and govern work under this section.

1.02 DESCRIPTION OF WORK

A. Provide labor and materials and everything necessary for and incidental to the complete installation of building insulation shown on the drawings and described herein.

B. The following items are specifically included without limiting the generality implied by these specifications and the drawings.
   1. Perimeter insulation.
   2. Roof insulation.
   3. Roof insulation (tapered)
   4. Masonry insulation.
   5. Batt insulation with vapor barrier.
   6. Rigid EPS board masonry insulation.
   7. Sound attenuation blanket.

1.03 CERTIFICATION

The manufacturers shall submit the insulation characteristics and tests of types to be used. The Contractor shall submit a list of insulation types and thicknesses and their intended places of use with the manufacturers submittal for the Architect's approval.

1.04 REFERENCES

A. ASTM C 423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.

B. ASTM C 518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

C. ASTM C 553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.

D. ASTM C 612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation.

E. ASTM C 665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

F. ASTM C 764 - Standard. Specification for Mineral Fiber. Loose-Fill Thermal Insulation.

G. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

H. ASTM E 96 - Standard Test Methods for Water Vapor Transmission of Materials.

I. ASTM E 119 - Standard Test Methods for Fire Tests of Building Construction and Materials.

J. ASTM E 136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 Degrees C.

K. ASTM E 814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops.

L. Federal Specification HH-I-521F: Insulation Blankets, Thermal (Mineral Fiber, For Ambient Temperatures).

M. Federal Specification HH-I-558B: Insulation, Blocks, Blankets, Felts, Sleeving (Pipe and Tube Covering), and Pipe fitting Covering, Thermal (Mineral Fiber, Industrial Type)

N. National Fire Protection Association (NFPA) Life Safety Code
Underwriters Laboratories (UL) - UL 2079 Standard test method for fire resistance of Building Joint Systems

PART II - PRODUCTS

2.01 MANUFACTURERS
- A. Thermal Foams,
- B. Owens Corning
- C. Owens Corning Thermafiber - Mineral Wool
- D. Johns Manville
- E. CertainTeed

2.02 MATERIALS

A. Rigid Insulation: The insulations listed are based on products manufactured by Thermal Foams, Inc., 2101 Kenmore Avenue, Buffalo, NY 14209, or roof insulation by Carlisle Syntec Corp. Products of other manufacturers with equal characteristics will be considered.

1. Perimeter Insulation: Thermal Foams, 2" thick Expanded Polystyrene (EPS) Insulation , 1.5 lb. density R-9.1 @ 40º F.
2. Roof Insulation: Polyisocyanurate HJP-H insulation, to have a minimum compressive strength of 120 kPa with an acceptable facer (mineral coated glass fleece, bituminous impregnated glass fleece, felt, etc.) with sufficient delamitation strength and thickness equal to or exceeding an R-value of 30.0. This manufacturer must be compatible with the specified roofing system in Section 07501 and maintain all warranties. One source supplier of roofing material is essential to obtaining warranties.
3. Roof Insulation Tapered: Polyisocyanurate HP-H tapered insulation to have a minimum compressive strength of 120 kPa with an acceptable facer (mineral coated glass fleece, bituminous impregnated glass fleece, felt, etc.) with sufficient delamitation strength and thickness equal to or exceeding an R-value of 30.0. This manufacturer must be compatible with the specified roofing system in Section 07501 and maintain all warranties. One source supplier of roofing material is essential to obtaining warranties

B. Wall, Floor and Ceiling Batt Thermal Insulation:

1. Type: Interior Stud Walls - Unfaced glass fiber thermal/sound attenuating insulation complying with ASTM C 665, Type I and ASTM E 136.

2. Metal Frame Insulation: R value 19 when tested in accordance with ASTM C 518, thickness 6", width 16".
3. Wood Frame Wall Insulation: R value 21 when tested in accordance with ASTM C 518, thickness 5 ½", width 16".
4. Surface Burning Characteristics:
   a. Unfaced insulation
      i. Maximum flame spread: 10
      ii. Maximum smoke developed: 10
5. Combustion Characteristics:
   a. Unfaced insulation passes ASTM E 136 test.
6. Dimensional Stability:
   a. Linear shrinkage less than 0.1%.

C. Masonry Insulation (Granular):
1. Granular EPS insulation shall be installed in the cores of masonry units located in exterior walls where no drywall finish is indicated on the interior side.
2. Manufacturers: Masonry insulation shall be EPS Bead by ThermoFoams, Inc.

D. Masonry Insulation (Rigid): ½" thick, 1.25 lb. density, 1.93 R minimum by Thermal Foams, or Architect approved equal.

E. Sound Attenuation Blanket:
1. Owens Corning Sound Attenuation Batts (SAB) As specifically manufactured by U. S. Gypsum Corp. for
2. Thermafiber SAFB (Sound Attenuation Fire Blankets) mineral wool batts 3" min. or as shown on plans to fill cavity

F. Fire Safing: Thermafiber Safing Insulation AFSB (Sound Attenuation Fire Blankets) mineral wool batts 3" min. or as shown on plans to fill cavity. These products may not be substituted with standard batt insulation as a fire safing.

PART III - EXECUTION

3.01 INSTALLATION

A. General:
1. All materials shall be installed in strict accordance with the manufacturer's recommendations.
2. Surfaces to receive insulation with bonding adhesives shall be clean and free of protrusions. All form release agents on concrete shall be completely removed. Bonding adhesives shall be used in strict conformance with manufacturer's requirements.
3. Where caulk joint is shown, insulation shall be held back 3/4".
4. Rigid insulation shall be neatly cut and fitted with firm contact to adjacent surfaces.
5. Batt and loose insulation shall be tucked into voids of exterior walls. Care shall be taken to avoid holes in vapor barrier.
6. Maintain minimum temperatures when adhesives require curing or warm surfaces for application is recommended by manufacturer.

B. Comply with manufacturer's instruction for particular conditions of installation in each case.

C. Mechanical fasteners
   1. Apply insulation directly to the interior surface of the exterior wall with appropriate spindle or prong-type anchors.
      a. Fasten anchors to wall by welding the pin to metal and then impale the insulation or by using pre-attached heads and welding them through the insulation.
      b. Fasten anchors to wall with adhesive. Follow manufacturer's recommendations for surface preparation and adhesive pattern.
      c. Impale insulation on anchor and secure with washer. Select pin lengths to ensure tight fit. Protect pin tips where subject to human contact. See manufacturer's diagram for impaling pin pattern.

D. Adhesive Fastening
   1. Apply insulation with adhesives. Follow adhesive manufacturer's recommendations for surface preparation and adhesive pattern.

E. Furring Strips
   1. Install insulation between furring strips, hat channels or Z-shaped furring in areas where finish surface will be applied.
   2. Contact the furring strip manufacturer for recommendations on the appropriate fastener system to use.

F. Between Metal Studs
   1. Friction-fit insulation between studs after cover material has been installed on one side of the cavity. When unfaced insulation is used and in applications without a cover material or where the stud depth is larger than the insulation thickness, use wire or metal straps to hold insulation in place. When faced insulation is used, the attachment flanges may be taped to the face of metal stud prior to applying the interior finish.
      a. Provide supplementary support to hold the product in place until finish surface is applied when insulation is installed over 8 feet.

G. Between Wood Studs
   1. Friction-fit unfaced insulation between studs after cover material has been installed on one side of the cavity. When unfaced insulation is used and in applications without a cover material, use wire or metal straps to hold insulation in place. When faced insulation is used, staple attachment flanges to face or side of stud every 8 to 12 inches to prevent gaps along the edge of the vapor retarding facing.

H. Roof Insulation :
   1. Roof slope is to be 1/4" per foot with a minimum thickness of 1" at roof drains.
   2. Compliance: Federal Spec. HH-1-1972-2 Class 1 Factory Mutual Class 1 approved.

3. Roof insulation shall be installed in compliance with the manufacturer's latest printed recommendations. Installation shall be approved by the manufacturer for the issue of "Specification Warranty" on the completed roof system installation.
4. Insulation Attachment and - Thermal insulation mechanically attached
   a. Install the insulation on above underlay with end joints staggered.
   b. When installing two layers of insulation boards, ensure that the joints of both layers do not coincide.
   c. Mechanically fix to pattern and frequency advised by manufacturer, all in accordance with national wind uplift standards.
   d. Install fully in accordance with manufacturers instructions.
   e. Use Firestone insulation plates and fasteners or equivalent.
   f. Install in any one day only as much boards as can be protected by the completed roofing system that same day.

I. Installation of Masonry Insulation: Insulation shall be poured from the bag directly into the concrete block core. Pours may be made at any convenient interval without bridging. Rigid 2" EPS board is to be secured to the exterior face of all exterior wall back-up masonry block.

J. Protection: All insulation to be protected and kept under cover both in transit and on job site. Materials shall not be delivered unduly long before required for proper conduct of work.

K. Inspection: Upon completion of insulation work, and prior to the application of finishing materials, the contractor shall notify the Architect before proceeding.

3.02 INSTALLATION - VAPOR RETARDERS

A. Maintain Vapor retarder integrity by tightly abutting adjacent insulation. Repair punctures or tears in vapor retarder facing by taping. Tape edges of all opening created for items such as electrical boxes, conduits etc. Follow tape manufacturer’s application recommendations.

- - - END OF SECTION - - -

PART I – GENERAL

1.01 SUMMARY

A. This document is to be used in preparing specifications for projects utilizing the ***Dryvit Outsulation Plus MD Drainable System.*** For complete product description and usage refer to:
1. Dryvit Outsulation System Data Sheet, DS447.
2. Dryvit Outsulation System Application Instructions, DS204.
3. Dryvit Outsulation System Installation Details, DS107.

B. Related Sections
1. Concrete – Sections 03
2. Unit Masonry – Section 04
3. Metal Studs – Section 05
4. Caulking & Sealants – Section 07
5. Flashing & Sheet Metal – Section 07
6. Backstop Moisture & Air Barrier- Section 07

1.02. REFERENCES

A. Section Includes
1. ASTM B 117 (Federal Test Standard 141A Method 6061) Standard Practice for Operating Salt Spray (Fog) Apparatus
2. ASTM C 150 Standard Specification for Portland Cement
3. ASTM C 297 Standard Test Method for Flatwise Tensile Strength of Sandwich Constructions
4. ASTM C 1177 Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing
5. ASTM C 1396 (formerly C 79) Standard Specification for Gypsum Board
6. ASTM D 968 (Federal Test Standard 141A Method 6191) Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive
7. ASTM D 2247 (Federal Test Standard 141A Method 6201) Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity
8. ASTM D 3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber
9. ASTM D 4060 Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser
10. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials
11. ASTM E 96 Standard Test Methods for Water Vapor Transmission of Materials
12. ASTM E 119 Standard Method for Fire Tests of Building Construction and Materials
13. ASTM E 330 Test Method for Structural Performance of Exterior Windows, Doors and Curtain Walls by Uniform Static Air Pressure Difference
14. ASTM E 331 Test Method for Water Penetration of Exterior Windows, Skylights, Doors and Curtain Walls by Uniform Static Air Pressure Difference.
15. ASTM E 2098 Test Method for Determining the Tensile Breaking Strength of Glass Fiber Reinforcing Mesh for use in Class PB Exterior Insulation and Finish Systems (EIFS), after Exposure to Sodium Hydroxide Solution
16. ASTM E 2134 Test Method for Evaluating the Tensile-Adhesion Performance of Exterior Insulation and Finish Systems (EIFS)
17. ASTM E 2430 Standard Specification for Expanded Polystyrene (EPS) Thermal Insulation Boards for use in Exterior Insulation and Finish System (EIFS)
18. ASTM E 2485 (formerly EIMA Std. 101.01) Standard Test Method for Freeze-Thaw Resistance of Exterior Insulation and Finish Systems (EIFS) and Water-Resistive Barrier Coatings

19. ASTM E 2486 (formerly EIMA Std. 101.86) Standard Test Method for Impact Resistance of Class PB and PI Exterior Insulation and Finish Systems (EIFS)
20. ASTM G 155 (Federal Test Standard 141A Method 6151) Standard Practice for Operating-Xenon Arc Light Apparatus, for Exposure of Nonmetallic Materials
21. DS107, Dryvit Outsulation System Installation Details
22. DS131, Dryvit Expanded Polystyrene Insulation Board Specification
23. DS135, Specification for Outsulation System with Mechanical Fasteners
24. DS151, Custom Brick™ Polymer System Specifications for Use on Vertical Walls
25. DS152, Dryvit Cleaning and Recoating
26. DS153, Dryvit Expansion Joints and Sealants
27. DS159, Dryvit Water Vapor Transmission
28. DS204, Dryvit Outsulation System Application Instructions
29. DS456, Rapidry DM™ 35-50 or DS457, Rapidry DM™ 50-75 Data Sheets
30. DS494, Dryvit AquaFlash™ System
31. Mil Std E5272 Environmental Testing
32. Mil Std 810B Environmental Test Methods
33. UBC Std 26-4 (Formerly UBC 17-6) Multi-Story Fire Evaluation of Exterior Non Load-Bearing Foam Plastic Insulated Wall Systems
34. NFPA 268 Standard Test Method for Determining Ignitibility of Exterior Wall Assemblies Using a Radiant Heat Energy Source.
35. NFPA 285 Standard Method of Test for the Evaluation of Flammability Characteristics of Exterior Non Load-Bearing Wall Assemblies Containing Combustible Components Using the Intermediate-Scale, Multistory Test Apparatus
36. ULC S101 Standard Methods of Fire Endurance Tests of Building Construction Materials
37. ANSI FM 4880 Evaluating Insulated Wall or Wall and Roof/Ceiling Assemblies; Plastic Interior Finish Materials; Plastic Exterior Building Panels; Wall/Ceiling Coating Systems; Interior or Exterior Finish Systems

1.03 DEFINITIONS

A. Base Coat: Material used to encapsulate one or more layers of reinforcing mesh fully embedded that is applied to the outside surface of the EPS.

B. Building Expansion Joint: A joint through the entire building structure designed to accommodate structural movement.

C. Contractor: The contractor that installs the Outsulation System to the substrate.

D. Dryvit: Dryvit Systems, Inc., the manufacturer of the Outsulation Plus MD Drainable System, a Rhode Island corporation.

E. Expansion Joint: A structural discontinuity in the Outsulation Plus MD Drainable System.

F. Finish: An acrylic-based coating, available in a variety of textures and colors that is applied over the base coat.

G. Insulation Board: Expanded polystyrene (EPS) insulation board, which is affixed to the substrate.

H. Panel Erector: The contractor who installs the panelized Outsulation Plus MD Drainable System.

I. Panel Fabricator: The contractor who fabricates the panelized Outsulation Plus MD Drainable System.

J. Reinforcing Mesh: Glass fiber mesh(es) used to reinforce the base coat and to provide impact resistance.

K. Sheathing: A substrate in sheet form.

L. Substrate: The material to which the Outsulation Plus MD Drainable System is affixed.

M. Substrate System: The total wall assembly including the attached substrate to which the Outsulation Plus MD Drainable System is affixed.

N. Moisture Barrier to be system drainable wrap, installed and detailed per manufacturer recommendations.

1.04 SYSTEM DESCRIPTION

A. General: The Dryvit Outsulation Plus MD Drainable System is an Exterior Insulation and Finish System, Class PB, consisting of an adhesive, expanded polystyrene insulation board, base coat, reinforcing mesh(es), drainable moisture barrier and finish. Mechanically attached systems shall conform to Dryvit specification DS135.

B. Methods of Installation
1. Field Applied: The Outsulation Plus MD Drainable System is applied to the substrate system in place.

C. Design Requirements
1. Acceptable substrates for the Outsulation Plus MD Drainable System shall be:
   a. Exterior grade gypsum sheathing meeting ASTM C 1396 (formerly C 79) requirements for water-resistant core or Type X core at the time of application of the Outsulation Plus MD Drainable System.
   b. Exterior sheathing having a water-resistant core with fiberglass mat facers meeting ASTM C 1177.
   c. Exterior fiber reinforced cement or calcium silicate boards.
   d. APA Exterior or Exposure 1 Rated Plywood, Grade C-D or better, nominal 12.7 mm (1/2 in), minimum 4-ply.
   e. Unglazed brick, cement plaster, concrete, or masonry.
   f. APA Exposure 1 rated Oriented Strand Board (OSB), nominal 12.7 mm (1/2 in).
   g. Galvanized expanded metal lath 1.4 or 1.8 kg/m^2 (2.5 or 3.4 lbs/yd^2) installed over a solid substrate.
2. Deflection of substrate systems shall not exceed 1/240 times the span.
3. The substrate shall be flat within 6.4 mm (1/4 in) in a 1.2 m (4 ft) radius.
4. The slope of inclined surfaces shall not be less than 6:12, and the length shall not exceed 305 mm (12 in).
5. All areas requiring an impact resistance classification higher than “standard”, as defined by ASTM E 2486 (formerly EIMA Std. 101.86), shall be as detailed in the drawings and described in the contract documents. Refer to Section 1.04.D.1.c of this specification.
6. Expansion Joints
   a. As a minimum, expansion joints shall be placed at the following locations:
      1) Where expansion joints occur in the substrate system.
      2) Where building expansion joints occur.
      3) At floor lines in wood frame construction.
      4) At floor lines of non-wood framed buildings where significant movement is expected.

5) Where the Outsulation Plus MD Drainable System abuts dissimilar materials.
6) Where the substrate type changes
7) Where prefabricated panels abut one another
8) In continuous elevations at intervals not exceeding 23 m (75 ft).
9) Where significant structural movement occurs such as changes in roofline, building shape or structural system.

7. Terminations
   a. Prior to applying the Dryvit Outsulation Plus MD Drainable System, wall openings shall be treated with Dryvit AquaFlash System or Flashing Tape. Refer to Dryvit Outsulation System Installation Details, DS107.
   b. The Outsulation Plus MD Drainable System shall be held back from adjoining materials around openings and penetrations such as windows, doors and mechanical equipment a minimum of 19 mm (3/4 in) for sealant application. See Dryvit's Outsulation Plus MD Drainable System Installation Details, DS107.
   c. The system shall be terminated a minimum of 203 mm (8 in) above finished grade.
   d. Sealants
      1) Shall be manufactured and supplied by others.
      2) Shall be compatible with Outsulation System materials. Refer to current Dryvit Publication DS153 for listing of sealants tested by sealant manufacturer for compatibility.
      3) The sealant backer rod shall be of closed cell.
8. Vapor Retarders –Refer to Dryvit Publication DS159 for additional information.
9. Dark Colors - The use of dark colors must be considered in relation to wall surface temperature as a function of local climatic conditions. Use of dark colors in high temperature climates can affect the performance of the system.
10. Flashing: Shall be provided at all roof-wall intersections, windows, doors, chimneys, decks, balconies and other areas as necessary to prevent water from entering behind the Outsulation Plus MD System.

D. Performance Requirements
   1. The Outsulation Plus MD Drainable System shall have been tested as follows:
      a. Durability

TEST	TEST METHOD	CRITERIA	RESULTS
Abrasion Resistance	ASTM D 968	No deleterious effects after 500 liters (528 quarts)	No deleterious effects after 1000 liters (1056 quarts)
Accelerated Weathering	ASTM G 155 Cycle 1	No deleterious effects after 2000 hours	No deleterious effects after 5000 hours
	ASTM G 154 Cycle 1 (QUV)		No deleterious effects after 5000 hours
Freeze-Thaw	ASTM E 2485 (formerly EIMA 101.01)	No deleterious effects after 60 cycles	Passed - No deleterious effects after 90 cycles
	ASTM C 67 modified	No deleterious effects after 60 cycles	Passed - No deleterious effects after 60 cycles
	ASTM E 2485/ICC-ES Proc.; ICC ES (AC219)***	No deleterious effects after 10 cycles	Passed - No deleterious effects after 10 cycles
Mildew Resistance	ASTM D 3273	No growth during 28 day exposure period	No growth during 60 day exposure period

Water Resistance	ASTM D 2247	No deleterious effects after 14 days exposure	No deleterious effects after 42 days exposure
Taber Abrasion	ASTM D 4060	N/A	Passed 1000 cycles
Salt Spray Resistance	ASTM B 117	No deleterious effects after 300 hours exposure	No deleterious effects after 1000 hours exposure
Water Penetration	ASTM E 331 ICC ES (AC 219)***	No water penetration beyond the inner-most plane of the wall after 2 hours at 299 Pa (6.24 psf)	Passed 2 hours at 299 Pa (6.24 psf)
Water Vapor Transmission	ASTM E 96 Procedure B	Vapor permeable	EPS 5 perm-inch Base Coat* 40 Perms Finish** 40 Perms
* Base Coat perm value based on Dryvit Genesis® ** Finish perm value based on Dryvit Quarzputz *** AC 219 – Acceptance Criteria for EIFS			

b. Structural

TEST	TEST METHOD	CRITERIA	RESULTS
Tensile Bond	ASTM C 297/E 2134	Minimum 104 kPa (15 psi) – substrate or insulation failure	Minimum 132 kPa (19.1 psi)
Transverse Wind Load	ASTM E 330	Withstand positive and negative wind loads as specified by the building code	Minimum 4.3 kPa (90 psf)* 16 inch o.c. framing, ½ in sheathing screw attached at 203 mm (8 inch) o.c.
* All Dryvit components remain intact – for higher wind loads contact Dryvit Systems, Inc.			

c. Impact Resistance: In accordance with ASTM E 2486 (formerly EIMA Standard 101.86).

Reinforcing Mesh/Weight g/m² (oz/yd²)	Minimum Tensile Strengths	EIMA Impact Classification	EIMA Impact Range		Impact Test Results	
			Joules	(in-lbs)	Joules	(in-lbs)
Standard - 146 (4.3)	27 g/cm (150 lbs/in)	Standard	3-6	(25-49)	4	(36)
Standard Plus™ - 203 (6)	36 g/cm (200 lbs/in)	Medium	6-10	(50-89)	6	(56)
Intermediate® - 407 (12)	54 g/cm (300 lbs/in)	High	10-17	(90-150)	12	(108)
Panzer® 15 * - 509 (15)	71 g/cm (400 lbs/in)	Ultra High	>17	(>150)	18	(162)
Panzer 20 * - 695 (20.5)	98 g/cm (550 lbs/in)	Ultra High	>17	(>150)	40	(352)
Detail® Short Rolls - 146 (4.3)	27 g/cm (150 lbs/in)	n/a	n/a	n/a	n/a	n/a
Corner Mesh™ - 244 (7.2)	49 g/cm (274 lbs/in)	n/a	n/a	n/a	n/a	n/a
*Shall be used in conjunction with Standard Mesh (recommended for areas exposed to high traffic)						

d. Fire performance

TEST	TEST METHOD	CRITERIA	RESULTS
Fire Resistance	ASTM E 119	No effect on the fire resistance of a rated wall assembly	Passed 1 hour Passed 2 hour
Ignitability	NFPA 268	No ignition at 12.5 kw/m^2 at 20 minutes	Passed
Full Scale Multi-Story Fire Test	UBC Std. 26-4 (formerly 17-6)	1. Resist vertical spread of flame within the core of the panel from one story to the next 2. Resist flame propagation over the exterior surface 3. Resist spread of vertical flame over the interior surface from one story to the next 4. Resist significant lateral spread of flame from the compartment of fire origin to adjacent spaces	Passed
Intermediate Multi-Story Fire Test	NFPA 285 (UBC 26-9)	1. Resist flame propagation over the exterior surface 2. Resist vertical spread of flame within combustible core/component of panel from one story to the next 3. Resist vertical spread of flame over the interior surface from one story to the next 4. Resist lateral spread of flame from the compartment of fire origin to adjacent spaces	Passed
Full Scale Multi-Story* (corner test)	ANSI FM 4880	Resist flame propagation over the exterior surface.	Passed; No height restrictions*
* Dryvit FM products must be specified			

2. The Outsulation components shall be tested for:
   a. Fire

TEST	TEST METHOD	CRITERIA	RESULTS
Surface Burning Characteristics	ASTM E 84	All components shall have a: Flame Spread $\leq$ 25 Smoke Developed $\leq$ 450	Passed

b. Durability

TEST	TEST METHOD	CRITERIA	RESULTS
Reinforcing Mesh **Alkali Resistance of Reinforcing Mesh**	ASTM E 2098 (formerly EIMA 105.01)	> 21dN/cm (120 pli) retained tensile strength after exposure	Passed
EPS (Physical Properties) **Density** **Thermal Resistance**	ASTM C 303, D 1622 ASTM C 177, C 518	15.2-20.0 kg/m^3 (0.95-1.25 lb/ft^3) 4.0 @ 4.4 ℃ (40 ℉)	Pass Pass Pass

Water Absorption	ASTM C 272	3.6 @ 23.9 °C (75 °F)	Pass
Oxygen Index	ASTM D 2863	2.5 % max. by volume	Pass
Compressive Strength	ASTM D 1621 Proc. A	24% min. by volume	Pass
Flexural Strength	ASTM C 203	69 kPa (10 psi) min.	Pass
Flame Spread	ASTM E 84	172 kPa (25 psi) min.	Pass
Smoke Developed		450 max.	Pass
Flame Spread		25 max.	Pass

1.05 SUBMITTALS

A. Product Data – The contractor shall submit to the owner/architect the manufacturer's product data sheets describing products, which will be used on this project.

B. Shop Drawing for Panelized Construction: The panel fabricator shall prepare and submit to the owner/architect complete drawings, showing: wall layout, connections, details, expansion joints and installation sequence.

C. Samples: The contractor shall submit to the owner/architect two (2) samples of the Outsulation System for each finish, texture and color to be used on the project. The same tools and techniques proposed for the actual installation shall be used. Samples shall be of sufficient size to accurately represent each color and texture being utilized on the project.

D. Test Reports – When requested, the contractor shall submit to the owner/architect copies of selected test reports verifying the performance of the Outsulation System.

1.06 QUALITY ASSURANCE

A. Qualifications
   1. System Manufacturer: Shall be Dryvit Systems, Inc. All materials shall be manufactured or sold by Dryvit and shall be purchased from Dryvit or its authorized distributors.
      a. Materials shall be manufactured at a facility covered by a current ISO 9001:2000 certification. Certification of the facility shall be done by a registrar accredited by the American National Standards Institute, Registrar Accreditation Board (ANSI-RAB).
   2. Contractor: Shall be knowledgeable in the proper installation of the Dryvit Outsulation Plus MD Drainable System and shall be experienced and competent in the installation of Exterior Insulation and Finish Systems. Additionally, the contractor shall possess a current Outsulation System Trained Contractor Certificate* issued by Dryvit Systems, Inc.
   3. Insulation Board Manufacturer: Shall be listed by Dryvit Systems, Inc., shall be capable of producing the Expanded Polystyrene (EPS) in accordance with current Dryvit Specification for Insulation Board, DS131, and shall subscribe to the Dryvit Third Party Certification and Quality Assurance Program.
   4. Panel Fabricator: Shall be a contractor experienced and competent in the fabrication of architectural wall panels and shall possess a current Outsulation System Contractor Certificate* issued by Dryvit Systems, Inc.
   5. Panel Erector: Shall be experienced and competent in the installation of architectural wall panel systems and shall be:
      a. The panel fabricator, or
      b. An erector approved by the panel fabricator or
      c. An erector under the direct supervision of the panel fabricator

B. Regulatory Requirements
1. The EPS shall be separated from the interior of the building by a minimum 15-minute thermal barrier.
2. The use and maximum thickness of EPS shall be in accordance with the applicable building codes.

C. Certification
1. The Outsulation Plus MD Drainable System shall be recognized for the intended use by the applicable building code(s).

D. Mock-Up
1. The contractor shall, before the project commences, provide the owner/architect with a mock-up for approval.
2. The mock-up shall be of suitable size as required to accurately represent the products being installed, as well as each color and texture to be utilized on the project.
3. The mock-up shall be prepared with the same products, tools, equipment and techniques required for the actual application. The finish used shall be from the same batch that is being used on the project.
4. The approved mock-up shall be available and maintained at the job site.
5. For panelized construction, the mock-up shall be available and maintained at the panel fabrication location.

1.07 DELIVERY, STORAGE AND HANDLING

A. All Dryvit materials shall be delivered to the job site in the original, unopened packages with labels intact.

B. Upon arrival, materials shall be inspected for physical damage, freezing, or overheating. Questionable materials shall not be used.
1. Materials shall be stored at the jobsite in a cool, dry location, out of direct sunlight, protected from weather and other sources of damage. Minimum storage temperature shall be as follows:
a. Demandit®, Revyvit®: 7 °C (45 °F)
2. Maximum storage temperature shall not exceed 38° C (100 °F).

NOTE: Minimize exposure of materials to temperatures over 32 °C (90 °F). Finishes exposed to temperatures over 43 °C (110 °F) for even short periods may exhibit skinning, increased viscosity and should be inspected prior to use.

C. Protect all products from inclement weather and direct sunlight.

1.08 PROJECT CONDITIONS

A. Environmental Requirements
1. Application of wet materials shall not take place during inclement weather unless appropriate protection is provided. Protect materials from inclement weather until they are completely dry.
2. At the time of application, the minimum air and wall surface temperatures shall be as follows:
a. Demandit, Revyvit: 7 °C (45 °F) To be determined with a recordable thermometer left on project site for a 24 hour period.
3. These temperatures shall be maintained with adequate air ventilation and circulation for a minimum of 24 hours (48 hours for Ameristone, TerraNeo and Lymestone) thereafter, or until the products are completely dry. Refer to published product data sheets for more specific information.

B. Existing Conditions - The contractor shall have access to electric power, clean water, and a clean work area at the location where the Dryvit materials are to be applied.

1.09 SEQUENCING AND SCHEDULING

A. Installation of the Outsulation Plus MD System shall be coordinated with other construction trades.

B. Sufficient manpower and equipment shall be employed to ensure a continuous operation, free of cold joints, scaffold lines, texture variations, etc.

1.10 LIMITED MATERIALS WARRANTY

A. Dryvit Systems, Inc. shall provide a limited warranty against defective material upon written request. Dryvit shall make no other warranties, expressed or implied. Dryvit does not warrant workmanship. Full details are available from Dryvit Systems, Inc.

B. The applicator shall warrant workmanship separately. Dryvit shall not be responsible for workmanship associated with installation of the Outsulation Plus MD System.

1.11 MAINTENANCE

A. Maintenance and repair shall follow the procedures noted in Dryvit Outsulation Application Instructions, DS204.

B. All Dryvit products are designed to minimize maintenance. However, as with all building products, depending on location, some cleaning may be required. See Dryvit publication DS152 on Cleaning & Recoating.

C. Sealants and Flashings should be inspected on a regular basis and repairs made as necessary.

PART II – PRODUCTS

2.01 MANUFACTURER

A. All components of the Outsulation Plus MD System shall be supplied or obtained from Dryvit or its authorized distributors. Substitutions or additions of materials other than specified will void the warranty. ***Refer to the Elevations for material and color selections. Colors are Brand specific and must match the Pantone PMS colors listed.***

2.02 MATERIALS

A. Portland Cement: Shall be Type I or II, meeting ASTM C 150, white or gray in color, fresh and free of lumps.

B. Water: Shall be clean and free of foreign matter.

C. Mechanical Fasteners (required when installing in accordance with DS135): Shall be Wind-lock's Wind Devil™ plates, or equivalent, used in conjunction with corrosion resistant fasteners appropriate for the substrate system.

2.03 COMPONENTS – All liquid barriers to be trowled to drain.

A. Flashing Materials: Used to protect substrate edges at terminations.
1. Liquid Applied: An extremely flexible water-based polymer material, ready for use.
a. Shall be AquaFlash and AquaFlash Mesh
2. Sheet Type:
a. Shall be Flashing Tape and Surface Conditioner
1) Dryvit Flashing Tape™: A high density polyethylene film backed with a rubberized asphalt adhesive available in rolls 102 mm (4 in), 152 mm (6 in) and 229 mm (9 in) wide by 23 m (75 ft) long.
2) Dryvit Flashing Tape Surface Conditioner™: A water-based surface conditioner and adhesion promoter for the Dryvit Flashing Tape.

B. Adhesives: Used to adhere the EPS to the substrate, shall be compatible with the substrate and the EPS.
1. Cementitious: A liquid polymer-based material, which is field mixed with Portland cement for use over non wood-based substrates.
a. Shall be Primus®, Genesis® or Genesis FM
2. Ready mixed: A dry blend cementitious, copolymer-based product, field mixed with water for use over non wood-based substrates.
a. Shall be Primus® DM, Genesis® DM, Genesis® DMS, Rapidry DM 35-50 or Rapidry DM 50-75.
3. Noncementitious: A factory-mixed, fully formulated water-based adhesive for use over wood-based substrates.
a. Shall be ADEPS®.

C. Insulation Board: Expanded polystyrene meeting Dryvit Specification for Insulation Board, DS131.
1. Thickness of insulation board shall be minimum 19 mm (3/4 in) and shall be maintained at all locations. **Note: Dryvit recommends that a minimum of 25 mm (1 in) thick insulation board be installed to maintain the minimum thickness after rasping, reveals are installed, etc.**
2. The insulation board shall be manufactured by a board supplier listed by Dryvit Systems, Inc.

D. Base Coat: Shall be compatible with the EPS insulation board and reinforcing mesh(es).
1. Cementitious: A liquid polymer-based material, which is field mixed with Portland cement.
a. Shall be Primus, Genesis or Genesis FM.
2. Noncementitious: A factory-mixed, fully formulated, water-based product.
a. Shall be NCB™.
3. Ready mixed: A dry blend cementitious, copolymer-based product, field mixed with water.
a. Shall be Primus DM, Genesis DM, Genesis DMS, Rapidry DM 35-50 or Rapidry DM 50-75.

E. Reinforcing Mesh: A balanced open weave, glass fiber fabric treated for compatibility with other system materials.

F. Color & Finish: Shall be the type, color and texture to match the existing EIFS system.

G. Drainage Track: UV treated PVC “J” channel perforated with weep holes, complying with ASTM D1784 and C1063. Drainage track usage is limited to the base of the system at finished grade level when installing system in noncombustible construction. All other horizontal terminations shall utilize the Dryvit Drainage Strip as shown in Outsulation Plus MD Drainable Installation Details. Reference to manufacturer detail DS110.

PART III – EXECUTION

3.01 EXAMINATION

A. Prior to installation of the Outsulation Plus MD Drainable System, the contractor shall verify that the substrate:
   1. Is of a type listed in Section 1.04.C.1.
   2. Is flat within 6.4 mm (1/4 in) in a 1.2 m (4 ft) radius.
   3. Is sound, dry, connections are tight, has no surface voids, projections or other conditions that may interfere with the Outsulation Plus MD Drainable System installation or performance.

B. Prior to the installation of the Outsulation Plus MD Drainable System, the architect or general contractor shall insure that all needed flashings and other waterproofing details have been completed, if such completion is required prior to the Outsulation application. Additionally, the Contractor shall ensure that:
   1. Metal roof flashing has been installed in accordance with Asphalt Roofing Manufacturers Association (ARMA) Standards.
   2. Openings are flashed in accordance with the Outsulation System Installation Details, DS107, or as otherwise necessary to prevent water penetration.
   3. Chimneys, Balconies, and Decks have been properly flashed.
   4. Windows, Doors, etc. are installed and flashed per manufacturer's requirements and the Outsulation Plus MD Drainable System Installation Details, DS107.

C. Prior to the installation of the Outsulation Plus MD Drainable System, the contractor shall notify the general contractor, and/or architect, and/or owner of all discrepancies.

3.02 PREPARATION

A. The Outsulation materials shall be protected by permanent or temporary means from inclement weather and other sources of damage prior to, during, and following application until completely dry.

B. Protect adjoining work and property during Outsulation installation.

C. The substrate shall be prepared as to be free of foreign materials, such as, oil, dust, dirt, form release agents, efflorescence, paint, wax, water repellants, moisture, frost and any other condition that inhibit adhesion.

3.03 INSTALLATION

A. The system shall be installed in accordance with the current Dryvit Outsulation Plus MD Drainable System Application Instructions, DS204.

B. The overall minimum base coat thickness shall be sufficient to fully embed the mesh. The recommended method is to apply the base coat in two (2) passes.

C. Sealant shall not be applied directly to textured finishes or base coat surfaces. Dryvit Outsulation Plus MD Drainable System base coat surfaces in contact with sealant shall be coated with Demandit or Color Prime.

D. When installing the Outsulation Plus MD Drainable System, the notched trowel method of adhesive application shall be used over gypsum sheathing substrates.

3.04 FIELD QUALITY CONTROL

A. The contractor shall be responsible for the proper application of the Outsulation materials.

B. Dryvit assumes no responsibility for on-site inspections or application of its products.

C. If required, the contractor shall certify in writing the quality of work performed relative to the substrate system, details, installation procedures, workmanship and as to the specific products used.

D. If required, the EPS supplier shall certify in writing that the EPS meets Dryvit's specifications.

E. If required, the sealant contractor shall certify in writing that the sealant application is in accordance with the sealant manufacturer's and Dryvit's recommendations.

3.05 CLEANING

A. All excess Outsulation Plus MD Drainable System materials shall be removed from the job site by the contractor in accordance with contract provisions and as required by applicable law.

B. All surrounding areas, where the Outsulation System has been installed, shall be left free of debris and foreign substances resulting from the contractor's work.

3.06 PROTECTION

A. The Outsulation Plus MD Drainable System shall be protected from inclement weather and other sources of damage until dry and permanent protection in the form of flashings, sealants, etc. are installed.

- END OF SECTION -

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Ethylene-Propylene-Diene-Monomer Roofing (EPDM) roofing system, including all components specified.

B. Comply with the published recommendations and instructions of the roofing membrane manufacturer, at http://manual.fsbp.com.

C. Commencement of work by Contractor shall constitute acknowledgement by Contractor that this specification can be satisfactorily executed, under the project conditions and with all necessary prerequisites for warranty acceptance by roofing membrane manufacturer. No modification of the Contract Sum will be made for failure to adequately examine the Contract Documents or the project conditions.

1.02 RELATED REQUIREMENTS

A. Section 06 20 13 – Rough & Finish Carpentry: Wood nailers associated with roofing and roof insulation.

B. Section 07 60 00 – Flashing & Sheet Metal: Formed metal flashing and trim items associated with roofing.

1.03 DEFINITIONS

A. LTTR: Long Term Thermal Resistance, as defined by CAN-ULC S770.

1.04 REFERENCE STANDARDS

A. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2012.

B. CAN-ULC-S770 - Standard Test Method Determination of L-Term Thermal Resistance Of Closed-Cell Thermal Insulating Foams; 2009.

1.05 SUBMITTALS

A. See Section 01 33 00 - Administrative Requirements, for submittal procedures.

B. Product Data:
   1. Provide membrane manufacturer's printed data sufficient to show that all components of roofing system, including insulation and fasteners, comply with the specified requirements and with the membrane manufacturer's requirements and recommendations for the system type specified; include data for each product used in conjunction with roofing membrane.

C. Samples: Submit samples of each product to be used.

D. Specimen Warranty: Submit prior to starting work.

E. Installer Qualifications: Letter from manufacturer attesting that the roofing installer meets the specified qualifications.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver products in manufacturer's original containers, dry and undamaged, with seals and labels intact and legible.

B. Store materials clear of ground and moisture with weather protective covering.

C. Keep combustible materials away from ignition sources.

1.07 WARRANTY

A. Comply with all warranty procedures required by manufacturer, including notifications, scheduling, and inspections.

B. Warranty: Firestone Limited Warranty covering membrane, roof insulation, and other indicated components of the system, for the term indicated.
   1. Limit of Liability: No dollar limitation.

2. Scope of Coverage: Repair leaks in the roofing system caused by:
   a. Ordinary wear and tear of the elements.
   b. Manufacturing defect in Firestone brand materials.
   c. Defective workmanship used to install these materials.
   d. Damage due to winds up to 72 mph (116 km/h).
3. Not Covered:
   a. Damage due to winds in excess of 72 mph (116 km/h).
   b. Damage due hurricanes or tornadoes.
   c. Hail.
   d. Intentional damage.
   e. Unintentional damage due to normal rooftop inspections, maintenance, or service.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturer - Roofing System: Firestone Building Products LLC, Carmel, IN: www.firestonebpco.com.

B. Manufacturer of Insulation and Cover Boards: Same manufacturer as roof membrane.

C. Manufacturer of Metal Roof Edging: Same manufacturer as roof membrane.

2.02 ROOFING SYSTEM DESCRIPTION

A. Roofing System: Ethylene-propylene-diene-monomer (EPDM) single-ply membrane.
   1. Membrane Attachment: Fully adhered.
   2. Warranty: Full system warranty; Firestone 20 year Red Shield Limited Warranty covering membrane, roof insulation , and membrane accessories.
   3. Comply with applicable local building code requirements.

B. Roofing System Components: Listed in order from the top of the roof down:
   1. Membrane: Thickness as specified in paragraph 2.03.
   2. Insulation:
      a. Maximum Board Thickness: 3.25 inches (75 mm); use as many layers as necessary; stagger joints in adjacent layers.
      b. Tapered: Slope as indicated on drawings; place tapered layer on bottom.
      c. Total R Value: 24, minimum average.
      d. Crickets: Tapered insulation of same type as specified for top layer; slope as indicated.
      e. Provide 3/4” Perlite board on metal deck.

2.03 EPDM MEMBRANE MATERIALS

A. Roofing and Flashing Membrane: Black, cured synthetic single-ply membrane composed of ethylene propylene diene terpolymer (EPDM) with the following properties:
   1. Reinforcement: None; membrane complying with ASTM D 4637 Type I.
   2. Thickness: 0.060 inch (1.5 mm).
   3. Nominal Thickness Tolerance: Plus/minus 10 percent.
   4. Acceptable Product: RubberGard Platinum EPDM Membrane by Firestone.

B. Flashing Membrane: Self-curing, non-reinforced membrane composed of nonvulcanized EPDM rubber, complying with ASTM D 4811 Type II.

C. Self-Adhesive Flashing Membrane: Semi-cured 45 mil EPDM membrane laminated to 35 mil (0.9 mm) EPDM tape adhesive; QuickSeam Flashing by Firestone.

D. Pre-Molded Pipe Flashings: EPDM, molded for quick adaptation to different sized pipes; Firestone EPDM Pipe Flashing.

E. Self-Adhesive Lap Splice Tape: 35 mil (0.9 mm) EPDM-based, formulated for compatibility with EPDM membrane and high-solids primer; QuickSeam Splice Tape by Firestone.

F. Bonding Adhesive: Neoprene-based, formulated for compatibility with EPDM membrane and wide variety of substrate materials, including masonry, wood, and insulation facings; LVOC Single Ply Bonding Adhesive by Firestone.

G. Adhesive Primer: Synthetic rubber based primer formulated for compatibility with EPDM membrane and tape adhesive, with VOC content less than 2.1 lb/gal (250 g/L); QuickPrime Plus LVOC by Firestone.

H. Seam Edge Treatment: EPDM rubber-based sealant, formulated for sealing exposed edges of membrane at seams; Lap Sealant HS by Firestone.

I. Pourable Sealer: Two-part polyurethane, two-color for reliable mixing; Pourable Sealer by Firestone.

J. Water Block Seal: Butyl rubber sealant for use between two surfaces, not exposed; Water Block Seal by Firestone.

K. Termination Bars: Aluminum bars with integral caulk ledge; 1.3 inches (33 mm) wide by 0.10 inch (2.5 mm) thick; Firestone Termination Bar by Firestone.

2.04 ROOF INSULATION

A. Polyisocyanurate Board Insulation: Closed cell polyisocyanurate foam with black glass reinforced mat laminated to faces, complying with ASTM C1289 Type II Class 1, with the following additional characteristics:

1. Thickness: As indicated elsewhere to achieve minimum average R-20.
2. Size: 48 inches (1220 mm) by 96 inches (2440 mm), nominal.
   a. Exception: Insulation to be attached using adhesive or asphalt may be no larger than 48 inches (1220 mm) by 48 inches (1220 mm), nominal.
3. R-Value (LTTR):
   a. Calculated based on 1.0 inch (25 mm) Thickness = 6.0, minimum.
4. Compressive Strength: 20 psi (138 kPa) when tested in accordance with ASTM C1289.
5. Ozone Depletion Potential: Zero; made without CFC or HCFC blowing agents.
6. Recycled Content: 19 percent post-consumer and 15 percent post-industrial, average.

PART 3 INSTALLATION

3.01 GENERAL

A. Install roofing, insulation, flashings, and accessories in accordance with roofing manufacturer's published instructions and recommendations for the specified roofing system. Where manufacturer provides no instructions or recommendations, follow good roofing practices and industry standards. Comply with federal, state, and local regulations.

B. Obtain all relevant instructions and maintain copies at project site for duration of installation period.

C. Do not start work until Pre-Installation Notice has been submitted to manufacturer as notification that this project requires a manufacturer's warranty.

D. Perform work using competent and properly equipped personnel.

E. Temporary closures, which ensure that moisture does not damage any completed section of the new roofing system, are the responsibility of the applicator. Completion of flashings, terminations, and temporary closures shall be completed as required to provide a watertight condition.

F. Install roofing membrane only when surfaces are clean, dry, smooth and free of snow or ice; do not apply roofing membrane during inclement weather or when ambient conditions will not allow proper application; consult manufacturer for recommended procedures during cold weather.

G. Protect adjacent construction, property, vehicles, and persons from damage related to roofing work; repair or restore damage caused by roofing work.
   1. Protect from spills and overspray from bitumen, adhesives, sealants and coatings.
   2. Particularly protect metal, glass, plastic, and painted surfaces from bitumen, adhesives, and sealants within the range of wind-borne overspray.
   3. Protect finished areas of the roofing system from roofing related work traffic and traffic by other trades.

H. Until ready for use, keep materials in their original containers as labeled by the manufacturer.

I. Consult membrane manufacturer's instructions, container labels, and Material Safety Data Sheets (MSDS) for specific safety instructions. Keep all adhesives, sealants, primers and cleaning materials away from all sources of ignition.

3.02 EXAMINATION

A. Examine roof deck to determine that it is sufficiently rigid to support installers and their mechanical equipment and that deflection will not strain or rupture roof components or deform deck.

B. Verify that surfaces and site conditions are ready to receive work. Correct defects in the substrate before commencing with roofing work.

C. Examine roof substrate to verify that it is properly sloped to drains.

D. Verify that the specifications and drawing details are workable and not in conflict with the roofing manufacturer's recommendations and instructions; start of work constitutes acceptable of project conditions and requirements.

3.03 PREPARATION

A. Take appropriate measures to ensure that fumes from adhesive solvents are not drawn into the building through air intakes.

B. Prior to proceeding, prepare roof surface so that it is clean, dry, and smooth, and free of sharp edges, fins, roughened surfaces, loose or foreign materials, oil, grease and other materials that may damage the membrane.

C. Fill all surface voids in the immediate substrate that are greater than 1/4 inch (6 mm) wide with fill material acceptable insulation to membrane manufacturer.

3.04 INSULATION AND COVER BOARD INSTALLATION

A. Install insulation in configuration and with attachment method(s) specified in PART 2, under Roofing System.

B. Install only as much insulation as can be covered with the completed roofing system before the end of the day's work or before the onset of inclement weather.

C. Lay roof insulation in courses parallel to roof edges.

D. Neatly and tightly fit insulation to all penetrations, projections, and nailers with gaps not greater than 1/4 inch (6 mm). Fill gaps greater than 1/4 inch (6 mm) with acceptable insulation. Do not leave the roofing membrane unsupported over a space greater than 1/4 inch (6 mm).

E. Mechanical Fastening: Using specified fasteners and insulation plates engage fasteners through insulation into deck to depth and in pattern required by membrane manufacturer.

3.05 SINGLE-PLY MEMBRANE INSTALLATION

A. Beginning at low point of roof, place membrane without stretching over substrate and allow to relax at least 30 minutes before attachment or splicing; in colder weather allow for longer relax time.

B. Lay out the membrane pieces so that field and flashing splices are installed to shed water.

C. Install membrane without wrinkles and without gaps or fishmouths in seams; bond and test seams and laps in accordance with membrane manufacturer's instructions and details.

D. Install membrane adhered to the substrate, with edge securement as specified.

E. Adhered Membrane: Bond membrane sheet to substrate using membrane manufacturer's recommended bonding material, application rate, and procedures.

F. Edge Securement: Secure membrane at all locations where membrane terminates or goes through an angle change greater than 2 in 12 inches (1:6) using mechanically fastened reinforced perimeter fastening strips, plates, or metal edging as indicated or as recommended by roofing manufacturer.
   1. Exceptions: Round pipe penetrations less than 18 inches (460 mm) in diameter and square penetrations less than 4 inches (200 mm) square.
   2. Metal edging is not merely decorative; ensure anchorage of membrane as intended by roofing manufacturer.

3.06 FLASHING AND ACCESSORIES INSTALLATION

A. Install flashings, including laps, splices, joints, bonding, adhesion, and attachment, as required by membrane manufacturer's recommendations and details.

B. Metal Accessories: Install metal edgings, gravel stops, and copings in locations indicated on the drawings, with horizontal leg of edge member over membrane and flashing over metal onto membrane.
   1. Follow roofing manufacturer's instructions.
   2. Remove protective plastic surface film immediately before installation.
   3. Install water block sealant under the membrane anchorage leg.
   4. Flash with manufacturer's recommended flashing sheet unless otherwise indicated.
   5. Where single application of flashing will not completely cover the metal flange, install additional piece of flashing to cover the metal edge.
   6. If the roof edge includes a gravel stop and sealant is not applied between the laps in the metal edging, install an additional piece of self-adhesive flashing membrane over the metal lap to the top of the gravel stop; apply seam edge treatment at the intersections of the two flashing sections.
   7. When the roof slope is greater than 1:12, apply seam edge treatment along the back edge of the flashing.

3.07 FINISHING AND WALKWAY INSTALLATION

A. Install walkways at access points to the roof, around rooftop equipment that may require maintenance, and where indicated on the drawings.

3.08 FIELD QUALITY CONTROL

A. Inspection by Manufacturer: Provide final inspection of the roofing system by a Technical Representative employed by roofing system manufacturer specifically to inspect installation for warranty purposes (i.e. not a sales person).

B. Perform all corrections necessary for issuance of warranty.

3.09 CLEANING

A. Clean all contaminants generated by roofing work from building and surrounding areas, including bitumen, adhesives, sealants, and coatings.

B. Repair or replace building components and finished surfaces damaged or defaced due to the work of this section; comply with recommendations of manufacturers of components and surfaces.

C. Remove leftover materials, trash, debris, equipment from project site and surrounding areas.

3.10 PROTECTION

A. Where construction traffic must continue over finished roof membrane, provide durable protection and replace or repair damaged roofing to original condition.

END OF SECTION

PART I - GENERAL

1 .01 GENERAL

The Drawings, Instructions to Bidders, Form of Proposal, General Conditions, Supplementary General Conditions, and Division 1 are included herein and govern work under this section.

1 .02 DESCRIPTION OF WORK

A. Provide labor and materials and everything necessary for, and incidental to the execution and completion of the flashing and sheet metal work indicated on the drawings and specified herein

B. The following items are specifically included without limiting the generality implied by these specifications and the drawings:
   1. Sheet Metal Flashing/Trim
   2. Cap Flashing
   3. Thru-Wall Flashing
   4. Coping system (metal).
   5. Vent Stack Flashing.
   6. Reglets and Counter-flashings.
   7. Miscellaneous Materials and Accessories

Examine drawings and specifications to determine nature of construction. Provide items in advance of use that are to be built into work by other trades, or may interfere with the normal installation or quality of their work.

1 .03 REFERENCES

A. AISC - Stainless Steel, Uses in Architecture.

B. ASTM A167 – Standard Specification for Stainless and Heat-Resisting Chromium-Nickel SteelPlate

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

D. ASTM B32 – Standard Specification for Solder Metal

E. ASTM B101 - Standard Specification for Lead-Coated Copper Sheet and Strip for Building Construction

F. ASTM B209 – Standard Specification for Aluminum and Alloy Sheet and Plate

G. ASTM B370 – Standard Specification for Copper Sheet and Strip for Building Construction

H. ASTM B813 - Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube.

I. ASTM D226 – Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing

J. ASTM D4586 – Standard Specification for Asphalt Roof Cement, Asbestos-Free

H. FS O-F-506 - Flux, Soldering, Paste and Liquid

I. NRCA (National Roofing Contractors Association) - Roofing Manual

J. SMACNA - Architectural Sheet Metal Manual

1 .04 SUBMITTALS

A. Product Data: Submit manufacturer's product data, installation instructions and general recommendations for each specified sheet material and fabricated product.
B. Samples: Submit 8" square samples of specified sheet materials to be exposed as finished surfaces. Submit 12" long, completely finished units of specified factory-fabricated products.
C. Shop Drawings: Submit shop drawings showing layout, joining, profiles and anchorages of fabricated work, including but not limited to counter-flashings,

PART II - PRODUCTS

2 .01 MATERIALS

A. Sheet Metal Flashing/Trim:
1. Aluminum Sheet: Commercial quality, ASTM B209, 6063-T5 alloy, mill finish, shop precoated, 0.032" thick (minimum) except as otherwise indicated.

B. Cap Flashing: Aluminum pre-finished sheet of alloy and temper recommended by the aluminum producer for the use intended. Thickness shall be .032" thick (20 gauge). Finish shall be clear anodized. Cap flashing shall be shaped to profiles shown on drawings; workmanship shall follow SMACNA standards. Field work shall provide sharp clean profiles and properly fitted joints to exclude weather.

C. Thru-Wall Flashing:
1. Furnish to mason for installation of concealed flashings over lintels of all exterior openings, under window sills and as elsewhere indicated on the drawings or wherever flashings are set in a bed of mortar. Form around intersecting columns or other projects that occur in line of flashing. All flashings in exterior walls shall extend through the wall to within ½" of the exterior face and turn up 2" on the interior unless otherwise shown on drawings.
2. All thru-wall flashing set by mason shall be set with a bed of mortar above and below the flashing and shall be installed in strict accordance with the plans and specifications. The roofing and sheet metal subcontractor shall supervise and be responsible for its proper installation.
3. Shall be either Wasco Copper-Fabric flashing as manufactured by Wasco Products, Inc. or by Grace Perm-A-Barner Flashing as manufactured by Grace Construction Products. Fabric shall consist of full sheet of copper weighing 3 ounces per square foot, bonded to and between two (2) layers of coarsely woven asphalt saturated cotton fabric. Flashing shall be grooved with a series of parallel depressions and drip edge.

D. Coping System (Metal):

1. Metal: .063 aluminum with Kynar coatings; Coping cap: length of 12'-0" (3.65 m), widths to 24" manufactured to job requirements. True radii may be built to template. Coping vertical face and back leg: 2¼" to 12½" manufactured to job requirements. Concealed splice plates: 8" wide. Finish to match finish of coping cap with factory applied dual non-curing sealant strips. Anchor/Support Cleat: 20 ga. prepunched galvanized cleat with stainless steel spring mechanically locked to cleat normally 12" (305 mm) wide @ 4'-0" (1.22 M) on center. Mechanically fastened as indicated and detailed. Fasteners: Shall provide a minimum pull out resistance of 240# (109 kg) per substrate application. No exposed fasteners shall be permitted. Fasteners shall be electrolytically compatible.
2. Finishes: Shall be standard pre-coated Kynar 500 from manufacturer’s color list. Color shall match exist.
3. Furnish and install custom formed coping system as detailed and noted on the drawings. Aluminum shall be .063. Finish shall be anodized, color to be selected by the Architect.

4. Gutter/splice plate shall be aluminum finished to match coping. Anchor plate shall be galvanized steel. Finish shall be Super-Cote II baked enamel.

E. Vent Stack Flashing:
1. Preformed stainless steel vent extensions with a vandal proof cap.
2. Field verify the flashing height prior to ordering/installation to comply with the plans.

F. Reglets and Counter-flashings: Shall be prefabricated, 24-gauge with factory mitered corners.
1. Provide continuous foam backer rod and elastomeric sealant where shown.

G. Miscellaneous Materials and Accessories:
1. Solder: Provide approved sheet metal compatible lead free solder with resin flux.
2. Fasteners: Stainless Steel or other non-corrosive metal as recommended by sheet manufacturer. Match finish of exposed heads with material being fastened.
3. Bituminous Coating: FS TT-C-494 or SSPC-Paint 12, solvent type bituminous mastic, nominally free of sulfur, compounded for 15-mil dry film thickness per coat.
4. 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, non-corrosive, size and gauge required for performance.
5. Roofing Cement: ASTM D4586 with no asbestos.
6. Master Sealant: For slipping joints in flashings shall be polyisobutylene and be nonhardening, non-migrating, non-skinning, and non-drying.
7. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15-mil.

PART III - EXECUTION

3 .01. INSTALLATION

A. Flashing shall be installed where shown on drawings. Provide cements as recommended by the manufacturer and install with laps and cemented joints as recommended by the manufacturer.

B. Except as otherwise indicated, comply with manufacturer's installation instructions and recommendations and with SMACNA Architectural Sheet Metal Manual.

C. Anchor units of work securely in place by methods indicated, providing for thermal expansion of metal units; conceal fasteners and set units true to line and level as indicated.

D. Install work with laps, joints and seams that will be permanently watertight and weatherproof.Drip edge flashing shall be provided with concealed splice plates for joints 10' o. c.

E. Bed flanges of work in a thick coat of bituminous roofing cement where required for waterproofing performance.

F. Provide for separation of metal from non-compatible metal or corrosive substrates by coating concealed surfaces at locations of contract, with bituminous coating to other permanent separation as recommended by manufacturer/fabricator.

G. Install reglets to receive counter-flashing in manner and by methods recommended by manufacturer.

H. Install counter-flashing in reglets by snap-in seal arrangement.

I. Install elastic flashing in accordance with manufacturers' recommendations. Where required, provide for movement at joints by forming loops or bellows in width of flashing. Locate cover or filler strips at joints to facilitate complete drainage of water from flashing. Seam adjacent flashing sheets with adhesive, seal and anchor edges in accordance with manufacturer's recommendations.

3 .02. CLEANING AND PROTECTION

A. Clean exposed metal surfaces, removing substances that might cause corrosion of metal or deterioration of finishes.

B. Provide for surveillance and protection of flashings and sheet metal work during construction, to ensure the work will be without damage or deterioration, other than natural weathering at time of substantial completion.

3 .03. VERIFICATION OF ROOF GUARANTEE

The General Contractor shall verify and coordinate with the Cap Flashing Contractor and Roofing Contractor compatibility, acceptance and written roof guarantee.

- - - END OF SECTION - - -

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Roofing accessories which are installed integral with roofing membrane are specified in roofing system sections as roofing work.

1.3 SUBMITTALS

A. Product Data; Gutters, scuppers and downspouts: Manufacturer's technical product data, installation instructions and general recommendations for each specified sheet material and fabricated product.

B. Samples of the Following Items:
1. Gutters and downspouts: 6" long.
a. Hangers: Two each type.

1.4 PROJECT CONDITIONS

A. Coordinate work of this section with interfacing and adjoining work for proper sequencing of each installation. Ensure best possible weather resistance and durability of work and protection of materials and finishes.

1.5 WARRANTY

A. Furnish Owner with written five year guarantee against defective materials and workmanship for all metal flashing used in conjunction with roofing.

PART 2 - PRODUCTS

2.1 PREFINISHED GUTTERS AND DOWNSPOUTS

A. Gutters and scuppers are to be made of 3005-H25 aluminum, 0.32 gauge with 3” x 4” downspouts, .027 gauge roof aprons to be .027 gauge. Eve caps to be .019 gauge. Inside and outside miters to be .032 gauge. Downspout clips 0.14 gauge. Gutter hangers to be .051 gauge. Pre-finished, color to be selected by Architect.

2.2 MISCELLANEOUS MATERIALS AND ACCESSORIES

A. Sealant: Complying with requirements for joint sealants as specified in Division 7.

B. 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, non-corrosive, size and gage required for performance.

2.3 FABRICATED UNITS

A. General Metal Fabrication: Shop-fabricate work to greatest extent possible. Comply with details shown, and with applicable requirements of SMACNA "Architectural Sheet Metal Manual" and other recognized industry practices. Fabricate for waterproof and weather-resistant performance; with expansion provisions for running work, sufficient to permanently prevent leakage, damage or deterioration of the work. Form work to fit substrates. Comply with material manufacturer instructions and recommendations for forming material. Form exposed sheet metal work without excessive oil-canning, buckling and tool marks, true to line and levels indicated, with exposed edges folded back to form hems.

B. Seams: Fabricate non-moving seams in sheet metal with flat-lock seams. Tin edges to be seamed, form seams, and solder.

C. Expansion Provisions: Where lapped or bayonet-type expansion provisions in work cannot be used, or would not be sufficiently water/weatherproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

D. Sealant Joints: Where movable, non-expansion type joints are indicated or required for proper performance of work, form metal to provide for proper installation of sealant, in compliance with SMACNA standards.

E. Separations: Provide for separation of metal from noncompatible metal or corrosive substrates by coating concealed surfaces at locations of contact, with bituminous coating or other permanent separation as recommended by manufacturer/fabricator.

PART 3 - EXECUTION

3.1 INSTALLATION REQUIREMENTS

A. General: Except as otherwise indicated, comply with manufacturer's installation instructions and recommendations, and with SMACNA 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 which will be permanently watertight and weatherproof.

B. Gutters, Scuppers and Downspouts:
1. Provide gutters scuppers and downspouts where indicated including accessories, anchors and fasteners as required to make installation complete.
   a. Obtain necessary dimensions in field.
2. Install gutters by use of hangers in such manner that movement is not restricted.
   a. Space hangers maximum 24 inch on center.
   b. Hangers shall be capable of supporting minimum of 40 lbs. per lineal foot of gutter.
3. Install gutters to slope to downspouts.
4. Where joints are required in gutters, provide approved slip joint connector.
5. Provide end pieces, outlet tubes, caps and elbows as required.
6. Place strainers in all leader openings.

7. Install downspouts where indicated.
   a. Securely anchor downspouts with strap hangers spaced maximum 6' 0" on center.
   b. Where downspouts terminate at splash blocks, provide elbow at bottom of downspout.
   c. Where indicated, terminate downspout to drain.

3.2 CLEANING AND PROTECTION

A. Clean exposed metal surfaces, removing substances which might cause corrosion of metal or deterioration of finishes.

B. Protection: Advise Contractor of required procedures for surveillance and protection of flashings and sheet metal work during construction, to ensure that work will be without damage or deterioration, other than natural weathering at time of substantial completion.

- End of Section -

PART I - GENERAL

1.01 GENERAL

The Drawings, Instructions to Bidders, Form of Proposal, General Conditions, Supplementary General Conditions, and Division 1 are included herein and govern work under this section.

1.02 DESCRIPTION OF WORK

Provide labor, materials and equipment necessary for and incidental to the application of spray-on fireproofing to beams and girders.

1.03 COOPERATION

All fireproofing application is to be coordinated with all other trade so as not to interfere or hinder in any manner other work being done. Coordinate with steel fabricator so as not to prime steel that is scheduled for spray fireproofing.

PART II - PRODUCTS

2.01 FIBRE

A. Shall be as manufactured by Grace Construction Products GPC.
B. The fibers of Monokote MK-6 shall be a homogenous mixture of cementitious fire proofing plaster especially prepared for spraying. No asbestos fibers of any kind.

2.02 CHARACTERISTICS

A. Type 105: Monokote Acoustic 5, Z-106, Z-106/G, Z-106/HY, sprayed fibre fireproofing. U.L. approved in accordance with ASTM-E605, 73, 761, 859.
B. Fireproofing shall have a One and one-half hour rating, or UL rating listed on drawings:
   1. 1-1/2" Sprayed Fibre.
   2. UL #S701.
C. Contractor to provide plans and schedule of steel to receive fireproofing material.

A. GUARANTEES

All applications are to be guaranteed for a one (1) year period, after installation, against failure due to faulty application or material. Obtain a Guarantee Bond.

PART III - EXECUTION

3.01 APPLICATION

A. Preparation of Surfaces: All surfaces to be sprayed, such as metal, masonry, concrete or other rigid surfaces, must be clean and free of dirt, rust, grease, scale, loose paint, loose plaster, or any extraneous materials.
B. A coating of primer and adhesive shall first be sprayed to all surfaces to be treated. Application shall be made to only as much surface as can be sprayed with fiber while primer is still "tacky".
C. Apply sprayed stone fibers in an even coat to the specification listed above to obtain the required ratings.
D. All work is to be done by an experienced licensed or approved applicator.

- - - END OF SECTION - - -

PART I – GENERAL

1. 01 GENERAL

The Drawings, Instructions to Bidders, Form of Proposal, General Conditions, Supplementary General Conditions and Division 1 are included herein and govern work under this section.

1. 02 DESCRIPTION OF WORK

A. The work covered by this section of the specifications consists of providing all equipment, materials and labor, and performing all the work as required for the complete execution of caulking and sealing as indicated. Included, but not necessarily limited to, are the following:
   1. Caulking all joints between masonry and steel and aluminum frames.
   2. Caulking all around all exterior door frames, louvers and other items built into exterior walls.
   3. Caulking all joints between exterior architectural metal work and other materials.
   4. Caulking all exterior door saddles.
   5. Caulking all joints between flashing and other work beneath flashings.
   6. Sealing at control and expansion joints.
   7. Sealing or caulking at all other locations where sealant or caulking is indicated.
   8. Firestopping.

B. The following work is specified under other divisions and/or sections of the specifications:
   1. Division 3 - Premolded expansion joint filler at concrete slabs.
   2. Division 8 - Glass and Glazing.
   3. Division 2 - Joint filler and sealer for sidewalks.

1. 03 GENERAL PERFORMANCE

Except as otherwise indicated, joint sealers are required to establish and maintain airtight and waterproof continuous seals on a permanent basis, within recognized limitations of wear and aging as indicated for each application. Failures of installed sealers to comply with this requirement will be recognized as failures of materials and workmanship. All sealants and caulking shall be in compliance, meet recommendations, and be compatible to product to which it is being applied.

1. 04 SUBMITTALS

A. Product Data: Submit manufacturer's product specifications, handling, installation, curing instructions, and performance tested data sheets for each elastomeric product required. This submittal must specifically address compatibility with the materials to which they are being applied.

B. Certified Tests: With product data submit test reports for elastomeric sealants on aged performances as specified, including hardness, stain resistance, adhesion, cohesion, or tensile strength, elongation, low-temperature flexibility, compression set, modules of elasticity, water absorption, and resistance (aging, weight loss, deterioration) to heat and exposures to ozone and ultraviolet. **SWRI VALIDATION** All sealants to be validated by the Sealant Weatherproofing Restoration Institute (www.SWRIONLINE.org).

C. Samples:
   1. Submit in duplicate, samples of all material specified herein, for approval of Architect.
   2. Approved samples shall be the standard for comparison of all installed work.

1. 05 JOB CONDITIONS

Weather Conditions: Do not proceed with installation of liquid sealants under unfavorable weather conditions. Install blastomeric sealants when temperature is in lower third of temperature range recommended by manufacturer for installation.

1. 06 WARRANTY

A. Provide manufacturer's standard Non Stain Warranty .

B. Provide manufacturer's standard Weatherseal Warranty .

PART II - PRODUCTS

2. 01 MANUFACTURERS

A. Elastomeric Sealant
1. Sealant compound shall be manufactured by one of the following companies and shall comply with specification requirements:
   a. Tremco Manufacturing Company
   b. Pecora, Corp.
   c. DAP, Inc
   d. Dow Corning
2. It shall be furnished in proper consistency for gun or knife application as required.
3. Color shall be approved by the Architect.

B. Fire Stopping System
1. Fire Stop System shall be manufactured by one of the following companies and shall comply with specification requirements:
   a. Tremco Manufacturing Co. (Tremstop WBM)
   b. Specified Technologies Inc. (Spec Seal ES)
   c. Hilti (CP 606)

2. 02 ELASTOMERIC SEALANT COMPOUND

A. Elastomeric Sealant
1. Type: Low dirt pick-up, non-staining, medium-modules, one component, pre-pigmented, neutral-cure elastomeric silicone sealant.
2. Compliance: Sealant shall meet or exceed requirements of ASTMC920, Type S, Grade NS, Class 50, use NT, G, M, A and O.
3. Sealant: Dow Corning 756,790 or 795 SMS Building Sealant as manufactured by Dow Corning Corp., or approved equal.

B. All elastomeric sealing compound shall be a one-part non-acid curing silicone base.

C. Sealant shall have a Shore Hardness Durometer reading of 25 to 35 as recommended by manufacturer for specific conditions and shall withstand temperature extremes from minus degrees F. to plus 260 degrees F.

D. Sealant shall absorb movement not to exceed 100% of its applied width after ten (10) years exposure without loss of adhesion or cohesion.

E. Sealant must be non-staining and non-blushing after contact with masonry terra cotta, mortar, or metal of any kind. Exterior sealants must be non-staining and non-blushing due to exposure to the elements.

F. Color shall be selected by the Architect.

G. All elastomeric sealing compound furnished under this section shall be of the same brand unless otherwise approved by the Architect in writing.

2. 03 JOINT BACKUP

A. Joint backup material shall be compatible with sealant used.

B. Size of backup material shall be determined by the condition and as recommended by the manufacturer.

C. One of the following brands and manufacturers shall be used providing they are compatible with sealant used:
1. Aerocor PL-336 fiberglass as manufactured by Owens Corning Fiberglass Corp.
2. Ethafoam as manufactured by Dow Corning Corp.
3. Foam Polyethylene as manufactured by the Tremco Manufacturing Co.
4. Sonofoam Backer Rod as manufactured by Sonneborn, Inc.

D. Bond breaker: Joint backing should be used to control depth of joint to the recommended thickness and to prevent three-sided adhesion. Where joint design or depth of joint will not permit the use of joint backing, an adhesive backed polyethylene bond breaker tape (470 tape or 481 tape by 3M are acceptable) must be installed to prevent three-sided adhesion. Joint shall be backed by round polyurethane foam, closed-cell polyethylene, non-bleeding neoprene or butyl rod installed under the manufacturer's recommended compression. Polyurethane foam (open-cell joint backing) is approved or used in vertical joints only. It is not approved for use in cavity wall construction, rain screen construction, and Exterior Insulation and Finish Systems (EIFS).

2. 04 FIRE STOPPING SYSTEM

A. A UL listed Fire Stop System shall be installed in joints and through penetrations of fire rated floors, walls and partitions. Fire stop system shall be as tested in accordance with ASTME814, with a minimum positive pressure differential of 0.01 inch (2.49 Pa) of water and shall have an F rating and T rating of not less than the required fire resistant rating of the floor or wall penetrated.

B. Fire stop material shall be a UL listed, intumescent elastomeric specifically formulated for use in horizontal and vertical application and shall be of the type and design recommended by the material manufacturer and required by Code for the specific application.

PART III - EXECUTION

3. 01 INSPECTION

Installer must examine substrates (joint surfaces) and conditions under which joint sealer work is to be performed, and must notify Contractor in writing of unsatisfactory conditions. Do not proceed with joint sealer work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3. 02 TESTING

A. Prior to construction of building elements that will be in contact with sealant an adhesion test should be performed on all substrates meeting manufacturers' recommendation. Compatibility of sealant with all substrates must also be verified by contractor.

3. 03 JOINT PREPARATION

A. Clean joint surfaces immediately before installation of gaskets, sealants or caulking compounds. Remove dirt, insecure coatings, moisture and other substrate which could interfere with seal of gasket or bond of sealant or caulking compound. Etch concrete and masonry joint surfaces as recommended by sealant manufacturer. Roughen vitreous and glazed joint surfaces as recommended by sealant manufacturer.

B. Prime or seal joint surfaces where recommended by sealant manufacturer. Apply primer to comply with joint sealant manufacturers written recommendations. Confine primer/sealer to areas of sealant bond; do not allow spillage or migration onto adjoining surfaces.

3. 04 INSTALLATION

A. Comply with manufacturers' printed instructions except where more stringent requirements are shown or specified, and except where manufacturers' technical representative directs otherwise.

B. Rake out, clean out thoroughly all joints and recesses to be caulked or sealed so as to be free of all loose or foreign material, just prior to sealing.

C. Remove all foreign matter including methacrylate lacquer that would prohibit bond adhering to metal with a solvent recommended by manufacturer of compound.

D. Pack all joints deeper than 3/8" with joint filler to 3/8" from face of as detailed on drawings.

E. Apply manufacturers' recommended primer to concrete, masonry and stone surfaces before sealing if recommended by manufacturer.

F. Apply compound to dry surfaces only when temperature is above 40 degrees F.

G. Fill all joints and recesses completely. Finish all compounds against stop where this is provided. Elsewhere finish to a neat uniform bevel. Finish all joints with beading tool.

H. Consistency of compound shall be such as to prevent sagging.

I. Use all possible precautions to avoid smearing any compound of finished work.

J. Remove immediately all compound smeared on any adjacent surfaces, using a non-staining solvent recommended by manufacturer of compound.

K. Caulking and Sealant Joints:
   1. Minimum Caulking Joint: 1/4" x 1/4"/6mm x 6 mm; depth of joint should not exceed width of joint for joints 1/4"/6mm wide.
   2. For joints wider than 1/4"/6mm, but less than 1/2" /12mm wide, the depth of sealant should be no more than 3/8" /10 mm.
   3. For joints 1/2"/12mm to 2"/ 51mm wide, the depth of sealant should be no more than 1/2"/12 mm.
   4. Maximum Joint Size: Approximately 2"/51mm width by 1/2"/12 mm in depth in a single application. Joints several inches wide have been installed in vertical walls with multiple applications.

L. Expansion Joint Sealant:
   1. Minimum width of joint should be four times the anticipated movement, but not less than 1/4" wide.
   2. Joint depth to be 1/4" for joints 1/4" to 1/2" in width.
   3. Maximum joint depth not to exceed ½".
   4. Maximum joint size approximately 3” width x 1/2" depth in a single application.

3. 05 CURE AND PROTECTION

A. Cure sealants and caulking compounds in compliance with manufacturer's instructions and recommendations, to obtain high early bond strength, internal cohesive strength and surface durability. Advise Contractor of procedures required for cure and protection of joint sealers during construction period, so that they will be without deterioration or damage (other than normal wear and weathering) at time of substantial completion.

B. All existing work shall be adequately protected from damage and staining during all caulking and sealing operations.

- - END OF SECTION - - -

PART I - GENERAL

1.01 GENERAL

The Drawings, Instructions to Bidders, Form of Proposal, General Conditions, Supplementary General Conditions, and Division 1 are included herein and govern work under this section.

1.02 SCOPE OF WORK

A. Furnish labor and materials required for the installation of aluminum entrances shown on the drawings and specified herein. Interior door frame and borrowed lights at entry are included.

B. Glass and Glazing - Section 08 81 00.

1.03 SUBMITTALS

A. Submit shop drawings and product data in accordance with General Conditions

B. Sample of aluminum finish.

1.04 MANUFACTURER

This specification is based on products manufactured by Kawneer Company. A manufacturer considered equal to Kawneer is Vistawall.

PART II - PRODUCTS

2.01 GENERAL

A. Doors and frames to be fabricated of aluminum extrusions AA-6063-T5 aluminum alloy with Finish as directed by Architect.

B. All finish hardware for doors shall be included. Butt hinges (heavy duty), three (3) butt hinges per door, ½" high aluminum mill finish thresholds, panic devices LCN 4040 super smoothee surface closers, and sealair weatherstripping systems are included in this section. Doors and frames shall be adequately reinforced to receive all hardware.

C. Aluminum frames shall be Kawneer Trifab 451T (Thermally Broken) at exterior Series or Trifab 450 Series (Non-Thermally Broken) at interior locations

D. Provide accessory aluminum sheet material to match, where detailed in proximity of frames.

2.02 DOORS

A. Medium Style - Series 350 (Kawneer) with Adams-Rite MS 1850A deadlock with two (2) 1-5/32 diameter five-pin cylinders (key operated both sides of door). Provide architectural classic CP push bar and CO-9 pull.

B. All doors shall have mortised tension rod, mortised and reinforced corner construction.

C. Doors shall be completely and continuously weatherstripped at heads and jambs.

D. Doors shall have extruded aluminum snap-in glass with vinyl insert for puttyless glazing.

PART III - EXECUTION

3.01 INSTALLATION OF ALUMINUM ENTRANCES

A. General: Aluminum surfaces in contact with masonry concrete, wood or steel shall be protected from contact by use of neoprene gaskets or a coat of bituminous paint to prevent galvanic or corrosive action. All dimensions, elevations and slopes shall be checked to ensure proper fit and weatherstripping constructions.

B. Install frame members in accordance with manufacturer's approved shop drawings, and installation instructions. All material is to be accurately cut, fitted and secured in place.

C. Install sheet aluminum laminated/cemented to rigid substrate as detailed.

3.02 CLEANING

Clean aluminum surfaces after installation exercising care to avoid damage to finish. Remove excess grease and sealant components, dirt and other substances.

------END OF SECTION------

PART I - GENERAL

1.01 GENERAL

The Drawings, Instructions to Bidders, Form of Proposal, General Conditions, Supplementary General Conditions, and Division 1 are included herein and govern work under this section.

1.02 DESCRIPTION OF WORK

A. Extent of hollow metal doors and frames is shown and scheduled on drawings and specified herein.

B. Work included, but not necessarily limited to, is as follows:
1. Hollow metal doors.
2. Hollow metal frames for doors, transoms, sidelights, windows and other openings.
3. Knockdown metal Frames
4. Vision panels in hollow metal doors where indicated.
5. Shop prime painting.
6. Reinforcing as required and as indicated.

C. Builders hardware is specified elsewhere in Division 8.

D. Building in of anchors and grouting frames is specified in Division 4.

1.03 QUALITY ASSURANCE

A. Manufacturer: Provide standard steel doors and frames by a single firm specializing in production of this type of work.

B. Provide hollow metal doors and frames by one of the following:
1. Amweld Building Products Division
2. Ceco Corporation
3. Fenestra
4. Steel Craft Manufacturing Company
5. Curries/Assa Abloy

1.04 FIRE-RATED ASSEMBLIES

Provide fire-rated door investigated and tested as for door assemblies, complete with type of hardware to be used. Identify each fire door with Factory Mutual and/or Underwriters Laboratory labels, indicating applicable fire rating of steel door and frame. Construct and install assemblies to comply with NFPA Standard No. 80, and as herein specified.

1.05 SUBMITTALS

A. Product Data: Submit manufacturer's specifications for fabrication and installation, including data substantiating that products comply with requirements.

B. Shop Drawings: Submit for fabrication and installation of hollow metal door and frames. Include details for each frame type, elevations of door design types, conditions at opening, details of construction, location and installation requirements of finish hardware and reinforcements, and details of joints and connections. Show anchorage and accessory items.

1. Provide schedule of doors and frames using same reference numbers for details and openings as those on contract drawings.

C. Label Construction Certification: Submit manufacturer's certification for oversize fire-rated doors and frames that each assembly has been constructed with materials and methods equivalent to requirements for labeled construction.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver hollow metal work cartoned or crated to provide protection during transit and job storage.

B. Inspect hollow metal work upon delivery for damage. Minor damages may be repaired provided finish items are equal in all respects to new work and acceptable to the Architect; otherwise, remove and replace damaged items as directed.

C. Store doors and frames at building site under cover. Place units on wood sills at least 4" high, or otherwise store on floors in manner that will prevent rust and damage. Avoid use of non-vented plastic or canvas shelters which could create humidity chamber. If cardboard wrapper on door becomes wet, remove carton immediately. Provide 1/4" space between stacked doors to promote air circulation.

PART II - PRODUCTS

2.01 MATERIALS

A. Steel: In U.S. standard gauges as herein specified; prime quality, cold rolled, full pickled, double annealed, stretcher-leveled, free from scale, pitting, rust, surface or internal defects.

B. Sound Deadening: Mineral wool, fiberglass, or cord to reduce metallic ring and act as insulator. Fill in labeled door shall be in accordance with Underwriter's Laboratories, Inc.

C. Galvanized Steel Sheets: Zinc-coated carbon steel sheets of commercial quality, complying with ASTM A526, with ASTM A525, G60 zinc coating, mill phosphatized.

D. Supports and Anchors: Fabricate of not less that 18 ga. galvanized sheet steel.

E. Inserts, Bolts and Fasteners: Manufacturer's standard units, except hot-dip galvanize items to be built into exterior walls, complying with ASTM A153, Class C or D as applicable.

2.02 SHOP APPLIED PAINT

Primer: Rust-inhibitive enamel or paint, baked on, suitable as a base for specified finish paints.

2.03 FABRICATION, GENERAL

A. Fabricate hollow metal door and frame units to be rigid, neat in appearance and free from defects, warp or buckle. Whenever practicable, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory-assembled before shipment, to assure proper assemble at project site.

B. Fabricate exposed faces of doors and panels, including stiles and rails of nonflush units, from only cold-rolled steel.

C. Fabricate frames, concealed stiffeners, reinforcement, edge channels, louvers and moldings from either cold-rolled or hot-rolled steel (at fabricator's option).

D. Fabricate doors, panels and frames in wet areas (Exterior, Swimming Pools, Mechanical Rooms etc.) from galvanized sheet steel. Close top and bottom edges of exterior doors as integral part of door construction or by addition of inverted steel channels.

E. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat Phillips heads for exposed screws and bolts.

2.04 THERMAL-RATED (INSULATING) ASSEMBLIES

A. Where shown or scheduled, provide door and frame assemblies and tested in accordance with ASTM C236.

B. Unless otherwise indicated, maximum apparent U factors for thermal-rated assemblies is 0.24 BTU/hr(ft2)F.

2.05 SOUND-RATED (ACOUSTICAL) ASSEMBLIES

A. Where shown or scheduled, provide door and frame assemblies which have been fabricated as sound-reducing type, tested in accordance with ASTM E90, and classified in accordance with ASTM E413.

B. Unless otherwise indicated, minimum sound rating for acoustical assemblies is STC 33.

2.06 FINISH HARDWARE PREPARATION

A. Prepare doors and frames to receive mortised and concealed finish hardware in accordance with final Finish Hardware Schedules and templates provided by hardware supplier. Comply with applicable requirements of ANSI A 115 series specifications for door and frame preparation for hardware.

B. Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied finish hardware may be done at project site.

C. Locate finish hardware as shown on final shop drawings or, if not shown, in accordance with "Recommended Locations for Builder's Hardware," published by Door and Hardware Institute.

2.07 SHOP PAINTING

A. Clean, treat, and paint exposed surfaces of steel door and frame units, including galvanized surfaces.

B. Clean steel surfaces of mill scale, rust, oil, grease, dirt, and other foreign materials before application of paint.

C. Apply shop coat of prime paint of even consistency to provide a uniformly finished surface ready to receive finish paint.

2.08 HOLLOW METAL DOORS

A. Provide metal doors of types and styles indicated on drawings or schedules.

B. Type: Full-flush, of thickness and sizes as indicated.

C. Panel Plates: Made from one sheet of metal, two (2) sheets per door, connected by interlocking seams.

D. Gauge of Face Plates: 16 ga. for all exterior doors; 16 ga. and 18 ga. for interior doors as indicated on drawings.

E. Construction:
1. Reinforcing: Internal 20 ga. vertical reinforcing channels, spaced not over 8" on center, full height of door, uniformly spot welded to mated pans, or equivalent construction standard with manufacturer. Provide additional reinforcing as required in doors with glazing and in oversize doors.
2. Stiffeners: Continuous 18 ga. channels, welded to face plates, top and bottom of all doors.
3. Filler Channels: To close top of all exterior and interior doors.
4. Cut-outs: For vision panels, uniformly located as indicated, integrally glazed into door.
5. Moldings: Integral with and welded into door providing three (3) recessed rebates at all vision panels. Top interior glazing stop furnished. Provide standard drip molding at bottom on outside of exterior doors.
6. Astragals: On active leaf of all pairs of exterior doors, full height, of 12 ga. steel strip, 1-3/4" wide, standard type.
7. Labeled Doors: Provide Underwriters' Laboratories labels with fire resistance ratings for openings as indicated.
8. Sound Deadening: Install material in all interior voids of all doors.
   a. Form exterior frames of hot dip galvanized steel.
9. Hardware Reinforcement: Provide concealed reinforcement of sheet or bar steel to receive mortise type hardware. Include 9 ga. reinforcing for butts, 12 ga. for locksets and latchsets and 14 ga. for surface applied hardware. Include reinforcement for all door closers.
   a. Finish after assembly, clean thoroughly, grind smooth. Apply two shop coats of baked-on rust inhibitive primer.

2.09 HOLLOW METAL FRAMES (Welded)

A. Provide metal frames for doors, transoms, sidelights, borrowed lights, windows, and other openings, of types and styles as shown on drawings and schedules. Conceal fastenings, unless otherwise indicated.

B. Type:
1. Hollow metal, 16 ga., to profiles and sizes indicated. Provide where required, rough bucks with expansion shield anchors as indicated. Head member of frame shall be reinforced with 10 ga. channel shaped reinforcing for all doors exceeding 44 inches in width.

C. Welded Unit Construction: Assemble frames in shop, weld corners, molds, returns, weld to hairline joint. Grind exposed beads smooth. Corners of frames shall be mitered.

D. Combination Frames: Shop assembled and welded units for door frames with transoms, sidelights, borrowed lights, etc. as indicated, complete with muntins, mullions, impost sections, fabricated to requirements indicated. Provide glazing stops, moldings for field assembly with counter-sunk oval head self-tanning screws, not over 16" o.c.

E. Door Silencers: Prepare jamb rebates for rubber door silencers, as specified in Builder's Hardware Section. Locate three (3) for single doors, two (2) for pairs of doors.

F. Reinforcing: Provide concealed reinforcement to receive mortise type hardware, mortised, drilled and tapped to template. Reinforcement shall include 3/16" butt reinforcing 12 ga. lock strike, 14 ga. for surface applied items. Include reinforcement for door closers.

G. Anchors: Provide frames with type of anchors as indicated. Unless otherwise indicated, anchors shall be adjustable, not less than four (4) anchors per jamb. For frames set in previously placed walls, provide anchors and/or rough bucks, of design suitable for the purpose and secure with expansion bolts.

H. Label: Provide Underwriters' Laboratories label for frames for labeled doors.

I. Finish: After assembly, clean thoroughly removing all dust, scale, grease, oil and rough spots. Supply two (2) shop coats of rust inhibitive primer.

2.010 Compression Type Anchor Drywall Frame: (Knock Down)

A. Type: Shop primed knocked down steel frame consisting of separate strike and/or hinge jambs and header slip-on drywall frames for 1-3/4" doors.

B. Construction:
1. Formed from l8 ga. cold rolled steel conforming to ASTM A1008 .
2. Frames are knocked down, field assembled type. Components have diecut mitered corners that interlock rigidly when field assembled.
3. Components have backbend-returns that protect the wall surface during installation..
4. Sill anchoring is by means of screws through dimpled holes in faces.
5. Manufactured to receive 4-l/2" x 4-l/2" square corner hinges.
6. Supplied with l4 ga. zinc coated hinge reinforcement gussets premounted on hinge jambs.
7. Manufactured to receive a standard 2-3/4" or 4-7/8" A.N.S.I. strike as specified.
8. Supplied with a patented adjustable strike when the 2-3/4" strike is specified.
9. Adjustable, compression type anchors are welded to jambs and allow frame installation, plumbing and squaring after wallboard is applied .
10. Prepare jamb rebates for rubber door silencers, as specified in Builder's Hardware Section. Locate three (3) for single doors, two (2) for pairs of doors.
11. U.L. Frame is designed to be used with labeled fire doors.
12. All doors shall be of the size and thickness and machined as specified to fit the Frame. Necessary hardware (other than specified above) shall be furnished by others.
13. Doors and frames shall be installed in accordance with the manufacturer's instructions.

2.011 Stud Type Anchor Drywall Frame: (KD)

A. Type: Shop primed Frames are knocked down, field assembled or welded unit type. Components have diecut mitered corners that interlock rigidly when field assembled.

B. Construction:
   1. Formed from l8 ga. cold rolled steel conforming to ASTM A1008 .
   2. Frames are knocked down, field assembled type. Components have diecut mitered corners that interlock rigidly when field assembled.
   3. Components have backbend-returns that protect the wall surface during installation..
   4. Manufactured to receive 4-l/2" x 4-l/2" square corner hinges.
   5. Supplied with l4 ga. zinc coated hinge reinforcement gussets premounted on hinge jambs.
   6. Manufactured to receive a standard 2-3/4" or 4-7/8" A.N.S.I. strike as specified.
   7. Supplied with a patented adjustable strike when the 2-3/4" strike is specified.
   8. Prepare jamb rebates for rubber door silencers, as specified in Builder's Hardware Section. Locate three (3) for single doors, two (2) for pairs of doors.
   9. U.L. Frame is designed to be used with labeled fire doors.
   10. All doors shall be of the size and thickness and machined as specified to fit the Frame. Necessary hardware (other than specified above) shall be furnished by others.
   11. Doors and frames shall be installed in accordance with the manufacturer's instructions.

2.012 WORKMANSHIP

A. General: Shop fabricated to profiles as indicated. All edges straight and sharp. Miters and other joints tight and well formed.

B. All doors and frames to be accurately mortised for locks and hinges. All cutting, drilling, etc. to be clean and well defined with no burrs.

C. All openings in doors for lights, louvers, etc. are to be plumb and square.

D. All welding shall conform to applicable standards of American Welding Society for high grade hollow metal work. All exposed beads to be ground smooth.

PART III - EXECUTION

3.01 INSPECTION

A. Installer must examine substrate and conditions under which steel doors and frames are to be installed and must notify Contractor in writing of any conditions detrimental to proper and timely completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.02 INSTALLATION

A. General: Install hollow doors, frames, and accessories in accordance with final shop drawings and manufacturer's data, and as herein specified.

B. Placing Frames:
   1. Comply with provisions of SDI-105 "Recommended Erection Instructions for Steel Frames," unless otherwise indicated.

2. Except for frames located at in-place concrete or masonry and at drywall installations, place frames prior to construction of closing walls and ceilings. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders leaving surfaces smooth and undamaged.
   a. In masonry construction, locate three (3) wall anchors per jamb at hinge and strike levels. Building in of anchors and grouting frames is specified in Division 4.
   b. At in-place concrete or masonry construction, set frames and secure to adjacent construction with machine screws and masonry anchorage devices.
   c. Install fire-rated frames in accordance with the U.L. test procedure, machine screws and masonry anchorage devices.
   d. In metal stud partitions, install at least three (3) wall anchors per jamb at hinge and strike levels. In open steel stud partitions, place studs in wall anchors to studs with tapping screws.

C. Door Installation:
   1. For hollow metal doors accurately in frames, within clearances specified in SDI-100.
   2. Place Fire-rated doors with clearances as specified in NFPA Standard No. 80.

D. Undercutting: Doors shall be factory undercut as indicated on door schedule and as required to allow for thresholds. Install into solid blocking.

3.03 ADJUST AND CLEAN

E. Prime Coat Touch-up: Immediately after erection, sand and smooth any rusted or damaged areas of prime coat and apply touch-up of compatible air-drying primer.

F. Final Adjustments: Check and readjust operating finish hardware items, leaving steel doors and frames undamaged and in complete and proper operating condition.

- - - END OF SECTION - - -

PART I - GENERAL

1.01 GENERAL

The Drawings, Instructions to Bidders, Form of Proposal, General Conditions, Supplementary General Conditions, and Division 1 are included herein and govern work under this section.

1.02 DESCRIPTION OF WORK

A. Extent and location of each type of wood door is shown on drawings and in schedules.

B. Types of doors required include the following: molded hollow core, six-panel doors, flush wood doors solid core flush wood doors with paint grade faces as indicated on plans.

C. Shop priming of wood doors is included in this section.

D. Shop finishing of wood doors is included in this section.

E. Factory-fitting to frames (prefitting) and factory-preparation for hardware (premachining) for wood doors is included in this section.

F. Louvers for wood doors, including furnishing and installation, are specified under this section.

1.03 QUALITY ASSURANCE

A. NWMA Quality Marketing: Mark each wood door with NWMA Wood Flush Door Certification Hallmark certifying compliance with applicable requirements of ANSI/NWMA I.S. 1 series. For manufacturers not participating NWMA Hallmark Program, a certification of compliance may be substituted for marking of individual doors.

B. Fire-Rated Wood Doors: Provide wood doors with fire resistance ratings indicated or required to comply with governing regulations and which are identical in materials and type of construction to those used in assemblies which have been tested in compliance with ASTM E152 and are labeled and listed by Factory Mutual and/or Underwriters' Laboratory.

C. Manufacturer: Obtain doors from a single manufacturer to ensure uniformity in quality of appearance and construction, unless otherwise indicated.

1.04 REFERENCES

A. Comply with the applicable requirements of the following standards unless otherwise indicated:
   1. ANSI/NWMA I.S. 1, "Industry Standard for Wood Flush Doors" published by National Manufacturers Association (NWMA).

1.05 SUBMITTALS

A. Product Data: Submit door manufacturer's product data, specifications and installation instructions for each type of wood door.
   1. Include details of core and edge construction, trim for openings and louvers (if any) and similar components.
   2. Include finishing specifications for doors to receive factory-applied shop finish.

3. Include certifications as may be required to show compliance with specifications.

B. Shop Drawings: Submit shop drawings indicating location and size of each door, elevation of each kind of door, details of construction, location and extent of hardware blocking, fire ratings, requirements for factory finishing and other pertinent data.

C. Samples: Submit samples for the following:
1. Transparent Finished Doors: Submit veneer sheet from each available flitch to be used for face veneers. Also submit strips of solid wood 3" x 1'-0" of species to be used for exposed edges, trim and other solid wood components.

D. Specific Product Warranty:
1. Submit written agreement on door manufacturer's standard form signed by manufacturer, installer and contractor, agreeing to repair or replace defective doors which have warped (bow, cup or twist) or which show telegraphing of core construction below in face veneers, or do not conform to tolerance limitations of NWMA and AWI.
2. The warranty shall also include refinishing and reinstallation which may be required due to repair or replacement of defective doors.
3. Warranty shall be in effect during following period of time after date of substantial completion.
4. Solid Core Flush Interior Doors: Life of installation.

E. Product Delivery, Storage and Handling:
1. Protect wood doors during transit, storage and handling to prevent damage, soiling and deterioration. Comply with the "On-Site Core" recommendations of NWMA pamphlet "Care and Finishing of Wood Doors" and with manufacturer's instruction, and as otherwise indicated.
2. Package doors at factory prior to shipping using method indicated: Manufacturer's standard method.

PART II - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, provide products of one of the following:

1. Eggers Hardwood Products Corp.
2. Weyerhauser Company
3. Mohawk
4. Marlite; 202 Harger Street, Dover, OH 44622. 800-377-1221 Fax (330) 343-4668, E-Mail: info@marlite.com www.marlite.com

2.02 MATERIAL AND COMPONENTS

A. General: Provide wood doors complying with applicable requirements of referenced standards for kinds and types of doors indicated and as specified.

B. Face Panels:
1. Manufacturer's standard flush face panels, unless otherwise indicated.

C. Exposed Surfaces: Provide kind shown or scheduled and as further specified. Provide same exposed surface material on both faces of each door, as well as all edges, unless otherwise indicated.

D. Wood louvers: Door manufacturer's standard solid wood louvers of material to match face veneer, unless otherwise indicated. Size as shown.

E. All Glass doors and adjacent windows are to have opaque markings identifying there location. Markings are to occur in two locations, 30" AFF, but not more than 36", and 60" AFF, but not more than 66".

2.03 SIZES

Height and width, refer to Door Schedule and Details.

2.04 GENERAL FABRICATION REQUIREMENTS

A. Transom Panels: Wherever transom panels of wood are shown in same framing systems as wood doors, provide panels which match quality and appearance of associated wood doors. Fabricate matching panels with same construction, exposed surfaces and finish as specified for associated doors. Attach to frame with concealed fastening system: Window spring bolts - 1697 by Stanley or approved equal - two (2) each side of panel. See detail.

B. Openings: Cut and trim opening through doors and panels as shown. Comply with applicable requirements of referenced standards for kind(s) of doors required.

C. Light Openings: Factory cut openings. Trim openings for non-fire-rated doors with solid wood moldings of profile shown.

D. Wood Louvers: Factory install louvers in prepared openings.

E. Edge Strips: Two-ply hardwood, outer ply to match face veneer. Inner ply tongue and grooved to core.

F. Finish Preparation: Belt sanded with fine grade sandpaper to receive finishes.

2.05 INTERIOR FLUSH WOOD DOORS

A. All doors shall receive an opaque finish..

B. Solid Core Doors with Opaque Finish:
1. Quality: NWMA I.S. -1 premium grade face veneers of plain sliced unless otherwise indicated. Provide exposed edges and other exposed solid wood components of same species as face veneers.

C. Core Construction: [Particleboard, ANSI/208.1, 1-LD-2 Solid core**),**

D. Fire-Rated Core Doors:

1. Faces and AWI Grade: Provide faces and grade to match non-rated doors in same area of building, unless otherwise indicated**.**
2. Core Construction: Manufacturer's standard core construction as required to provide fire-resistance rating indicated.
3. All fire-rated doors shall exhibit Factory Mutual or Underwriters Laboratory rating label on hinge edge.

E. Doors - General: Flush wood doors faced with NEMA LD 3, Grade HGS (0.048 inch (1.21mm)) thick high pressure plastic laminate:
   1. Total Thickness: 1-3/4 inches (44mm).
   2. Facing selection: High pressure plastic laminate selected from manufacturer’s standard line of solids, patterns or wood grains.
   3. Edge Banding: Matching facing laminate.

F. Non-Fire Rated Solid Core Doors
   1. AWI Type PC-HDPL-5 and conforming to WWDA I.S 1-A:
      a. Particleboard Core - average 30 pcf (480 kg/cu m) density core, complying with ANSI A208.1 Grade LD-1.
   2. Stiles and Rails: Structural composite lumber:
      a. Stile and Top and Bottom Rail Widths - 1-3/8 inches (35mm) before trimming.
   3. Adhesive: National Casein CL1809HVJ.
   4. Provide factory cutouts for lights and black wood stops.

G. 20-Minute Fire Doors:
   1. Fire Rating: ITS (Warnock Hersey) 20-minute label.
   2. AWI Type PC-HDPl-5 FD1/3 and conforming to WWDA I.S 1-A.
      a. Particleboard Core - Average 30 pcf (480 kg/cu m) density core complying with ANSI A208.1 Grade LD-1.
   3. Stiles and Rails: Structural composite lumber.
      a. Stile and Top and Bottom Rail Widths - 1-3/8 inches (35MM) before trimming.
   4. Adhesive: Type 1 waterproof HB. Fuller XR2859.
   5. Provide factory cutouts for lights. Stops are specified in separate section.

H. Fire Doors Rated Over 20 Minutes:
   1. Fire Rating:
      a. ITS (Warlock Heresy) 45-minute label.
      b. ITS (Warlock Heresy) 60-minute label.
      c. ITS (Warlock Heresy) 90-minute label.
      d. ITS (Warlock Heresy) label in rating specified on drawings.
   2. A.I. Type FD-HDL-5:
      a. Core: Non-asbestos mineral composition.
      b. Cross-banding: 1/10 inch (2.5mm) thick 3-ply wood cross-banding.
   3. Stiles and Rails: Fire retardant treated structural composite lumber.
      a. Stiles, 1-3/8 inches (35MM) before trimming.
      b. Rails:
         1. Top” width.
         2. Bottom 2" width.
   4. Adhesive: Type 1 waterproof HB. Fuller XR2859.
   5. Provide factory cutouts for lights. Stops are specified in separate section.

I. Edge Construction: Provide manufacturer's standard laminated edge construction for improved screw-holding capability and split resistance over edges composed of a single layer of tread lumber. Exposed edge material shall match face veneer.

J. Lock Blocks: Provide lock blocks at all interior wood doors.

K. Shop Priming:
   4. Before delivery of doors to project site, shop-prime as follows:
      a. Transparent Finish: Prime doors shown or scheduled for transparent finish with stain (if required) and other required pretreatments and first coat of finish as specified in Division 9 "Painting" sections of these specifications.

L. Shop Finish:
   5. Prefinish wood doors at factory of finish shop.
   6. Comply with recommendations of A.I. for factory finishing of doors, including final sanding immediately before application of finishing materials.
   7. Provide finishes as shown or scheduled and as specified in Division 9 "Painting" sections of these specifications.

M. Prefitting and Preparation for Hardware:
   8. Prefit and premachine wood doors at factory.
   9. Comply with tolerance requirements of A.I. for prefitting. Machine doors for hardware requiring cutting of doors. Comply with final hardware schedules and door frame shop drawings and with hardware templates and other essential information required to ensure proper fit of doors and hardware.
   10. Take accurate field measurements of hardware mortises in metal frames to verify dimensions and alignment before proceeding with machining in factory.

N. Astragal: Shall be provided on inactive or less active leaf in all double door situations. Astragal shall be decorative profiled wood trim to match species and finish of door.

PART III - EXECUTION

3.01 INSPECTION

Installer must examine door frames and verify that frames are correct type and have been installed as required for proper hanging of corresponding doors and notify Contractor in writing of conditions detrimental to proper and timely installation of wood doors. Do not proceed with installation until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.02 INSTALLATION

A. Condition doors to average prevailing humidity in installation area prior to hanging.

B. Hardware: For installation see Division 8 "Finish Hardware" section of these specifications.

C. Manufacturer's Instructions: Install wood doors in accordance with manufacturer's instructions and as shown.

D. Install fire-rate doors in corresponding fire-rated frames in accordance with requirements of NFPA No.80.

E. Job Fit Doors: Align doors to frame for proper fit and uniform clearance at each edge and machine for hardware. Seal cut surfaces after fitting and machining.
   1. Bevel non-rated doors 1/8" in 2" at lock and hinge edges.
   2. Bevel fire-rated doors 1/8" in 2" in lock edge.

F. Prefit Doors: Fit to frames and machine for hardware to whatever extent not previously worked at factory as required for proper fit and uniform clearance at each edge.

G. Clearance:
   1. For not-rated doors provide clearances of 1/8" at jambs and heads; 1/8" at meeting stiles for pairs of doors; and ½" 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.
   2. For fire-rated doors, provide clearances complying with NFPA 80.

H. Shop-Finished Doors: Restore finish on edges of shop-finished doors before installation, if fitting or matching is require at the job site.

3.03 ADJUST AND CLEAN

A. Operation: Rehang or replace doors which do not swing or operate freely, as directed by Architect.

B. Finished Doors: Refinish or replace doors damaged during installation, as directed by Architect.

C. Protection and Completed Work: Advise Contractor of proper procedures required for protection of installed wood doors from damage or deterioration until acceptance of work.

- - - END OF SECTION - - -

PART 1 GENERAL

1.1 SUMMARY

A. **Section Includes:** Manual automatic closing rolling counter fire doors.
B. **Related Sections:**
1. Metal Fabrications; Door opening jamb and head members.
2. Rough Carpentry; Door opening jamb and head members.
3. Access Doors and Panels; Access doors.
4. Hardware; Padlocks, Masterkeyed cylinder.
5. Painting; Field painting.
6. Division 26. Electrical wiring and conduit, fuses, disconnect switches, connection of operator to power supply, installation of control station and wiring, and connection to alarm system.
C. **Products That May Be Supplied, But Are Not Installed Under This Section:**
1. Control station
2. Electrical disconnect
3. Annunciators
4. Primary and control wiring
5. Conduit and fittings

1.2 SYSTEM DESCRIPTION

A. **Performance Requirements:**
1. Provide doors with Underwriters' Laboratories, Inc. label for the fire rating classification, 1 1/2 hr.

1.3 SUBMITTALS

A. Reference Section 01 33 00 Submittal Procedures; submit the following items:
1. **Product Data**
2. **Shop Drawings:** Include special conditions not detailed in Product Data. Show interface with adjacent work.
3. **Quality Assurance/Control Submittals:**
a. Provide proof of manufacturer ISO 9001:2008 registration.
b. Provide proof of manufacturer and installer qualifications - see 1.4 below.
c. Provide manufacturer's installation instructions.
4. **Closeout Submittals:**
a. Operation and Maintenance Manual.
b. Certificate stating that installed materials comply with this specification.

1.4 QUALITY ASSURANCE

A. **Qualifications:**
1. **Manufacturer Qualifications:** ISO 9001:2008 registered and a minimum of five years experience in producing counter fire doors and smoke control units of the type specified.
2. **Installer Qualifications:** Manufacturer's approval.

1.5 DELIVERY STORAGE AND HANDLING

A. Follow manufacturer's instructions.

1.6 WARRANTY

A. **Standard Warranty:** Two years from date of shipment against defects in material and workmanship.
B. **Maintenance:** Submit for owner's consideration and acceptance of a maintenance service agreement for installed products.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. **Manufacturer:**
1. **CornellCookson:** 24 Elmwood Avenue Mountain Top, PA 18707.
John Walsh - Architectural Design Support
john.walsh@cornellcookson.com - 800.233.8366 ext. 4070
. **Model:** ERC10
2. **Clopay Building Products**

Substitutions: Not permitted.

2.2 MATERIALS

A. **Curtain:**
1. **Slat Configuration:**
a. **Galvanized Steel with Finish as Described Below:** No. 1F, interlocked flat-faced slats, 1-1/2 inches (38 mm) high by 1/2 inch (13 mm) deep, minimum 22 gauge ASTM A 653, Commercial Quality, galvanized steel with plain steel bottom bar and vinyl astragal.

2. **Finish:**
a. **GalvaNex™ Coating System (Stock Colors):**
1) ASTM A 653 galvanized base coating treated with dual process rinsing agents in preparation for chemical bonding baked-on base coat and gray baked-on polyester enamel finish coat.

B. **Endlocks:**
Fabricate continuous interlocking slat sections with high strength galvanized steel endlocks riveted to slats per UL requirements.

C. **Guides:**
1. **Configuration & Finish:**
a. **Steel:** minimum 12 gauge formed shapes
1) **Powder Coat (Stock Colors):** Zirconium treatment followed by a gray baked-on polyester powder coat; minimum 2.5 mils (0.065 mm) cured film thickness.

D. **Counterbalance Shaft Assembly:**
1. **Barrel:** Steel pipe capable of supporting curtain load with maximum deflection of 0.03 inches per foot (2.5 mm per meter) of width.
2. **Spring Balance:** Oil-tempered, heat-treated steel helical torsion spring assembly designed for proper balance of door to ensure that maximum effort to operate will not exceed 25 lbs (110 N). Provide wheel for applying and adjusting spring torque.

E. **Brackets:**
Fabricate from reinforced steel plate with permanently lubricated ball or roller bearings at rotating support points to support counterbalance shaft assembly and form end closures.
1. **Finish:**
a. **Powder Coat (Stock Colors):** Zirconium treatment followed by a gray baked-on polyester powder coat; minimum 2.5 mils (0.065 mm) cured film thickness.

F. **Hood and Mechanism Covers:**
24 gauge galvanized steel with reinforced top and bottom edges. Provide minimum 1/4 inch (6.35 mm) steel intermediate support brackets as required to prevent excessive sag.
1. **Finish:**
a. **GalvaNex™ Coating System (Stock Colors):**
1) ASTM A 653 galvanized base coating treated with dual process rinsing agents in preparation for chemical bonding baked-on base coat and gray baked-on polyester finish coat.

2.3 OPERATION

A. **FireGard™ Series Manual Push-Up Operation:** Conventional spring tension release operating system.
a. Provide bottom bar lift handles and a pull-down pole with hook.
b. Activate automatic closure by melting of a fusible link.
c. Maintain automatic closure speed at an average of 6” – 24” per second .
d. Reset of spring tension, mechanical dropouts or release devices to be completed only by an approved and trained door systems technician.
e. Notify electrical contractor to supply and install the appropriate disconnect switch, all conduit and wiring per the door system wiring instructions.
f. Drop test and reset door system twice by all means of activation and comply fully with NFPA 80, Section 5.

2.4 ACCESSORIES

A. **Locking:**
1. **None**

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates upon which work will be installed and verify conditions are in accordance with approved shop drawings.
B. Coordinate with responsible entity to perform corrective work on unsatisfactory substrates.
C. Commencement of work by installer is acceptance of substrate.

3.2 INSTALLATION

A. Install door and operating equipment with necessary hardware, anchors, inserts, hangers and supports.

B. Comply with NFPA 80 and follow manufacturer's installation instructions.

3.3 ADJUSTING

A. Following completion of installation, including related work by others, lubricate, test, and adjust doors for ease of operation, free from warp, twist, or distortion.

3.4 FIELD QUALITY CONTROL

A. Site Test: Test doors for normal operation and automatic closing. Coordinate with authorities having jurisdiction to witness test and sign Drop Test Form.

3.5 CLEANING

A. Clean surfaces soiled by work as recommended by manufacturer.

B. Remove surplus materials and debris from the site.

3.6 DEMONSTRATION

A. Demonstrate proper operation to Owner's Representative.

B. Instruct Owner's Representative in maintenance procedures.

- END OF SECTION -

PART I - GENERAL

1.01 GENERAL

The Drawings, Instructions to Bidders, Form of Proposal, General Conditions, Supplementary General Conditions, and Division 1 are included herein and govern work under this section.

1.02 SCOPE OF WORK

A. Furnish all labor and materials necessary to complete all aluminum window work shown on drawings and specified herein:
   1. Aluminun windows
   2. All miscellaneous hardware screws, bolts, etc.

B. Related Work Specified Elsewhere:
   1. Glass and Glazing - Section 08 81 00.

1.03 SHOP DRAWINGS

Submit shop drawings and product data in accordance with General Conditions

1.04 PERFORMANCE REQUIREMENTS

A. Air infiltration shall be tested in accordance with ASTM E283. Infiltration shall not exceed.06 CFM per square foot (.0003 M3/S-M2) of fixed area.

B. Water infiltration shall be tested in accordance with ASTM E331. No water penetration at a test pressure of 8 P.S.F. (384 Pa).

C. Structural performance shall be based on: Maximum deflection of 1/175 of the span and allowable stress with a safety factor of 1.65.

D. Thermal Performance:
   1. Mullion and perimeter gutters shall be separated from mullion and perimeter faces by a special designed clip, eliminating all metal to metal contact between exterior and interior of the frame. Performance shall be such that condensation will appear on the interior surface of 1" insulated glass before on the metal.
   2. When tested in accordance with AAMA 1502.7-1981 and 1503.11980, the following results should be attained:
      a. U - Maximum of .56
      b. CRF - Minimum of 57

E. The aluminum window contractor shall be responsible for verification of all window frame sizes in order to meet manufacturer's structural performance and wind load requirements. The window subcontractor shall be responsible for any internal frame reinforcing or frame upsizing as required to meet manufacturer's requirements at no cost to the Owner.

PART II - PRODUCTS

2.01 APPROVED MANUFACTURERS

This specification is based on the standard items as manufactured by Kawneer, Bloomsburg, PA, (717) 784-8000. A manufacturer considered equal to Kawneer is Vistawall.

2.02 MATERIALS

A. Extrusions shall be 6063-T5 alloy and temper (ASTM B221 alloy G.S. 10A-T5). Fasteners, where exposed, shall be aluminum, stainless steel or zinc plated steel in accordance with ASTM A164. Perimeter anchors shall be aluminum or steel, providing the steel is properly isolated from the aluminum. Glazing gaskets shall be elastomeric. Single acting entrance frame weathering shall be nonporous, polymeric material.

B. All exterior windows shall be TriFab 451T"(2" Face) system as manufactured by Kawneer Co., Inc.

C. All Glass doors and adjacent windows ar to have opaque markings identifying their location. Markings are to occur in two locations 30"AFF, but not more than 36" and 60"AFF, but not more than 66".

2.03 FABRICATION

A. Mullion and perimeter framing shall be of two-part construction consisting of gutter and face sections, designed to permit unobstructed face glazing with through site lines and no protecting stops. All exterior face members will be seamless. All vertical and horizontal framing members shall have a nominal face dimension of 2". Overall depth shall be 4-1/2".

B. All assemblies shall be secured internally be means of face clips of special form, in such manner as to be positively held against accidental disassembly in the event of glass breakage. Face clips shall be such a design as to provide a non-reversible snap action, and prevent metal to metal contact of the face and gutter sections.

2.04 FINISH

A. All exposed framing surfaces shall be free of scratches and other serious blemishes.

B. Aluminum moldings shall be given a caustic etch followed by finish to be at the direction of the Architect to obtain an architectural coating conforming to Aluminum Association Standards.

PART III - EXECUTION

3.01 INSTALLATION

A. All glass framing shall be set in correct locations as shown in the details and shall be level, square, plumb and in alignment with other work in accordance with the manufacturer's installation instructions and approved shop drawings. All joints between framing and the building structure shall be sealed in order to secure a watertight installation.

3.02 COMPLETION

A. After installation, the General Contractor shall adequately protect exposed portions of aluminum surfaces from damage by grinding and polishing compounds, plaster, lime, acid, cement, or other contaminants. The General Contractor shall be responsible for final cleaning.

- - - END OF SECTION - - -

PART I - GENERAL

1.01 SECTION INCLUDES:

A. Materials: Aluminum windows and related components as on the drawings and specified in this section.

B. Installation: All labor, materials, tools, equipment, and services needed to furnish and install aluminum windows.

C. Glass and glazing.

1.02 RELATED SECTIONS

Section 07 92 13 Caulking Sealants

1.03 REFERENCES

A. AAMA - American Architectural Manufacturers Association
1. AAMA/NWWDA 101/I.S.2-97 “Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors”.
2. AAMA 502-02 “Voluntary Specification for Field Testing of Windows and Sliding Glass Doors”.
3. AAMA 611-98 “Voluntary Specification for Anodized Architectural Aluminum”.
4. AAMA 800-92 “Voluntary Specifications and Test Methods for Sealants”.
5. AAMA 910-93 “Voluntary ‘Life Cycle’ Specifications and Test Methods for Architectural Grade Windows and Sliding Glass Doors”.
6. AAMA 1503-98 “Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections”.
7. AAMA 2603-02 “Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coating on Aluminum Extrusions and Panels”.
8. AAMA 2604-02 “Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coating so n Aluminum Extrusions and Panels”.
9. AAMA 2605-02 “Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels”.
10. AAMA CW-10-04 “Care and Handling of Architectural Aluminum for Shop to Site”.

B. ASTM - American Society for Testing and Materials
1. ASTM E283-04 “Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen”.
2. ASTM E 330-02 “Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights, and Curtain Walls by Uniform Static Air Pressure Difference”.
3. ASTM E 547-00 “Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference”.
4. ASTM E 2190-02 “Standard Specification for Insulating Glass Unit Performance and Evaluation”.

5. NFRC - National Fenestration Rating Council: NFRC 100-04 “Procedure for Determining Fenestration Product U Factors”.

1.04 SYSTEM DESCRIPTION

A. AAMA Designation: F-AW65.

B. Windows: 2-1/4" frame depth; extruded aluminum with integral structural polyurethane thermal break in the frame members; equal-leg frame; finish factory-applied; frames factory-assembled.

C. Configuration: fixed; glazing beads on interior.

D. Glazing: exterior 100% hot melt silicone; 1" insulating glass; silicone heel bead; EPDM gasket; interior aluminum glazing bead; glass description in paragraph 2.04; factory-glazed.

1.05 PERFORMANCE REQUIREMENTS

A. Conformance to F-AW60 specifications in AAMA/NWWDA 101/I.S.2-97 when tests are performed on the prescribed 5'0" x 8'0" minimum test size with the following test results:
1. Air Infiltration: maximum .05 cfm/square foot when tested per ASTM E 283-04 at a static air pressure difference of 6.24 psf.
2. Water Penetration: no uncontrolled water leakage when tested per ASTM E 331-00 at a static air pressure difference of 15 psf.
3. Uniform Deflection: no more than L/175 when tested per ASTM E-330-02at a static air pressure difference of 60 psf.
4. Uniform Structural Load: no glass breakage or permanent damage to fasteners, and maximum .2% permanent deformation of the span of any frame member when tested per ASTM E 330-02 at a static air pressure difference of 90 psf.

B. Thermal testing per AAMA 1503-98, at the prescribed 4'0" x 6'0" test size glazed with 1" insulating glass made with 1/8" clear, 1/8" hard coat low E, and argon gas, with the following test results:
1. Condensation Resistance Factor: minimum 50 frame and 54 glass CRF.
2. Thermal Transmittance: maximum .50 BTU/HR/SQ.FT/F U value.

C. Thermal computer simulation testing per NFRC 100-04, at the prescribed 40" x 40" Non-Residential Size, glazed with 1" insulating glass made with 1/8" clear and 1/8" soft coat low E lites and argon gas: Thermal Transmittance to be maximum .50 BTU/HR/SQ.FT/F U value.

1.06 SUBMITTALS

A. Shop Drawings: elevations, floor plans, or window location chart; typical window elevations; scaled details of composite members and components not in manufacturer’s data; and glazing details for factory-glazing units.

B. Product data: manufacturer’s specifications, test reports from an AAMA-accredited laboratory, and standard details verifying conformance with specifications.

C. Samples: one sample of each specified finish for aluminum and other samples as requested by the architect.

1.07 QUALITY ASSURANCE

A. Submit for prebid approval ten days prior to bid opening a sample window representing the bid window except for color and valid test reports from an AAMA-accredited laboratory conforming to test results in Paragraph 1.07.

B. Acceptance will be by addendum only as no verbal approvals will be allowed.

C. Submit bid on prequalified products in prebid written addendum. Bidder must identify manufacturer and model of product on which the bid is based.

D. Furnish a valid AAMA “Notice of Product Certification” indicating that the windows for the project conform to AAMA/NWWDA 101/I.S.2-97.

E. Furnish visible, permanent IGCC certification labels indicating conformance to ASTM E 2190-02 on double insulating glass units.

F. Manufacturer’s warranties:
1. Windows: warrant for one year against defects in material or workmanship under normal use.
2. Insulating glass units: warrant seal for five years against visual obstruction from film formation or moisture collection between internal glass surfaces, excluding that caused by glass breakage or abuse.
3. Paint finish: PPG Duranar™ organic finish conforming to AAMA 2605-02; warrant for fifteen years against chipping, peeling, cracking, chalking, or fading.

1.10 DELIVERY, STORAGE AND HANDLING

Handle and protect windows and accessories in accordance with AAMA CW-10-04 until project completion.

PART II - PRODUCTS

2.01 MANUFACTURERS

A. TRACO TR-2800 Fixed Thermal Aluminum Window.

B. Other acceptable manufacturers who have demonstrated a successful history of manufacturing for 10 years equivalent products:
1. Quaker
2. Wojan

2.02 MATERIALS

Aluminum extrusions: produced from commercial quality 6063-T5 alloy; free from defects impairing strength and durability.

2.03 FABRICATION

A. Frame: joined with two stainless steel screws per corner.

B. Frame joints: factory-sealed with sealant conforming to AAMA 800-92.
C. Water control: frame weeps and foam baffles to allow water to drain by gravity and resist wind-driven water.

2.04 DOUBLE INSULATING GLASS UNITS

A. Performance
1. Dual-seal durability: conformance to ASTM E 2190-02; visible, permanent IGCC certification label.
2. U - maximum .56

B. Exterior Glass lite
1. Thickness: 3/16"
2. Tint: Special - as selected by Architect
3. Type: Annealed

C. Interior glass lite
1. Thickness: 3//16"
2. Tint: Clear
3. Type: Annealed
4. Coating: Hard coat low E on #3 surface

2.05 FINISH ON ALUMINUM EXTRUSIONS

A. Application: on clean extrusions free from serious surface blemished or scratches; on exposed surfaces visible when the installed product's operating sash are closed.

B. Coating: PPG Duranar™ with resin containing 70% fluoropolymer; thermosetting; alternative finishes will not be acceptable.

C. Quality standard: conforming to AAMA 2605-02, including 10 years Florida exposure and 4000 hours humidity tests.

D. Pretreatment: five-stage; zinc chromate conversion coating.

E. Application: electrostatic spray and oven bake by approved applicator.

F. Coating quantity: minimum one primer coat and once color coat.

G. Dry film thickness: minimum 1.2 mils on exposed surfaces, except inside corners and channels.

H. Color: chosen from manufacturer's standards.

PART III - EXECUTION

3.01 PREPARATION

Prepare openings to be in tolerance, plumb, level, provide for secure anchoring, and in accordance with approved shop drawings.

3.02 INSTALLATION

A. Install windows in accordance with manufacturer's recommendations and approved shop drawings with skilled craftspeople who have demonstrated a successful history of installing windows for five (5) years.

B. Provide required support and securely fasten and set windows plumb, square, and level without twist or bow.

C. Apply sealant per sealant manufacturer's recommendations at joints, wipe off excess, and leave exposed sealant surfaces clean and smooth.

3.03 FIELD TESTING

A. Test installed units in conformance with AAMA 502-02 minimum requirements for air and water infiltration with the window manufacturer, contractor, and owner present.

B. Select test units as directed by the owner's representative and use an AAMA accredited laboratory provided by the owner or contractor.

3.04 ADJUSTING AND CLEANING

Adjust windows as necessary for weather tightness and leave windows clean and free of construction debris.

- - - END OF SECTION - - -

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes furnishing, installation and commissioning of door hardware for doors specified in "Hardware Sets" and required by actual conditions: including screws, bolts, expansion shields, electrified door hardware, and other devices for proper application of hardware.

B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

C. Related Divisions:
1. Division 07 Joint Sealants
2. Division 08 Openings
3. Division 09 Finishes

1.02 REFERENCES

A. American National Standards Institute/Builders Hardware Manufacturers Association (ANSI):
1. ANSI/BHMA A156.1 Butts & Hinges (2016)
2. ANSI/BHMA A156.2 Bored & Preassembled Locks & Latches (2011)
3. ANSI/BHMA A156.3 Exit Devices (2014)
4. ANSI/BHMA A156.4 Door Controls – Closers (2013)
5. ANSI/BHMA A156.6 Architectural Door Trim (2015)
6. ANSI/BHMA A156.7 Template Hinge Dimensions (2016)
7. ANSI/BHMA A156.8 Door Controls – Overhead Stops and Holders (2015)
8. ANSI/BHMA A156.16 Auxiliary Hardware (2013)
9. ANSI/BHMA A156.18 Materials & Finishes (2016)
10. ANSI/BHMA A156.21 Thresholds (2014)
11. ANSI/BHMA A156.22 Door Gasketing Systems (2012)
12. ANSI/BHMA A156.28 Keying Systems (2013)

B. International Code Council/American National Standards Institute (ICC/ANSI)/ADA:
1. ICC/ANSI A117.1 Standards for Accessible and Usable Buildings and Facilities 2006

C. Underwriters Laboratories, Inc. (UL):
1. UL 10C Positive Pressure Fire Test of Door Assemblies.
2. UL 1784 Air Leakage Test of Door Assemblies.
3. UL 294 Access Control System Units

D. Door and Hardware Institute (DHI):
1. DHI Publications – Keying Systems and Nomenclature (1989).
2. DHI Publication – Abbreviations and Symbols.
3. DHI Publication – Installation Guide for Doors and Hardware.
4. DHI Publication – Sequence and Format of Hardware Schedule (1996).

E. National Fire Protection Agency (NFPA):
   1. NFPA 70 National Electrical Code 2008
   2. NFPA 80 Standard for Fire Doors and Other Opening Protectives 2007
   3. NFPA 101 Life Safety Code 2006
   4. NFPA 105 Standard for the Installation of Smoke Door Assemblies 2007

1.03 SUBMITTALS

A. Submit in accordance with Conditions of the Contract and Division 1 Administrative Requirements and Submittal Procedures Section.

B. Shop Drawings:
   1. Organize hardware schedule in vertical format as illustrated in DHI Publications Sequence and Formatting for the Hardware Schedule. Include abbreviations and symbols page according to DHI Publications Abbreviations and Symbols. Complete nomenclature of items required for each door opening as indicated.
   2. Coordinate final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of hardware.
   3. Architectural Hardware Consultant (AHC), as certified by DHI, who will affix seal attesting to completeness and correctness, including the review of the hardware schedule prior to submittal.

C. Submit manufacturer's catalog sheet on design, grade, and function of items listed in hardware schedule. Identify specific hardware item per sheet, provide an index, and cover sheet.

D. Templates:
   1. Upon final approval of the architectural hardware schedules, submit one set of complete templates for each hardware item to the door manufacturers, frame manufacturers, and the installers. Date and index these 8-1/2 inch x 11 inch papers in a three ring binder, including detailed lists of the hardware location requirements for mortised and surface applied hardware within fourteen days of receiving approved door hardware submittals.

E. Closeout Submittals: Submit to Owner in a three-ring binder or CD if requested.
   1. Warranties.
   2. Maintenance and operating manual.
   3. Maintenance service agreement.
   4. Record documents.
   5. Copy of approved hardware schedule.
   6. Copy of approved keying schedule with bitting list.
   7. Door hardware supplier name, phone number, and fax number.

1.04 QUALITY ASSURANCE

A. Listed and Labeled electrified door hardware as defined in NFPA 70, Article 100, by a testing agency acceptable to authority having jurisdiction.

B. Hardware supplier will employ an Architectural Hardware Consultant (AHC) as certified by DHI and a member of the seal program who will be available at reasonable times during course of work for Project hardware consultation.

C. Door hardware conforming to ICC/ANSI A117.1: Handles pulls, latches locks and operating devices: Shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist.

D. Fired Rated Door Assemblies: Where fire-rated door assemblies are indicated, provide door hardware rated for use in assemblies complying with NFPA 80 that are listed and/or labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to UL 10C, unless otherwise indicated.

E. Fire Door Inspection: Prior to receiving certificate of occupancy have fire rated doors inspected by an independent Certified Fire and Egress Door Assembly Inspector (FDAI), as certified by Intertek (ITS), a written report be submitted to Owner and Contractor. Doors failing inspection must be adjusted, replaced or modified to be within appropriate code requirements.

F. Smoke and Draft Control Door Assemblies: Where smoke and draft control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.

G. Door hardware certified to ANSI/BHMA standards as noted, participate and be listed in BHMA Certified Products Directory.

H. Substitution request: create a comparison chart that includes the testing information as well as the warranty for both the specified product and the proposed substitution. Include the reason for requesting the substitution, clear catalog copy highlighting the proposed product and options, compliance statement, technical data, product warranty and lead time, to show how the proposed can meet or exceed established level of design, function, and quality. Approval of request is at the discretion of the owner, architect, and their designated consultants and will be addressed via addendum prior to bid date.

I. Meetings: Comply with requirements in Division 1 Section “Project Meetings.”
   1. Keying Meeting
      a. Within fourteen days of receipt of approved door hardware submittals, contact Owner with representative from hardware supplier to establish a keying conference. Verify keyway, visual key identification, number of master keys and keys per lock. Provide keying system per Owner’s instructions.

J. Installer Qualifications: Specialized in performing installation of this Section and have five years minimum documented experience.

K. Hardware listed in 3.07 – Hardware Schedule is intended to establish minimum level of design, type, function and grade of hardware to be used.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Provide clean, dry and secure room for hardware delivered to Project but not yet installed. Shelve hardware off of the floor and with larger items of hardware being stored on wooden pallets. Arrange locksets and keyed cylinders by opening number. Organize the balance of hardware by brand, model of hardware, and hardware set number. Leave the door markings of the hardware visible for installers.

B. Furnish hardware that is not bulk packed with each unit marked and numbered in accordance with approved finish hardware schedule. Include architect's opening number, hardware set number, and item number for each type of hardware. Include keyset symbols and corresponding hardware component for keyed products.

C. Pack each item complete with necessary parts and fasteners in manufacturer's original packaging.

D. Deliver architectural hardware to the job site according to the phasing agreed upon in the pre-installation meeting. Inventory the delivery with the supplier's assistance. Immediately note shortages and damages on the shipping receipts and bill of ladings. Coordinate replacement or repair with the supplier.

E. Deliver permanent keys and related accessories directly to Owner via registered mail or overnight package service. Establish the instructions for delivery to Owner at "Keying Conference."

F. Waste Management and Disposal: Separate waste materials for use or recycling in accordance with Division 1.

1.06 WARRANTY

A. General Warranty: Owner may have under provisions of the Contract Documents and be an addition and run concurrently with other warranties made by Contractor under requirements of the Contract documents.

B. Special Warranty: Warranties specified in this article will not deprive Owner of other rights.
   1. Ten years for manual door closers.
   2. Five years for mortise, auxiliary and bored locks.
   3. Five years for exit devices.

C. Replace or repair defective products during warranty period in accordance with manufacturer's warranty at no cost to Owner. There is no warranty against defects due to improper installation, abuse, and failure to exercise normal maintenance.

D. Maintenance Tool and Instructions: Furnish a complete set of specialized tools and maintenance instructions for Owner's continued adjustment, maintenance, removal and replacement of door hardware.

PART 2 – PRODUCTS

2.01 HINGES

A. Hinges, electric hinges, and self-closing hinges of one manufacturer as listed for continuity of design and consideration of warranty.

B. Standards: Products to be certified and listed by the following:
   1. Butts and Hinges: ANSI/BHMA A156.1.
   2. Template Hinge Dimensions: ANSI/BHMA A156.7.
   3. Self-Closing Hinges: ANSI/BHMA A156.17.

C. Butt Hinges:
   1. Hinge weight and size unless otherwise indicated in hardware sets:
      a. Doors up to 36” wide and up to 1-3/4” thick provide hinges with a minimum thickness of .134” and a minimum of 4-1/2” in height.
      b. Doors from 36” wide up to 42” wide and up to 1-3/4” thick provide hinges with a minimum thickness of .145” and a minimum of 4-1/2” in height.
      c. For doors from 42” wide up to 48” wide and up to 1-3/4” thick provide hinges with a minimum thickness of .180” and a minimum of 5” in height.
      d. Doors greater than 1-3/4” thick provide hinges with a minimum thickness of .180” and a minimum of 5” in height.
      e. Width of hinge is to be minimum required to clear surrounding trim.
   2. Base material unless otherwise indicated in hardware sets:
      a. Exterior Doors: 304 Stainless Steel, Brass or Bronze material.
      b. Interior Doors: Steel material.
      c. Fire Rated Doors: Steel or 304 Stainless Steel materials.
      d. Stainless Steel ball bearing hinges to have stainless steel ball bearings. Steel ball bearings are unacceptable.
   3. Quantity of hinges per door unless otherwise stated in hardware sets:
      a. Doors up to 60” in height provide 2 hinges.
      b. Doors 60” up to 90” in height provide 3 hinges.
      c. Doors 90” up to 120” in height provide 4 hinges.
      d. Doors over 120” in height add 1 additional hinge per each additional 30” in height.
      e. Dutch doors provide 4 hinges.
   4. Hinge design and options unless otherwise indicated in hardware sets:
      a. Hinges are to be of a square corner five-knuckle design, flat button tips and have ball bearings unless otherwise indicated in hardware sets.
      b. Out-swinging exterior and out-swinging access controlled doors are required to have Non-Removable Pins (NRP) to prevent removal of pin while door is in closed position.
      c. When full width of opening is required, use hinges that are designed to swing door completely from opening when door is opened to 95 degrees.
      d. When shims are necessary to correct frame or door irregularities, provide metal shims only.

   5. Acceptable Manufacturers:

	Standard Weight	Heavy Weight
Hager	BB1279/BB1191	BB1168/BB1199
Bommer	BB5000/BB5002	BB5004/BB5006
McKinney	TA2714/TA2314	T4A3786/T4A3386

2.02 FLUSH BOLTS

A. Flush bolts of one manufacturer as listed for continuity of design and consideration of warranty.

B. Standards: Manufacturer to be listed by the following: Auxiliary Hardware: ANSI/BHMI A156.16.

C. Labeled openings: Provide automatic or constant latching flush bolts per hardware schedule for inactive leaf of pairs of doors. Provide dust proof strikes for bottom bolt.

D. Non-Labeled openings: Provide two flush bolts for inactive leaf of pairs of doors per hardware schedule. Provide extension rods so that the center line of the top flush bolt is not more than 78" above the finish floor. Provide dust proof strike from bottom bolt.

E. Acceptable Manufacturers:

	Manual Flush Bolt		Dust Proof Strike
Hager	282D		280X
Rockwood	555		570
Trimco	3917		3911

2.03 LOCKS AND LATCHES

A. Locks and latches of one manufacturer as listed for continuity of design and consideration of warranty.

B. Standards: Product to be certified and listed by following:
1. ANSI/BHMA A156.2 Series 4000 Certified to Grade 2.
2. ANSI/BHMA A250.13 Certified for a minimum design load of 860 lbf (80 psf) for a single out swinging doors measuring 36" in width and 84" height and a minimum design of 860 lbf (50 psf) for out swinging single doors measuring 48" in width and 84" I height.
3. UL/cUL Labeled and listed for functions up to 3 hours for single doors up to 48" in width and up to 96" in height.
4. UL10C/UBC 7-2 Positive Pressure Rated.

C. Lock and latch function numbers and descriptions of manufacturer's series as listed in hardware sets.

D. Material and Design:
1. Lock and latch chassis to be zinc dichromate for corrosion resistance.
2. Keyed functions to be of a freewheeling design to help resist against vandalism.
3. Non-handed, field reversible.
4. Thru-bolt mounting with no exposed screws.
5. Levers, zinc cast and plated to match finish designation in hardware sets.
6. Roses, wrought brass or stainless steel material.

E. Latch and Strike:
1. Stainless steel latch bolt with minimum of 1/2" throw and deadlocking for keyed and exterior functions. Standard backset to be 2-3/4" and adjustable faceplate to accommodate a square edge door or a standard 1/8" beveled edge door.
2. Strike is to fit a standard ANSI A115 prep measuring 1-1/4" x 4-7/8" with proper lip length to protect surrounding trim.

F. Acceptable Manufacturers:

Hager	3500 Series
Schlage	AL Series
Best	7K Series

2.04 EXIT DEVICES

A. Exit Devices of one manufacturer as listed for continuity of design and consideration of warranty. Touchpad type, finish to match balance of door hardware.

B. Standards: Manufacturer to be certified and/or listed by the following:
   1. BHMA Certified ANSI A156.3 Grade 1.
   2. UL/cUL Listed for up to 3 hours for "A" labeled doors.
   3. UL10C/UBC 7-2 Positive Pressure Rated.
   4. UL10B Neutral Pressure Rated.
   5. UL 305 Listed for Panic Hardware.
   6. 2007 Florida Building Code Certification Number: FL9481.1.
   7. ANSI/BHMA A250.13 Severe Windstorm Resistant Component.

C. Material and Design:
   1. Provide exit devices with actuators that extend a minimum of one-half of door width.
   2. Where trim is indicated in hardware sets provide the lever design to match design of lock levers.
   3. Exit device to mount flush with door.
   4. Latchbolts:
      a. Rim device – 3/4" throw, Pullman type with automatic dead-latching, stainless steel
      b. Surface vertical rod device – Top 1/2" throw, Pullman type with automatic dead-latching, stainless steel. Bottom 1/2" throw, Pullman type, held retracted during door swing, stainless steel.
   5. Fasteners: Wood screws, machine screws, and thru-bolts.

D. Lock and Latch Functions: Function numbers and descriptions of manufacturer's series and lever styles indicated in door hardware sets.

E. Acceptable Manufactures:

Hager	4500 Series	
Von Duprin	99 Series	
Sargent	80 Series	

2.05 CYLINDERS AND KEYING

A. Cylinders of one manufacturer as listed for continuity of design and consideration of warranty.

B. Products to be certified and listed by the following:
   1. Auxiliary Locks: ANSI/BHMA A156.5
   2. DHI Handbook "Keying systems and nomenclature" (1989)

C. Cylinders:
   1. Manufacturer's standard tumbler type, conventional core as directed by Architect/Owner
   2. Furnish with cams/tailpieces as required for locking device that is being furnished for project.

D. Keying:
   1. Copy of Owners approved keying schedule submitted to Owner and Architect with documentation of which keying conference was held and Owner's sign-off.
   2. Provide a bitting list to Owner of combinations as established, and expand to twenty-five percent for future use or as directed by Owner.
   3. Key into Owner's existing keying system if applicable.
   4. Keys to be shipped to Owner's Representative, individually tag per keying conference.
   5. Provide construction keyed cylinders and 10 keys as required per the keying meeting.

E. Acceptable Manufacturers:

PROVIDE AS DIRECTED BY ARCHITECT/OWNER

2.06 PUSH/PULL PLATES

A. Push/Pull plates and bars of one manufacturer as listed for continuity of design and consideration of warranty.

B. Standards: Manufacturer to be certified by the following:
   1. Architectural Door Trim: ANSI/BHMA A156.6.
   2. Americans with Disabilities Act Accessibility Guidelines (ADAAG).

C. Push plates: .050" thick, square corner and beveled edges with countersunk screw holes. Width and height as stated in hardware sets.

D. Acceptable Manufacturers:

Hager	30S
Rockwood	
Trimco	

E. Pull Plates: .050" thick, square corner and beveled edges. Width and height as stated in hardware sets, 3/4" diameter pull, with clearance of 2-1/2" from face of door.

F. Acceptable Manufacturers:

Hager	H33J
Rockwood	
Trimco	

2.07 CLOSERS

A. Closers of one manufacturer as listed for continuity of design and consideration of warranty, unless otherwise indicated on hardware schedule, comply with manufacturer's recommendations for size of closer, depending on width of door, frequency of use, atmospheric pressure, ADAAG requirement, and fire rating.

B. Standards: Manufacturer to be certified and or listed by the following:
   1. BHMA Certified ANSI A156.4 Grade 1.
   2. ADA Complaint ANSI A117.1.
   3. UL/cUL Listed up to 3 hours.
   4. UL10C Positive Pressure Rated.
   5. UL10B Neutral Pressure Rated.

C. Material and Design:
   1. Provide cast iron non-handed bodies with full plastic covers.
   2. Closers will have separated staked adjustable valve screws for latch speed, sweep speed, and backcheck.
   3. Provide Tri-Pack arms and brackets for regular arm, top jamb, and parallel arm mounting.
   4. One-piece seamless steel spring tube sealed in hydraulic fluid.
   5. Double heat-treated steel tempered springs.
   6. Precision-machined heat-treated steel piston.
   7. Triple heat-treated steel spindle.
   8. Full rack and pinion operation.

D. Mounting:
   1. Out-swing doors use surface parallel arm mount closers except where noted on hardware schedule.
   2. In-swing doors use surface regular arm mount closers except where noted on hardware schedule.
   3. Provide brackets and shoe supports for aluminum doors and frames to mount fifth screw.
   4. Furnish drop plates where top rail conditions on door do not allow for mounting of closer and where backside of closer is exposed through glass.

E. Size closers in compliance with requirements for accessibility (ADAAG). Comply with following maximum opening force requirements.
   1. Interior hinged openings: 5.0 lbs.
   2. Fire-rated and exterior openings use minimum opening force allowable by authority having jurisdiction.

F. Fasteners: Provide self-reaming, self-tapping wood and machine screws, and sex nuts and bolts for each closer.

G. Acceptable manufacturers:

Hager	5100 Series
LCN	4040XP Series
Sargent	281 Series

A. Size closers in compliance with requirements for accessibility (ADAAG). Comply with following maximum opening force requirements.
   1. Interior hinged openings: 5.0 lbs.
   2. Fire-rated and exterior openings are to be adjusted to have minimum opening force allowable by authority having jurisdiction.

2.08 PROTECTIVE TRIM

A. Protective trim of one manufacturer as listed for continuity of design and consideration of warranty.

B. Size of protection plate: single doors, size two inches less door width (LDW) on push side of door, and one inch less door width on pull side of door. For pairs of doors, size one inch less door width (LDW) on push side of door, and 1/2 inch on pull side of door. Adjust sizes to accommodate accompanying hardware, such as, edge guards, astragals and others.
   1. Kick Plates 10" high or sized to door bottom rail height.
   2. Mop Plates 4" high.

C. Products to be certified and listed by the following:
   1. Architectural Door Trim: ANSI/BHMA A156.6.
   2. UL.

D. Material and Design:
   1. 0.050" gage stainless steel.
   2. Corners square, polishing lines or dominant direction of surface pattern so they run across door width of plate.
   3. Bevel top, bottom, and sides uniformly leaving no sharp edges.
   4. Countersink holes for screws. Space screw holes so they are no more than eight inches CTC, along a centerline not over 1/2" in from edge around plate. End screws maximum of 0.53" from corners.

E. UL label stamp required on protection plates when top of plate is more than 16 inches above bottom of door on fire rated openings. Verify door manufacturer's UL listing for maximum height and width of protection plate to be used.

F. Acceptable Manufacturers:

Hager	190S
Trimco	
Burns	

2.09 STOPS AND HOLDERS

A. Stops and holders of one manufacturer as listed for continuity of design and consideration of warranty.

B. Wall Stops: Provide door stops wherever necessary to prevent door or hardware from striking an adjacent partition or obstruction. Provide wall stops when possible. Door stops and holders mounted in concrete floor or masonry walls have stainless steel machine screws and lead expansion shields.

C. Products to be certified and listed by the following:
   1. Auxiliary Hardware: ANSI/BHMA A156.16.

D. Acceptable Manufacturers:

	Convex	
Hager	232W	
Rockwood		
Burns		

E. Overhead Stops and Holders: Provide overhead stops and holders for doors that open against equipment, casework sidelights and other objects that would make wall stops/holders and floor stops/holders inappropriate. Provide sex bolt attachments for mineral core wood door applications.

F. Products to be certified and listed by the following:
   1. Overhead Stops and Holders: ANSI/BHMA A156.8 Grade 1.

G. Acceptable Manufacturers:

	Heavy Duty Surface	
Hager	7000 SRF Series	
Glynn Johnson	90 SRF Series	
Sargent	590 Series	

2.10 THRESHOLDS

A. Thresholds of one manufacturer as listed for continuity of design and consideration of warranty.

B. Set thresholds for exterior and acoustical openings in full bed of sealant with lead expansion shields and stainless steel machine screws complying with requirements specified in Division 7 Section “Joint Sealants: Notched in field to fit frame by hardware installer. Refer to Drawings for special details.

C. Standards: Manufacturer to be certified by the following:
   1. Thresholds: ANSI/BHMA A156.21.
   2. American with Disabilities Act Accessibility Guidelines (ADAAG).

D. Acceptable Manufacturers:

Hager	417S/520S
K.N. Crowder	
Reese	

2.11 DOOR GASKETING AND WEATHERSTRIP

A. Door gasketing and weatherstrip of one manufacturer as listed for continuity of design and consideration of warranty.

B. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing where indicated on hardware schedule. Provide noncorrosive fasteners for exterior applications.
   1. Perimeter gasketing: Apply to head and jamb, forming seal between door and frame.
   2. Meeting stile gasketing: Fasten to meeting stiles, forming seal when doors are in closed position.
   3. Door buttons: Apply to bottom of door, forming seal with threshold or floor when door is in closed position.
   4. Sound Gasketing: Cutting or notching for stop mounted hardware not permitted.
   5. Drip Guard: Apply to exterior face of frame header. Lip length to extend 4” beyond width of door.

C. Products to be certified and listed by the following:
   1. Door Gasketing and Edge Seal Systems: ANSI/BHMA A156.22.
   2. BHMA certified for door sweeps, automatic door bottoms, and adhesive applied gasketing.

D. Smoke-Labeled Gasketing: Comply with NFPA 105 listed, labeled, and acceptable to Authorities Having Jurisdiction, for smoke control indicated.
   1. Provide smoke-labeled gasketing on 20 minute rated doors and on smoke rated doors.

E. Fire-Rated Gasketing: Comply with NFPA 80 listed, labeled, and acceptable to Authorities Having Jurisdiction, for fire ratings indicated.

F. Refer to Section 08 1416 Wood Doors for Category A or Category B. Comply with UBC 7-2 and UL10C positive pressure where frame applied intumescent seals are required.

G. Acceptable Manufacturers:
   1. Perimeter Gasketing:

	Stop Applied	Adhesive Applied
Hager	881S	726
K.N. Crowder		
Reese		

   2. Meeting Stile Weatherstrip:

Hager	756S
K.N. Crowder	
Reese	

   3. Overlapping Astragal:

Hager	835S
K.N. Crowder	
Reese	

   4. Door Bottom Sweeps:

Hager	750S / 770SV
K.N. Crowder	
Reese	

   5. Overhead Drip Guard

Hager	810S
K.N. Crowder	
Reese	

2.12 SILENCERS

A. Where smoke, light, or weather seal are not required, provide three silencers per single door frame, two per double door frame and four per Dutch door frame.

B. Products to be certified and listed by the following:
   1. Auxiliary Hardware: ANSI/BHMA A156.16

C. Acceptable Manufacturers:

	Hollow Metal Frame	
Hager	307D	
Rockwood		
Trimco		

2.13 KEY CABINET

A. Provide key cabinet; surface mounted to wall.

B. Key control system:
1. Include two sets of key tags, hooks, labels, and envelopes.
2. Contain system in metal cabinet with baked enamel finish.
3. Capacity will be able to hold actual quantities of keys, plus 50 percent.
4. Provide tools, instruction sheets, and accessories required to complete installation.

C. Acceptable Manufacturers:

Lund Equipment
Telkee Incorporated
Key Control

2.14 FINISHES

A. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if within 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 range of approved samples.

B. Comply with base material and finish requirements indicated by ANSI/BHMA A156.18 designations in hardware schedule.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine doors and frames, with Installers present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance.

3.02 INSTALLATION

A. Install hardware using manufactures recommended fasteners and installation instructions, at height locations and clearance tolerances that comply with:
   1. NFPA 80
   2. NFPA 105
   3. ICC/ANSI A117.1
   4. ANSI/BHMA A156.115 Hardware Preparation in Steel Doors and Steel Frames
   5. ANSI/BHMA A156.115W hardware Preparation in Wood Doors with Wood or Steel Frames
   6. DHI Publication – Installation Guide for Doors and Hardware
   7. Approved shop drawings
   8. Approved finish hardware schedule

B. Install soffit mounted gaskets prior other soffit mounted hardware to provide a continuous seal around the perimeter of the opening without cutting or notching.

C. Install door closers so they are on the interior of the room side of the door. Stairwell doors will have closers mounted on the stair side and exterior doors will be mounted on the interior side of the building.

D. In drywall applications provide blocking material of sufficient type and size for hardware items that mount directly to the wall.

E. Locate wall mounted bumper to contact the trim of the operating trim.

F. Mount mop and kick plates flush with the bottom of the door and centered horizontally on the door.

G. Set thresholds for exterior, and acoustical doors at sound control openings in full bed of sealant complying with requirements specified in Division 07 Section “Joint Sealants” forming a tight seal between threshold and surface to which set.

H. Anchor all components firmly into position and use anchoring devices furnished with the hardware item, unless otherwise specified.

I. Do not install surface mounted items until finishes have been completed on substrates involved. Set unit level, plumb and true to line location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.

3.03 FIELD QUALITY CONTROL

A. Material supplier to schedule final walk through to inspect hardware installation ten (10) business days before final acceptance of Owner. Material supplier will provide a written report detailing discrepancies of each opening to General Contractor within seven (7) calendar days of walk through.

3.04 ADJUSTMENT, CLEANING, AND DEMONSTRATING

A. Adjustment: Adjust and check each opening to ensure proper operation of each item of finish hardware. Replace items that cannot be adjusted to operate freely and smoothly or as intended for application at no cost to Owner.

B. Cleaning: Clean adjacent surfaces soiled by hardware installation. Clean finish hardware per manufacturer's instructions after final adjustments have been made. Replace items that cannot be cleaned to manufacturer's level of finish quality at no cost to Owner.

C. Conduct a training class for building maintenance personnel demonstrating the adjustment, operation of mechanical and electrical hardware. Special tools for finish hardware to be turned over and explained usage at the meeting.

3.05 PROTECTION

A. Leave manufacturer's protective film intact and provide proper protection for all other finish hardware items that do not have protective material from the manufacture until Owner accepts project as complete.

3.06 HARDWARE SET SCHEDULE

A. Intent of Hardware Groups
   1. Should items of hardware not specified be required for completion of the Work, furnish such items of type and quality comparable to adjacent hardware and appropriate for service required.
   2. Where items of hardware aren't correctly specified and are required for completion of the Work, a written statement of such omission, error, or other discrepancy is required to be submitted to Architect, prior to date specified for receipt of bids for clarification by addendum; or, furnish such items in the type and quality established by this specification, and appropriate to the service intended.

B. Guide: Door hardware items have been placed in sets which are intended to be a guide of design, grade, quality, function, operation, performance, exposure, and like characteristics of door hardware, and may not be complete. Provide door hardware required to make each set complete and operational.

C. Hardware schedule does not reflect handing, backset, method of fastening, and like characteristics of door hardware and door operation.

D. Review door hardware sets with door types, frames, sizes and details on drawings. Verify suitability and adaptability of items specified in relation to details and surrounding conditions.

3.07 HARDWARE SCHEDULE

Hardware Sets

SET #1

Doors: 101A

3	Hinge	BB1199 5 X 4 1/2 NRP	US3	HA
1	Exit Device	4501 RIM	US3	HA
1	Closer	5100 x HDCS	GOL	HA
1	Set Weatherstrip	881S N x LAR	GLD	HA
1	Drip Cap	810S x LAR	GLD	HA
1	Door Bottom	770S V x LAR	GLD	HA
1	Threshold	520S V x LAR	GLD	HA

SET #2

Doors: 101B, 201A

3	Hinge	BB1279 4 1/2 x 4 1/2 NRP	US3	HA
1	Exit Device	4501 RIM F	US3	HA
1	Exit Device Trim	45BE AUG	US3	HA
1	Closer	5100 x HDCS	GOL	HA
1	Seal	726 x LAR	S	HA
1	Door Sweep	750S N x LAR	GLD	HA
1	Threshold	417S x LAR	GLD	HA

SET #3

Doors: 102A

NOTE: CYLINDER(S) AS REQUIRED.
REMAINDER OF HARDWARE BY DOOR SUPPLIER

SET #4

Doors: 103A

6	Hinge	BB1191 4 1/2 X 4 1/2 NRP	US4	HA
2	Exit Device	4501 CVR	US4	HA
1	Exit Device Trim	45NL AUG	US4	HA
1	Rim Cylinder	3901	US4	HA
2	Closer	5100 x HDCS	GOL	HA
1	Set Weatherstrip	881S N x LAR	GLD	HA
1	Drip Cap	810S x LAR	GLD	HA
2	Door Bottom	770S V x LAR	GLD	HA
2	Meeting Stile Astragal	756S V x LAR	GLD	HA
1	Threshold	520S V x LAR	GLD	HA

SET #5

Doors: 103B, 103C

6	Hinge	BB1279 4 1/2 x 4 1/2 NRP	US4	HA
2	Flush Bolt	282D	US4	HA
1	Dust Proof Strike	280X	US4	HA
1	Lockset	3580 AUG	US4	HA
2	OH Stops	7016 x SRF	US3	HA
1	Seal	726 x LAR	S	HA
1	Astragal	835S x LAR	GLD	HA

SET #6

Doors: 104

3	Hinge	BB1199 5 X 4 1/2 NRP	US4	HA
1	Exit Device	4501 RIM	US4	HA
1	Closer	5100 x HDCS	GOL	HA
1	Set Weatherstrip	881S N x LAR	GLD	HA
1	Drip Cap	810S x LAR	GLD	HA
1	Door Bottom	770S V x LAR	GLD	HA
1	Threshold	520S V x LAR	GLD	HA

SET #7

Doors: 201B

3	Hinge	BB1168 5 X 4 1/2	US3	HA
1	Exit Device	4501 RIM F	US3	HA
1	Exit Device Trim	45BE AUG	US3	HA
1	Closer	5100	GOL	HA
1	Wall Stop	232W	US3	HA
1	Seal	726 x LAR	S	HA

SET #8

Doors: 202

3	Hinge	BB1279 4 1/2 X 4 1/2	US4	HA
1	Lockset	3570 AUG	US4	HA
1	Closer	5100	GOL	HA
1	Kick Plate	190S 10" x 2" LDW	US4	HA
1	Wall Stop	232W	US4	HA
1	Seal	726 x LAR	S	HA

SET #9

Doors: 203

3	Hinge	BB1279 4 1/2 X 4 1/2	US4	HA
1	Push Plate	30S 6 X 16	US4	HA
1	Door Pull	H 33J 4 X 16	US4	HA
1	Closer	5100	GOL	HA
1	Kick Plate	190S 10" x 2" LDW	US4	HA
1	Mop Plate	190S 4" x 1" LDW	US4	HA
1	Wall Stop	232W	US3	HA
3	Door Silencer	307D	GREY	HA

END OF SECTION

PART I - GENERAL

1.01 GENERAL

The Drawings, Instructions to Bidders, Form of Proposal, General Conditions, Supplementary General Conditions and Division 1 are included herein and govern work under this section.

1.02 DESCRIPTION OF WORK

A. Definitions: "Glass" includes prime glass, processed glass, and fabricated glass products. "Glazing" includes glass installation and materials used to install glass.

B. Included, but not necessarily limited to, are the following:
   1. Plate glass
   2. Tempered glass
   3. Insulating glass
   4. Laminated glass
   5. Glazing of windows, doors, transoms, side lights, and all other glazed openings as indicated.

1.03 MANUFACTURERS

A. Prime Glass Manufacturer: One of the following for each type of glass:
   1. ASG Industries, Inc.
   2. C-E Glass Division
   3. Pilkington Glass Company
   4. PPG Industries, Inc.
   5. Guardian Industries

1.04 SUBMITTALS

A. Samples: Furnish duplicate samples, for approval, of the various types of glass specified herein. Samples shall be 12" x 12" and shall include an assembled 12" x 12" insulating glass sample. Samples of other glazing materials shall be submitted in duplicate if requested by Architect.

B. Approved samples shall become the standard for comparison for all installed work.

C. Shop Drawings: Submit shop drawings and descriptive literature for all products for use. Shop drawings shall include full scale glazing details of window wall. Shop drawings shall be submitted in accordance with Division 1.

1.05 JOB CONDITIONS

Pre-installation: Meet with Glazier and other trades affected by glass installation, prior to beginning of installation. Do not perform work under adverse weather or job conditions. Install liquid sealants when temperatures are within lower or middle third of temperature range by manufacturer.

1.06 PRODUCT WARRANTY

Warranty on Hermetic Seals: Provide insulating glass manufacturer's written warranty, agreeing to, within specified period, furnish FOB project site, replacement units for insulating glass units which have defective hermetic seals (excluding that due to glass breakage); defined to include intrusion of moisture or dirt, internal condensation at temperatures above -20 degrees F (-31 degrees C), deterioration of internal glass coatings, and other visual evidence of seal failure or performance failure, provided manufacturer's instructions for handling, installation, protection and maintenance have been adhered to during warranty period.

PART II - PRODUCTS

2.01 GLASS PRODUCTS

A. Polished Plate Glass: All polished plate glass shall be 1/4" thick, unless otherwise indicated, glazing quality. Equal quality float glass will be acceptable. "U" factor for glass shall be 1.13 or better.

B. Tempered Plate Glass:
   1. Tempered plate glass shall be heat tempered of sizes indicated. Thickness shall be 1/4" unless otherwise indicated or unless a thicker glass is recommended by manufacturer for size of opening in which used.
   2. Tempered glass shall be "Tuf-Flex" as manufactured by Pilkington Glass Co. or equal product of PPG Industries or ASG Industries. Glass shall conform to federal Specification DD-G-1403B. "U" factor for glass shall be 1.13 or better.
   3. Provide one way tempered glass at door type G.

C. Laminated Glass: Provide laminated glass with Saflex inter-layer as manufactured by Solutia Company or approved equal, glass shall be 1/4" thick.

D. Insulating Glass:
   1. Insulating glass shall be DualPane as manufactured by DualPane, Inc. or equal product of Pilkington Glass or PPG Industries.
   2. Where indicated "1" insulating glass", provide the following: Units shall consist of 1/4" tinted polished plate glass outer pane, a 1/2" air space and a 1/4" polished plate glass inner pane.
   3. Where indicated "1" laminated insulating glass", provide the following: Units shall consist of 1/4" laminated tinted outer pane, a 1/2" air space and a 1/4" tinted [color] laminated glass inner pane.
   4. Tinted color to be as selected by Architect.
   5. Panes shall be hermetically sealed with a metal to glass bond and separated with a dehydrated air space.
   6. Separators between glass panes shall be hot dipped galvanized with welded corners. Glass to be metal shall be sealed with a primary seal of polyisobutalene and two-part polysulphide for the secondary seal. Unit shall be bonded with a continuous metal band and sealed with a two-part polysulphide between metal and glass. "U" factor for glass assembly shall be 0.69 or better. Shading coefficient shall be at least 0.54. Separator to be black finish.

2.02 GLAZING TYPES

A. Doors:
   1. Refer to door types on drawing for locations of all glazing types. All doors to have laminated glass.

B. Windows:
   1. All exterior windows shall be glazed with 1" insulating glass unless indicated otherwise under the respective sections for metal, aluminum, PVC or wood windows.
   2. Provide 1" laminated insulating glass in all exterior windows and sidelights located adjacent to each side of exterior doors.
   3. Provide 1" laminated insulating glass in all exterior windows where glass is within 18" of the floor.
   4. Provide 1/4" laminated glass in all interior window openings, sidelites adjacent to doors and/or within 18" of the floor.

2.03 GLAZING SEALANTS AND COMPONENTS

A. General: Provide color of exposed sealant/compound as selected by Architect from manufacturer's standard colors. Comply with manufacturer's recommendation for selection of hardness, depending upon the location of each application, conditions at the time of installation, and performance requirements as indicated. Select materials, and variations or modifications, carefully for compatibility with surfaces contacted in the installation.

B. Silicone Glazing Compound: Silicone sealant 1200 as manufactured by general Electric Company or equal product of Dow Corning shall be used to set all joints as shown on drawings. Color shall be as selected by Architect from stock.

C. Elastomeric Glazing Compound:
   1. All channel glazing shall be with a one part, 100% liquid polymer, acrylic base sealant. Product shall be "Mono-Lasto-Metric" as manufactured by the Tremco Manufacturing Company or equal product of Pecora, Inc. or Toch Brothers, and shall be used in strict conformance with manufacturer's instructions. Color as selected by Architect.
   2. Primers shall be used if and as recommended by manufacturer.

D. Elastomeric Glazing Compound:
   1. Elastic glazing compound shall be oleo-resinous, knife consistency sealant, for use on non-porous surfaces under compression. It shall be non-corrosive on metal.
   2. Color shall be approximately the same as adjacent surfaces and shall be approved by Architect.
   3. This compound shall be as manufactured by Tremco Manufacturing Company, Pecora Incorporated, or Presstite Division of Martin Marietta Corp.
   4. All elastic glazing compound shall be formulated from selected processed oils and pigments which will remain plastic and resilient over a long period of time. Comply with latest revision of the Aluminum Window Manufacturer's Association.

2.04 MISCELLANEOUS GLAZING MATERIALS

A. Cleaners, Primers and Sealers: Type recommended by sealant or gasket manufacturer.

B. Glazing Tape:
   1. Glazing tape shall be a polyisobutylene-butyl base with an integral shim equal to Tremco 440 Shimmed Tape, as manufactured by the Tremco Manufacturing Company. Tape and elastomeric sealing compound shall be by same manufacturer.
   2. Verify thickness of tape required by glazing a sample window on the job. Sample shall be inspected and approved by Architect before proceeding with glazing work.

C. Spacer Shims and Setting Blocks:
   1. All spacer shims shall be of 40 to 50 durometer neoprene.
   2. All setting blocks shall be lead or 80 durometer neoprene as recommended by glass manufacturer based on weight of glass.
   3. All spacer shims and setting blocks shall be at least 1/4" thick by 3" long by width of recess.

PART III - EXECUTION

3.01 STANDARDS AND PERFORMANCE

A. Watertight and airtight installation of each glass product is required, except as otherwise shown. Each installation must withstand normal temperature changes, wind loading, impact loading (for operating sash and doors), without failure including loss or breakage of glass, failure of sealants or gaskets to remain watertight and air tight, deterioration of glazing materials and other defects in the work.

B. Protect glass from edge damage during handling and installation, and subsequent operation of glazed components of the work. During installation, discard units with significant edge damage or other imperfections.

C. Labels: Deliver all glass on the job carefully paper packed and protected, each pane bearing manufacturer's identifying label, giving name, quality and grade of glass.

D. Glazing channel dimensions as shown are intended to provide for necessary bite on glass, minimum edge clearance, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by job conditions at time of installation.

E. Comply with combined recommendations and technical reports by manufacturers of glass and glazing products as used in each glazing channel, and with recommendations of Flat Glass Marketing Association "Glazing Manual", except where more stringent requirements are indicated.

F. Install insulating glass units to comply with recommendations by Sealed Insulating Glass Manufacturers Association, except as otherwise specifically indicated or recommended by glass and sealant manufacturers.

3.02 PREPARATION FOR GLAZING

A. Clean glazing channel and other framing members to receive glass, immediately before glazing. Remove lacquer from metal surfaces where elastomeric sealants are used.

B. Remove all coatings in glazing rebate area with a solvent that will not etch or mar surface of metal, recommended by manufacturer of glazing compound.

C. All surfaces to be glazed shall be free of moisture.

D. Avoid glazing at temperature below 40 degrees F. If glazing schedule requires work during cold periods, warm the glass and rabbeted surfaces to avoid condensation.

E. Remove manufacturer's instruction tags from windows.

F. Cover metal surfaces liable to be damaged by smear of sealing compound with tape. Remove tape after glazing.

G. Prepare all glazing compounds in strict accordance with manufacturer's instructions. Compounds shall not be cut or thinned.

H. Apply primer or sealant to joint surfaces where recommended by sealant manufacturer.

3.03 GLAZING

A. Install setting blocks of proper size in sill rabbet, located 1/4th of glass width from each corner. Set blocks in thin course of heel-bead compound, if any.

B. Provide spacers inside and out, of proper size and spacing, for glass sizes larger than 50 united inches, except where gaskets or preshimmed tapes are used for glazing. Provide 1/8" minimum bite of spacers on glass and use thickness equal to sealant width, except with sealant tape use thickness slightly less than final compresses thickness of tape.

C. Set units of glass in each series with uniformity of pattern, draw, bow and similar characteristics.

D. Voids and Filler Rods: Prevent exudation of sealant or compound by reforming voids or installing filler rods in channel at heel of jamb and head (do not leave voids in sill channels), except as otherwise indicated and depending on light size, thickness and type of glass, and complying with manufacturer's recommendations.

E. Force sealants into channel to eliminate voids and to ensure complete "wetting" or bond of sealant to glass and channel surfaces.

F. Tool exposed surfaces of glazing liquids and compounds to provide a substantial "wash" away from glass. Install pressurized tapes and gaskets to protrude slightly out of channel, so as to eliminate dirt and moisture pockets.

G. Clean and trim excess glazing materials from glass and stops or frames promptly after installation, and eliminate stains and discolorations.

H. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage to ensure that gasket will not "walk" out when installation is subjected to movement. Anchor gasket to stop with matching ribs, or by proven adhesives, including embedment of gasket tail in cured heel bead.

I. Gasket Glazing: Miter cut and bond ends together at corners where gaskets are used for channel glazing, so that gaskets will no pull away from corners and result in voids or leaks in glazing system.

3.04 CURE, PROTECTION AND CLEANING

A. Protect exterior glass from breakage immediately upon installation, by use of crossed streamers attached to framing and held away from glass. Do not apply markers to surfaces of glass. Remove nonpermanent labels and clean surfaces. Cure sealants for high early strength and durability.

B. Remove and replace glass which is broken, chipped, cracked, abraded or damaged in other ways during construction period, including natural causes, accidents and vandalism.

C. Wash and polish glass on both faces not more than four (4) days prior to date scheduled for inspections intended to establish date of substantial completion in each area of project. Comply with glass product manufacturer's recommendations for final cleaning.

- - - END OF SECTION - - -

PART 1 - GENERAL

1.1 CONDITIONS AND REQUIREMENTS

A. The General Conditions, Supplementary Conditions, and Division 01 – General Requirements apply.

1.2 SECTION INCLUDES

A. Decorative films.

1.3 RELATED SECTIONS

A. Section 08 80 00 - Glazing: Substrate for application of decorative film.

1.4 REFERENCES

A. ASTM International (ASTM):
1. ASTM D882 - Standard Test Method for Tensile Properties of Thin Plastic Sheeting.
2. ASTM D1044 - Test for Resistance of Transparent Plastics to Surface Abrasion (Taber Abrader Test).
3. ASTM D4830 - Standard Test Methods for Characterizing Thermoplastic Fabrics Used in Roofing and Waterproofing. Section 7: Puncture Strength.
4. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.
5. ASTM E903 - Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres.

1.5 DEFINITIONS

A. Privacy Series Decorative Films: These films are available in a wide range of colors and are used in commercial applications where low reflectivity is desired. These films are ideal for use in commercial interior glazing applications to achieve privacy or interior design goals.

1.6 PERFORMANCE REQUIREMENTS

A. Scratch Resistance: Solar control films shall average less than 12 percent increase in haze when tested according to ASTM D1044 using a Teledyne Taber Abrader using CS10F Type III wheels each loaded to 0.5 kg for 100 cycles in a 70 percent vacuum.
1. Scratch resistance testing shall be performed by an independent third party agency.

B. Surface Burning Characteristics: Provide films that have Flame Spread Index of 0 and Smoke Developed Index of 30 or less when tested in accordance with ASTM E84.

C. Ultraviolet Transmission: Provide decorative films with UV absorbing materials that limit the weighted UV Transmission to 16 percent when measured according to ASTM E903.

D. Provide decorative films that do not have a masking sheet.

1.7 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Product Data: Submit for each product specified indicating:
   1. Performance properties.
   2. Preparation and installation instructions and recommendations.
   3. Storage and handling recommendations.

C. Samples: For each type of decorative film specified, two (2) samples, 12 inches square.

D. Qualification Data: Submit documentation indicating qualifications of decorative film manufacturer.

E. Operation and Maintenance Data: Submit for decorative film to include in maintenance manuals.

F. Warranty: Submit sample special warranty specified in this section.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that has a minimum of 40 years of documented experience manufacturing decorative films similar to that used for this project.

B. Installer Qualifications: A firm that is authorized by decorative film manufacturer to install film in accordance with guidelines set forth by the manufacturer.

C. Source Limitations: Obtain each type of decorative film from same manufacturer.

D. Mockups: Build mockups to verify selections made under sample submittals and to evaluate surface preparation techniques and application workmanship.
   1. Construct 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.

E. Preinstallation Conference: Conduct conference at project site to discuss methods and procedures relating to installation of the decorative films.

1.9 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, and handle materials in manufacturer's protective packaging.

B. Store and protect materials according to manufacturer's written recommendations to prevent damage from condensation, temperature changes, direct exposure to sun, or other causes.

1.10 SITE CONDITIONS

A. Ambient Conditions: Maintain temperature, humidity, and ventilation within limits recommended by manufacturer.

1.11 WARRANTY

A. Manufacturer's Warranty: Manufacturer's standard form in which manufacturer agrees to replace films that fail within specified warranty period.
   1. Warranty Period: 5 years from date of original installation.
   2. Warranty coverage limited to owner of property at time of installation.
   3. Manufacturer’s obligation is limited to furnishing replacement film for any film covered by limited warranty which manufacturer determines to be defective. Manufacturer will not be liable for installation costs of replacement film or for any special, indirect, incidental or consequential damages.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: The design for decorative films is based on SOLYX® Decorative Films manufactured by Decorative Films LLC. Telephone: 1-888-657-5224; Web Site: www.decorativfilm.com.

2.2 DECORATIVE FILMS

A. Decorative Film: SOLYX® SX-1303 Frost Film with the following performance characteristics when applied to the interior surface of single-pane, 1/8-inch clear glass:
   1. Product Code: SX-1303
   2. Product Family: Simple Frosted
   3. Film Type: Polymeric Vinyl
   4. Adhesive Type: Pressure-sensitive
   5. Usage: Interior or Exterior
   6. Available Width(s): 48”
   7. Full Roll Length: 100 linear feet (30.5m)
   8. Film Thickness: 4 mil
   9. Visible Light Transmission: 68%
   10. UV Transmission: 16%
   11. Infra-Red Transmission: 66%

2.3 DECORATIVE FILM ACCESSORIES

A. General: Provide accessories either manufactured by or acceptable to decorative film manufacturer for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Adhesive: Pressure sensitive clear acrylic adhesive system.

C. Cleaners, Primers, and Sealers: Types recommended by decorative film manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates for compliance with requirements and for conditions affecting performance of decorative film including glass that is broken, chipped, cracked, abraded, or damaged in any way.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Comply with manufacturer's written instructions for surface preparation.

B. Clean substrates thoroughly prior to installation.

C. Prepare substrates using methods recommended by decorative film manufacturer to achieve the best results for the substrate under project conditions.

D. Protect window frames and surrounding surfaces to prevent damage during installation.

3.3 INSTALLATION

A. Install in accordance with manufacturer's written instructions.

B. Install film continuously, but not necessarily in one (1) continuous length. Install with no gaps or overlaps. Make seams non-overlapping.

C. Do not remove release liner from film until just before each piece of film is cut and ready for installation.

D. Install film with mounting solution and custom cut to the glass with neat, square corners and edges to within 1/8-inch of window frame.

E. Remove air bubbles, blisters, and other defects. Be careful to remove "fingers" to eliminate any contamination or excess water pockets. It is crucial to remove as much water as possible during installation.

F. A final squeegee pass over the entire pane using a Blue Max Blade with an extended handle design (or Thor's Hammer) is recommended.

3.4 FIELD QUALITY CONTROL

A. After installation, view film from a distance of 10 feet against a bright uniform sky or background. Film shall appear uniform in appearance with no visible streaks, wrinkles, banding, thin spots or pinholes.

B. If installed film does not meet these criteria, remove and replace with new film.

3.5 CLEANING AND PROTECTION

A. Remove excess mounting solution at finished seams, perimeter edges, and adjacent surfaces.

B. Use cleaning methods recommended by decorative film manufacturer.

C. Replace films that cannot be cleaned.

D. Protect installed products until completion of project.

E. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

PART I - GENERAL

1.01 GENERAL

The Drawings, Instructions to Bidders, Form of Proposal, General Conditions, Supplementary General Conditions, and Division 1 are included herein and govern work under this section.

1.02 DESCRIPTION OF WORK

A. Definitions: Tile includes ceramic surfacing units made from clay or other ceramic materials. The types of work of this section include:
   1. Ceramic floor tiles and base
   2. Ceramic wall tiles
   3. Trim and Accessories
   4. Special shapes as required or indicated
   5. Setting beds as required or indicated
   6. Grout and setting materials
   7. Waterproofing membranes
   8. Cutting and setting materials
   9. Cutting, drilling and fitting tile work in connection with work by others.

1.03 QUALITY ASSURANCE

A. Manufacturer: Provide products by one of the following for each type of tile:
   1. Ceramic Tile:
      a. American Olean Tile Co.
      b. DalTile
      c. Quality Marble and Tile Distributors, Inc.

B. Manufacturer: Provide products for each type of waterproofing, grout admixtures and ceramic tile sealants by:
   1. Laticrete International, Inc.

C. Tile Manufacturing Standard: TCA 137.1 Furnish tile complying with standard grade requirements unless indicated otherwise.

D. Proprietary Materials: Handle, store, mix and apply proprietary setting and grouting materials in compliance with manufacturer's instructions.
   1. Provide materials obtained from one source for each type and color of tile, grout, and setting materials.

1.05 SUBMITTALS

A. Product Data: Submit manufacturer's technical information and installation instructions for materials required, except bulk materials. Include certifications and other data to show compliance with these specifications.

1.06 SAMPLES

A. Submit samples in duplicate for approval showing quality, color, texture, and finish for each kind of tile. Submit 12" x 12" panels of floor tile patterns and all custom patterns.

B. No work for which such samples are required shall proceed until samples have been approved by the Architect, and all tile work shall be executed in strict accordance with the approved samples.

1.07 DELIVERY AND STORAGE OF TILE AND MATERIALS

A. All tile shall be graded, sealed and delivered in accordance with Department of Commerce Simplified Practice Recommendation R-61, latest issue, and this specification.

B. Deliver all tile in unbroken packages bearing the brand and manufacturer's name and store them on platforms, properly covered to protect them from moisture.

C. Keep all containers in which tiles are packed, dry until tiles are removed. Take every precaution to see that tiles are not stained.

D. At completion of work, turn over to the Owner (for signed receipt) a minimum of one (1) box of unbroken tile of each color of tile used in the work for future patching purposes.

E. All grout and admixtures shall be stored in original unbroken or unopened containers, protected from moisture. Grout and admixtures shall be stored to achieve ambient room temperature before using. Extreme high and low temperature differentials shall be avoided.

1.09 MAINTENANCE INSTRUCTIONS

Furnish in triplicate (3) copies of instructions for the care, cleaning, and maintenance of ceramic and quarry tile.

PART II - PRODUCTS

2.01 KINDS OF TILE

A. All tile shall be of domestic manufacture, standard grade, meeting the requirements of recommended standard specification for Ceramic Tile TCA 137.1-1980. All packages shall bear quality triangle of Tile Council of America, Inc.
B. All ceramic floor tile shall be dust pressed, vitreous, unglazed, ceramic porcelain. Edges shall be plain or cushion as selected.
C. All base shall be coved and match floor and/or wall tile.
D. Include all special shapes required such as bullnose, cove, trim, caps, etc. These shall be of the same kind and finish as adjacent tile.

2.02 COLOR, PATTERNS, SIZES OF TILE

A. All colors of tile shall be as selected by the Architect from manufacturer's standard colors.
B. Color shall be as selected by the Architect from standard color list. No premium price colors will be selected. Quarry tile base shall be coved 5" high with bullnose top.

2.03 TERMINAL EDGES

Furnish and install bullnose tiles at terminal edges of ceramic tile.

2.04 MORTAR AND GROUTING MATERIALS

A. All cement shall be Portland cement conforming to ASTM Specifications C150, latest edition, Type 1.

B. All hydrated lime shall comply with ASTM Specifications C206 and C207, Type S.

C. All sand shall be clean, sharp, durable, fine natural aggregate, free from salt, loam, clay, soluble salts organic impurities, conforming to ASTM C144.
1. Sand for floor setting beds shall be well graded, passing #8 sieve, not over 5% passing #100 mesh screen.
2. Sand for grout shall pass #30 mesh sieve, not over 5% passing #100 mesh screen.

D. Water shall be clean, free from injurious amount of oil, acid, soluble salts, organic impurities.

E. Dry-set Mortar: Conform with ANSI A118.1, and be prepared under Tile Council Formula. Package shall bear quality triangle of Tile Council of America, Inc.

F. All grout shall be neat waterproof Portland cement. All colors of grout shall be as selected by Architect.

G. All materials shall be measured accurately by volume thoroughly mixed and placed within a reasonable time after mixing. Do not re-temper.

PART III - EXECUTION

3.01 SETTING METHODS

A. All tile installation work shall be in accordance with latest recommendations of the Tile Council of America, Inc. and as indicated on drawings and specified herein. In case of conflict, the more stringent shall apply.

B. Expansion and control joints shall be located in all tile floors where floors adjoin vertical surfaces. Provide intermediate control joint in ceramic and quarry tile floors exceeding 24'0" in any direction, unless otherwise directed by the Architect.

C. Thin Bed Installation over Masonry:
1. Provide scratch and leveling coat with laticrete admix on wire lath over concrete block.
2. Provide laticrete 4237 latex thinset mortar over leveling coat to set ceramic tiles.
3. Follow this procedure for installation of ceramic wall tile in toilet rooms and ceramic accent tile at exterior walls

D. Preparation by Tile Contractor for Tile Shower Enclosure: Surround drain with broken pieces of tile or crushed stone to prevent mortar from blocking weep holes.

3.02 STANDARD FOR TILE WORK

A. Except as otherwise specified, all details of tile setting and workmanship shall conform with the requirements of the "2016 Handbook for Ceramic Tile Installation" of the Tile Council of America, Inc. (or latest revision) and the 2015 ANSI A108/A118/A136.1 Specifications for the Installation of Ceramic Tile (or latest revision).

B. Shower Enclosure Installation Specifications:
1. Cementitious backer units: ANSI A108.11.
2. Tile: ANSI A108.5.

3.03 TILE SETTING PROCEDURE

A. A detailed inspection of all surfaces on which tile is to be placed shall be made. A report, in writing, of any defects found as a result of this inspection, shall be made to the Contractor, who shall immediately remedy such defects before the placing of the tile.

B. All rooms or spaces in which tile floors are being laid, shall be closed to traffic or other work, and kept closed until the floors are completed and the tile firmly set.

C. No tile shall be set on surfaces where other work is specified or shown to be embedded in the tile work until such work has been installed and approved.

D. Tile work shall be laid out so as to avoid small cuts. All cuts shall be rubbed smooth and even.

E. Replace all tile misfits with properly cut tile.

F. No tile shall be placed or allowed to set in temperatures below 40 degrees F.

G. Provide metal transition strip where tile abuts differing material, unless directed otherwise by Architect.

3.04 SETTING FLOOR AND WALL TILE

A. Installation of the tile shall comply with standards previously specified and with ANSI 108.5.

B. Clean surface of all dust, deleterious film and non-compatible matter, moisten well with water, allow no free water to remain on surface. Do not saturate.

C. Spread specified setting mortar, screen to true plane at proper height, sloped to drains or level as indicated.

D. Do not spread more setting mortar at one time than can be covered during same working period.

E. Lay all sheets to straight edge, maintain uniform joint between sheets. All joints shall align in all directions.

F. Press sheets of tile into still plastic mortar and beat to true surface, using approved tools.

G. Provide expansion joints in locations and as required by recommendations of Tile Council of America, Inc.

H. Back mounted sheets shall have 75% minimum coverage by mortar on back of each panel when removed for inspection.

I. Remove paper before initial set. Avoid excess use of water.

3.05 GROUTING

A. After removal of paper, grout all tile joints. Fill be screening or brushing specified grout until joints are full, avoiding air traps or voids.

B. Tool all cushion edge joints to depth of cushion.

C. Remove all surplus grout from tile, using diagonal strokes across joints. Check for gaps or air holes, filling same.

3.06 PROTECTION

A. Immediately after initial set of grout, apply a coat of non-corrosive soap to all wall tile or cover it completely with heavy gauge plastic sheets, properly secured and joints well taped.

B. Cover all tile floors with building paper with taped joints. Where necessary to truck over tile floors, General Contractor shall provide planking.

C. Close all rooms to traffic for ten (10) days after grouting tile.

D. Protect all finished work until the Architect authorizes the removal of protection.

3.07 CLEANING

A. After grout has set, wash and rinse all tile work with sponge and clean water. Polish with dry cloth.

B. Avoid the use of acid if possible. If absolutely necessary, obtain approval of Architect and use 10% muriatic solution and rinse thoroughly with clean water.

C. All cleaning shall be done in such a manner as not to adversely affect mortar joints and finish of tile.

- END OF SECTION -

PART I - GENERAL

1.01 GENERAL

The Drawings, Instructions to Bidders, Form of Proposal, General Conditions, Supplementary General Conditions, and Division 1 are included herein and govern work under this section.

1.02 DESCRIPTION OF WORK

A. Extent of each type of acoustical ceiling is shown and scheduled on drawings. Refer to Room Finish Schedule, reflected ceiling plans, and other pertinent details as indicated on drawings.

B. Types of acoustical ceilings specified in this section include the following: Acoustical panel ceilings, exposed suspension.

1.03 QUALITY ASSURANCE

A. Installer: Firm with not less than three (3) years of successful experience in installation of acoustical ceilings similar to requirements for this project and which is acceptable to manufacturer of acoustical units, as shown by current written statement from manufacturer.

B. All acoustical tile panels specified herein, shall have a flame spread rating of 25 or less when tested by an independent testing laboratory in accordance with ASTM E84-70.

C. Manufacturer shall submit substantiating data as evidence of compliance.

1.04 SUBMITTALS

A. Product Data: Manufacturer's product specifications and installation instructions for each acoustical ceiling material required, and for each suspension system, including certified laboratory test reports and other data as required to show compliance with these specifications. Include manufacturer's recommendations for cleaning and refinishing acoustical units, including precautions against materials and methods which may be detrimental to finishes and acoustical performances.

B. Samples: Set of 12" square samples for each acoustical unit required showing full range of exposed color and texture to be expected in completed work. Set of 12" long samples of each exposed runner and molding.

C. Maintenance Stock: At time of completing installation, deliver stock of maintenance material to Owner. Furnish full size units matching units installed, packaged with protective covering for storage, and identified with appropriate labels. Furnish amount equal to 2.0% of acoustical units and exposed suspension installed.

1.05 JOB CONDITIONS

Recommendations of the Acoustical Materials Association in their latest bulletin shall apply. Acoustical materials shall be installed under temperature and humidity conditions closely approximating those which will exist when the building is occupied. They should not be installed when buildings are damp and cold or dry and hot. Plastering, concrete, and flooring shall be completed and then allowed to dry before the installation of acoustical tiles. All windows and doors shall be in place and glazed. Heating system should be installed and operating where necessary to maintain proper conditions before, during, and after the acoustical ceiling installation. Concrete should be thoroughly dry.

PART II - PRODUCTS

2.01 CEILING UNITS

A. Type 1: Similar to Armstrong “Cortega”, fissured, mineral fiber, 24" x 48" x 5/8" square lay-in, medium texture. Final selection tio be made by Architect Exposed grid as shown on Drawings, NRC range .55, CAC 40. Class A.

B. Type 2: 24" x 24" x 5/8", 9/16" mineral fiberlay-in, fine textured, tiles.. NRC range .50 - .60, CAC 35 to be selected by Architect .

2.02 CEILING SUSPENSION MATERIALS

C. Exposed Tee Suspension System:
1. System shall include all hangers, wire, carrying tees, cross tees, edge angles, clips, and all other components to complete installation. Provide proper amount and proper type of "hold down" clips as required to prevent "uplift" and "shifting" of tiles.
2. Suspension system shall be matched to existing suspension systems.
3. Main tees shall be sufficiently supported to carry load imposed, which shall include weight of lights.
4. Light fixtures in exposed grid suspension system, weighing <10 lb may be supported by the suspension system provided proper wire supports are added to the suspension system as follows. A minimum of four (4) hangers per light shall be used and for lights over 4'-0" long, and additional two (2) hangers for each additional 2'-0" of length shall be used.
5. Diffusers, grilles, fans and other mechanical system related equipment shall be independently supported.
6. Main tees and cross tees shall be made of fully zinc coated steel of gauges as previously noted. All connections of main tees, cross tee, perimeter moldings, etc. shall be mechanically interlocked. All work shall be level, square, and at proper height. Provide perimeter moldings where ceiling abuts walls or partitions.
7. Hanger wire shall be No. 12 annealed galvanized wire, spaced not to exceed 4" o.c.
8. All ceiling suspension shall be supported from floor and roof construction above. Provide all supplementary framing as required to adequately support the suspended ceiling.

PART III - EXECUTION

3.01 INSPECTION

Installer must examine conditions under which acoustical ceiling work is to be performed and must notify Contractor in writing of unsatisfactory conditions. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to installer.

3.02 PREPARATION

A. Coordination: Furnish layouts for inserts, clips, or other supports required to be installed by other trades for support of acoustical ceilings.

B. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less-than-half width units at borders, and comply with reflected ceiling plans wherever possible.

3.03 INSTALLATION

A. General: Install materials in accordance with manufacturer's printed instructions, and to comply with governing regulations, fire resistance rating requirements as indicated, and industry standards applicable to work.

B. Installation - Lay-In Type:
   1. Attach to carrying channels, at right angles, the tee bars or exposed grid at spacing determined by the tile size. Provide additional support to exposed grid carrying tees at recessed lights (light to bear on tees). Ceiling diffusers to be supported independently by heating contractor. Provide tee bar splices as required.
   2. Ceiling contractor to coordinate his work with that of electrical and heating contractors to insure satisfactory installation of lights, diffusers and ceiling and with metal deck installer to assure proper placement of strap hangers. Frame around ceiling diffusers to support ceiling tile as required.
   3. Furnish and install all accessories and items necessary for proper suspension.
   4. Acoustical ceiling tile shall be placed in an approved manner as recommended by the manufacturer.
   5. Lay out work to avoid small pieces at room perimeters. All damaged ceiling tile shall be replaced before final acceptance of structure and all acoustical installations shall be made by an acoustical contractor approved by the manufacturer of the acoustical materials as being thoroughly experienced in erection of acoustical materials.
   6. Anchorage and fastenings shall be secure and adequate for the use intended.
   7. Acoustical ceilings shall be erected in a rigid and secure manner, level with tight joints, free from wave, buckles, and sags. All acoustical tile shall be properly supported.
   8. Cut and fit all acoustical units neatly and accurately against beams and walls and around pipes, electrical outlets, and equipment so that flanges will cover units where cut.
   9. All joints shall be kept in proper alignment and parallel to walls, unless otherwise indicated.
   10. All finished ceiling areas shall be flat with not tile or edges of the tile protruding or recessed in relation to adjacent tile.
   11. Metal edge channels, fillers, moldings, etc. shall be in as long pieces as possible and joints shall be neatly and as inconspicuously as possible. Trim shall be attached with approved concealed fastenings. All angles, corners, and filler shall have mitered joints.
   12. Insert for support of suspended ceilings from slab above and for attachment of suspension wire shall be of type recommended by manufacturer and shall be of a type to support ceiling loads imposed.

3.04 ADJUST AND CLEAN

Upon completion, all exposed surfaces of factory finished acoustical work shall be cleaned and left in a condition entirely satisfactory to the Architect. Remove all debris, equipment, and material from premises.

- - - END OF SECTION - - -

PART I - GENERAL

1.01 GENERAL

The Drawings, Instructions to Bidders, Form of Proposal, General Conditions, Supplementary General Conditions, and Division 1 are included herein and govern work under this section.

1.02 SCOPE

Furnish labor and materials to complete vinyl composition tile, sheet vinyl flooring tile, and vinyl base work as indicated and specified herein.

1.03 SUBMITTALS

A. Submit samples of work specified herein.

B. At completion of work, turn over to the Owner (for signed receipt) a minimum of one box (each color) of unbroken tile of each color of tile used in the work for future patching purposes.

PART II - PRODUCTS

2.01 MATERIALS

A. Vinyl Composition Tile:
1. 1/8" x 12" x 12".
2. Fire Test Data: ASTM E648 Critical Radiant Flux - 0.45 watts/cm2 or more, ASTM E84 flame spread - 75 or less, ASTM E662 NBS smoke - 450 or less.
3. Colors to be selected to match existing.
4. Tile shall be laid to be compatible in direction with existing conditions.

B. Base: Vinyl 1/8" thick, ASTM F-1861 Type TV, coil stock, 4" high, "set-on" cove with premolded smooth top and cove base premolded internal and external angles - color to be compatable with existing. Furnish 1/8", 4" high straight base with premolded angles where carpet is installed.

C. Cement: As recommended by tile manufacturer (waterproof).

D. Edging: Of approved design to protect exposed tile edges; 1/8" thick vinyl edge strip where tile is terminated at doorways adjacent to exposed concrete floors.

E. Underlayment: Use mastic type for floors requiring leveling, minor undulations and minor cracks.

F. Cleaner and Wax: Standard of tile manufacturer used herein.

PART III - EXECUTION

3.01 TILE AND VINYL BASE INSTALLATION

A. Inspect subfloors before starting work. Notify Architect in writing of any defect in subfloor. Do not proceed until such defects are reported and have been corrected. Starting of work implies acceptance by this contractor of underflooring.

B. Fill subfloor cracks, etc. Clean subfloor of grease or other dirt. Do not begin until work of other trades, including painting, has been completed.

C. Construction Contractor: Maintain rooms and subfloors at 70° F. minimum for at least 48 hours before, during, and 48 hours after flooring operations.

D. Use only experienced workmen. Lay tiles with even joints and with finished surfaces in true plane, smooth. Lay tiles square and symmetrical with room axis. Cut, fit, scribe to wall.

E. Install protective edgings where flooring edges are exposed and where required to saddle difference of finished floor elevation between ceramic tile and resilient tile.

F. Cement base firmly to walls using proper adhesive for surface to which it is to be applied. Scribe base accurately to trim.

G. Base coils must be unrolled and acclimated to room temperature 24 hours before installation.

3.02 CLEANING AND FINISHING

A. Clean and wax in accordance with tile manufacturer's recommendation for tile used herein.

B. Do not permit traffic on finished floors unless they are protected with heavy paper by the construction contractor.

C. Inspect and make necessary adjustments within one month of time that heat is supplied continuously in finished areas. Replace broken, "unseated" tile.

- - - END OF SECTION - - -

PART I - GENERAL

1.01 GENERAL

The Drawings, Instructions to Bidders, Form of Proposal, General Conditions, Supplementary General Conditions, and Division 1 are included herein and govern work under this section.

1.02 SCOPE

Furnish for installation all labor and materials to complete vinyl stair treads and risers.

1.03 SUBMITTALS

A. Submit samples of work specified herein.

B. Furnish Architect with manufacturer's sample color chain for color selection by the Architect.

PART II - PRODUCTS

2.01 MATERIALS

A. Stair Treads: No. GS365 Koroseal Vinyl Grit-Strip rib design stair treads by Musson Rubber; 7/32" thick, 12" deep; 1-1/4" square nose; two black* 1" wide abrasive Grit-Strips inlaid in tread, 1” from front edge, spaced 1-1/4" apart; contains no asbestos fiber; made of first quality homogenous vinyl, color throughout thickness; free from imperfections which might lessen serviceability. Trim from standard lengths. Select standard solid color.

B. Stair Tread Risers: No 405CR Koroseal vinyl coved stair riser by Musson Rubber.

PART III - EXECUTION

3.01 INSTALLATION

A. Cement treads firmly to steps using R.C. Musson Adhesive.

B. Cut and scribe treads precisely to stairs.

C. Clean and wax finished work.

- - - END OF SECTION - - -

PART I - GENERAL

1.01 GENERAL

The Drawings, Instructions to Bidders, Form of Proposal, General Conditions, Supplementary General Conditions, and Division 1 are included herein and govern work under this section.

1.02 DESCRIPTION OF WORK

A. Extent of painting work is shown on drawings and schedules, and as herein specified.

B. The work includes painting and finishing of interior exposed items and surfaces throughout the project, except as otherwise indicated.
1. Surface preparation, priming, and coats of paint specified are in addition to shop-priming and surface treatment specified under other sections of work.

C. "Paint" as used herein means all coating systems materials, including primers, emulsions, enamels, stains, sealers and fillers, and other applied materials whether used as prime, intermediate, or finish coats.

D. Paint exposed surfaces whether or not colors are designated in "schedules", except where natural finish of material is specifically mentioned, paint same as adjacent similar materials or areas. If color or finish is not designated, Architect will select these from colors available for materials systems specified.

E. Paint in accordance with Room Finish Schedule, all drywall, concrete, concrete block, and ferrous metals, including galvanized and all exposed structural steel.

F. Paint all exposed surfaces that are shop or job primed under other sections of the specifications. Touch-up all primed surfaces where prime coat has been marred or damaged, including touch-up of structural steel.

G. Paint all exposed light iron and structural steel, and other miscellaneous brackets, hangers, angles, and clips attached hereto. Shop prime coat as specified in Division 5.

H. Paint all exposed mechanical and electrical work.

I. Paint all electrical panel covers to match room wall finishes.

J. Finish all architectural woodwork, millwork, including counters, and all other millwork items that cannot be completely prefinished at the factory.

K. Paint all hollow metal doors, frames, and other hollow metal work of a ferrous material.

L. Back prime all wood trim and all plywood and millwork.

M. Paint all light iron, structural steel and light gauge metal framing in pool area.

1.03 RELATED WORK

A. Following categories of work are not included as part of field-applied finish work, or are included in other sections of the specifications.

B. Shop Priming: Unless otherwise specified, shop priming of ferrous metal items is included under various sections for structural steel, miscellaneous metal, hollow metal work, and similar items. Also, for fabricated components such as architectural work, and similar items. Also, for fabricated or factory-built mechanical and electrical equipment or accessories.

C. Pre-Finished Items: Unless otherwise indicated, do not include painting when factory-finishing or installer finishing is specified for such items as (but not limited to) architectural woodwork and casework, finished mechanical and electrical equipment, including light fixtures, distribution cabinets, doors, and equipment.

D. Concealed Surfaces: Unless otherwise indicated, painting is not required on surfaces such as walls or ceilings in concealed areas and generally inaccessible areas.

E. Finished Metal Surfaces: Metal surfaces of anodized aluminum, stainless steel, chromium plate, copper, bronze, and similar finished materials will not require finish painting, unless otherwise indicated.

F. Operating Parts and Labels: Moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sinkages, sensing devices, motor and fan shafts will not require finish painting, unless otherwise indicated.

G. Do not paint over any code-required labels, such as UL and Factory Mutual, or any equipment identification, performance rating, name or nomenclature plates.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's technical information including paint label analysis and application instructions for each material proposed for use.

B. Samples: Submit samples for Architect's review of color and texture only. Provide a listing of material and application for each coat of each finished sample.
   1. On 12" x 12" hardboard, provide two samples of each color and materials, with texture to simulate actual conditions. Resubmit samples as requested by the Architect until acceptable sheen, color, and texture is achieved.
   2. On actual wood surfaces, provide two 4" x 8" samples of natural and stained wood finish. Label and identify each as to location and application.

1.05 DELIVERY AND STORAGE

A. Deliver materials to job site in original, new and unopened packages and containers, bearing manufacturer's name and label, and following information:
   1. Name or title of material
   2. Manufacturer's stock number and date of manufacturer
   3. Manufacturer's name
   4. Contents of volume, for major pigment and vehicle constituents
   5. Thinning instructions

6. Application instructions
7. Color name and number

B. Storage of Materials:
1. Store and mix all materials only in such rooms as may be assigned for this purpose. Take all necessary precautions in storage of painting materials and implements to prevent fire.
2. Provide galvanized iron pans of suitable size in which all mixing pails must be placed. No mixing shall be done outside of these pans. Pay for repairs for all damage caused by mixing or spillage.
3. Remove all oily rags and waste each night after being placed in a covered metal receptacle during the day.

1.06 JOB CONDITIONS

A. Before commencing painting, make certain that surfaces to be coated are in perfect condition to receive the coating by being clean, dry, smooth, and at the proper temperature. No materials shall be applied if and when unfavorable atmospheric conditions prevail which could adversely affect the drying, appearance, color, or adhesion of the materials. If surface, atmospheric, or other conditions to be improper for paint or finishing are found, report such conditions to the Architect at once and do not proceed until the situation is corrected. Commencement of work in any given areas shall be construed to mean acceptance of such areas by the Contractor.

B. Apply solvent-thinned paints only when temperature of surfaces to be painted and surrounding air temperatures are between 45 deg. F (7 deg. C) and 95 deg. F (35 deg. C), unless otherwise permitted by paint manufacturer's printed instructions.

C. Do not apply paint in snow, rain, fog or mist; or when relative humidity exceeds 85%; or damp or wet surfaces; unless otherwise permitted by paint manufacturer's printed instructions.

D. Painting may be continued during inclement weather if areas and surfaces to be painted are enclosed and heated within temperature limits specified by paint manufacturer during application and drying periods.

E. Material List and Maintenance Instructions: Furnish triplicate (3) copies of a complete list of materials being used, including type, brand and color used for painting and finishing each room and portion of building, interior and exterior. Include instructions for proper maintenance.

PART II - PRODUCTS

2.01 COLORS AND FINISHES

A. Prior to beginning work, Architect will select colors for surfaces to be painted.
1. Use representative colors and finishes when preparing samples for review.
2. Final acceptance of colors will be from samples applied on the job.

B. Color Pigments: Pure, non-fading, applicable types to suit substrates and service indicated.
   1. Lead content in pigment, if any, is limited to contain not more than 0.5% lead, as lead metal based on the total non-volatile (dry-film) of paint by weight.

C. Paint Coordination: Provide finish coats which are compatible with prime paints used. Review other sections of these specifications in which prime paints are to be provided to ensure compatibility of total coatings system for various substrates. Upon request from other trades, furnish information on characteristics of finish materials proposed for use, to ensure compatible prime coats are used. Provide barrier coats over incompatible primers or remove and reprime as required. Notify Architect in writing of any anticipated problems using specified coating systems with substrates primed by others.

2.02 MATERIAL QUALITY

Provide best quality grade of various types of coating as regularly manufactured by acceptable paint materials manufacturers. Materials not displaying manufacturer's identification as a standard, best-grade product will not be acceptable.

2.03 MANUFACTURERS

A. Use the same brand of each respective material throughout the job.

B. Primers and undercoats shall be those made by manufacturers of respective finish coats.

C. The following manufacturer's first line products are approved for use on this project:
   1. Sherwin-Williams Co. (SW)
   2. Benjamin Moore & Co. (BM)
   3. Pittsburgh Paint (PPG)
   4. Glidden Professional (GP)

D. Galvanized surface pre-treatment shall be manufactured by American Chemical Paint Company or Nielson Chemical Company.

2.04 STANDARD MATERIALS

A. Comply with requirements of latest editions of these standard specifications for the following materials, whether used directly or as ingredients of factory prepared products:
   1. Raw Linseed Oil - ASTM A234
   2. Boiled Linseed Oil - ASTM D260
   3. Liquid Drier - Federal Spec. TT-D-651
   4. White Shellac - Federal Spec. TT-V-91a
   5. Turpentine - ASTM D13
   6. Mineral Spirits - ASTM D235
   7. Interior Wood Filler - Federal Spec. TT-F-336
   8. Pigments-in-Oil - Federal Spec. FF-P-381

2.05 PAINTING MATERIALS

A. All basic materials entering into the compounding and manufacture of paints and other finishing materials specified, shall be of the best quality products of recognized manufacturers, subject to approval of the Architect. Reference to ASTM or Federal Spec. for the purpose of establishing a testing basis for requirements of quality.

B. Coloring materials shall be pure tint colors, and of the highest grade of tinting strength and fineness obtainable. Coloring materials shall be composed of ingredients that will mix with the various coatings specified without impairing the ultimate result for which coatings are selected.

C. All materials shall be delivered in original unopened containers, each container bearing the brand and maker's name, completely identifying the contents, including formula, and given directions for its proper use.

D. All materials shall be used without thinning, unless otherwise specified or approved by the Architect. If any material is thus thinned, use only the thinner recommended by paint manufacturer.

2.06 TYPES OF FINISHES

A. Provide the following systems for various substrates, as indicated. Unless otherwise noted, all materials specified are the products of Sherwin-Williams Co. The specifying of the products of one manufacturer is intended to indicate the type of product desired and equivalent products of approved manufacturers listed in this section will be accepted as equal, subject to conformance with specifications.
   1. Interior Exposed Concrete and Concrete Block:
      a. 1st Coat - SW PrepRite Block Filler B25W25
      b. 2nd & 3rd Coats - SW Promar 200 Latex Eggshell (B31-2200)
   2. Exterior Exposed Concrete Block:
      a. 1st Coat - SW PrepRite Block Filler B25W25
      b. 2nd & 3rd Coats - SW A100 Latex Satin H&T A82 Series
   3. Gypsum Drywall Systems:
      a. 1st Coat - SW PrepRite 200 Latex Primer B28W200
      b. 2nd & 3rd Coats - SW Promar 200 Latex Eggshell (B31-2200)
   4. Paint all Steel and Iron as follows, (exterior exposed steel per below):
      a. Ferrous Metals:
         (1) Prime Coat - SW DTM Acrylic Primer/Finish (B66W1)
         (2) Two (2) Coats - SW DTM Acrylic Semi-Gloss Coating (B66-200)
      b. Metal Doors and Frames:
         (1) One (1) Coat - SW DTM Acrylic Primer/Finish (B66W1)
         (2) Two (2) Coats - SW DTM Acrylic Semi-Gloss Coating (B66-200)
   5. Paint the backs of all Wood Trim and back of all Plywood and Millwork:
      a. One (1) Coat - SW PrepRite ProBlock HS Interior Alkyd Primer/Sealer (B79W810)
   6. Natural Finish Woodwork:
      a. One (1) Coat - Minwax 250 V.O.C. Compliant Wood Finish
      b. One (1) Coat - Gloss Minwax High Build Polyurethane
      c. One (1) Coat - Satin Minwax High Build Polyurethane

7. Concrete Floors to be Sealed:
   a. Son-No-Mar by Sonneborn Building Products or approved equal.
8. Interior Wood (Painted):
   a. One (1) Coat - SW ProBlock HS Interior Alkyd Primer/Sealer (B79W810)
   b. Two (2) Coats - SW Promar 200 Latex Semi-Gloss (B31-2200)
9. Pool enclosure (Painted):Gyp
   a. One (1) Coat - SW PrepRite 200 latex
   b. Two (2) Coats - SW Pro Industrial Precatalyzed Epoxy
10. Pool enclosure (Painted):Steel
   a. One (1) Coat - DTM Acrylic Primer
   b. Two (2) Coats - SW Pro Industrial Precatalyzed Epoxy
11. Exterior Exposed Steel
   a. One (1) Primer Coat - Sherwin Williams Macropoxy 646 Fast Cure Epoxy.
   b. Two (2) Finish Coats - Sherwin Williams Corethane 2 Satin Polyurethane

See Division 7 for coordination of use of fire proofing spray & Intumescent paint use & locations

PART III - EXECUTION

3.01 INSPECTION

A. Applicator must examine areas and conditions under which painting work is to be applied and notify Contractor in writing of conditions detrimental to proper and timely completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to applicator.

B. Starting of paint work will the construed as applicator's acceptance of surfaces and conditions within any particular area.

C. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to formation of a durable paint film.

3.02 SURFACE PREPARATION

A. General:
   1. Perform preparation and cleaning procedures in accordance with paint manufacturer's instructions and as herein specified, for each particular substrate condition.
   2. Remove hardware, hardware accessories, machine surfaces, plates, lighting fixtures, and similar items in place and not to be finish-painted, or provide surface applied protection prior to surface preparation and painting operations. Remove, if necessary, for complete painting of items and adjacent surfaces. Following completion of paint of each space or area, reinstall removed items.
   3. Clean surfaces to be painted before applying paint or surface treatments. Remove oil and grease prior to mechanical cleaning. Program cleaning and painting so the contaminants from cleaning process will not fall onto wet, newly-painted surfaces.

B. Cementitious Materials: Prepare cement plaster to be painted be removing efflorescence, chalk, dust, dirt, grease, oils and by roughening as required to remove glaze.

C. Wood:
1. Clean wood surfaces to be painted of dirt, oil or other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sandpaper smooth those finish surfaces exposed to view, and dust off. Scrape and clean small, dry, seasoned knots and apply a thin coat of white shellac or other recommended knot sealer, before application of priming coat. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood-filler. Sandpaper smooth when dried.
2. Prime, stain, or seal wood required to be job-painted immediately upon delivery to job. Prime edges, ends, faces, undersides and backsides of wood, including cabinets, counters, cases, paneling.
3. When transparent finish is required, use spar varnish for backpriming.

D. Ferrous Metals:
1. Clean ferrous surfaces, which are not galvanized or shop-coated, of oil, grease, dirt, loose mill scale and other foreign substances by solvent or mechanical cleaning.
2. Touch up shop-applied prime coats wherever damaged or bare, where required by other sections of these specifications. Clean and touch up with same type shop primer.

E. Galvanized Surfaces: Clean free of oil and surface contaminants with nonpetroleum based solvent.

3.03 MATERIALS PREPARATION

A. Mix and prepare painting materials in accordance with manufacturer's directions.
B. Store materials not in actual use in tightly covered containers. Maintain containers used in storage, mixing, and application of paint in a clean condition, free of foreign materials and residue.

C. Stir materials before application to produce a mixture of uniform density, and stir as required during application. Do not stir surface film into material. Remove film and, if necessary, strain material before using.

3.04 APPLICATION

A. General:
1. Apply paint in accordance with manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied.
2. Apply additional coats when undercoats, strains or other conditions show through final coat of paint, until paint film is of uniform finish, color and appearance. Give special attention to insure that surfaces, including edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
3. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Paint surfaces behind permanently-fixed equipment or furniture with prime coat only before final installation of equipment.
4. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, non-specular black paint.
5. Finish exterior doors on tops, bottoms and side edges same as exterior faces, unless otherwise indicated.

6. Omit first coat (primer) on metal surfaces which have been shop-primed and touch-up painted, unless otherwise indicated.
7. Apply stain on wood material to an even finish. Apply first coat of varnish, steel wool. Add second coat of varnish. Provide a smooth clean finish.

B. Scheduling Painting:
1. Apply first-coat material to surfaces that have been cleaned, pretreated or otherwise prepared for paint as soon as practicable after preparation and before subsequent surface deterioration.
2. Allow sufficient time between successive coatings to permit proper drying. Do no recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.

C. Minimum Coating Thickness: Apply materials at not less than manufacturer's recommended spreading rate, to establish a total dry film thickness as indicated or, if not indicated, as recommended by coating manufacturer.

3.05 CLEAN-UP AND PROTECTION

A. Clean-Up: During progress of work, remove from site discarded paint materials, rubbish, cans and rags at end of each work day.

B. Upon completion of painting work, clean window glass and other paint-spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.

C. Protection: Protect work of other trades, whether to be painted or not, against damage by painting and finishing work. Correct any damage by cleaning, repairing or replacing, and repainting, as acceptable to Architect.

D. Provide "Wet Paint" signs as required to protect newly-painted finishes. Remove temporary protective wrappings provided by others for protection of their work, after completion of painting operations.

E. At the completion of the work of other trades, touch up and restore all damaged or defaced painted surfaces.

3.06 TOUCH-UP PAINT SUPPLY

Supply a minimum of one (1) quart of each paint or stain product used for Owner's use in touching up. Label cans as to color name and/or number, finish (i.e., semi-gloss), and location where used.

- - - END OF SECTION - - -

PART I - GENERAL

1.01 GENERAL

The Drawings, Instructions to Bidders, Form of Proposal, General Conditions, Supplementary General Conditions, and Division 1 are included herein and govern work under this section.

1.02 DESCRIPTION OF WORK

A. Furnish all labor, materials necessary and required to completely install all equipment required by the drawings and specified herein.

B. The Contractor is cautioned that all necessary built-in anchorage and built-in fasteners or other necessary support for these accessories are part of this section and the installation of same are the responsibility of the contractor for this section.

PART II - PRODUCTS

2.01 METAL TOILET PARTITIONS (OVERHEAD BRACED)

A. Shall be manufactured by one of the following:
1. Sanymetal Products Company
2. General Partition
3. Hadrian Corp.

B. Colors (baked on thermo-setting acrylic enamel) to be selected by Architect.

C. Doors shall be 1" thick with two sheets of 22 gauge galvanized bonderized steel enclosing sound-deadening Bridgecore. All formed edges shall be welded every l8" and sealed with a surrounding oval-crown locking strip, mitered, welded and finished at the corners.

D. Panels shall be 1" thick with two sheets of 22 gauge galvanized bonderized steel enclosing sound-deadening Bridgecore. All formed edges sealed with a surrounding oval-crown locking strip, mitered, welded and finished at the corners.

E. Pilasters: Pilasters shall be 1-1/4" thick with two sheets of acrylic-coated 20 gauge galvanized-bonderized steel welded and finished as specified for baked enamel doors. Pilaster bases shall be attached with floor stirrups and leveling bolts for secure anchorage.

F. Accessories:
1. Each door shall have a cast alloy chrome-plated coat hook and bumper. It shall be attached by one-way head screws.
2. Each door shall be equipped with latch with face mortised flush with edge locking strip.
3. Latch bolts shall be stainless steel with chrome plated ferrous metal handles and escutcheon plates.
4. One (1) stop and keeper shall be furnished for each compartment.
5. Provide sufficient backing in partitions for paper holders where indicated on drawing.

6. Partitions are to be rigidly mounted in accordance with the manufacturer's recommendations.

2.02 URINAL SCREENS

A. Urinal screens shall be type, color, and materials as designated and as manufactured by:
1. Sanymetal Products Company
2. General Partition
3. Hadrian Corp.

B. Material:
1. Baked Enamel: Panels shall be 1" thick made of two sheets of #22 gauge galvanized-bonderized stretcher levered steel, assembled over and cemented under pressure to a dense sound deadening Bridgecore insulation. The two face plates of the panel shall have formed edges sealed with a continuous oval-crown locking strip, mitered, welded and finished at corners.
2. Fittings: Partitions shall be attached to the wall with two brackets made of heat-treated, polished and anodized, extruded aluminum alloy and each stirrup bracket shall be 3" long and provided with four holes for attachment of screws to the wall and two thru-bolts through the partition.
3. Finish: All units shall be mechanically cleaned by means of automatic vapor degreasing and finish shall consist of a prime coat and a finish color of thermo--setting acrylic enamel applied electrostatically and baked on to produce a uniform, smooth, lustrous protective finish.

C. Color: To be selected by Architect.

PART III - EXECUTION

3.01 INSPECTION

A. Check areas to receive partitions for correct height and spacing of support structures and plumbing fixtures that may affect quality and execution of work.

B. Commence installation of toilet partitions when all checks have been made.

C. Start of work constitutes acceptance of job conditions.

3.02 INSTALLATION

A. Install hardware as recommended by manufacturer.

B. Conceal evidence of drilling in walls on finished work.

C. Adjust pilaster shoes to fit flush with finish floor.

3.03 ADJUST AND CLEAN

A. Adjust brackets to provide uniform clearances not exceeding:
   1. Pilaster and wall: 1"
   2. Panels and wall: 1"
   3. Pilasters and panels: l/2"
   4. Pilasters and doors: 3/l6"

B. Adjust hardware for proper operation.

C. Set hinges to hold in-swinging doors ajar when not latched.

D. After completion of installation, clean and polish exposed compartment and screen surfaces and touch-up minor scratches.

- - - END OF SECTION - - -

PART I - GENERAL

1. 01 GENERAL

The Drawings, Instructions to Bidders, Form of Proposal, General Conditions, Supplementary General Conditions and Division 1 are included herein and govern work under this section.

1. 02 DESCRIPTION OF WORK

A. This section consists of specifications for a variety of toilet accessories which may or may not be exclusively used on this project. The extent of each type of toilet accessory is shown on drawings.

B. Types of toilet accessories required include but are not necessarily limited to the following
1. Recessed paper towel dispenser/waste receptacle
2. Surface mounted toilet tissue dispensers - single
3. Surface mounted (counter or lavatory) soap dispensers
4. Grab bars - sizes and configurations as shown on plans
5. Mirrors - flat surface mounted and tilted surface mounted
6. Coat Hooks

C. Some types of toilet accessories are included as part of toilet partitions elsewhere in Division 10.

1. 03 QUALITY ASSURANCE

A. Inserts and Anchorage: Furnish inserts and anchoring devices which must be set in concrete or built into masonry; coordinate delivery with other work to avoid delay.

B. Accessory Locations: Coordinate accessory locations with other work to avoid interference and to assure proper operation and servicing of accessory units.

C. Products: Provide products of same manufacturer for each type of accessory unit and for units exposed in same areas, unless otherwise acceptable to Architect.

D. Manufacturer: Provide toilet accessories as manufactured by one of the following:
1. Bradley Corp. (use as a standard)
2. Bobrick Washroom Equipment, Inc.
3. American Specialties, Inc.
4. Franklin Brass Mfg. Co.- a Liberty Hardware Manufacturing Corp.

1. 04 SUBMITTALS

A. Product Data: Submit manufacturer's technical data and installation instructions for each toilet accessory.

B. Shop Drawings: Furnish for Architect's approval in accordance with Division 1, copies each of brochures, schedules and other pertinent information relative to toilet room accessories and building accessories.

C. Maintenance Manual: Furnish a schedule of all toilet room accessories, indicating the model, finish, manufacturer, and location installed, together with descriptive brochures of all installed equipment specified herein. This information shall be included in the maintenance manual specified in Division 1.

D. Setting Drawings: Provide setting drawings, templates, instructions, and directions for installation of anchorage devices in other work.

PART II - PRODUCTS

2. 01 RECESSED PAPER TOWEL DISPENSER / WASTE RECEPTACLE

A. In Women Room #203, provide two (2) High Efficiency Heated Air Hand Dryer: XLERATOR; Hand Dryer; EPD Certified, Rapid-drying, energy efficient, rapid drying, automatic sensor, adjustable speed and sound control, adjustable heat control, electric hand dryer; surface mounted or semi-recessed; entire dryer internally grounded. Made in the USA Certified. Warranty 5 year limited.

B. Model XL-SI:
1) Cover: Stainless Steel
2) Finish Brushed Number 4 finish.
3) Surface Mounted - Women's Toilets: 43 inches (1092 mm).
4) Power Source : 110 - 120 Volts, 11.3 - 12.2 Amps, 50/60 Hz, 1240 - 1450 Watts.

C. Unit shall meet ANSI A117.1-1992 requirements for use by person in a wheelchair.

2. 02 TOILET TISSUE DISPENSER - SINGLE

A. Provide one (1) toilet tissue dispenser at each water closet. Units shall be Franklin Brass Model No. 5508B or approved equal.

B. Unit shall be constructed of 22 gauge chrome plated steel.

2. 03 SOAP DISPENSERS - SURFACE MOUNTED (COUNTER OR LAVATORY)

A. Provide surface mounted (in sink or counter) soap dispensers at each lavatory as shown on drawings. Units shall be Bobrick model No. B-822 or approved equal.

B. Unit piston, spout and top cover shall be constructed of Type-304 stainless steel with bright polished finish.

C. Soap Container shall be translucent, shatter-resistant polyethylene, 34 fl. oz. capacity.

D. Valve operation shall be by one hand and shall meet ADA requirements.

2. 04 GRAB BARS

A. Grab bars at toilets shall be of configuration as indicated, as manufactured by Franklin Brass. Model 5600 Series, Bobrick 6800 Series, or approved equal.

B. Grab bars shall be constructed of Type 304 stainless steel and shall have a minimum wall thickness of 18 gauge. Exposed surfaces shall have a satin finish. Diameter (O.D.) shall be 1-1/2". Provide 11 gauge stainless steel flanges and 13 gauge stainless steel mounting plate. Gripping area shall have knurled or textured surface to comply with applicable Accessible Codes.

C. Grab bars shall be mounted at heights and in locations indicated on drawings.

D. Sizes: as shown on Drawings.

E. Provide all required anchoring devices to properly mount grab bars in a secure manner so as to adequately support the load to be imposed. Anchor into solid blocking wood or metal.

F. Grab bars shall meet all applicable provision of ANSI 117.1 1992.

G. Provide grab bars at all locations as indicated on drawings.

2. 05 MIRRORS - FLAT SURFACE MOUNTED

A. Sizes shall be as indicated on drawings and shall be Bradley Corp. Model No. 781 or approved equal.

B. Frame fabricated of 18 gauge Type 304 satin finish stainless steel with welded and polished corners and no screws or seams appearing on surface. Mirror shall be No. 1 quality 1/4" polished plate glass, triple silvered electro-copper plated, baked enamel backing.

C. If flat surface mounted mirror is shown on plans for use at handicapped lavatories then mounting height shall comply with ADA requirements.

2. 06 COAT HOOKS

A. Coat hooks shall be Franklin Brass Model #1402. An additional lower robe hook is required at all handicap guest bathrooms or approved equal.

B. Hooks shall have concealed fasteners and satin finish.

2. 07 RECESSED PAPER TOWEL DISPENSER / WASTE RECEPTACLE -WOMEN'S STALL

A. Recessed paper towel dispenser / waste receptacles shall be Bobrick Corp. Model B369 or approved equal.

B. Units shall be constructed of satin finish stainless steel with seamless beveled edge. Towel capacity: Either 475 multi-fold or 350 C-fold towels.

PART III - EXECUTION

3. 01 INSPECTION

Installer must examine substrates, previously installed inserts and anchorages necessary for mounting of toilet accessories, and other conditions under which installation is to occur, and must notify Contractor in writing of condition detrimental to proper and timely completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to installer.

3. 02 INSTALLATION

Install toilet accessory units in accordance with manufacturer's instructions, using fasteners which are appropriate to substrate and recommended by manufacturer of unit. Install units plumb and level, firmly anchored in locations indicated. Contractor shall verify and coordinate proper vertical and horizontal mounting heights for all handicap and ADA Compliant products.

3. 03 ADJUST AND CLEAN

A. Adjust toilet accessories for proper operation and verify that mechanisms function smoothly.

B. Clean and polish all exposed surfaces after removing protective coatings.

----- END OF SECTION -----

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes the following:
1. Piping materials and installation instructions common to most piping systems.
2. Mechanical sleeve seals.
3. Sleeves.
4. Escutcheons.
5. Supports and anchorages.

1.02 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in chases.

1.03 SUBMITTALS

A. Welding certificates.

1.04 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
1. Comply with provisions in 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.
3. Coordinate inspection of required welder’s stamp/identification of shop welded pipe with Owner prior to installation. Coordinate inspection of required welder’s stamp/identification of field welded pipe with Owner as work progresses, prior to enclosure.

C. Electrical Characteristics for Fire-Suppression Equipment: Equipment of different electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

PART 2 - PRODUCTS

2.01 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 21 piping Sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.02 JOINING MATERIALS

A. Refer to individual Division 21 piping Sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.

C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

E. Welding Filler Metals: Comply with AWS D10.12.

F. Solvent Cements for Joining CPVC Plastic Piping: ASTM F 493.

2.03 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

B. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.

C. Pressure Plates: Stainless steel. Include two for each sealing element.

D. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.04 SLEEVES

A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral water stop, unless otherwise indicated.

2.05 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

B. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.
1. Finish: Polished chrome-plated and rough brass.

PART 3 - EXECUTION

3.01 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Provide piping according to the following requirements and Division 21 Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Provide piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Provide piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Provide piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Provide piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Provide piping to permit valve servicing.

G. Provide piping at indicated slopes.

H. Provide piping free of sags and bends.

I. Provide fittings for changes in direction and branch connections.

J. Provide piping to allow application of insulation.

K. Select system components with pressure rating equal to or greater than system operating pressure.

L. Provide escutcheons for penetrations of walls, ceilings, and floors.

M. Provide sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

N. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
   1. Provide steel pipe for sleeves smaller than 6 inches in diameter.
   2. Provide cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.
   3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

O. Underground, Exterior-Wall Pipe Penetrations: Provide cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
   1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten

bolts against pressure plates that cause sealing elements to expand and make watertight seal.

P. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with fire stop materials. Refer to Division 07 Section "Penetration Fire Stopping" for materials.

Q. Verify final fire protection equipment locations prior to roughing-in.

R. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.02 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 21 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. 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:
   1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
   2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

E. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

F. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.03 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Division 05 Section "Metal Fabrications" for structural steel.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor fire-suppression materials and equipment.

C. Field Welding: Comply with AWS D1.1.

- - - END OF SECTION - - -

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data:
1. Manufacturer's catalog sheets, specifications, and installation instructions for each type backflow preventer and test kit.

1.02 QUALITY ASSURANCE

A. Regulatory Requirements:
1. Comply with the State Department of Health Sanitary Code for Cross Connection Control, and the other standards listed in Part 2 of this section.
2. Where conflicts occur between the referenced standards, the most stringent requirements shall apply.

1.03 MAINTENANCE

A. Special Tools (as furnished or recommended by the backflow preventer manufacturer). Deliver to the Owner's Representative:
1. Test Kit B: Sight tube, of required length, for testing backflow preventer for proper operation, and printed procedure for conducting test.

PART 2 PRODUCTS

2.01 BACKFLOW PREVENTERS

A. Double Check Detector Assembly Valve (DCDA) device with metered by-pass, conforming to ASSE Standard 1015, AWWA C-510, USC specifications manual for Cross Connection control, and listed as acceptable in the New York State Department of Health, Environmental Health manual.
1. Performance: 150 psig, and 130 degrees F, maximum working conditions.
2. Assembly: OS&Y gate valve with integral tamper switch on inlet side and OS&Y gate valve with integral tamper switch on outlet side, and one test cock, all as furnished or recommended by the backflow preventer manufacturer.

PART 3 EXECUTION

3.01 INSTALLATION

A. Provide the Work of this section in accordance with the manufacturer's printed installation instructions.

3.02 FIELD QUALITY CONTROL

A. Operation Test: Test kit as specified under Part 1 of this section may be used. Conduct test in the presence of the Owner's Representative.
1. DCDA Backflow Preventer: Test the device with the test kit in accordance with the manufacturer's test procedure.

B. Re-testing: Repair or replace any device failing the operation test, and repeat the test.

- - - END OF SECTION - - -

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Equipment-Label Schedule: Include a listing of all equipment to be labeled and the proposed content for each label.

PART 2 - PRODUCTS

2.01 EQUIPMENT LABELS

A. Metal Labels for Equipment:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Brady Corporation.
b. Emedco.
c. Seton Identification Products.
2. Material and Thickness: Brass, 0.032 inch thick, with predrilled holes for attachment hardware.
3. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
4. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
5. Fasteners: Stainless-steel rivets or self-tapping screws.
6. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Plastic Labels for Equipment:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Brady Corporation.
b. emedco.
c. Seton Identification Products.
2. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, with predrilled holes for attachment hardware.
3. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
4. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
5. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
6. Fasteners: Stainless-steel rivets or self-tapping screws.
7. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

C. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.

D. Equipment-Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.02 PIPE LABELS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Brady Corporation.
   2. Emedco.
   3. Seton Identification Products.

B. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service and showing flow direction.

C. Pretensioned Pipe Labels: Precoiled, semi rigid plastic formed to fully cover circumference of pipe and to attach to pipe without fasteners or adhesive.

D. Self-adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

E. Pipe-Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.
   1. Flow-Direction Arrows: Integral with piping-system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
   2. Lettering Size: At least 1/2 inch for viewing distances up to 72 inches and proportionately larger lettering for greater viewing distances.

PART 3 - EXECUTION

3.01 PREPARATION

A. Clean piping and equipment surfaces of incompatible primers, paints, and encapsulants, as well as dirt, oil, grease, release agents, and other substances that could impair bond of identification devices.

3.02 LABEL INSTALLATION REQUIREMENTS

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be installed.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install or permanently fasten labels on each major item of mechanical equipment.

D. Locate equipment labels where accessible and visible.

E. Piping: Painting of piping is specified in Section 099600 "High-Performance Coatings."

F. Pipe-Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
   1. Near each valve and control device.
   2. Near each branch connection excluding short takeoffs. Where flow pattern is not obvious, mark each pipe at branch.
   3. Near penetrations and on [both sides of through walls, floors, ceilings, and inaccessible enclosures.
   4. At access doors, manholes, and similar access points that permit a view of concealed piping.
   5. Near major equipment items and other points of origination and termination.
   6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
   7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

- - - END OF SECTION - - -

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes fire-suppression water-service piping and related components outside the building and service entrance piping through floor into the building and service entrance piping through wall into the building.

B. Related Sections:
1. Division 21 Section "Wet-Pipe Sprinkler Systems" for wet-pipe fire-suppression sprinkler systems inside the building.

1.02 SUBMITTALS

A. Product Data: Provide submittals for each type of product indicated in this section and for the final O & M Manuals.

B. Shop Drawings:
1. Wiring Diagrams: For power, signal and control wiring.

C. Warranty Information: Provide warranty information for each type of product indicated in this section and for the final O & M Manuals.

D. Record Drawings and Pressure Test reports: Provide pressure test reports for the final O & M Manuals and shop drawings of the actual location of installed water mains located on the plumbing and site – civil utility plan.

1.03 QUALITY ASSURANCE

A. Regulatory Requirements:
1. Comply with the written requirements of the AHJ’s Water Department’s for the installation of water services. Provide for the tapping of water mains and backflow prevention requirements in compliance with the AHJ’s Water Department’s written backflow prevention design requirements.
2. Comply with the standards of the authorities having jurisdiction above for fire-suppression water-service piping, including materials, hose threads, installation, and pressure testing.

B. Piping materials shall bear label, stamp, or other markings of specified testing agency. Provide U.L. Listed products.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with the "Approval Guide," published by FM Global, or UL's "Fire Protection Equipment Directory" for fire-service-main products.

E. NFPA Compliance: Comply with NFPA 24 for materials, installations, tests, flushing, and valve supervision for fire-suppression water-service piping.

1.04 COORDINATION

A. Coordinate service shut-downs and connection to water main with utility company.

PART 2 - PRODUCTS

2.01 DUCTILE-IRON PIPE AND FITTINGS

A. Mechanical-Joint, Ductile-Iron Pipe: Class 52, AWWA C151, with mechanical-joint bell and plain spigot end. Cement lined and asphalt coated.

B. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern. Pipe shall be cement lined and asphalt coated exterior.
   1. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

C. Mechanical – joint restraint system for ductile-Iron pipe:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Star Pipe Products.
      b. EBAA Iron, Inc.
      c. U.S. Pipe, Inc.
      d. Or equal
   2. “Megalug” Restraint devices for nominal pipe sizes 3 inch through 12 inch shall consist of multiple gripping wedges incorporated into a follower gland meeting the applicable requirements of ANSI/AWWA C110/A21.10. Gland body, wedges and wedge actuating components shall be cast from grade 65-45-12 ductile iron material in accordance with ASTM A536. Ductile iron gripping wedges shall be heat treated within a range of 370 to 470 BHN.
   3. Restrained flange adapters shall be used in lieu of threaded, or welded, flanged spool pieces. Flange adapters shall be made of ductile iron conforming to ASTM A536 and have flange bolt circles that are compatible with ANSI/AWWA C110/A21.10. Restraint for the flange adapter shall consist of a plurality of individual actuated gripping wedges to maximize restraint capability. Torque limiting actuating screws shall be used to insure proper initial set of gripping wedges.

D. Grooved-End, Ductile-Iron Pipe Appurtenances:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Anvil International, Inc.
      b. Shurjoint Piping Products.
      c. Star Pipe Products.
      d. Victaulic Company.
      e. EBAA Iron, Inc.
      f. ROMAC Industries Inc.

2.02 PIPING SPECIALTIES

A. Transition Fittings: Manufactured fitting or coupling same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

B. Tubular-Sleeve Pipe Couplings:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Cascade Waterworks Manufacturing.
      b. Dresser, Inc.; Dresser Piping Specialties.

c. Ford Meter Box Company, Inc. (The); Pipe Products Division.
d. JCM Industries.
e. ROMAC Industries Inc.
f. Smith-Blair, Inc.; a Sensus company.
g. Viking Johnson.

2. Description: Metal, bolted, sleeve-type, reducing or transition coupling, with center sleeve, gaskets, end rings, and bolt fasteners, and with ends of same sizes as piping to be joined.
3. Standard: AWWA C219.
4. Center-Sleeve Material: Ductile iron.
5. Gasket Material: Natural or synthetic rubber.
6. Pressure Rating: 150 psig minimum.
7. Metal Component Finish: Corrosion-resistant coating or material.

2.03 ENCASEMENT FOR PIPING

A. Standard: ASTM A 674 or AWWA C105.

B. Material: Linear low-density PE film of 0.008-inch minimum thickness or high-density, cross-laminated PE film of 0.004-inch minimum thickness.

C. Form: Sheet or tube for complete wrapping around underground ductile iron piping.

D. Color: Black or natural.

2.04 ALARM DEVICES

A. General: UL 753 and "Approval Guide," published by FM Global, listing, of types and sizes to mate and match piping and equipment.

PART 3 - EXECUTION

3.01 EARTHWORK

A. Comply with OSHA requirements for excavating, trenching, and backfilling. Refer to Division 32 specifications.

3.02 PIPING INSTALLATION

A. Water-Main Connection: Pipe sizes and location are indicated the on the Civil / Site Utility Plans.

B. Comply with NFPA 24 and American Water Works Association requirements for fire-service-main piping materials and installation.

C. Provide ductile-iron, water-service piping in accordance with AWWA C600 and AWWA M41.

D. Bury piping with a minimum depth of cover over top shall be 5’-0”, with top at least 12 inches below level of maximum frost penetration.

E. Provide for extension of building fire-suppression water-service piping to site water main and connect to water-supply source. Provide a post indicator valve. Extend water service into building and connect to fire sprinkler system at service entrance point as indicated on plans.
1. Terminate fire-suppression water-service piping inside building 12 inches above finished floor with flange for extension to sprinkler system piping. Cover end of water service with

blind flange until building fire protection water piping systems are installed. Provide final connection to building's fire-suppression water-service piping systems when those systems are installed.

F. Provide underground piping with restrained joints at horizontal and vertical changes in direction. Provide restrained-joint piping, thrust blocks, anchors and other supports through foundation wall and building floor.

G. Comply with requirements in Division 21 Sections for fire-suppression-water piping inside the building.

H. Provide sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Division 21 Section "Common Work Results for Fire-Suppression Piping."

I. Provide mechanical sleeve seals for piping penetrations of concrete foundation wall and floor slab. Comply with requirements for sleeve seals specified in Division 21 Section "Common Work Results for Fire-Suppression Piping."

3.03 JOINT CONSTRUCTION

A. Provide couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure rating same as or higher than systems pressure rating for aboveground applications unless otherwise indicated.

B. Provide unions adjacent to each valve in tubing NPS 2 and smaller.

C. Provide flanges, flange adaptors, or couplings for grooved-end piping on valves and adaptors to equipment having NPS 2-1/2 and larger end connections.

D. Remove scale, slag, dirt, and debris from outside and inside of pipes, and fittings before assembly. Provide and plug ends of completed underground pipe at the end of each work day and when work stops.

E. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with bolts according to ASME B31.9.

F. Dissimilar Materials Piping Joints: Use adapters compatible with both piping materials, with OD, and with system working pressure.

3.04 ANCHORAGE INSTALLATION

A. Anchorage, General: Provide and install water-distribution piping with restrained joints.

B. Provide anchorages for tees, plugs and caps, bends, crosses and valves in fire-suppression water-service piping according to NFPA 24 and the following:
1. Mechanical-Joint, Ductile-Iron, Water-Service Piping: According to AWWA C600.

C. Apply full coats of bitumastic coatings, asphalt or other acceptable corrosion-resistant material to surfaces of installed ferrous anchorage devices.

3.05 ALARM DEVICE INSTALLATION

A. General: Comply with NFPA 24 for devices and methods of valve supervision. Underground valves with valve box do not require supervision.

B. Supervisory Switches: Supervise valves in open position.
   1. Indicator Posts: Drill and thread hole in upper-barrel section at target plate. Provide switch, with toggle against target plate, on barrel of indicator post. Also provide padlock on wrench on indicator post. Provide Owner with 2 sets of keys. Coordinate work and location of signal wiring with electrical contractor.

C. Water-Flow Indicators: provide and install in water-service piping. Select indicator with saddle and vane matching pipe size. Drill hole in pipe, insert vane, and bolt saddle to pipe.

D. Provide for wiring and connection of fire alarm devices including tamper and flow switches to building's fire-alarm system. Wiring and fire-alarm devices are specified in Division 26 Sections.

3.06 CONNECTIONS

A. Connect fire-suppression water-service piping to existing water main. Provide ductile iron tee and gate valve.

B. Provide proper flushing and hydrostatic testing of all new underground water service piping at 200 psi for (2) hours, or 50 psi above static pressure, whichever is greater. Provide NFPA 13 Contractor’s Material and Test Certificate for Below Ground Piping for all new underground piping serving the sprinkler systems.

C. Connect building service fire-suppression water piping to interior fire-suppression sprinkler piping.

3.07 FIELD QUALITY CONTROL

A. Provide written test procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, provide for procedure described below.

B. Piping Tests: Conduct piping tests before joints are covered and after concrete thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.

C. Hydrostatic Tests: Test at not less than the working pressure, 200 psig for (2) - two hours.
   1. Increase pressure in 50-psig increments and inspect each joint between increments. Hold at test pressure for one hour; decrease to 0 psig. Slowly increase again to test pressure and hold for one more hour. Maximum allowable leakage is 2 quarts per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within allowed limits.

D. Provide written pressure test and inspection reports for the final O & M Manuals.

3.08 IDENTIFICATION

A. Provide continuous underground detectable warning tape during backfilling of trench for underground fire-suppression water-service piping. Locate below finished grade, directly over piping. Underground warning tapes are specified in Division 31 Section "Earth Moving."

B. Permanently attach equipment nameplate or marker indicating fire-suppression water-service piping with electrically insulated fittings, on main electrical meter panel.

3.09 CLEANING AND TESTING

A. Clean fire-suppression water-service piping as follows:
   1. Purge new piping systems and parts of existing systems that have been altered, extended or repaired before use.
   2. Use purging procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in NFPA 24 for flushing of piping. Flush piping system with clean, potable water until dirty water does not appear at points of outlet.

B. Provide written reports of flushing and purging activities for the final O & M Manuals.

3.10 PIPING SCHEDULE

A. Underground and under slab fire-suppression water-service piping NPS 3 to NPS 6 inches shall be one of the following:
   1. Mechanical-joint, ductile-iron pipe; mechanical-joint, ductile- or gray-iron, standard-pattern or ductile-iron, compact-pattern fittings; glands, gaskets, and bolts; and gasketed joints.

3.11 VALVE SCHEDULE

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

B. Underground fire-suppression water-service shutoff valves NPS 6 shall be the following:
   1. 200-psig, AWWA, iron, non rising-stem, resilient-seated gate valves.

C. Indicator-post underground fire-suppression water-service valves NPS 3 and larger shall be 175-psig, UL-listed or FM-approved, iron, non rising-stem gate valves with indicator-post flange.

- - - END OF SECTION - - -

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
1. Pipes, fittings, and specialties.
2. Fire-protection valves.
3. Fire-department connections.
4. Sprinklers.
5. Alarm devices.
6. Pressure gauges.

1.02 SYSTEM DESCRIPTIONS

A. Wet-Pipe Sprinkler System: Automatic sprinklers are attached to piping containing water and that is connected to water supply through alarm valve. Water discharges immediately from sprinklers when they are opened. Sprinklers open when heat melts fusible link or destroys frangible device. Hose connections are included if indicated.

1.03 PERFORMANCE REQUIREMENTS

A. Standard-Pressure Piping System Component: Listed for 175-psig minimum working pressure.

B. Delegated Design: Any changes other than minor adjustments to the layout of piping which in the opinion of the Architect have no effect upon the hydraulic performance of the system, shall be performed and submitted by the fire sprinkler contractor, using performance requirements and design criteria indicated herein, as well as a current hydrant flow test.
1. Fire-hydrant flow test to be obtained by Fire Sprinkler Contractor.

C. Sprinkler system design shall be approved by authorities having jurisdiction.
1. Margin of Safety for Available Water Flow and Pressure: 10 percent, including losses through water-service piping, valves, and backflow prevention devices.
2. Sprinkler Occupancy Hazard Classifications:
a. Building Service Areas: Ordinary Hazard, Group 1.
b. Electrical Equipment Rooms: Ordinary Hazard, Group 1.
c. General Storage Areas: Ordinary Hazard, Group 1.
d. Mechanical Equipment Rooms: Ordinary Hazard, Group 1.
e. Restaurant Service Areas: Ordinary Hazard, Group 1.
f. Mosque, Multi-Purpose room and Public Areas: Light Hazard.
3. Minimum Density for Automatic-Sprinkler Piping Design:
a. Light-Hazard Occupancy: 0.10 gpm
b. Ordinary-Hazard, Group 1 Occupancy: 0.15 gpm
4. Maximum Protection Area per Sprinkler: Per UL listing.
5. Maximum Protection Area per Sprinkler:
a. Mosque, Multi-Purpose room and Public Areas: 225 sq. ft.
b. Storage Areas: 130 sq. ft.
c. Mechanical Equipment Rooms: 130 sq. ft.
d. Restaurant Service Areas: 130 sq. ft.
e. Electrical Equipment Rooms: 130 sq. ft.
f. Other Areas: According to NFPA 13 recommendations unless otherwise indicated.
6. Total Combined Hose-Stream Demand Requirement: According to NFPA 13 unless otherwise indicated:
a. Light-Hazard Occupancies: 100 gpm.
b. Ordinary Hazard Occupancies: 250 gpm.

D. Conduct NFPA compliant fire hydrant flow test prior to commencing with work. Submit test report to the Architect for approval.

1.04 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For wet-pipe sprinkler systems. Include plans, elevations, sections, details, and attachments to other work.
   1. Wiring Diagrams: For power, signal, and control wiring.

C. Delegated-Design Submittal: For sprinkler systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the fire sprinkler contractor responsible for their preparation.

D. Qualification Data: For qualified Installer and professional engineer.

E. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been approved by authorities having jurisdiction, including hydraulic calculations if applicable.

F. Welding certificates.

G. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13. Contractor shall provide NFPA-13, Contractors Material and Test Certificate for below ground piping and Contractors Material and Test Certificate for Above Ground Piping for each system. Submit for review prior to acceptance testing for Fire Alarm monitoring.

H. Field quality-control reports.

I. Operation and maintenance data.

J. Fire hydrant test report.

K. Coordination Drawings: Scale coordination drawings that demonstrate coordination of the work of this section with that of all other trades and existing building conditions.

1.05 QUALITY ASSURANCE

A. Installer Qualifications:
   1. Installer's responsibilities include designing, fabricating, and installing sprinkler systems and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test.

B. Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. NFPA Standards: Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with the most recent edition of following:
   1. NFPA 24, "Installation of Private Fire Service Mains and Their Appurtenances."

2. NFPA-14 “Standard for the Installation of Standpipe and hose systems”.
3. NFPA-13, “Standard for the Installation of Sprinkler Systems”.
4. International Building Code.
5. International Fire Code.

PART 2 - PRODUCTS

2.01 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, and fitting materials, and for joining methods for specific services, service locations, and pipe sizes.

2.02 STEEL PIPE AND FITTINGS

A. Standard Weight Schedule 40, Black-Steel Pipe: ASTM A 53/A 53M, Type E Pipe ends may be factory or field formed to match joining method.

B. Black-Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M, standard-weight, seamless steel pipe with threaded ends.

C. Uncoated, Steel Couplings: ASTM A 865, threaded.Fittings in first paragraph below are available in NPS ¼ to NPS 12 (DN 8 to DN 300).
D. Uncoated, Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.

E. Malleable- or Ductile-Iron Unions: UL 860.

F. Cast-Iron Flanges: ASME 16.1, Class 125.

G. Steel Flanges and Flanged Fittings: ASME B16.5, Class 150.

H. Steel Welding Fittings: ASTM A 234/A 234M and ASME B16.9.

I. Grooved-Joint, Steel-Pipe Appurtenances:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following: (or “approved equal”)
      a. Anvil International, Inc.
      b. Shurjoint Piping Products.
      c. Tyco Fire & Building Products LP.
      d. Victaulic Company.
   2. Pressure Rating: 175 psig minimum.
   3. Galvanized and Uncoated, Grooved-End Fittings for Steel Piping: ASTM A 47/A 47M, malleable-iron casting or ASTM A 536, ductile-iron casting; with dimensions matching steel pipe.
   4. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213, rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.

2.03 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch thick.
   1. Class 125, Cast-Iron Flat-Face Flanges: Full-face gaskets.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.04 LISTED FIRE-PROTECTION VALVES

A. General Requirements:
   1. Valves shall be UL listed or FM approved.
   2. Minimum Pressure Rating: 175 psig.

B. Check Valves:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. American Cast Iron Pipe Company; Waterous Company Subsidiary.
      b. Anvil International, Inc.
      c. Crane Co.; Crane Valve Group; Crane Valves.
      d. Crane Co.; Crane Valve Group; Jenkins Valves.
      e. Crane Co.; Crane Valve Group; Stockham Division.
      f. Fire-End & Croker Corporation.
      g. Globe Fire Sprinkler Corporation.
      h. Kennedy Valve; a division of McWane, Inc.
      i. Milwaukee Valve Company.
      j. Mueller Co.; Water Products Division.
      k. Potter Roemer.
      l. Reliable Automatic Sprinkler Co., Inc.
      m. Shurjoint Piping Products.
      n. Tyco Fire & Building Products LP.
      o. Victaulic Company.
      p. Viking Corporation.
      q. Watts Water Technologies, Inc.
   2. Standard: UL 312.
   3. Pressure Rating: 250 psig minimum.
   4. Type: Swing check.
   5. Body Material: Cast iron.
   6. End Connections: Flanged or grooved.

C. Bronze OS&Y Gate Valves:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Crane Co.; Crane Valve Group; Crane Valves.
      b. Crane Co.; Crane Valve Group; Stockham Division.
      c. Milwaukee Valve Company.
      d. NIBCO INC.
      e. United Brass Works, Inc.
   2. Standard: UL 262.
   3. Pressure Rating: 175 psig.
   4. Body Material: Bronze.
   5. End Connections: Threaded.

D. Iron OS&Y Gate Valves:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. American Cast Iron Pipe Company; Waterous Company Subsidiary.
      b. American Valve, Inc.
      c. Clow Valve Company; a division of McWane, Inc.
      d. Crane Co.; Crane Valve Group; Jenkins Valves.

e. Crane Co.; Crane Valve Group; Stockham Division.
f. Hammond Valve.
g. Milwaukee Valve Company.
h. Mueller Co.; Water Products Division.
i. NIBCO INC.
j. Shurjoint Piping Products.
k. Tyco Fire & Building Products LP.
l. Watts Water Technologies, Inc.

2. Standard: UL 262.
3. Pressure Rating: 250 psig minimum.
4. Body Material: Cast or ductile iron.
5. End Connections: Flanged or grooved.

E. Indicating-Type Butterfly Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Anvil International, Inc.
b. Kennedy Valve; a division of McWane, Inc.
c. Milwaukee Valve Company.
d. NIBCO INC.
e. Shurjoint Piping Products.
f. Tyco Fire & Building Products LP.
g. Victaulic Company.
2. Standard: UL 1091.
3. Pressure Rating: 175 psig minimum.
4. Valves NPS 2 and Smaller:
a. Valve Type: Ball or butterfly.
b. Body Material: Bronze.
c. End Connections: Threaded.
5. Valves NPS 2-1/2 and Larger:
a. Valve Type: Butterfly.
b. Body Material: Cast or ductile iron.
c. End Connections: Flanged, grooved, or wafer.
6. Valve Operation: Integral electrical, 115-V ac, prewired, single-circuit, supervisory switch indicating device.

2.05 TRIM AND DRAIN VALVES

A. General Requirements:
1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
2. Minimum Pressure Rating: 175 psig.

B. Ball Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Anvil International, Inc.
b. Conbraco Industries, Inc.; Apollo Valves.
c. Fire-End & Croker Corporation.
d. Fire Protection Products, Inc.
e. Flowserve.
f. Kennedy Valve; a division of McWane, Inc.
g. Milwaukee Valve Company.
h. NIBCO INC.
i. Potter Roemer.

j. Tyco Fire & Building Products LP.
k. Victaulic Company.
l. Watts Water Technologies, Inc.

2.06 SPECIALTY VALVES

A. General Requirements:
1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
2. Minimum Pressure Rating: 175 psig.

B. Commercial Riser Assembly:
1. Basis-of-Design Product: Subject to compliance with requirements, provide a 4 inch Reliable Model G or comparable product by one of the following: (or “approved equal”.
a. Globe Fire Sprinkler Corporation.
b. Reliable Automatic Sprinkler Co., Inc.
c. Tyco Fire & Building Products LP.
d. Victaulic Company.
e. Viking Corporation.
2. Standard: UL 193.
3. Design: For horizontal or vertical installation.
4. Include trim sets for drain, electrical sprinkler alarm switch, pressure gauges.
5. Body Material: 250 psi working pressure, elastomer faced clapper, cast gray iron.
6. Size: 4-6 inch.
7. End Connections: Grooved.
8. Gauges: (two), 300 psig.
9. Valves: (two) 3 –way globe valves.
10. Drain: 2 inch angle valve and close nipple.
11. Approvals: UL Listed and FM approved.

C. Automatic (Ball Drip) Drain Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. AFAC Inc.
b. Reliable Automatic Sprinkler Co., Inc.
c. Tyco Fire & Building Products LP.
2. Standard: UL 1726.
3. Pressure Rating: 175 psig minimum.
4. Type: Automatic draining, ball check.
5. Size: NPS 3/4.
6. End Connections: Threaded.

2.07 FIRE-DEPARTMENT CONNECTIONS

A. Flush-Type, Fire-Department Connection:
1. Basis-of-Design Product: Subject to compliance with requirements, provide Potter Roemer type as determined by the AHJ, or comparable product by one of the following:
a. Elkhart Brass Mfg. Company, Inc.
b. Fire End & Crocker.
c. Guardian Fire Equipment, Inc.
d. Potter Roemer.
2. Standard: UL 405.
3. Type: Flush, for wall mounting.
4. Pressure Rating: 175 psig minimum.
5. Body Material: Corrosion-resistant metal.

6. Inlets: Brass with threads according to NFPA 1963 and matching local fire-department sizes and threads. Include extension pipe nipples, brass lugged swivel connections, and check devices or clappers.
7. Caps: Brass, lugged type, with gasket and chain.
8. Escutcheon Plate: Rectangular, brass, wall type.
9. Outlet: With pipe threads.
10. Body Style: Horizontal.
11. Number of Inlets: One.
12. Outlet Location: Back.
13. Escutcheon Plate Marking: Similar to "AUTO SPKR" or "STANDPIPE"
14. Finish: Chrome plated.
15. Outlet Size: NPS 4 for sprinkler, NPS 6 for standpipe.

2.08 SPRINKLER SPECIALTY PIPE FITTINGS

A. Branch Outlet Fittings:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Anvil International, Inc.
   b. National Fittings, Inc.
   c. Shurjoint Piping Products.
   d. Tyco Fire & Building Products LP.
   e. Victaulic Company.
2. Standard: UL 213.
3. Pressure Rating: 175 psig minimum.
4. Body Material: Ductile-iron housing with EPDM seals and bolts and nuts.
5. Type: Mechanical-T and -cross fittings.
6. Configurations: Snap-on and strapless, ductile-iron housing with branch outlets.
7. Size: Of dimension to fit onto sprinkler main and with outlet connections as required to match connected branch piping.
8. Branch Outlets: Grooved, plain-end pipe, or threaded.

B. Flow Detection and Test Assemblies:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. AGF Manufacturing Inc.
   b. Reliable Automatic Sprinkler Co., Inc.
   c. Tyco Fire & Building Products LP.
   d. Victaulic Company.
2. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
3. Pressure Rating: 175 psig minimum.
4. Body Material: Cast- or ductile-iron housing with orifice, sight glass, and integral test valve.
5. Size: Same as connected piping.
6. Inlet and Outlet: Threaded.

C. Sprinkler Inspector's Test Fittings:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. AGF Manufacturing Inc.
   b. Triple R Specialty.
   c. Tyco Fire & Building Products LP.
   d. Victaulic Company.
   e. Viking Corporation.

2. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
3. Pressure Rating: 175 psig minimum
4. Body Material: Cast- or ductile-iron housing with sight glass.
5. Size: Same as connected piping.
6. Inlet and Outlet: Threaded.

D. Adjustable Drop Nipples:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. CECA, LLC.
   b. Corcoran Piping System Co.
   c. Merit Manufacturing; a division of Anvil International, Inc.
2. Standard: UL 1474.
3. Pressure Rating: 250 psig minimum.
4. Body Material: Steel pipe with EPDM-rubber O-ring seals.
5. Size: Same as connected piping.
6. Length: Adjustable.
7. Inlet and Outlet: Threaded.

2.09 SPRINKLERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Globe Fire Sprinkler Corporation.
2. Reliable Automatic Sprinkler Co., Inc.
3. Tyco Fire & Building Products LP.
4. Victaulic Company.
5. Viking Corporation.

B. General Requirements:
1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
2. Pressure Rating for Automatic Sprinklers: 175 psig minimum.

C. Automatic Sprinklers with Heat-Responsive Element:
1. Nonresidential Applications: UL 199.
2. Characteristics: Nominal 1/2-inch orifice with Discharge Coefficient K of 5.6, and for "Ordinary" temperature classification rating unless otherwise indicated or required by application.

D. Sprinkler Finishes:
1. Chrome plated.
2. Bronze.
3. Factory Painted.

E. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications. Escutcheons for concealed, flush, and recessed-type sprinklers are specified with sprinklers.
1. Sidewall Mounting: White factory finish, two pieces, semi-recessed.

F. Sprinkler Guards:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Reliable Automatic Sprinkler Co., Inc.

b. Tyco Fire & Building Products LP.
c. Victaulic Company.
d. Viking Corporation.

2. Standard: UL 199.
3. Type: Wire cage with fastening device for attaching to sprinkler.

2.10 ALARM DEVICES

A. Alarm-device types shall match piping and equipment connections.

B. 10 inch Electric Bell:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. System Sensor.
b. Tyco Fire & Building Products LP.
c. Viking Corporation.
2. Type: Electrically operated. 120 volt.
3. Alarm Gong: Cast aluminum with red-enamel factory finish.
4. Size: 10-inch diameter.

C. Water-Flow Indicators:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. ADT Security Services, Inc.
b. McDonnell & Miller; ITT Industries.
c. Potter Electric Signal Company.
d. System Sensor; a Honeywell company.
e. Viking Corporation.
f. Watts Industries (Canada) Inc.
2. Standard: UL 346.
3. Water-Flow Detector: Electrically supervised.
4. Components: Two single-pole, double-throw circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed.
5. Type: Paddle operated.
6. Pressure Rating: 250 psig.
7. Design Installation: Horizontal or vertical.

D. Valve Supervisory Switches:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Fire-Lite Alarms, Inc.; a Honeywell company.
b. Kennedy Valve; a division of McWane, Inc.
c. Potter Electric Signal Company.
d. System Sensor; a Honeywell company.
2. Standard: UL 346.
3. Type: Electrically supervised.
4. Components: Single-pole, double-throw switch with normally closed contacts.
5. Design: Signals that controlled valve is in other than fully open position.

2.11 PRESSURE GAUGES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following]:

1. AMETEK; U.S. Gauge Division.
2. Ashcroft, Inc.
3. Winters Instruments.
4. WIKA Instrument Corporation.

B. Standard: UL 393.

C. Dial Size: 3-1/2- to 4-1/2-inch diameter.

D. Pressure Gauge Range: 0 to 300 psig minimum.

E. Water System Piping Gauge: Include "WATER" or "AIR/WATER" label on dial face.

PART 3 - EXECUTION

3.01 SERVICE-ENTRANCE PIPING

A. Connect sprinkler piping to water-service piping at service entrance inside building. Comply with requirements for exterior piping in Division 21 Section "Facility Fire-Suppression Water-Service Piping."

B. Install OS & Y shutoff valve, double check detector assembly backflow prevention device, pressure gauge, drain, and other accessories indicated at connection to fire protection water-service piping. Comply with requirements for backflow prevention devices in Division 21 Section "Facility Fire-Suppression Water-Service Piping."

C. Underground flushing shall be performed at a pressure at least equal to the rated pressure of the sprinkler system.

D. Contractor shall submit a “Statement of Compliance” for each sprinkler system in accordance with FCNYS 901.2.1, requesting final acceptance test with Authority Having Jurisdiction.

3.02 PIPING INSTALLATION

A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical.
1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.

B. Piping Standard: Comply with requirements for installation of sprinkler piping in NFPA 13.

C. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

D. Install unions adjacent to each valve in pipes NPS 2 and smaller.

E. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

F. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, and sized and located according to NFPA 13.

G. Install sprinkler piping with drains for complete system drainage. Piping shall pitch back toward the system drain. Provide a min. ¾” plug or nipple and cap for trapped sections 5-50 gallon

capacity. Provide min. 1” valve piped to an accessible location for trapped sections greater than 50 gallon capacity.

H. Install sprinkler control valves, test assemblies, and drain risers adjacent to standpipes when sprinkler piping is connected to standpipes.

I. Install automatic (ball drip) drain valve at each check valve for fire-department connection, to drain piping between fire-department connection and check valve. Install drain piping to and spill over floor drain or to outside building.

J. Install alarm devices in piping systems.

K. Install system drains and pipe to building exterior to discharge to grade.

L. Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements for hanger materials in NFPA 13.

M. Install pressure gauges on riser or feed main, at each sprinkler test connection, and at top of each standpipe. Include pressure gauges with connection not less than NPS 1/4 and with soft metal seated globe valve, arranged for draining pipe between gauge and valve. Install gauges to permit removal, and install where they will not be subject to freezing.

N. Fill sprinkler system piping with water.

O. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Division 22.

P. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Division 22.

Q. Firestop all joints, penetrations within rated construction in compliance with the specification section 078400.

R. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Division 22.

3.03 JOINT CONSTRUCTION

A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.

B. Install unions adjacent to each valve in pipes NPS 2 and smaller.

C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

D. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.

G. 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:
   1. Apply appropriate tape or thread compound to external pipe threads.
   2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

H. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.
   1. Shop weld pipe joints where welded piping is indicated. Do not use welded joints for galvanized-steel pipe.

I. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.

J. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

K. Coordinate inspection of required welder’s stamp/identification of shop welded pipe with Owner prior to installation. Coordinate inspection of required welder’s stamp/identification of field welded pipe with Owner as work progresses, prior to enclosure.

3.04 VALVE AND SPECIALTIES INSTALLATION

A. Install listed fire-protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NFPA 13 and authorities having jurisdiction.

B. Install listed fire-protection shutoff valves supervised open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.

C. Install check valve in each water-supply connection. Install backflow prevention devices instead of check valves in potable-water-supply sources.

D. Specialty Valves:
   1. General Requirements: Install in vertical position for proper direction of flow, in main supply to system.
   2. Alarm Valves: Include bypass check valve and retarding chamber drain-line connection.

3.05 SPRINKLER INSTALLATION

A. Install sprinklers in suspended ceilings in center of or quarter panel of acoustical ceiling panels.

B. Provide additional sprinklers where required due to obstructions (e.g. columns, beams, soffits, ductwork, piping, conduit, light fixtures, exit signs, ceiling mounted equipment etc.) Provide sprinklers under ducts greater than 4’-0” wide. Coordinate with final M/E/P layout.

C. Locate sprinklers minimum distances from heat sources for compliance with NFPA-13.

3.06 FIRE-DEPARTMENT CONNECTION INSTALLATION

A. Install wall-type, fire-department connections. Confirm type with local fire marshal or AHJ prior to installation.

B. Install automatic (ball drip) drain valve at each check valve for fire-department connection.

C. Locate 30 inches above finished grade.

3.07 IDENTIFICATION

A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13.

B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

3.08 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections: Coordinate all testing of sprinkler tamper and waterflow switches for the fire alarm acceptance test with fire alarm contractor. Operate as required. Testing shall include proper pre-testing with the FA, vendor and Acceptance Testing with the AHJ.
1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
3. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
4. Energize circuits to electrical equipment and devices.
5. Coordinate with fire-alarm tests. Operate as required.
6. Verify that equipment hose threads are same as local fire-department equipment.

C. Sprinkler piping system will be considered defective if it does not pass tests and inspections.

D. Tests and Inspections: Coordinate all testing of sprinkler tamper and waterflow switches for the fire alarm acceptance test with fire alarm contractor. Operate as required. Testing shall include proper pre-testing with the Fire alarm, vendor and Acceptance Testing with the AHJ.

E. Prepare test and inspection reports.

3.09 CLEANING

A. Clean dirt and debris from sprinklers.

B. Remove and replace sprinklers with paint other than factory finish.

3.10 PIPING SCHEDULE

A. Piping between Fire-Department Connections and Check Valves: Galvanized, standard-weight steel pipe with threaded ends; cast-iron threaded fittings; and threaded joints.

B. Sprinkler specialty fittings may be used, downstream of control valves, instead of specified fittings.

C. Wet-pipe sprinkler system, NPS 2 and smaller, shall be one of the following:
1. Standard-weight schedule 40, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.

2. Standard-weight schedule 40, black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.

D. Standard-pressure, wet-pipe sprinkler system, NPS 2-1/2 to NPS 6, shall be one of the following:
1. Standard-weight schedule 40, black-steel pipe with flanged or grooved fittings; uncoated, gray-iron threaded fittings; and threaded joints.

3.11 SPRINKLER SCHEDULE

A. Use sprinkler types in subparagraphs below for the following applications:
1. Rooms without Ceilings: Upright sprinklers.
2. Rooms with Suspended Ceilings: Concealed pendent sprinklers.

B. Provide sprinkler types in subparagraphs below with finishes indicated.
1. Concealed Sprinklers: Rough brass, with factory-painted white cover plate.

- - - END OF SECTION - - -

PART I – GENERAL

1.01 SUMMARY

A. Section Includes:
1. Ball valves
2. Balance valves
3. Check valves
4. Gas valves
5. Pressure reducing valves
6. Thermostatic mixing valves

1.02 BASIS OF DESIGN

A. General Duty Valves for Plumbing Piping listed in “Part 2 – Products” are basis-of-design products subject to compliance with design requirements; provide the product indicated or an approved listed equal.

1.03 SUBMITTALS

A. Product Data: For each type of valve.
1. Certification that products comply with Lead-Free drinking water requirements, ANSI/NSF 61 and ANSI/NSF 372.
2. Submit dimensioned drawings, specifications and cut-sheets.

B. Quality Reports.
1. Provide a full written report of all adjusting and balancing performed on the domestic water distribution system. Results of the report shall be guaranteed. Contractor shall be subject to recall to site to verify report information prior to acceptance of report.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS FOR VALVES

A. Source Limitations for Valves: Obtain each type of valve from single source and from single manufacturer.

B. ASME Compliance:
1. ASME B1.20.1 for threads for threaded end valves.
2. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
3. ASME B16.18 for solder-joint connections.
4. ASME B31.9 for building services piping valves.
5. ASME B16.1 for flanges on iron valves.

C. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.

D. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

E. Valve Sizes: Same as upstream piping unless otherwise indicated.

F. Valve Actuator Types:
   1. Handlever: For quarter-turn valves smaller than NPS 4.

G. Valves in Insulated Piping:
   1. Include 2-inch stem extensions.
   2. Extended operating handles of nonthermal-conductive material and protective sleeves that allow operation of valves without breaking vapor seals or disturbing insulation.
   3. Memory stops that are fully adjustable after insulation is applied.

2.02 VALVE MANUFACTURERS

A. Valves listed in this section are basis-of-design products subject to compliance with requirements, provide the product indicated on the drawings or a comparable product by one of the following:
   1. Apollo.
   2. Bell & Gosset.
   3. Hammond.
   4. Homestead.
   5. Milwaukee.
   6. Nibco.
   7. Nordstrom.
   8. Red valve corporation.
   9. Resun.
   10. Watts.

2.03 BRASS BALL VALVES

A. Description:
   1. 2 inch and smaller: 2-Piece, Full Port, Lead-free, brass body with chrome-plated ball and stem, 600 psi WOG, 150 psi WSP, quarter-turn operation, threaded or soldered ends. Valve shall have separate handle nut and packing nut. Watts LFFBV-3C (threaded) or Watts LFFBVS-3C (soldered).

2.04 BALANCING VALVES

A. Lead-free, brass body with 304 type stainless steel ball, fitted with 1/4 inch NPT tapped drain port.
   1. Valve shall have meter connections with internal seals, built-in check valves, memory stop feature with an integral pointer to register degree of valve opening, and port openings for connecting differential pressure meter.
   2. Balance valves shall be balance to individual gpm ranges as indicated on the contract documents.
   3. Threaded end valves only. Bell & Gossett Model CB-LF “Circuit Setter Plus”

2.05 CHECK VALVES

A. Swing type (horizontal positions only)
   1. 2 inch and smaller: Lead-Free, Tee Pattern, Bronze body, cap and disc, Stainless steel, hanger pin and plug, 200 psi WOG. Threaded end connections only. Watts LFCV

B. Spring type (horizontal or vertical positions)

1. 2 inch and smaller: Lead-Free, Bronze body, PTFE disc, Stainless steel spring and stem, 250 psi WOG. Threaded end connections only. Nibco T-480-Y-LF

2.06 GAS VALVES

A. Description:
1. 2 inch and smaller: UL listed, CSA approved to 0.5 psig and 5 psig, brass body, 2-Piece, full port ball valve. Threaded end valves only for natural gas use. Watts FBV-3C
2. 2-1/2 inch and larger: UL listed, CSA approved, 200 psi WOG, Class 125 flange type, Cast iron lubricated plug valve with manual lever actuators. Homestead Figure 612.

2.07 PRESSURE-REDUCING VALVES

A. Standard Capacity Pressure Reducing Valves – (PRV-1):
1. 2 inch and smaller: Lead-free, ASSE 1003 certified, cast copper silicon alloy body construction, integral stainless steel strainer, replaceable seat module, bypass thermal expansion control. Watts LFU5B-GG
2. Size: 2 inch.
3. Design Flow Rate: 80 gpm
4. Design Inlet Pressure: 80 psig
5. Design Outlet Pressure Setting: 60 psig
6. End Connections: Threaded
7. Provide pressure gauge and tapping on valve body.

2.08 TEMPERATURE-ACTUATED, WATER MIXING VALVES

A. Thermostatic Water Mixing Valve – (TMV-1):
1. Master mixing valve, ASSE 1017 certified, Lead-free, paraffin-based thermal actuation, manual temperature control, check stops on hot- and cold-water supplies, and adjustable, temperature-control handle. Powers Hydro-guard LFSH1432
2. Connections: Threaded union inlets and outlet.
3. Inlets:
4. Tempered-Water Setting: 95 deg F.
5. Minimum Flow Rates: 1 gpm.
6. Tempered-Water Design Flow Rate: 18 gpm
7. Selected Valve Flow Rate at 20-psig Pressure Drop: 38 gpm.
8. Exposed: Factory fabricated, stainless steel, for surface mounting.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide access panels where necessary.

C. Install swing check valve, between pump and shutoff valve, on each pump discharge.

D. Provide isolation valves and unions or flanges on each side of balancing valves, check valves and pressure reducing valves.

E. Install valves in horizontal piping with stem at or above center of pipe.

F. Install valves in position to allow full stem movement.

G. Install balancing valves in locations where they can easily be adjusted.

H. Install temperature-actuated, water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet.
   1. Install cabinet-type units recessed in or surface mounted on wall as specified.
   2. Install heat trap on hot water supply line ahead of connection to mixing valve.

I. Use caution and extreme care when soldering valve connections to prevent valve seat damage. Apply heat with the flame pointed away from the center of the valve body. Inspect all valves after soldering, tighten valve packing nut and make adjustments if required to ensure proper valve operation. Replace all damaged valves.

J. Provide hose threaded drain valves at all low points, strainers, and equipment as called for.

3.02 ADJUSTING

A. Set field-adjustable pressure set points of water pressure-reducing valves as indicated in the specifications and on the contract documents.

B. Set field-adjustable flow set points of balancing valves as indicated on the contract documents.

C. Set field-adjustable temperature set points of temperature-actuated, water mixing valves as indicated in the specifications and on the contract documents.

- - - END OF SECTION - - -

PART I – GENERAL

1.01 SUMMARY

A. Section Includes:
1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Thermal-hanger shield inserts.
4. Fastener systems.
5. Pipe positioning systems.
6. Equipment supports.

1.02 PERFORMANCE REQUIREMENTS

A. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

1.03 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Welding certificates.

1.04 QUALITY ASSURANCE

A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

C. Provide for the support of plumbing piping in compliance with Chapter 3 of the Plumbing Code of New York State.

PART 2 - PRODUCTS

2.01 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:
1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

B. Copper Pipe Hangers:
1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.

2.02 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.03 THERMAL-HANGER SHIELD INSERTS

A. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig minimum compressive strength and vapor barrier.

B. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 552, Type II cellular glass with 100-psig with minimum compressive strength.

C. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

E. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.04 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

B. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.05 PIPE POSITIONING SYSTEMS

A. Description: IAPMO PS 42, positioning system of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.

2.06 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

B. Adjustable Stanchion Pipe Supports: All welded steel construction, corrosion resistant, base plate with adjustable steel threaded rod. Basis of Design: Watts Regulator Model RK-W-STD or approved equal.

2.07 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
   1. Properties: Nonstaining, noncorrosive, and nongaseous.
   2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.01 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.
   1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
   2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

D. Fastener System Installation:
   1. Provide powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
   2. Provide mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

E. Pipe Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture. See Division 22 plumbing fixture Sections for requirements for pipe positioning systems for plumbing fixtures.

F. Provide hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

H. Provide hangers and supports to allow controlled thermal movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

I. Provide lateral bracing with pipe hangers and supports to prevent swaying.

J. Provide building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

K. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

L. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

M. Insulated Piping:
1. Attach clamps and spacers to piping.
   a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
   b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
   c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
2. Provide MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
   a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
3. Provide MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
   a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
4. Shield Dimensions for Pipe: Not less than the following:
   a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
   b. NPS 4: 12 inches long and 0.06 inch thick.
   c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.

5. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.02 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.03 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and 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. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.04 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1- inches or less.

3.05 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 09 painting Sections**.**

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.06 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Provide hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Provide nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Provide carbon-steel pipe hangers and supports and metal trapeze pipe hangers and attachments for general service applications.

F. Provide copper-plated pipe hangers and copper attachments for copper piping and tubing.

G. Provide padded hangers for piping that is subject to scratching.

H. Provide thermal-hanger shield inserts for insulated piping and tubing.

I. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 6.

2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F, pipes NPS 4 to NPS 6, requiring up to 4 inches of insulation.
3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 6, requiring clamp flexibility and up to 4 inches of insulation.
4. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 6.
5. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 6.
6. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 6, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
7. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 6, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
8. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 6, from two rods if longitudinal movement caused by expansion and contraction might occur.
9. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 6 if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.

J. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
   1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 6.
   2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 6 if longer ends are required for riser clamps.

K. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
   1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
   2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.

L. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
   1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
   2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
   3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
   4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
   5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
   6. C-Clamps (MSS Type 23): For structural shapes.
   7. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:
      a. Light (MSS Type 31): 750 lb.
      b. Medium (MSS Type 32): 1500 lb.
      c. Heavy (MSS Type 33): 3000 lb.
   8. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.

M. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

N. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

O. Provide powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

P. Provide pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

- - - END OF SECTION - - -

PART I – GENERAL

1.01 SUMMARY

A. Section Includes:
1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.
4. Valve tags.

1.02 SUBMITTAL

A. Product Data: For each type of product indicated.

B. Identification components shall be compliant with ASME A13.1.

PART 2 - PRODUCTS

2.01 EQUIPMENT LABELS

A. Plastic Labels for Equipment:
1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.
2. Letter Color: Black.
3. Background Color: White.
4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
7. Fasteners: Stainless-steel rivets or self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

C. Equipment Label Schedule: Typewritten for each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

D. Valve Tags for Equipment:
1. Material and Thickness: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering

for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

3. Fasteners: Stainless-steel rivets or cable.
4. Basis of Design Manufacturer: Seton Style 300 or approved equal.

2.02 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.

B. Letter Color: Black.

C. Background Color: Yellow.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless-steel rivets or self-tapping screws.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Label Content: Include caution and warning information, plus emergency notification instructions.

2.03 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Pre-tensioned Pipe Labels: Pre-coiled, semi rigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.
   1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
   2. Lettering Size: At least 1-1/2 inches high.

EXECUTION

2.04 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

2.05 EQUIPMENT LABEL INSTALLATION

A. Provide or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

C. Provide plastic equipment signs and labels at equipment items.

D. Provide valve tags on all new valves installed in project. Provide a valve tag chart in the mechanical room hung 5’-0” above finished floor and in plastic sleeve.

2.06 PIPE LABEL INSTALLATION

A. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, and plenums; and exterior exposed locations as follows:
   1. Near each valve and control device.
   2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
   3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
   4. At access doors, manholes, and similar access points that permit view of concealed piping.
   5. Near major equipment items and other points of origination and termination.
   6. Spaced at maximum intervals of 30 feet along each run. Reduce intervals to 15 feet in areas of congested piping and equipment.
   7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

B. Pipe Label Color Schedule:
   1. Domestic Cold Water Piping:
      a. Background Color: Green.
      b. Letter Color: White.
   2. Domestic Hot Water Piping (110 degree):
      a. Background Color: Green.
      b. Letter Color: White.
   3. Domestic Hot Water Recirculation Water Piping:
      a. Background Color: Green.
      b. Letter Color: White.
   4. Domestic Tempid Water Piping:
      a. Background Color: Green.
      b. Letter Color: White.
   5. Storm, Sanitary Waste and Vent Piping:
      a. Background Color: Green.
      b. Letter Color: White.
   6. Natural Gas Piping:
      a. Background Color: Yellow.
      b. Letter Color: Black.

- - - END OF SECTION - - -

PART I – GENERAL

1.01 SUMMARY

A. Section includes insulating the following plumbing piping services:
   1. Domestic cold, hot water and hot water recirculation piping.
   2. Storm water, overflow and roof drainage piping.
   3. Supplies and drains for handicap-accessible lavatories and sinks.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.03 QUALITY ASSURANCE

A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
   1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

B. Comply with the following applicable standards and other requirements specified for miscellaneous components:
   1. Supply and Drain Protective Shielding Guards: ICC A117.1.

PART 2 - PRODUCTS

2.01 INSULATION MATERIALS

A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Mineral-Fiber, Preformed Pipe Insulation:
   1. Type I, 850 Deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ-SSL. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.02 INSULATING CEMENTS

A. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.

2.03 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

C. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

D. PVC Jacket Adhesive: Compatible with PVC jacket.

2.04 FIELD-APPLIED JACKETS

A. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

2.05 MAKES

A. Fiberglass: Certainteed, Knauf, Johns Manville, Owens-Corning or approved equal.

B. Adhesives: Childers, Foster Products, Tremco.

PART 3 - EXECUTION

3.01 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.02 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
   1. Install insulation continuously through hangers and around anchor attachments.
   2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
   3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
   4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:
   1. Draw jacket tight and smooth.
   2. Cover circumferential joints with 3-inch wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
   3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.
      a. For below-ambient services, apply vapor-barrier mastic over staples.
   4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
   5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above-ambient services, do not install insulation to the following:
   1. Vibration-control devices.
   2. Testing agency labels and stamps.

3. Nameplates and data plates.
4. Cleanouts.

3.03 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
   1. Seal penetrations with flashing sealant.
   2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
   3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
   4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

C. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
   1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

D. Insulation Installation at Floor Penetrations:
   1. Pipe: Install insulation continuously through floor penetrations.
   2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.04 INSTALLATION OF MINERAL-FIBER PREFORMED PIPE INSULATION

A. Insulation Installation on Straight Pipes and Tubes:
   1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
   2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
   3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
   4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:
   1. Install preformed pipe insulation to outer diameter of pipe flange.
   2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
   3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
   4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:
1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.05 FIELD-APPLIED JACKET INSTALLATION

A. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints. Seal with manufacturer's recommended adhesive.
1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

3.06 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:
1. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, of threaded fittings, of welded fittings, of threaded valves, and flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.07 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Water: Insulation shall be the following:
1. Mineral-Fiber, Preformed Pipe Insulation, Type I: For domestic hot water and hot water recirculation piping, 1 inch thick on pipe sized 1 NPS and smaller.
2. Mineral-Fiber, Preformed Pipe Insulation, Type I: For domestic cold water piping, 1/2 inch thick on pipe sized 2 NPS and smaller.

B. Stormwater, Roof Drains and Overflow: Insulation shall be the following:
1. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

3.08 INDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. Piping Elbows and Tees:
   1. PVC: 20 mils thick.

- - - END OF SECTION - - -

PART I – GENERAL

1.01 SUMMARY

A. Section Includes:
1. Hub-and-spigot, cast-iron soil pipe and fittings.
2. Copper tube and fittings.
3. Steel pipe and fittings.
4. Specialty pipe fittings.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.03 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

B. System purging and disinfecting activities report.

1.04 WARRANTY

A. Listed manufacturers to provide labeling and warranty of their respective products.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:
1. Soil, Waste, Storm and Vent Piping: A minimum of 10-foot head of water.
2. Domestic water piping: 50 psi greater than operating pressure or at the least 125 psi.
3. Natural gas piping: 25 psi minimum unless otherwise indicated.

2.02 PIPING MATERIALS

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

C. Potable-water piping and components shall comply with NSF 14, NSF 61, and NSF 372. Include marking "NSF-pw" on piping.

D. Steel Support Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

E. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

F. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.03 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe: ASTM A 74, Service weight cast iron.

B. Fittings: Service weight type with “push-on” type fittings with ASTM C 564 extra heavy neoprene gasket.

C. Calking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

2.04 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe: ASTM A 888 no-hub cast iron.

B. Fittings: ASTM C 1540 cast iron no-hub pattern with stainless-steel shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

C. Make: Charlotte Pipe, Clamp-All, Husky, Tyler “Widebody”.

D. Above Slab Applications only.

2.05 COPPER TUBE AND FITTINGS

A. Copper Type DWV Tube: ASTM B 306, drainage tube, drawn temper.
   1. Copper piping is prohibited for urinal waste.

B. Copper Type L Tube (Above Slab Water): ASTM B 88, water tube, drawn temper.

C. Copper Type K Tube (Below Slab Water Only): ASTM 88, water tube, annealed temper.

D. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.

E. Copper Pressure Fittings:
   1. Copper Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
   2. Copper Unions: MSS SP-123, copper-alloy, hexagonal-stock body with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

F. Copper Flanges: ASME B16.24, Class 150, cast copper with solder-joint end.
   1. Flange Gasket Materials: ASME B16.21, full-face, flat, nonmetallic, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
   2. Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

G. Solder: ASTM B 32, lead free with ASTM B 813, water-flushable flux.

H. Copper Pressure-Seal-Joint Fittings:
   1. Fittings for NPS 2 and Smaller: Wrought-copper fitting with EPDM-rubber, O-ring seal in each end.
   2. Fittings for NPS 2-1/2 to NPS 4: Cast-bronze or wrought-copper fitting with EPDM-rubber, O-ring seal in each end.

2.06 STEEL TUBES, AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.
   1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.
   2. Wrought-Steel Welding Fittings: ASTM A 234/A 234M for butt welding and socket welding.
   3. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.
   4. Protective Coating for Underground Piping: Factory-applied, three-layer coating of epoxy, adhesive, and PE.
      a. Joint Cover Kits: Epoxy paint, adhesive, and heat-shrink PE sleeves.

B. Joint Compound and Tape: Suitable for natural gas.

C. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.07 SPECIALTY PIPE FITTINGS

A. Transition Couplings:
   1. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
   2. Shielded, Nonpressure Transition Couplings:
      a. Standard: ASTM C1460.
      b. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
      c. End Connections: Same size as and compatible with pipes to be joined.

B. Copper to Steel Pipe: Cast bronze copper to iron female or male adapter with shoulder for drainage piping only. Dielectric pipe fittings.

C. Copper to Cast Iron Pipe: Cast bronze, cast iron to sweat adapter.

D. Steel to Cast Iron Pipe: Manhoff fittings, Cast iron soil pipe connector with spigot and IPS male thread end.

E. Dielectric Pipe Fittings:
   1. Tensile strength, ASME B16.8, union 250 psi, or flange design, 175 psi, pressure rating, at 210 Deg F, threaded or solder joint, constructed to prevent gasket from squeezing into internal opening.
   2. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

PART 3 - EXECUTION

3.01 EARTH MOVING

A. Comply with requirements for excavating, trenching, and backfilling specified in Section 312000 "Earth Moving."

3.02 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems.
   1. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations.
   2. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install shutoff valve immediately upstream of each dielectric fitting.

G. Install domestic water piping level with 0.25 percent slope downward toward drain and plumb.

H. Install piping to permit valve servicing.

I. Install piping at indicated slopes.

J. Install piping free of sags and bends.

K. Install fittings for changes in direction and branch connections.

L. Install piping to allow application of insulation.

M. Make changes in direction for storm, soil, waste drainage and vent piping using appropriate branches, bends, and long-sweep bends.
   1. Tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical.
   2. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe.
      a. Straight tees, elbows, and crosses may be used on vent lines.
   3. Do not change direction of flow more than 90 degrees.
   4. Use proper size of standard increasers and reducers if pipes of different sizes are connected.
      a. Reducing size of waste or storm piping in direction of flow is prohibited.

N. Lay buried building waste piping beginning at low point of each system.
   1. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream.

2. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
3. Maintain swab in piping and pull past each joint as completed.

O. Install storm soil, waste and vent piping at the following minimum slopes unless otherwise indicated:
1. Building Storm, Sanitary and Waste: 2 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.
2. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

P. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

Q. Install aboveground copper tubing according to CDA's "Copper Tube Handbook."

R. Plumbing Specialties:
1. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary waste gravity-flow piping.
a. Comply with requirements for cleanouts specified in Section 223000 "Plumbing Equipment."
2. Install drains in sanitary waste gravity-flow piping.
a. Comply with requirements for drains specified in Section 223000 "Plumbing Equipment."

S. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

T. Install sleeves for piping penetrations of walls, ceilings, and floors.
1. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

U. Install sleeve seals for piping penetrations of concrete walls and slabs.
1. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

V. Install escutcheons for piping penetrations of walls, ceilings, and floors.
1. Comply with requirements for escutcheons specified in Section 223000 "Plumbing Equipment."

W. Do not use natural-gas piping as grounding electrode.

X. Install natural-gas piping at uniform grade of 2 percent down toward drip and sediment traps.

Y. Comply with requirements in Sections specifying gas-fired appliances and equipment for roughing-in requirements.

Z. Drips and Sediment Traps: Install drips at points where condensate may collect, including service-meter outlets. Locate where accessible to permit cleaning and emptying. Do not install where condensate is subject to freezing.
1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use nipple a minimum length of 3 pipe diameters, but not less than 3 inches long and

same size as connected pipe. Install with space below bottom of drip to remove plug or cap.

3.03 JOINT CONSTRUCTION

A. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

B. Join hubless, cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.

C. Join copper tube and fittings with soldered joints according to ASTM B 828. Use ASTM B 813, water-flushable, lead-free flux and ASTM B 32, lead-free-alloy solder.

D. Grooved Joints: Cut groove ends of pipe according to AWWA C606. Lubricate and install gasket over ends of pipes or pipe and fitting. Install coupling housing sections, over gasket, with keys seated in piping grooves. Install and tighten housing bolts.

E. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

F. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

G. 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:
   1. Apply appropriate tape or thread compound to external pipe threads.
   2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

H. Welded Joints:
   1. Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators.
   2. Bevel plain ends of steel pipe.
   3. Patch factory-applied protective coating as recommended by manufacturer at field welds and where damage to coating occurs during construction.

I. Pressure-Sealed Joints for Copper Tubing: Join copper tube and pressure-seal fittings with tools recommended by fitting manufacturer.

J. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

3.04 SPECIALTY PIPE FITTING INSTALLATION

A. Install transition couplings at joints of dissimilar piping.

B. Transition Fittings in Underground Domestic Water Piping:
   1. Fittings for NPS 1-1/2 and Smaller: Fitting-type coupling.
   2. Fittings for NPS 2 and Larger: Sleeve-type coupling.

C. Transition Fittings in Storm and Waste Drainage Piping:

1. Install transition couplings at joints of piping with small differences in OD's

D. Provided Shielded non-pressure transition couplings

3.05 VALVE INSTALLATION

A. Comply with requirements in Specification Section 220523 "General Duty Valves for Plumbing Piping" for general-duty valve installation requirements.

3.06 INSTALLATION OF HANGERS AND SUPPORTS

A. Comply with requirements for pipe hanger and support devices and installation specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
   1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
   2. Install stainless-steel pipe hangers for horizontal piping in corrosive environments.
   3. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
   4. Install stainless-steel pipe support clamps for vertical piping in corrosive environments.
   5. Vertical Piping: MSS Type 8 or Type 42, clamps.
   6. Install individual, straight, horizontal piping runs:
      a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
      b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
      c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.
   7. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
   8. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Install hangers for cast-iron, steel or copper piping, with maximum horizontal spacing and minimum rod diameters, to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

C. Support horizontal piping and tubing within 12 inches of each fitting, valve**,** and coupling.

D. Support vertical runs of cast iron, steel or copper piping to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

3.07 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect storm, soil and waste piping to exterior piping. Use transition fitting to join dissimilar piping materials.

C. Connect domestic water, waste and vent piping to the following:
   1. Plumbing Fixtures: Connect domestic water and waste piping in sizes indicated, but not smaller than required by plumbing code.
   2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
   3. Plumbing Specialties: Connect domestic water, storm, waste and vent piping in sizes indicated, but not smaller than required by plumbing code.
   4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.

5. Comply with requirements specified in Section 223000 "Plumbing Equipment."
6. Equipment: Connect piping as indicated.
    a. Provide shutoff valve if indicated and union for each connection.

D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

E. Make connections according to the following unless otherwise indicated:
1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.08 IDENTIFICATION

A. Identify exposed piping.

B. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.09 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric couplings or nipples.

C. Dielectric Fittings for NPS 2-1/2 to NPS 4 Use dielectric flanges or flange kits

3.10 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired.
    a. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced piping until it has been tested and approved.
    a. Expose work that was covered or concealed before it was tested.

3. Plumbing Test Procedure: Test storm, waste and vent piping except outside leaders on completion of roughing-in.
   a. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water.
   b. From 15 minutes before inspection starts to completion of inspection, water level must not drop.
   c. Inspect joints for leaks.
   d. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg.
   e. Use U-tube or manometer inserted in trap of water closet to measure this pressure.
   f. Air pressure must remain constant without introducing additional air throughout period of inspection.
   g. Inspect plumbing fixture connections for gas and water leaks.
   h. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
   i. Prepare reports for tests and for corrective action required.

4. Plumbing Test Procedure: Domestic water piping.
   a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
   b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
   c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
   d. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
   e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
   f. Prepare reports for tests and for corrective action required.
5. Plumbing test procedure: Natural gas piping.
   a. Perform tests as required by local Utility Company. Tests shall be witnessed by Owner’s representative and local Utility Company. Contractor shall pay all costs.
   b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
   c. Leave new, altered, extended, or replaced natural gas piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
   d. Cap and subject the piping to 25 psig pressure for two hours prior to final connections to gas fired equipment.
   e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
   f. Prepare reports for tests and for corrective action required.

3.11 CLEANING AND PROTECTION

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect piping during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

D. Repair damage to adjacent materials caused by piping installation.

E. Clean and disinfect potable domestic water piping as follows:
   1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
   2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:
      a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
      b. Fill and isolate system according to either of the following:
         1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
         2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.
      c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
      d. Repeat procedures if biological examination shows contamination.
      e. Submit water samples in sterile bottles to authorities having jurisdiction.

3.12 PIPING SCHEDULE

A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.

B. Paint exterior above grade, and interior natural gas piping with 1 coat Brunning Silathane Rust Inhibiting Primer #52014 and 2 coats Brunning Silethane (urethane) Semi-Gloss Enamel #52100 series, color shall be bright yellow. Apply paint in accordance with manufacturer's directions. Remove spilled and splattered paint from all surfaces.

Service	Pipe Materials	Fittings	Connections
Domestic water interior/hot, cold and circulating NPS 3 and smaller	Type L copper	Wrought copper	No-lead solder
Domestic water interior/hot, cold [Below Slab]	Type K copper, soft temper	Wrought Copper	No-lead solder
Sanitary, vent and storm [Below Slab]	Service weight cast iron soil pipe	Cast iron hub and spigot	Neoprene gasket compression type
Sanitary, vent and storm [Above Slab]	Service weight cast iron soil pipe or type DWV copper	Cast iron hub and spigot, No-hub or wrought copper; drainage pattern	Neoprene gasket compression type, no-hub neoprene gasket and stainless steel clamp assembly or no-lead solder
Natural gas [exterior above grade]	Schedule 40, black steel	Butt welded	Welded Note B
Natural gas, gas vent (interior)	Schedule 40, black steel	NPS 2 and smaller malleable; NPS 2-1/2 and over butt welded	Threaded and welded Note B

- - -END OF SECTION - - -

PART I – GENERAL

1.01 SUMMARY

A. This Section includes water-distribution piping and related components for water service.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.03 INFORMATIONAL SUBMITTALS

A. Field quality-control test reports.

1.04 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.05 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Comply with requirements of utility company supplying water. Including backflow prevention.
   2. Comply with standards of authorities having jurisdiction for potable-water-service piping, including materials, installation, testing, and disinfection.

B. Piping materials shall bear label, stamp, or other markings of specified testing agency.

C. NSF Compliance:
   1. Comply with NSF 61 Annex G for materials for water-service piping and specialties for domestic water.

1.06 PROJECT CONDITIONS

A. Interruption of Existing Water-Distribution Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water-distribution service according to requirements indicated:
   1. Notify Architect or Owner no fewer than two days in advance of proposed interruption of service.
   2. Do not proceed with interruption of water-distribution service without Architect's or Owner's written permission.

PART 2 - PRODUCTS

2.01 PIPING AND MATERIALS

A. Refer to Section 221000 “Plumbing Piping” for piping materials.

2.02 BACKFLOW PREVENTERS

A. Reduced-Pressure-Zone Backflow Preventers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Watts; a Watts Water Technologies company.
   b. Wilkins.
   c. Zurn Industries, LLC.
2. Watts Model NO.LF909; Lead-free, ASSE 1013 or AWWA C511 certified.
3. Operation: Continuous-pressure applications.
4. Pressure Loss: 12 psig maximum, through middle 1/3 of flow range.
5. Size: 2”.
6. Design Flow Rate: 60 gpm..
7. Selected Unit Flow Range Limits: 80 gpm.
8. Pressure Loss at Design Flow Rate: 12 psig.
9. Body: Bronze; cast iron with interior lining complying with AWWA C550 or that is FDA approved.
10. End Connections: Threaded.
11. Configuration: Designed for horizontal, straight through flow.
12. Accessories:
    a. Valves: Ball type with threaded ends on inlet and outlet.
    b. Air-Gap Fitting: ASME A112.1.2, matching backflow preventer connection.

PART 3 - EXECUTION

3.01 EARTHWORK

A. Refer to Section 312000 "Earth Moving" for excavating, trenching, and backfilling.

3.02 PIPING APPLICATIONS

A. General: Use pipe, fittings, and joining methods for piping systems according to the following applications.

B. Transition couplings and special fittings with pressure ratings at least equal to piping pressure rating may be used, unless otherwise indicated.

C. Do not use flanges or unions for underground piping.

D. Flanges, unions, and special fittings may be used, instead of joints indicated, on aboveground piping and piping in vaults.

E. Underground water-service piping NPS 3/4 to NPS 3 shall be soft copper tube, ASTM B 88, Type K; wrought-copper, solder-joint fittings; and brazed joints.

3.03 PIPING INSTALLATION

A. Install copper tube and fittings according to CDA's "Copper Tube Handbook."

B. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.

3.04 BACKFLOW PREVENTER INSTALLATION

A. Install backflow preventers of type, size, and capacity indicated. Include valves and test cocks. Install according to requirements of plumbing and health department and authorities having jurisdiction.

B. Do not install backflow preventers that have relief drain in spaces subject to flooding.

C. Do not install bypass piping around backflow preventers.

3.05 FIELD QUALITY CONTROL

A. Hydrostatic Tests – Domestic Water: Test at not less than one-and-one-half times working pressure for two hours.
   1. Increase pressure in 50-psig increments and inspect each joint between increments. Hold at test pressure for 1 hour; decrease to 0 psig. Slowly increase again to test pressure and hold for 1 more hour. Maximum allowable leakage is 2 quarts per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within allowed limits.

B. Prepare reports of testing activities.

3.06 CLEANING

A. Clean and disinfect water-distribution piping as follows:
   1. Purge new water-distribution piping systems and parts of existing systems that have been altered, extended, or repaired before use.
   2. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in AWWA C651 or do as follows:
      a. Fill system or part of system with water/chlorine solution containing at least 50 ppm of chlorine; isolate and allow to stand for 24 hours.
      b. Drain system or part of system of previous solution and refill with water/chlorine solution containing at least 200 ppm of chlorine; isolate and allow to stand for 3 hours.
      c. After standing time, flush system with clean, potable water until no chlorine remains in water coming from system.
      d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows evidence of contamination.

B. Prepare reports of purging and disinfecting activities.

- - - END OF SECTION - - -

PART I – GENERAL

1.01 SUMMARY

A. Section Includes:
1. Hose Bibbs
2. Wall Hydrants
3. Strainers
4. Water hammer arrestors
5. Trap seal devices
6. Floor drains
7. Roof drains
8. Cleanouts
9. Escutcheons
10. Meters and gauges
11. Downspout nozzles
12. Vertical expansion joints

1.02 BASIS OF DESIGN

A. Plumbing Equipment listed in “Part 2 – Products” are basis-of-design products subject to compliance with design requirements; provide the product indicated or an approved listed equal.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Field quality-control reports.

C. Operation and maintenance data.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Potable-water piping and components shall comply with Lead-free, NSF 61 Annex G and NSF 14.

B. Sanitary waste piping specialties shall bear label, stamp, or other markings of specified testing agency.

C. Comply with NSF 14 for plastic sanitary waste piping specialty components.

2.02 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig unless otherwise indicated.

2.03 STRAINERS FOR DOMESTIC WATER PIPING

A. Wye-Pattern Strainers:

1. Watts LF777SI; Lead-free, 125 psig minimum, with bronze body, tapped retainer cap and drain closure plug, 304 type stainless steel screen.

2.04 HOSE BIBBS

A. Hose Bibbs – (HB):
   1. Woodford model 40; ASSE 1011 certified, 3/4 inch NPT male hose thread, with atmospheric vacuum breaker, polished chrome exterior finish and loose tee key. For indoor use only. Provide two (2) operating keys with each hose bibb.
   2. Acceptable Makes: Acorn, Chicago, T&S brass or approved equal.

2.05 WALL HYDRANTS

A. Non freeze Wall Hydrants – (WH):
   1. Woodford model B65; ASME A112.21.3M, 125 psig pressure rated with integral vacuum breaker, 3/4 inch male hose thread, cast brass polished face, galvanized wall sleeve, adjustable wall clamp and loose key operation. Provide two (2) operating keys with each wall hydrant.
   2. Acceptable makes: Jay R. Smith, Watts, Zurn or approved equal.

2.06 WATER-HAMMER ARRESTERS

A. Water-Hammer Arresters – (WHA)
   1. Watts LF15M2; Lead-free, threaded brass, PDI-WH 201 and ASSE 1010 certified, Copper body, 150 psi working pressure.
   2. P.D.I. ratings based on water supply fixture units:
      a. Type A – 1 thru 11 fixture units.
      b. Type B – 12 thru 32 fixture units.
      c. Type C – 33 thru 60 fixture units
      d. Type D – 61 thru 113 fixture units.
      e. Type E – 114 thru 154 fixture units.
      f. Type F – 155 thru 330 fixture units.
   3. Acceptable makes: Jay r. Smith, Josam, Precision Plumbing Products or Zurn.

2.07 TRAP-SEAL PRIMER DEVICE

A. Supply-Type, Trap-Seal Primer Device – (TP):
   1. Precision Plumbing Products Model PR-500; ASSE 1018 approved, 125 psi pressure rated, automatic pressure drop activated, brass body, 1/2-inch NPT inlet and FNPT outlet.
   2. Provide additional distribution units as required for multiple traps.
   3. Acceptable makes: Jay R. Smith, Mifab, Sioux Chief or approved equal.

2.08 FLOOR DRAINS

A. Square type Floor Drain – (FD-1)
   1. Zurn Model ZN-415-6S-VP; 6x6 inch square strainer made of polished nickel bronze, coated cast iron body, bottom outlet, vandal resistant with collar, flashing clamp and drain weepholes.
   2. Acceptable makes: Jay R. Smith, Mifab, Watts or approved equal.

2.09 CLEANOUTS

A. Deck Plate Cleanout – (DPCO)
   1. Zurn “Level-Trol” Model ZN-1400-BP-KC; adjustable, dura-coated cast iron body with gas and watertight ABS tapered thread plug and round polished nickel bronze cover top adjustable to floor finish., vandal resistant with anchor flange, clamping collar and bronze plug.
   2. Acceptable makes: Jay R. Smith, Mifab, Watts or approved equal.

B. Wall Plate Cleanout – (WPCO)
   1. Horizontal type: Zurn Model Z-1441-BP-VP; vandal resistant, dura-coated cast iron body with gas and watertight ABS tapered thread plug and round smooth stainless steel access cover with securing screw.
   2. Vertical type: Zurn Model Z-1468-BP-VP; vandal resistant, dura-coated cast iron body with gas and watertight ABS tapered thread plug and round smooth stainless steel access cover with securing screw.
   3. Acceptable makes: Jay R. Smith, Mifab, Watts or approved equal.

2.10 ROOF DRAINS

A. Primary type Roof Drain – (RD-1)
   1. Zurn Model ZA-100-C-R-VP; Bottom outlet, Dura-Coated cast iron body with combination membrane flashing clamp/gravel guard and low silhouette Aluminum Dome. Fitted with underdeck clamp, roof sump receiver and vandal proof locking dome.
   2. Acceptable makes: Jay R. Smith, Mifab, Watts or approved equal.

2.11 VERTICAL EXPANSION JOINTS

A. Vertical Expansions Joints
   1. Zurn Model ZRB190; Dura-coated cast iron body, packing gland and siliconed bronze sleeve with preformed neoprene packing gasket.
   2. Acceptable makes: Jay R. Smith, Mifab, Watts or approved equal.

2.12 THERMOMETERS

A. Thermometers for domestic water distribution piping
   1. Weksler Model AS5H-9; 3-1/2 inch stem, 9-inch scale, brass well, swivel adjustment with 2 degree temperature scale integers and thermal well.
      a. For domestic cold water piping: 0 to 160 degrees F range.
      b. For domestic hot water piping: 30 to 240 degrees F range.
   2. Acceptable makes: American, Ashcroft, Moeller, Weiss or approved equal.

2.13 PRESSURE GUAGES

A. Thermometers for domestic water distribution piping
   1. Weksler Model EA14; 4-1/2 inch diameter dial with 0 to 160 psi range in 2 psi intervals, plastic lens and stainless steel class. Provide thermal well.
   2. Acceptable makes: American, Ashcroft, Moeller, Weiss or approved equal.

2.14 ESCUTCHEONS

A. Pipe Escutcheons Covers Plates
   1. Split hinge type, Cast-brass with polished chrome finish and set screw fastener. Provide chrome plated type escutcheons at all plumbing fixtures in finished areas.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install Y-pattern strainers for water on supply side of each control valve water pressure-reducing valve solenoid valve and pump.

B. Install water-hammer arresters in water piping according to PDI-WH 201.

C. Install wall hydrants in accordance with manufacturers written instructions. Mount a minimum of 24-inches above grade.

D. Install hose bibbs in accordance with manufacturers written instructions. Mount a minimum of 18-inches above grade.

E. Install supply-type, trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.

F. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:
   1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
   2. Locate at each change in direction of piping greater than 45 degrees.
   3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
   4. Locate at base of each vertical storm, soil and waste stack.

G. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

H. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

I. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.
   1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
   2. Size: Same as floor drain inlet.

J. Install expansion joints on vertical stacks and conductors. Position expansion joints for easy access and maintenance. Provide at roof drains that are located more than 25 feet above finished floor.

K. Install flashing fittings and assemblies on sanitary stack vents and vent stacks that extend through roof.

L. Install roof drains at low points of roof areas according to roof membrane manufacturer's written installation instructions.

1. Install flashing collar or flange of roof drain to prevent leakage between drain and adjoining roofing. Maintain integrity of waterproof membranes where penetrated.
2. Install expansion joints, if indicated, in roof drain outlets.
3. Position roof drains for easy access and maintenance.

M. Install wall cleanouts in vertical conductors. Install access door in wall if required.

N. Install thermometers on all inlet and outlets of domestic water heating equipment or tempered supply water. Adjust faces of thermometers to proper angle for best visibility.

O. Install pressure gauges upstream and downstream of incoming water service Adjust faces of gauges to proper angle for best visibility.

P. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

Q. Place plugs in ends of uncompleted piping at end of each day or when work stops.

- - - END OF SECTION - - -

PART I – GENERAL

1.01 SUMMARY

A. Section Includes:
1. Water closets
2. Lavatories
3. Ablution Washer
4. Wash Sink

1.02 BASIS OF DESIGN

A. Plumbing Fixtures listed in “Part 2 – Products” are basis-of-design products subject to compliance with design requirements; provide the product indicated or an approved listed equal.

1.03 ACTION SUBMITTALS

A. Product Data: Submit product data for all fixtures, trim and accessories prior to placing order for fixtures. Submit manufacturer’s color charts for fixture colors.

B. Shop Drawings: Include diagrams for power, signal, and control wiring.

C. Submit cut out data for countertop fixtures to General Contractor.

D. LEED Submittal: Include product data for credit WE 2, 3.1 and 3.2 documenting flow and water consumption requirements.

1.04 CLOSEOUT SUBMITTALS

A. Submit operations and maintenance information for each fixture, faucet, shower and trim piece.
1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
a. Servicing and adjustments of automatic faucets.
b. Servicing and adjustments of automatic flush valves.

1.05 FIXTURE MAINTENANCE

A. Provide owner with all special tools, wrenches or devices necessary for servicing plumbing fixtures and trim, as well as shower and faucet repair kits complete with all parts. Provide one (1) device for each five (5) fixtures installed, if there are less than five (5) devices installed provide a minimum of one (1) device.

1.06 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities" Public Law 101-336, "Americans with Disabilities Act"; for plumbing fixtures for people with disabilities.

B. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.

C. NSF Standard: Comply with NSF 61, NSF 62 and NSF 372, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.

D. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.

E. Comply with the following applicable standards and other requirements specified for plumbing fixtures:
   1. Slip-Resistant Bathing Surfaces: ASTM F 462.
   2. Solid-Surface-Material Lavatories and Sinks: ANSI/ICPA SS-1.
   3. Vitreous-China Fixtures: ASME A112.19.2M.
   4. Water-Closet, Flush Valve, Tank Trim: ASME A112.19.5.

F. Comply with the following applicable standards and other requirements specified for lavatory and sink faucets:
   1. NSF Potable-Water Materials: NSF 61, NSF 62 and NSF 372.
   2. Pipe Threads: ASME B1.20.1.
   3. Supply Fittings: ASME A112.18.1.
   4. Brass Waste Fittings: ASME A112.18.2.

G. Comply with the following applicable standards and other requirements specified for miscellaneous fittings:
   1. Brass and Copper Supplies: ASME A112.18.1.
   2. Manual-Operation Flushometers: ASSE 1037.
   3. Brass Waste Fittings: ASME A112.18.2.

H. Comply with the following applicable standards and other requirements specified for miscellaneous components:
   1. Grab Bars: ASTM F 446.
   2. Off-Floor Fixture Supports: ASME A112.6.1M.
   3. Plastic Toilet Seats: ANSI Z124.5.
   4. Supply and Drain Protective Shielding Guards: ICC A117.1.

PART 2 - PRODUCTS

2.01 FIXTURE MAKES

A. Fixtures listed in this section are basis-of-design products subject to compliance with requirements, provide the product indicated on the drawings or a comparable product by one of the following:
   1. Water Closets, Urinals and Lavatories: American Standard, Crane, Eljer, Kohler, Mansfield, Sloan or Zurn.
   2. Water Closet Seats: American Standard, Bemis, Church, Kohler, Olsonite or Zurn.
   3. Flushometers: Delany, Delta, Sloan or Zurn.
   4. Faucets: Chicago, Delta, Moen, Symmons, Sloan or Zurn.
   5. Fixture Traps, Stops and Supplies: Central, Cambridge, McGuire, Wolverine or T&S Brass.

2.02 FLOOR-MOUNTED, BOTTOM-OUTLET WATER CLOSETS WITH BIDET SPRAYER

A. Water Closets (WC-1):

1. American Standard Model No. 3043.001 “Madera”; ASME A112.19.2/CSA B45.1 and ASME A112.19.5 Compliant, Floor mounted, bottom outlet, 1-1/2 inch top spud, vitreous china, siphon jet, 1.28 gallons per flush, elongated type with fully glazed trap way, fitted with the following:
   a. Church Toilet Seat Model No. 9500SSC; white, solid plastic, open front with self-sustaining and external check holds/hinges less cover.
   b. Wax setting ring with cast iron water closet flange, stainless steel bolts and china bolt caps.
   c. Sloan “Optima Plus” Model 8111-1.28; Battery powered, sensor operated, quiet, exposed, diaphragm type, 1.28 gallons per flush with control stop plug, vacuum breaker and bumper on angle stop.
   d. CleanSpa Luxury Model CSL-40; Stainless Steel hand sprayer, metal T-valve for water pressure spray controllability, metal spiral hose and spray holster for wall mount. Provide Tempid water to T-valve and coordinate mounting location with Architect.
   e. Height: Handicapped according to ICC A117.1. Install in compliance with all ADA required clearances and dimensions.

2.03 COUNTER-MOUNTED, LAVATORIES

A. Lavatories (L-1):
   1. American Standard Model No. 0476.028 “Aqualyn”; ASME A112.19.2/CSA B45.1 Compliant, Counter mounted, 20 x 18 inch oval, 4 inch OC faucet holes, vitreous china, front overflow, self-draining deck, fitted with the following:
      a. Moen Faucets Model No. 8432; 4 inch OC, deck mounted, chrome plated with single lever handle and 0.5 GPM aerator.
      b. McGuire Model No. LF167K; 3/8 inch chrome plated wall supplies with 12 inch flexible risers, cast brass set screw escutcheons and loose key angle stops.
      c. McGuire Model No. 8902; 1-1/4 inch x 1-1/2 inch P trap, 17 gauge, chrome plated with cleanout plug and set screw escutcheon.
      d. McGuire Model No. 155-WC; 1-1/4 inch tailpiece, 17 gauge, chrome plated P.O. plug with open grid strainer and offset.
      e. Height: Handicapped according to ICC A117.1. Install in compliance with all ADA required clearances and dimensions.
      f. Provide Truebro “Lav Guard” insulated coverings on waste and supply piping.

2.04 ABLUTION WASHER

A. Ablution Washer (AB-1):
   1. Chicago Faucets Model No. 332-ABCP, Wall mounted, vandal resistant, single hole, chrome plated, single lever. S-Type swing spout, 6-inch center to center, 2.2 GPM aerator, 1/2 inch NPT thread inlet with integral wall flange.

2.05 WASH SINK

A. Wash Sink (WS-1):
   1. Elkay Model No. EWMA 72203, 72-inch x 20-inch 14 gauge stainless steel, wall mounted wash sink, fitted with three single faucet holes. Provide drain model No. LK18B, stainless steel strainer and grid with tailpiece.
   2. Provide Chicago Faucets Model No. 332-ABCP, Wall mounted, vandal resistant, single hole, chrome plated, single lever. S-Type swing spout, 6-inch center to center, 2.2 GPM aerator, 1/2 inch NPT thread inlet with integral wall flange.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before fixture installation.

B. Examine walls and floors for suitable conditions where fixture will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install fixtures level and plumb according to roughing-in drawings.

B. Install accessible fixtures at handicapped/elderly mounting height according to ICC/ANSI A117.1.

C. Set floor-mounted fixtures in leveling bed of cement grout.

D. Install water-supply piping with stop on each supply to each sink or lavatory faucet.
   1. Install stops in locations where they can be easily reached for operation.

E. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings.

F. Seal joints between fixtures and counters, floors, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

G. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible sinks.

H. Use carrier supports with waste-fitting assembly and seal.

I. Flushometer-Valve Installation:
   1. Install flushometer-valve, water-supply fitting on each supply to each water closet or urinal.
   2. Attach supply piping to supports or substrate within pipe spaces behind fixtures.
   3. Install lever-handle flushometer valves for accessible water closets or urinals with handle mounted on open side of water closet or urinal.
   4. Install actuators in locations that are easy for people with disabilities to reach.
   5. Install fresh batteries in battery-powered, electronic-sensor mechanisms.

J. Install toilet seats on water closets.

K. Install bidet sprayer with Tempid water for water closets, location as directed by architect.

3.03 CONNECTIONS

A. Connect fixtures with water supplies, stops, risers, traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

B. Comply with water, soil and waste piping requirements.

C. Where installing piping adjacent to water closets, allow space for service and maintenance.

3.04 ADJUSTING

A. Operate and adjust fixtures and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.

B. Adjust water pressure at flushometer valves and faucets to produce proper flow.

3.05 CLEANING AND PROTECTION

A. After completing installation of fixtures, inspect and repair damaged finishes.

B. Clean fixtures and fittings with manufacturers' recommended cleaning methods and materials.

C. Install protective covering for installed fixtures and fittings.

D. Do not allow use of fixtures for temporary facilities unless approved in writing by Owner.

- - - END OF SECTION - - -

PART I – GENERAL

1.01 SUMMARY

A. Section Includes:
1. Wiring

1.02 WORK INCLUDED

A. Provide labor, materials, equipment and services for the complete installation of motor control wiring and temperature control wiring as required in Contract Documents. Provide wiring and conduit, required to connect devices furnished as part of or adjunctive to the automatic temperature control system and for motor control, regardless of the source of supply. Control wiring includes 120 volt and lower voltage wiring for control signals directing equipment operation. Control circuits shall be 120 volt maximum. Provide wiring in accordance with requirements specified in Division 26, “Electrical” and the National Electrical Code. Provide devices required for proper system operation, including special electrical switches, transformers, disconnect switches, relays, and circuit breakers protection.

B. Coordinate all work with Division 26, “Electrical”.

1.03 QUALIFICATIONS

A. Wiring shall be installed in compliance with National Electrical Code (NEC), local governing codes, and applicable requirements of Division 26, “Electrical”.

1.04 ACTION SUBMITTALS

A. Provide complete wiring diagrams for equipment systems. Deliver wiring diagrams to proper trades in time for roughing of conduit, equipment connections and to avoid delay in construction schedule. Wiring diagrams and roughing information to clearly indicate items to be mounted and/or wired as part of the Work of Division 26, “Electrical”.

PART 2 - PRODUCTS

2.01 WIRING MATERIALS

A. Materials:
1. Rigid conduit, hot dipped galvanized steel with galvanized threaded malleable iron fittings.
2. Metallic type (EMT), low carbon steel, with galvanized steel compression type, concrete tight fittings.
3. Flexible conduit, steel interlock type, galvanized, with galvanized steel fittings, plastic coated in wet locations (crawl spaces, tunnels, outdoors).
4. Boxes and Fittings: Condulet style in damp or wet locations. Other locations; galvanized, stamped steel type or condulet type.
5. Wire: Annealed copper, 98% conductivity. #12 AWG minimum size for branch circuit and emergency system wiring, #14 AWG minimum size for 120-volt control circuits and #16 AWG for low voltage control circuits, unless otherwise called for.
6. Insulation: Type THHN. Power feeders and branch circuits rated 230 volts and under color-coded red, black and blue with white neutral conductor. Power feeders and branch

circuits rated 240 volts to 480 volts color-coded orange, brown and yellow, with gray neutral conductor.

2.02 SHIELDED INSTRUMENTATION WIRING

A. Suitable for analog input and output devices; #16 AWG twisted shielded pair.

PART 3 - EXECUTION

3.01 GENERAL

A. Check electrical wiring pertaining to equipment for completeness and correctness of connections. Correct any misapplied motor and/or motor starter, improper thermal overload device, or device that fails to function and resultant damage, whether due to incorrect connections or improper information on wiring diagrams.

3.02 WIRING FOR CONTROL SYSTEMS

A. Provide motor control and temperature control wiring for equipment. All wiring shall be in conduit, unless otherwise noted. Refer to Specification Section 260519 for type of conduit to be used in specific applications. Provide 18 in. length flexible conduit at motors and devices subject to vibration. Conduit supported on 5 ft. centers. Do not attach directly to hot surfaces, piping or ductwork.

B. Control wiring shall be in separate conduit from all other wiring.

C. Provide green grounding wire circuited from starter, and run ground wire through conduit to each remote auxiliary relay, pushbutton station, remote panel heating device, thermostat, or device with potentials in excess of 50 volts. Size ground wire as required by NEC.

D. All temperature control wiring shall be plenum rated type, meeting the requirements of NEC Article 300.

E. Provide pushbutton stations, pilot lights, selector switches, auxiliary starter contacts and other devices required to provide specified functions.

F. Where allowable by code and contract documents, temperature control wiring may be installed without conduit. Installation and wire insulation types shall be as described by NEC, Article 725. All low voltage wiring circuits 50 volts and under shall meet the following:
   1. Be adequately supported using bridle rings spaced a maximum of 36 in. on centers or other approved method when installed horizontally above accessible ceilings or run exposed in unfinished areas.
   2. Be installed in conduit when run in wall cavity or surface metal raceway where no access is available to wall cavity, in finished areas.
   3. Be installed in conduit when installed vertically in mechanical and electrical rooms from panels and devices up to ceiling.
   4. Be installed in conduit in all cases not specifically covered by the above cases, or where subject to physical damage.

G. All exposed vertical wiring shall be in minimum ¾-in. rigid metallic conduit.

3.03 EQUIPMENT WIRING

A. Provide control wiring from the package control system, to each respective electric heat coil, reheat coil or motor. Properly mount control package.

B. Provide power and control wiring between shipping splits, between remote panels, thermostats, disconnect switches, and their respective units.

C. Provide wiring from leak detection (including cooling coil drain pans and secondary containment piping) to building water detection system panel.

3.04 FIELD WIRING IN STARTERS, CONTROLLERS AND PANELS

A. Wiring within starters, controllers and temperature control panels, shall be routed neatly in gutter space, away from moving and/or heat producing parts.

B. Provide 30 ampere, 600 volt rated terminal blocks. Do not place more than two wire connections on pilot device or relay terminal. Where more than two circuit connections are required, use terminal block.

C. Provide nylon self-insulated, locking type spade lugs for all control wires.

D. Cables and wires shall be neatly bundled and lashed with nylon cable straps.

- - - END OF SECTION - - -

PART I - GENERAL

1.01 SUMMARY

A. Section Includes:
1. Motors
2. Starters.
3. Auxiliary devices
4. Disconnect switches.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Submittal lists of motors, including voltage, phase, RPM, hp, rated efficiency, duty, power factor, enclosure type, frame type and location.

1.03 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For motors to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.01 MOTORS

A. General Requirements:
1. Motors built for 60 Hz operation, three phase for ½ HP and larger; single phase for 1/3 HP and smaller. In compliance with NEMA Standards, wound specifically for nameplate voltage, and selected for appropriate duty and environment. 1.15 minimum service factor at rated voltage and frequency. Bearings rated 20,000 life hours. V-belt connected motors with adjustable slide rail bases and pulleys. Motors shall have Class F insulation system, with Class B temperature rise, except for inverter duty motors which shall have Class H insulation meeting NEMA MG 1 Part 31.4.4.2 and Class B temperature rise. Maximum allowable motor temperature rise for open drip-proof (ODP) or totally enclosed fan cooled (TEFC) type at 1.15 service factor shall be 80°C above 40°C ambient up to 300 HP. NEMA locked rotor kVA code as required to match unit equipment torque characteristics. Single-phase motors shall be capacitor start, induction run, or split phase type. Polyphase motors shall be constant speed, squirrel cage, unless otherwise called for. Nameplates shall have as a minimum, all information as described in NEMA Standard MG-1-20.60.
2. Motors for use with adjustable speed drive applications shall be premium efficiency invertor duty rated in accordance with NEMA and be capable of a 10:1 turndown. These motors shall meet NEMA corona inception voltage requirements, withstanding peak voltages up to 1600 volts, and be manufactured in accordance with NEMA MG-1 Part 31. All motors controlled by adjustable speed drives shall be equipped with circumferential micro-fiber shaft grounding rings to meet NEMA MGI 3.4.4.4.3 CAEGIS Shaft Grounding Kit, installed in accordance with manufacturer’s recommendation.
3. Three phase motors rated 1 HP and greater shall be special design, copper winding, relubable ball bearings, 1.15 service factor, premium efficiency, energy-saver type with a guaranteed NEMA nominal full-load efficiency, by IEEE Standard 112 Test Method “B”.

Motors shall have a three (3) year warranty. Efficiency rating shall appear on nameplate, and shall be not less than as follows:

MINIMUM NOMINAL FULL-LOAD MOTOR EFFICIENCY						
HP	ODP MOTORS (RPM)			TEFC MOTORS (RPM)		
	1200	1800	3600	1200	1800	3600
1	82.5	85.5	77.0	82.5	85.5	77.0
1.5	86.5	85.5	84.0	87.5	96.5	84.0
2	87.5	86.5	85.5	88.5	86.5	85.5
3	88.5	89.5	85.5	89.5	89.5	86.5
5	89.5	89.5	86.5	89.5	89.5	88.5
7.5	90.2	91.0	88.5	91.0	91.7	89.5
10	91.7	91.7	89.5	91.0	91.7	90.2

4. Nominal Motors Voltage:

Nominal System Voltage	Motor Nameplate
480V – 3 phase	460 volt
240V – 1 phase and 3 phase	230 volt
208V – 1 phase and 3 phase	200 volt
120V – 1 phase	115 volt

5. Provide the following enclosure types unless otherwise noted:

Environment/Location	Motor Enclosure Type
General Purpose	Open drip-proof, TEFC with cast iron frame, or encapsulated
Outdoors, below grade or high humidity	TECF with cast iron frame
Hazardous	Explosion-proof
Packaged Refrigeration Compressors	Hermetic or semi-hermetic

B. Basis of Design: General Electric

C. Acceptable Makes: Need not be all of same make, but one of the following: Baldor, General Electric, Gould, Lincoln, Marathon, Nidec, Reliance, Siemens, US Motors, or approved equal.

2.02 STARTERS

A. Starters, contactors and controllers shall comply with NEMA Standards, having NEMA 1 or 1B enclosure or as required for application. Minimum size 0.
   1. Each starter subject to electrical interlock and/or automatic control shall have necessary auxiliary contacts.
   2. Combination magnetic starters for motors operating 208 volts or over, line-to-line, equipped with self-contained fused and grounded control transformer, 120 volts.
   3. Starters with motor protection by manual reset.
   4. Starters and contactors to have pilot lights.

B. Manual Starters: Toggle operated, single-pole for line to neutral circuits, two-pole for line-to-line circuits; flush mounted unless otherwise called for. Gang with selector switch for multi-speed applications.

C. Combination Magnetic Starters: Single speed, with fuses, across-the-line type, HAND-OFF-AUTO selector switch in cover, wired for maintained contact, unless otherwise called for.

D. Magnetic Contactors: Control coil in series with automatic control devices. Type and arrangement as required.

E. Starting equipment and control devices a product of one manufacturer and furnished through a single supplier. Factory-wired or assembled packaged equipment shall be UL approved.

F. Enclosures:
   1. NEMA Type 1 enclosure for dry indoor locations.
   2. NEMA Type 3R (rainproof) for outdoor locations.

G. Basis of Design: General Electric

H. Acceptable Makes: Allen-Bradley, Cutler-Hammer, General Electric, ITE, Square D, or approved equal.

2.03 AUXILIARY DEVICES

A. Pushbutton stations, pilot lights, devices, relays, transformers, selector switches, electric thermostats, auxiliary starter contacts, as required for functions called for. Maintained contact type equipment for applications affecting building heat and other critical building functions where services must be restored automatically.

B. Flush mount with backbox and brushed stainless steel cover plate in finished rooms.

2.04 DISCONNECT SWITCHES

A. Heavy duty 600 volt with number of poles and ampere rating as required by code.

B. Switch shall be lockable in the “off” position.

C. Fusible when ahead of starting equipment where required by equipment vendor, or by NEC.

D. NEMA Type 1 enclosure for dry indoor locations.

E. NEMA Type 3R for outdoor locations.

F. Basis of Design: General Electric.

G. Acceptable Makes: Allen-Bradley, Cutler-Hammer, General Electric, Square D, or approved equal.

PART 3 - EXECUTION

3.01 MOTORS

A. Furnished by equipment manufacturer and specifically manufactured and/or selected, mounted and installed for intended use.

B. Install motors accessible for maintenance and belt adjustment.

3.02 STARTERS

A. Furnish starters and accessories for motors and equipment unless otherwise called for.

B. Starters shall be installed by Division 26 “Electrical”.

3.03 DISCONNECT SWITCHES

A. Locate as called for.

B. Provide stainless steel bolts and galvanized steel mounting hardware for outdoor installation.

C. Provide fuses where required.

- - - END OF SECTION - - -

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
1. Roof curbs
2. Roof curb adapters
3. Roof duct supports

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.01 ROOF CURBS

A. Double wall, 1-1/2 in. minimum thickness, with wood blocking, fully insulated in the interior cavity with rigid insulation. 18 in. high, unless otherwise indicated. Curb construction of galvanized steel, 1-1/2 in. thickness, 3 lb. density fiberglass insulation with continuously welded corner seams and painted at all welds. 20 gauge up to 36 in., 18 gauge 38 to 72 in., 16 gauge over 72 in. in any dimension. Provide curb with gasket on top to make airtight seal between curb and ventilator, fan, or air handling unit. Curb provided with raised cant, flanged or recessed. Curb flange shall suit roof construction and type of insulation being applied. Include internal stiffeners as required to support equipment.

B. Basis of Design: RPS Model 2A

C. Acceptable Makes: Connfab, Greenheck, Pate, RPS, Thybar.

2.02 ROOF CURB ADAPTERS

A. Double wall, 1-1/2 in. minimum thickness, with wood blocking, fully insulated in the interior cavity with rigid insulation. 18 in. high, unless otherwise indicated. Bottom dimensions to match existing curb and curb adapter to taper to new equipment dimensions. Curb construction of galvanized steel, 1-1/2 in. thickness, 3 lb. density fiberglass insulation with continuously welded corner seams and painted at all welds. 20 gauge up to 36 in., 18 gauge 38 to 72 in., 16 gauge over 72 in. in any dimension. Provide curb with gasket on top to make airtight seal between curb and ventilator, fan, or air handling unit. Curb provided with raised cant, flanged or recessed. Curb flange shall suit roof construction and type of insulation being applied. Include internal stiffeners as required to support equipment.

B. Basis of Design: RPS Model CA.

C. Acceptable Makes: Connfab, Greenheck, Pate, RPS, Thybar.

2.03 ROOF DUCT SUPPORTS

A. Base: High density polypropylene with UV inhibitors and anti-oxidants conforming to following:
1. Color: Black color as molded.
2. Moisture Content: Negligible.
3. Shrinking/Swelling due to moisture: Negligible.

4. Resistant to oil, gasoline, antifreeze, battery acid and sulfuric acid.
5. Do not use bases that are made of pressed rubber, steel, stainless steel, recycled tires or carbonated plastics.
6. Base Dimensions: 18-inches wide by 18-inches long by 3-inches tall.

B. Steel Frame: Steel, 12 gauge 1-5/8 in. or 1-7/8 in. strut galvanized per ASTM A123 or 14 gauge 13/16-in. strut galvanized per ASTM A653 for PP10 and SS8.

C. Hanger Type:
1. Conforms to MSS SP-58 and MSS SP-69.
2. Material: Carbon steel (standard); 304 SS available.
3. Clevis Hanger: Used for all insulated and uninsulated lines.
4. Roller Hanger: Used for uninsulated lines.
5. Finish: Hot dipped galvanized.

D. Basis of Design: PHP Systems PHP-D Enclosed.

E. Acceptable Makes: Cooper, Mifab, Miro Industries, PHP Systems.

PART 3 - EXECUTION

3.01 GENERAL

A. Height as recommended by equipment manufacturer, not less than that described in this Specification Section. The Contractor shall be responsible for exact size, length, and location and shall set and secure each curb to the roof. Shim and level curb as required. Provide curb and supports for all roof-mounted equipment. All roof penetrations shall be made through an appropriate curb. All roof mounted equipment including fans, air handling units, etc., shall be set on an equipment support unless otherwise noted. Refer to Contract Drawings for details on plenums extending from curbs.

B. Field verify dimensions of existing curbs prior to ordering curb adapters.

C. For duct support systems, install per manufacturer’s recommendations. If gravel roof system, remove gravel prior to setting bases. Install bases and supports no more than 8’-0” apart. Consult roofing manufacturer for roof membrane compression capacities. If necessary, a compatible sheet of roofing material (rubber pad) may be installed under rooftop support to disperse concentrated loads and add further membrane protection.

D. Any roofing work shall be done by a bonded roofing subcontractor so as to not void the existing roof warranty.

- - - END OF SECTION - - -

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

B. Specifications throughout all Divisions are directly applicable to this Section, and this Section is directly applicable to them.

1.02 SUMMARY

A. Section Includes:
1. Methodology for balancing air systems
2. Air balancing report

1.03 ACTION SUBMITTALS

A. Strategies and Procedures Plan: Submit testing and balancing strategies and step by step procedures as specified.

B. Certification: Submit Associated Air Balance Council (AABC) or National Environmental Balancing Bureau (NEBB) certification.

C. System Readiness Checklist: Submit system readiness checklist. Checklist to be utilized by the installing contractor verifying that systems are ready for testing and balancing.

1.04 CLOSEOUT SUBMITTALS

A. Certified Report:
1. Title sheet with project name, contractor, engineer, date, balancing contractor's name, address, telephone number and contact person's name and balancing technician's name.
2. Individual test sheets for air handlers, terminal units, air distribution devices, fans, duct traverses, coils.
3. Manufacturer's fan curves for equipment installed with design and actual operating conditions.
4. Single line sketch of system marked up with terminal unit numbers, room numbers, testport locations, register, grille and diffuser numbers to correlate test sheets. Data shall be provided with reports.
5. TAB Report Forms: Use standard AABC's "National Standards for Testing and Balancing Heating, Ventilating and Air Conditioning Systems" or NEBB's "Procedural Standards for Testing, Adjusting and Balancing of Environmental Systems".

1.05 QUALIFICATIONS

A. Follow procedures and methods published by one or more of the following:
1. Associated Air Balance Council (AABC) or National Environmental Balancing Bureau (NEBB).
2. Individual manufacturer requirements and recommendations.

B. Maintain qualified personnel at project for system operation and trouble shooting. TAB subcontractor shall change sheaves and perform mechanical adjustments in conjunction with balancing procedure.

C. Balancing subcontractor shall be current member of AABC or NEBB.

D. Instrument type, quantity, accuracy and calibration shall conform with AABC's "National Standards for Total System Balance".

PART 2 - PRODUCTS

2.01 GENERAL

A. Provide tools, ladders, recording meters, gauges, thermostats, velometers, anemomemters, Pitot tubes, including gauge manomemters, magnehelic gauges, amprobes, veltmeters, psychometers and tachometers required.

B. Instrumentation Calibration:
1. Calibrate instruments at least every six (6) months, or more frequently if required by instrument manufacturer.
2. Keep an updated record of instrument calibration that indicates date of calibration and the name of party performing instrument calibration.

C. Prior to concealment of systems, visit the job site to verify and advise on type and location of balancing devices and test points. Make changes as required to balance facilities.

D. Place system in satisfactory operating condition.
1. Adjusting and balancing shall be accomplished as soon as the systems are complete and before Owner takes possession.
2. Prior to balancing, adjust balancing devices for full flow, replace temporary filters.
3. Initial adjustment and balancing to quantities as called for in the Contract Documents, or as directed by the Engineer, to satisfy job conditions.
4. All outdoor conditions (DB, WB and description of weather conditions) at the time of testing shall be documented in the report.
5. Provide sheaves and belts as required to meet system performance requirements for all belt-driven fan motors 10 HP and greater. Adjust and align sheaves to obtain proper settings and operation. Verify motors are not overloading.
6. The Contractor shall replace balance cocks, flow balancers and dampers in new systems that cannot be manipulated to satisfy balancing requirements.
7. Identify dampers in existing systems that cannot be manipulated to satisfy balancing requirements.
8. Traverse main ducts to determine total system air quantities after all outlets have been set prior to final adjustment if the system does not meet design requirements. A sum of room airflows is not acceptable.
9. If duct construction and/or installation prohibits proper traverse readings, provide coil measurements at main coils and/or fresh air intake traverse with units operating in 100% outdoor air mode, where applicable.

E. Contractor's responsibilities:
1. Provide Testing and Balancing agency one (1) complete set of contract documents, change orders and approved submittals in digital and hard copy formats.

2. Temperature Controls Subcontractor shall provide required BMS hardware, software, personnel and assistance to Testing and Balancing agency as required to balance the system. Temperature Controls Subcontractor shall also provide trending report to demonstrate that systems are complete.
3. Coordinate meetings and assistance from suppliers and contractors as required by Testing and Balancing agency.
4. Provide additional dampers, sheaves and belts as required by Testing and Balancing agency.
5. Flag all manual volume dampers with fluorescent or other high-visibility tape.
6. Provide access to all dampers, test ports, nameplates and other appurtenances as required by Testing and Balancing agency.
7. The Contractor shall replace or repair insulation as required by Testing and Balancing agency.
8. Have the HVAC systems at complete operational readiness for Testing and Balancing to begin. As a minimum, verify the following:
   a. Airside:
      1) All ductwork is complete with all terminals installed.
      2) All volume, smoke and fire dampers are open and functional.
      3) Clean filters are installed.
      4) All fans are operating, free of vibration, and rotating in correct direction.
      5) VFD startup is complete and all safeties are verified.
      6) System readiness checklists are completed and returned to Testing and Balancing agency.
9. Promptly correct deficiencies identified during Testing and Balancing.
10. Maintain a construction schedule that allows the Testing and Balancing agency to complete work prior to occupancy.

PART 3 - EXECUTION

3.01 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Testing and Balancing Heating, Ventilating and Air Conditioning Systems" or NEBB's "Procedural Standards for Testing, Adjusting and Balancing of Environmental Systems" and this Specification Section.

B. Cut insulation, ducts, pipes and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to insulation Specifications for this project.

C. Mark equipment and balancing device settings with paint or other suitable, permanent identification material, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, to show final settings.

D. Take and report testing and balancing measurements in imperial (IP) units.

3.02 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Cross check the summation of required outlet volumes with required fan volumes.

B. For variable air volume systems, develop a plan to simulate diversity.

C. Determine the best locations in main and branch ducts for accurate duct airflow measurements.

D. Check airflow patterns from the outside-air louvers and dampers and the return and exhaust air dampers, through the supply fan discharge and mixing dampers.

E. Locate start-stop and disconnect switches, electrical interlocks and motor starters.

F. Verify that motor starters are equipped with properly sized thermal protection.

G. Check dampers for proper position to achieve desired airflow path.

H. Check for airflow blockages.

I. Check for proper sealing of air handling unit components.

J. Check for proper sealing of air duct systems.

K. Check condensate drains for proper connections and functions.

3.03 PROCEDURES FOR CONSTANT VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.
   1. Measure fan static pressures to determine actual static pressure as follows:
      a. Measure outlet static pressure as far downstream from the fan as practicable and upstream from restrictions in ducts, such as elbows and transitions.
      b. Measure static pressure directly at the fan outlet or through the flexible connection.
      c. Measure inlet static pressure of single inlet duct as near the fan as possible, upstream from flexible connection and downstream from duct restrictions.
      d. Measure inlet static pressure of double inlet fans through the wall of the plenum that houses the fan.
   2. Measure static pressure across each component that makes up an air handling unit.
      a. Simulate dirty filter operation and record the point at which maintenance personnel should change filters.
   3. Compare design data with installed condition to determine variations in design static pressures versus actual static pressures. Compare actual system affect factors to identify where variations occur. Recommend corrective action to align design and actual conditions.
   4. Once total system airflows are established and within limits of the Contract Documents, set the fan speed via the variable frequency drive and lock the maximum fan speed at the frequency that results in design airflow.
   5. Obtain approval from Engineer for adjustment of fan speed higher and lower than indicated speed. Make required adjustments to motor sizes and electrical connections to accommodate fan speed changes.

6. Do not make fan speed changes that result in motor overload. Consult equipment manufacturers about fan speed safety factors. Modulate dampers and measure fan motor amperage to ensure that no overload will occur. Measure amperage in full cooling, full heating, economizer, and any other operating modes to determine the maximum required brake horsepower.

B. Adjust volume dampers for main duct, submain ducts and major branch ducts to indicated airflows within specified tolerances.
   1. Measure static pressure at a point downstream from the balancing damper and adjust volume dampers until the proper static pressure is achieved. When sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.
   2. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.

C. Measure terminal outlets and inlets without making adjustments.
   1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.

D. Adjust terminal outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using volume dampers rather than extractors and the dampers at each terminal.
   1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
   2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.04 TOLERANCES

A. Set HVAC system's air flow rates within the following tolerances:
   1. Supply, Return and Exhaust Fans: 0 to +10%.
   2. Air Outlets and Inlets: ±10%.
   3. Minimum Outside Air: 0 to +10%.
   4. Maintaining pressure relationships as designed shall have priority over the tolerances specified above.

3.05 FINAL TEST AND BALANCE REPORT

A. The report shall be a complete record of the HVAC system performance, including conditions of operation, items outstanding and any deviations found during the Testing and Balancing process. The final report also provides a reference of actual operating conditions for the Owner. All measurements and test results that appear in the reports must be made on site and dated by the technicians.

B. The report shall be organized by system and shall include the following information:
   1. Title Page:
      a. AACB or NEBB Certified Company Name
      b. Company Address
      c. Company Telephone Number
      d. Project Identification Number
      e. Location
      f. Project Engineer

g. Project Contractor
h. Project Number
i. Date of Report
j. Certification Statement
k. Name, Signature and Certification Number

2. Table of Contents
3. National Performance Guarantee
4. Report Summary, including a list of items that do not meet design tolerances, with information that may be considered in resolving deficiencies.
5. Instrument List, including type, manufacturer, model, serial number and calibration date.

C. Required air side data – Test, adjust and record the following:
1. Motors:
   a. RPM
   b. BHP
   c. Full load amps
   d. Sheave size, number and size of belts
   e. Shaft diameter
   f. Complete nameplate data
2. Fans:
   a. CFM
   b. RPM
   c. VFD frequency
   d. Suction static pressure
   e. Discharge static pressure
   f. Sheave sizes, number and size of belts, key sizes, shaft diameter
   g. Complete nameplate data
3. Duct: Traverse Zones:
   a. CFM
   b. Static pressure
4. AHU (In both minimum outside air and economizer modes):
   a. Minimum outside air CFM
   b. Total discharge and return CFM
   c. Static profile through unit
   d. Complete nameplate data
5. Coil:
   a. Entering air temperature (DB/WB)
   b. Leaving air temperature (DB/WB)
   c. Static differential
   d. Face velocity and area
   e. CFM
   f. Complete nameplate data
6. Registers/Grilles/Diffusers:
   a. CFM
   b. Set, adjust and record air flow pattern

D. One (1) copy of the final test and balance report shall be sent directly to the Engineer of Record. Provide two additional copies to the Contractor.

- - - END OF SECTION - - -

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
1. Duct insulation
2. Jacketing

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Schedule of insulation application.

PART 2 - PRODUCTS

2.01 GENERAL

A. Insulation, jackets, adhesives, and coatings, shall comply with the following:
1. Treatment of jackets or facings for flame and smoke safety must be permanent. Water soluble treatments not permitted.
2. Insulation, including finishes and adhesives on the outer surfaces of ducts, pipes, and equipment, shall have a flame spread rating of 25 or less and a maximum smoke developed rating of 50 or less.
3. Asbestos or asbestos bearing materials not permitted.
4. Energy Conservation Construction Code of New York State.
5. All adhesives and sealants used for insulation in the interior of the shall comply with the maximum Volatile Organic Compound (VOC) limits as called for in the current version of the South Coast Air Quality Management District (SCAQMD) Rule 1113.

2.02 DUCT INSULATION – FLEXIBLE FIBERGLASS BLANKET

A. Duct wrap meeting ASTM C552 Types I, II and III, and ASTM C 1290, Greenguard compliant, flexible, limited combustible.

B. K Value of 0.27 at 75°F mean temperature. Maximum service temperature (faced) of 250°F.

C. Vapor retarder jacket shall be FSK conforming to ASTM C 1136 Type II.

D. Minimum 1.0 lb/ft^3 density.

E. Duct insulation shall have a thermal resistance (R) value identification mark by the manufacturer applied no less than every ten (10) feet.

F. Acceptable Makes: Certainteed, Knauf, Manville, Owen-Corning.

2.03 DUCT INSULATION – RIGID FIBERGLASS BOARD

A. Rigid duct board meeting ASTM C612 Types IA and IB.

B. K Value of 0.23 at 75°F mean temperature. Maximum service temperature of 450°F.

C. Vapor retarder jacket shall be ASJ conforming to ASTM C 1136 Type I, or FSK or PSK conforming to ASTM C 1136 Type II.

D. Minimum 3.0 lb/ft^3 density for concealed areas and 6.0 lb/ft^3 for exposed areas less than 8'-0" above finished floor.

E. Duct insulation shall have a thermal resistance (R) value identification mark by the manufacturer applied no less than every ten (10) feet.

F. Acceptable Makes: Certainteed, Knauf, Manville, Owen-Corning.

2.04 FIELD APPLIED JACKETS

A. Ductwork
1. Aluminum Jacket: Deep corrugated sheets manufactured from aluminum alloy complying with ASTM B 209, and having an integrally bonded moisture barrier over entire surface in contact with insulation. Metal thickness and corrugation dimensions are as scheduled within this Specification Section. Finish: Cross-crimp corrugated or stucco embossed finish. Moisture Barrier: 1-mil thickness, heat bonded polyethylene and kraft paper.

2.05 MATERIALS AND SCHEDULES

A. See Exhibits at the end of this Specification Section.

PART 3 - EXECUTION

3.01 GENERAL

A. All materials shall be installed by skilled labor regularly engaged in this type of work. All materials shall be installed in strict accordance with manufacturer's recommendations, building codes and industry standards.

B. Locate insulation and cover seams in the least visible location. All surface finishes shall be extended in such a manner as to protect all raw edges, ends and surfaces of insulation. No glass fibers shall be exposed to the air.

C. All duct insulation shall be continuous through hangers, sleeves, walls, ceilings or floor openings, or sleeves unless not allowed by fire stop system.

D. Provide thermal insulation on clean, dry surfaces and after piping, ductwork and equipment (as applicable) have been tested. Do not cover pipe joints with insulation until required tests are complete.

E. All cold surfaces that may "sweat" must be insulated. Vapor barrier must be maintained; insulation shall be applied with a continuous, unbroken moisture and vapor seal. All hangers, supports, anchors, or other projections that are secured to cold surfaces shall be insulated and vapor sealed to prevent condensation.

F. Items such as boil manholes, handholds, cleanouts, ASME stamp, and manufacturers' nameplates, may be left uninsulated unless omitting insulation would case a condensation problem. When such is the case, appropriate tagging shall be provided to identify the presence of these items. Provide neatly beveled edges at interruptions of insulation.

G. If any insulation material has become wet because of transit or job site exposure to moisture or water, the Contractor shall not install such material and remove it from the jobsite.

3.02 DUCTWORK INSULATION

A. Provide external thermal insulation for duct. Not required where ducts have internal acoustical insulation. Make special provisions at dampers, damper motors, thermometers, instruments and access doors. Apply as follows:
   1. Flexible Blanket Type: Install duct wrap to obtain specified R-value using a maximum compression of 25%. Installed R-value shall be per ASHRAE 90.1-2016 and all local and state codes. Firmly butt all joints. The longitudinal seam of the vapor retarder must be overlapped a minimum of 2 in. Where vapor retarder performance is required, all penetrations and damage to the facing shall be repaired using pressure-sensitive foil tape, or mastic prior to system startup. Pressure-sensitive foil tapes shall be a minimum 3 in. wide and shall be applied with moving pressure using a squeegee or other appropriate sealing tool. Closure shall have a 25/50 Flame Spread/Smoke Developed Rating, per UL 723. Duct wrap shall be additionally secured to the bottom of rectangular ductwork over 18 in. wide using mechanical fasteners on 18 in. centers. Self-adhesive clips shall not be acceptable. Care should be exercised to avoid over-compression of the insulation during installation.
   2. Rigid Board Type: Impale board over mechanical fasteners, welded pins or adhered clips, 12 in. to 18 in. on centers; minimum of two rows per side. Secure insulation with washer clips. Self-adhesive clips shall not be acceptable. Seal breaks and joints in vapor barrier with 4 in. wide matching tape or 4 in. glass-fab applied with BF 35-00. Apply tape over corner beading where exposed. Staple all joints.
   3. Exterior Ductwork: Finish with aluminum jacket. All joints shall be positioned so as to shed water; with a minimum 3 in. overlap, and completely weather sealed.

3.03 EXISTING INSULATION

A. Patch existing insulation damaged during the course of the work.

EXHIBIT "I" – DUCT INSULATION MATERIALS

SERVICE	INSULATION MATERIAL	THICKNESS	REMARKS
HVAC supply (concealed)	Flexible fiberglass	2 in.	Minimum R-5 value
HVAC supply (exposed within the conditioned space served)	Not insulated	Not insulated	Does not include the associated supply ductwork within the mechanical room or supply duct to the conditioned space
Interior ductwork indicated to be lined	Not insulated	Not insulated	Does not include the associated supply ductwork within the mechanical room or supply duct to the conditioned space
Return air	Not insulated	Not insulated	
Exhaust, relief or vent ducts and plenums (concealed)	Flexible fiberglass	2 in.	Minimum R-8 value. Insulate 15 ft. from exterior opening and plenums.
Exterior ductwork	Rigid board	2 in.	Minimum R-8 value. Cover with aluminum jacketing

- - - END OF SECTION - - -

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:
1. Ductwork construction standards and materials
2. Ductwork sealant
3. Dampers
4. Flexible duct connectors
5. Access doors

1.02 ACTION SUBMITTAL

A. Ductwork shop drawings.
1. Prepare minimum ¼ in. scale drawings:
a. As soon as possible after Contract Award.
b. Constructed from actual field inspections and measurements so as to ensure a complete job.
c. Incorporating dimensions of actual equipment used.
d. Showing adequate sections, elevations and plan views.
e. Indicating dampers, damper access doors and other required accessories.
f. Indicating elevation above floor and ceiling height for each room.
g. Indicating air balance test plug locations.
2. Call attention, in writing, to deviations from Contract Documents.
3. Indicate roof, wall and floor opening dimensions and locations.
4. Submit to each Contractor of other trades for review for interferences and coordination with their work.

B. Shop drawings on items and equipment being provided.

C. Submit a complete shop standard manual including miscellaneous materials and construction details for all shop fabricated items, including volume dampers, turning vanes, duct sealant, flexible connections, access doors, flex duct, acoustical duct lining, etc.

1.03 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For ductwork accessories to include in operation and maintenance manuals.

1.04 GENERAL REQUIREMENTS

A. Ductwork shall be fabricated and installed in compliance with the latest editions of each of the following:
1. SMACNA HVAC Duct Construction Standards - Metal and Flexible.
2. SMACNA Duct Liner Application Standard.
3. SMACNA Fibrous Glass Duct Construction Standards.
4. NFPA Standards, Bulletin 90A, 96, 101.
5. Plans and Specifications in excess of items listed above.

B. All adhesives and sealants used for ductwork in the interior of the shall comply with the maximum Volatile Organic Compound (VOC) limits as called for in the current version of the South Coast Air Quality Management District (SCAQMD) Rule 1113.

C. Provide volume dampers at all air outlets, diffusers, grilles and where noted on plans.

1.05 DUCTWORK CLASSIFICATION

A. Duct systems shall be classified and constructed per SMACNA Velocity-Pressure Classification as follows:
   1. Ductwork shall be constructed for a minimum pressure class of 2 in. w.g. for the following systems:
      a. Supply duct downstream of VAV terminal units.
      b. Typical low pressure supply ductwork.
      c. Typical return ductwork.
      d. Typical low pressure exhaust ductwork.
   2. Pressure classes above 3 in. w.g. shall be provided per the following, based upon the external static pressure as scheduled for each specific fan:

Scheduled External Static Pressure	**Pressure Class**
Over 3 in. up to 4 in. w.g.	4 in. w.g.
Over 4 in. up to 6 in. w.g.	6 in. w.g.
Over 6 in. up to 10 in. w.g.	10 in. w.g.

PART 2 - PRODUCTS

2.01 DUCTWORK MATERIALS

A. Unless otherwise called for, provide materials in Exhibit “I” at end of this section:
   1. Gauges and weights shall be per SMACNA and NFPA. Materials: New, marked with manufacturer's name, and comply with applicable ASTM and ANSI Standards.

2.02 SQUARE AND RECTANGULAR DUCTWORK

A. Manufactured of galvanized steel, conforming to ASTM A653 and A924, or aluminum as noted. Gauges per SMACNA Duct Construction Standards.

B. Duct reinforcement, transverse joint reinforcement, transverse and longitudinal seams shall conform to appropriate tables and figures per SMACNA Velocity-Pressure Classification for duct construction.
   1. Transverse joints shall be sealed with duct joint sealants or appropriate welded construction. “Ductmate” or “Nexus” 4-bolt connection systems may be used in lieu of standard construction.
   2. Field assembled longitudinal seams shall be sealed with duct sealant. Factory or shop fabricated rolled or machine pressed longitudinal seams, sealing not required.

C. Corner closures shall be required as described and illustrated by SMACNA HVAC Duct Construction Standards and shall be sealed.

D. Elbows: Throat radius not less than dimension of duct in plane of radius. Where this cannot be maintained, use shorter radius with internal guide vanes, or square elbow with turning vanes.

E. Bracing and hanging as per SMACNA Standards of same material as duct.

F. Transformations and side connection fittings made without reduction of free area. Maximum angle in straight duct, 20° for diverging flow and 30° for contraction flow. Transformation from square to round or flat oval seams, welded or brazed.

2.03 ROUND DUCTWORK

A. Standard Round Ductwork:
   1. Manufactured of G-90 galvanized steel, conforming to ASTM A653 and A924, or aluminum as noted. Material to match straight pieces of ductwork.
   2. All spiral ducts shall have locked seams so made as to eliminate leakage under pressure for which this system has been designed. Longitudinal seams duct shall have fusion-welded butt seams. No stovepipe shall be allowed.
   3. Round Ductwork Fittings:
      a. All fittings fabricated per SMACNA Standards for round and flat-oval ductwork, material to match straight pieces of ductwork.
      b. Fittings shall have continuous welded seams.
      c. 90° tees shall be conical type. 90° tees and 45° laterals up to and including 12 in. diameter tap size shall have a radiused entrance into the tap, produced by machine or press forming. The entrance shall be free of any restrictions.
      d. Round taps off the bottom of rectangular ducts down to diffusers shall be made with 45° square to round shoe-taps.
   4. Elbows:
      d. Diameters 3 in. to 8 in.: Two-section stamped and continuously welded elbows, material to match straight pieces of ductwork.
      e. Over 8 in.: Gored construction with standing seam construction and internally sealed or continuously welded. Less than 35° two gores, 36° to 71° three gores, over 71° five gores.
      f. Fabricated to a centerline radius of 1.5 times the cross-sectional diameter.
      g. Adjustable elbows may be used for round up to 12 in. diameter in Velocity-Pressure Classes 2 in. w.g. and under. Seal adjustable joints airtight after installation.
   5. Joints:
      a. Pipe-to-pipe joints in diameters up to 60 in. shall be by the use of sleeve couplings, reinforced by rolled beads.
      b. Pipe-to-fitting joints in diameters up to 60 in. shall be by slip-fit of projecting collar of the fitting into the pipe.
      c. Insertion length of sleeve coupling and fitting collar shall be 2 in. up to 36 in. diameter.

2.04 DUCT SEALING

A. SMACNA Duct Sealing Classification shall be used for duct systems using the following criteria:
   1. Seal Class A, includes transverse and longitudinal joints and grommets at damper shafts - Velocity-Pressure Classifications above 2 in. w.g.
   2. Seal Class B, includes transverse and longitudinal joints - Velocity-Pressure Classifications 2 in. w.g. and below.

B. Duct sealant for indoor applications shall be non-fibrated, water based Hardcast Iron-Grip IG-601, Foster 32-19 or Childers CP-146.

C. Sealants and tapes shall be listed and labeled in accordance with UL 181A or UL 181B listed and marked according to type.

2.05 TURNING VANES

A. Standard Type: Provide in mitered elbows and as shown on contract documents. Vanes 36 in. and longer shall be double wall air foil type. All turning vanes shall be installed as per the latest SMACNA Standards. Turning vane size and spacing shall be as per SMACNA Standards. Turning vane spacing greater than SMACNA Standards is not acceptable.

2.06 DAMPERS

A. Blade Type Volume Dampers: Construction per SMACNA, one gauge heavier than duct material, securely fastened to 3/8 in. square, cold rolled steel operator rod. Provide multiblade above 12 in. width or depth.
   1. Manual volume damper operators shall be dial type for 3/8" square rod, with open-shut marking and locking device.
   2. Operators on insulated ducts to have elevated stand-off to clear insulation.
   3. Acceptable Makes: Air Balance, Duro, Ruskin, Ventlock, or approved equal.

B. Splitter Dampers: Shall not be used.

2.07 FLEXIBLE DUCT CONNECTORS

A. Applies to connections between diffusers and ductwork, as defined by the Mechanical Code of New York State.

B. Shall be in compliance with NFPA Bulletin 90A and UL Standard 181, Class I Air Duct.
   1. Constructed of a reinforced aluminized trilaminate which is mechanically bonded to a corrosive resistant outside metal helix.
   2. The core shall be factory wrapped with formaldehyde-free 1-in. thick fiberglass insulation and covered by a flame retardant, non-toxic polyethylene vapor barrier.
   3. Flexible ductwork shall be rated for 10 in. w.g. positive pressure, 5500 fpm, operating temperature range -20˚F to 250˚F.
   4. Thermal conductance of R-6.

C. Basis of Design: Flexmaster Type 5T.

D. Acceptable Makes: Clevaflex, Flexmaster, Genflex, Technaflex, Theraflex, or approved equal.

2.08 FLEXIBLE CONNECTIONS TO FANS AND EQUIPMENT

A. Materials for flexible connections shall be fire retardant, water and mildew resistant, and comply with UL Standard 214 and ANSI/NFPA 701.

B. All systesm of heavy glass fabric, double neoprene coated, approximately 30 oz. per sq. yard, maximum operating temperature of 200˚F.

C. Basis of Design: Ventfabrics Ventglas.

D. Acceptable Makes: Durodyne, Flexicraft, Ventfabrics, Unaflex.

2.09 ACCESS DOORS

A. General:
1. All access doors shall be continuous piano hinged type, unless noted otherwise.
2. Non-hinged only allowed where clearances to ceiling does not allow a full 90˚ swing.
3. Double panel insulated type when used in insulated duct.
4. Single panel uninsulated type allowed in uninsulated duct.
5. Pressure rated according to system in which being installed. Door-to-frame and frame-to-duct gasketing.
6. Provide specified Seal Class A or B ductwork sealing around frame, and hand adjust the latch tension for proper seal, on all access doors other than sandwich panel style.
7. Minimum Access Door Sizes Per Duct Depth:
   a. 12 in. or Less: 12 in. x 8 in.
   b. 12 in. to 18 in.: 18 in. x 14 in.
   c. Over 18 in.: 24 in. x 18 in.
8. Basis of Design: Air Balance FSA100.
9. Acceptable Makes: Air Balance, Nailor, National Controlled Air, Ruskin, Safe Air.

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS

A. Equipment and systems shall be installed in accordance with local and state codes. Bracing and hanging of ductwork shall be per SMACNA Duct Construction Standards.

B. Install ductwork tight to structure above, and in locations to avoid interferences.

C. Sizes given are inside dimensions. Keep openings closed with protective caps or blanks during construction to prevent entrance of dirt and debris.

D. Provide sheet metal sleeves to trim each floor and wall duct opening.

E. Extend access openings, damper rods and levers, to outside of external insulation.

F. Make system airtight. Replace poor joints or careless work.

G. No piping, conduit or other obstruction to airflow permitted in ductwork, except where shown on reviewed shop drawings. Provide with airtight streamlined sleeve, soldered or brazed joint between sleeve and ductwork. Increase size of ductwork to maintain proper cross-sectional area.

H. Provide necessary openings, sleeves, hanger inserts, framing, chases, recesses, not provided by other trades.

I. Exposed exhaust or return registers, flush with face of duct; exposed supply registers shall be mounted outside airstream with extension collars.

J. Provide sleeves for ducts through walls or floors. Use Schedule 40 pipe or 14 gauge sleeve with framing through structural surfaces; 18 gauge sheet metal for other cases. Set sleeves 4 in. above finished floor in Mechanical Rooms, seal watertight to floor.

3.02 FLEXIBLE DUCT CONNECTIONS

A. Provide flexible connections for the intake and discharge connections of duct connected to fans and air handling equipment.

B. Round connections are to be made with adhesive and metal drawbands with ends tightly bolded.

C. Rectangular connections shall be made with material securely held in grooved seam between flanges. Attach with adhesive and mechanical fasteners on 6 in. centers.

D. Connections shall be made with a minimum of 2 in. space between duct and equipment collars, installed inline, and with 1 in. excess material folded so as to not interfere with airflow through connection.

E. Mechanically fastened and sealed, with specified duct sealant, at duct and equipment connections.

3.03 FLEXIBLE DUCTWORK

A. Joints made with adhesive applied to duct end or collar.

B. Duct slid on full depth of collar and 2 in. on duct end and secured with stainless steel worm-drive hose clamp.

C. Maximum length 48 in., but not more than 8 in. longer than actual distance between end of duct and collar.

D. Maximum one 90° angle bend.

3.04 TURNING VANES

A. Install only in square elbows of equal dimensions.

B. Install per latest SMACNA Standards.

C. Secure vane runners to duct with spot welding, riveting or sheet metal screws, or bolts.

D. When installing in ductwork with internal insulation, install runners in ductwork inside insulation and bolt through insulation and duct sides, welding bolts to insure rigid installation. Provide build-outs for lined duct and Velocity-Pressure classes above 2 in. w.g., per SMACNA.

3.05 CLEANING SYSTEM DUCTWORK

A. Clean rubbish and dirt, from system before fans are activated.

B. Keep openings closed during construction.

C. Pay damages resulting from dirt blown on painted or other finished surfaces.

D. Repair or replace damaged fan wheels, dampers, or other system parts damaged resulting from dirt.

E. Clean system as many times as required until the entire system is dirt free.

F. Exposed ductwork that is called to be painted shall be cleaned of all dirt, oils, etc. prior to paint being applied. All duct stickers shall be removed, and all residual adhesive shall be cleaned off the surface.

3.06 INSTALLATION OF ROUND DUCTWORK

A. Use factory fabricated couplings for joints.

B. After the joint is slipped together, sheetmetal screws shall be placed ½ in. from the joint bead for mechanical strength.

C. Sealer shall be applied to the outside of the joint and covering the screw heads.

D. Flanged joints shall be made with neoprene rubber gaskets.

3.07 TESTING OF DUCTWORK

A. Ductwork not required to be tested for leakage shall be checked and guaranteed to meet the standards of the specified SMACNA Duct Sealing Classifications. Air balancing and testing shall be used to determine satisfactory operation of duct systems. Balancing reports indicating excessive leakage amounts shall be required to rebuild, repair or seal ductwork having excessive leakage.

3.08 DAMPERS AND AIR CONTROL DEVICES

A. Provide dampers necessary to permit proper balancing of air quantities. Comply with code requirements for smoke and fire control. Prevent introduction of uncontrolled outside air into building through roof and wall openings.

B. When dampers are installed in acoustically lined ductwork, install with insulated buildouts per SMACNA.

C. Install all dampers furnished by the Temperature Controls Subcontractor.

3.09 ACCESS DOORS

A. As required for access to dampers, damper motors, smoke detectors, control instruments, fan bearings, and equipment requiring periodic inspection or service, complete with angle iron frame.

B. Provide double cam type and safety chain where limited clearance prevents door to open.

3.10 DUCT SUPPORTS

A. As per SMACNA, same material as duct. Hanger bands to extend down sides and turn under bottom 2 in. Minimum two metal screws per hanger. Angle iron on larger duct. Spaced per building structural system but not greater than 8 ft. Provide extra support angles as required.

B. Exposed round ductwork to have drawband support.

3.11 DUCT SEALING

A. Preparation:
1. Clean surfaces of dirt, oil, grease and loose of foreign matter that could impair adhesion, using soap and water or solvent.
2. Allow surfaces to dry completely before proceeding.

B. Installation of Sealant System:
1. Apply sealant system to duct joints, fasteners, and seams in accordance with manufacturer's recommendations.
2. Apply sealant by brush, putty knife or caulk gun, to full coverage. Remove excess adhesive immediately.
3. Completely seal duct joint, fasteners and seams without voids, to a minimum 20 mil thick wet film.
4. Apply and store at ambient temperature of 40˚F to 100˚F; protect from freezing until dry

C. Field Quality Control:
1. Allow duct sealant system to cure a minimum of 72 hours before operating the system.
2. Do not apply external duct insulation or coatings until the joints have been inspected by the Owner's Representative.

3.12 SMOKE DETECTION

A. Smoke detectors shall be furnished by Division 26 "Electric" unless factory provided by AC unit manufacturer. This Contractor shall install detectors located in ductwork.

B. Increase duct size at smoke detectors by 20 sq. in. and make rectangular duct section 24 in. long minimum to allow installation of smoke detector.

EXHIBIT "I" – DUCTWORK MATERIALS

SERVICE	MATERIAL	SPECIAL REQUIREMENTS
Supply, return, vent, relief, outside and exhaust	Lock forming quality, galvanized steel ASTM 525 or 527	Joints and features as called for
Accessories, dampers and air turns	Same material and gauge as parent duct	
Field constructed apparatus casings	Galvanized steel ASTM 525	Sealed airtight

- - - END OF SECTION - - -

PART I - GENERAL

1.01 SUMMARY

A. Section Includes:
1. Roof mounted fans.

1.02 WORK INCLUDED

A. Provide labor, materials, equipment and services for the complete installation.

1.03 ACTION SUBMITTALS

A. Product Data:
1. Include rated capacities, furnished specialties, and accessories for each fan.
2. Certified fan performance curves with system operating conditions indicated.
3. Certified fan sound-power ratings.
4. Motor ratings and electrical characteristics, plus motor and electrical accessories.
5. Material thickness and finishes, including color charts.
6. Dampers, including housings, linkages, and operators.

B. Shop Drawings:
1. Include plans, elevations, sections, and attachment details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

1.04 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For centrifugal fans to include in emergency, operation, and maintenance manuals.

1.05 QUALITY ASSURANCE

A. Capacity, size and arrangement, static pressure, brake horsepower, component parts and accessories shall be provided as called for or scheduled. Guaranteed full capacity delivery through duct systems finally installed and under conditions listed. The manufacturer shall guarantee sound-power level ratings not exceeding those of the design equipment. All equipment shall be statically and dynamically balanced to acceptable tolerances with weights permanently fastened. Fan wheels shall be rebalanced in the field, if necessary.

B. Pressure Classification:

Maximum Total S.P.	Class
Up to 3.75 in. w.g.	I

C. Certifications:
1. Fan shall be listed by Underwriters Laboratories UL 705 and UL listed for Canada CUL 705. Fan shall bear the AMCA certified ratings seal for sound and air performance.
2. All units shall bear an engraved aluminum nameplate and shall be shipped in ISTA certified transit-tested packaging.

PART 2 - PRODUCTS

2.01 GENERAL

A. Drive System:
1. Provide fans with belt or direct drive system, as scheduled. V-belt drives as recommended by drive manufacturer, unless otherwise specified or scheduled.
   a. Size drive for 150% of motor rating when motor is less than 10 hp.
   b. Drives shall be precision machined cast iron type, keyed and securely attached to the wheel and motor shafts.

B. Bearings:
1. Bearings shall be designed and individually tested specifically for use in air handling applications. Construction shall be heavy duty regreasable ball type in a pillow block cast iron housing selected for a minimum L50 life in excess of 200,000 hours as maximum cataloged operating speed.

C. Wheels and Propellers:
1. All wheels and propellers shall be balanced in accordance with AMCA Standard 204-05, “Balance Quality and Vibration Levels for Fans”. Wheel shall overlap an aerodynamic aluminum inlet cone to provide maximum performance and efficiency.
2. Blades on all sides shall be continuously welded to the backplate and deep spun inlet shroud.
3. All hubs shall be keyed and securely attached to the fan shaft.

D. Blower Shafts:
1. All blower shafts shall be AISI-C-1045 hot rolled and accurately turned, grounded and polished. Shafting shall be sized for critical speed of at least 125% of maximum cataloged operating speed.

E. Coatings:
1. All steel fan components shall contain an electrostatically applied, baked polyester powder coating. Paint must exceed 1,000 hour salt spray under ASTM B117 test method.

2.02 DOWNBLAST CENTRIFUGAL ROOF FANS

A. General:
1. Base fan performance at standard conditions (density 0.075 lb/ft^3).
2. Downblast fans shall be for roof mounted applications.
3. Maximum continuous operating temperature is 180°F.
4. Each fan shall bear a permanently affixed manufacturer’s engraved metal nameplate containing the model number and individual serial number.

B. Fan Housing:
1. Motor cover, shroud, curb cap and lower wind band shall be constructed of heavy gauge aluminum.
2. Shroud shall have an integral rolled bead for extra strength.
3. Shroud shall be drawn from a disc and direct air downward.
4. Lower windband shall have a formed edge for added strength.
5. Motor cover shall be drawn from a disc.

6. All housing components shall have final thickness equal to or greater than preformed thickness.
7. Curb cap shall have pre-punched mounting holes to ensure correct attachment.
8. Rigid internal support structure.
9. Leak proof.
10. Drive frame assembly shall be constructed of heavy gauge steel and mounted on rubber vibration isolators, sized to match the weight of each fan.

C. Wheel:
1. The fan wheel shall be constructed of aluminum, non-overloading, backward inclined centrifugal.
2. Statically and dynamically balanced in accordance with AMCA Standard 204-05.
3. The wheel cone and fan inlet shall be matched and shall have precise running tolerances for maximum performance and operating efficiency.

D. Motor:
1. The motor shall be AC induction type.

E. Accessories:
1. Birdscreen, galvanized steel.
2. Motorized backdraft damper.
3. Hinge kit and base.
4. Disconnect switch – factory wired and mounted.

F. Basis of Design: Greenheck G.

G. Acceptable Makes: Cook, Greenheck, New York Blower, Twin City Fans.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install equipment as per manufacturer’s recommendations.

B. All fans shall meet the intent of the system performance requirements.

C. Provide guards for all exposed belts, shafts and fan wheels.

D. Set fan on roof curb, level and secure.

- - - END OF SECTION - - -

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
1. Registers and Grilles.
2. Square ceiling diffusers.
3. Linear slot diffusers.

1.02 WORK INCLUDED

A. Provide labor, materials, equipment and services for the complete installation.

1.03 ACTION SUBMITTALS

A. Provide room schedule listing type, quantity, size, CFM and throw.

B. Provide product information, including performance, pressure drop, noise criteria, throw, direction of throw, accessories, finish, material type.

C. Provide color chart.

1.04 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For registers, grilles and diffusers to include in operation and maintenance manuals.

1.05 GENERAL REQUIREMENTS

A. Each manufacturer shall check noise level ratings for registers, grilles and diffusers to insure that the sizes selected will not produce noise to exceed Noise Criteria (NC) Level 24, measured at occupant level. Notify Owner's Representative of problems prior to submittal.

B. Pressure drop, airflow and noise criteria selected is based on design equipment. Manufacturers other than Basis of Design must provide written certification, included in submittal, that equipment submitted has been checked against and performs equal to the Basis of Design equipment.

C. Borders and frames shall be coordinated with materials and ceiling system.

PART 2 - PRODUCTS

2.01 SUPPLY TYPES

A. Type "1" – Square Cone Diffuser:
1. Construction: Diffuser shall be steel construction, consisting of a seamless, one-piece, precision formed backpan that incorporates a round inlet collar of sufficient length for connecting rigid or flexible duct. An inner cone assembly shall consist of 3 cones which drop below the ceiling plane to assure optimal VAV air diffusion performance. The inner cone assembly shall be completely removable from the diffuser face to allow for full access to any dampers or other ductwork components located near the diffuser neck. The diffuser shall be supplied with a fixed core.

2. Mounting Frame: The diffuser mounting frame shall be suitable for lay-in or surface mount applications.
3. Finish: All components shall have a baked-on powder coat finish with a minimum thickness of 2 mils and must demonstrate no degradation when tested in accordance with ASTM D1308 and ASTM D4752 paint durability tests, and shall pass 500 hour salt spray exposure with no measurable creep in accordance with ASTM D1654 and 1000 hours with no rusting or blistering in accordance with ASTM D610 and ASTM D714.
4. Provide equalizing grid.
5. Basis of Design: Price SCD.
6. Acceptable Makes: Anemostat, Carners, Krueger, Nailor, Price, Titus, Tuttle and Bailey.

2.02 RETURN/EXHAUST TYPES

A. Type “A” – Louvered Face Grille:
1. Construction: Shall be steel construction, single deflection type with blades spaced ¾-in. on center with 45 degree deflection. The blades shall run parallel to the long dimension. The integral volume damper shall be opposed-blade type and shall be constructed of cold rolled steel, operable from the register face.
2. Mounting Frame: The mounting frame shall be 1¼-in. wide with countersunk screw holes and sponge rubber gasket.
3. Finish: All components shall have a baked-on powder coat finish that shall pass 500 hour salt spray exposure with no measurable creep in accordance with ASTM D1654 and 1000 hours with no rusting or blistering in accordance with ASTM D610 and ASTM D714.
4. Basis of Design: Price 530.
5. Acceptable Makes: Anemostat, Carners, Krueger, Nailor, Price, Titus, Tuttle and Bailey.

B. Type “E” – Eggcrate Grille:
1. Construction: Grille shall be aluminum construction, consisting of an extruded aluminum border and an aluminum ½-in. x ½-in. x ½-in. grid egg crate core.
2. Mounting Frame: The mounting frame shall be suitable for sidewall, exposed duct or lay-in mounting, complete with a 1¼-in. frame with countersunk screw holes.
3. Finish: All components shall have a baked-on powder coat finish that shall pass 500 hour salt spray exposure with no measurable creep in accordance with ASTM D1654 and 1000 hours with no rusting or blistering in accordance with ASTM D610 and ASTM D714.
4. Basis of Design: Price 80.
5. Acceptable Makes: Anemostat, Carners, Krueger, Nailor, Price, Titus, Tuttle and Bailey.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install equipment as per manufacturer’s recommendations.

B. Registers and grilles shall be installed “sight-proof” where possible, with horizontal blades inclined up on high wall applications and inclined down on low wall applications.

C. Provide four-way blow on all diffusers, unless otherwise indicated. Provide sponge rubber gasket for all surface mounted frames.

D. When the final connection to an exhaust or return grille or register is made, provide a 12-in.minimum height plenum box. Plenum dimensions shall match grille size. Paint inside of plenum box flat black.

E. Seal all supply and return registers, grilles and diffusers during construction to limit duct entering HVAC system and ductwork. Remove seals just prior to testing and balancing.

- - - END OF SECTION - - -

PART I - GENERAL

1.01 SUMMARY

A. Section Includes:
1. Air filters.

1.02 WORK INCLUDED

A. Provide labor, materials, equipment and services for the complete installation.

1.03 ACTION SUBMITTALS

A. Provide filter product data, including certification date, pressure drops at the scheduled airflow, schedule of filter sizes for each system. All filter accessories, including framing systems, fastening clips, manometers, and differential pressure gauges.

B. Provide product test reports for each listed efficiency, including all details as prescribed in ASHRAE Standard 52.1 and 52.2.

1.04 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For filters and magnehelic gauges, operation and maintenance manuals.

PART 2 - PRODUCTS

2.01 GENERAL

A. Filters shall comply with the requirements of ASHRAE Standard 52.2-1999 and UL Standard 586-Class II requirements.

B. Filters shall comply with the requirements of applicable state and federal agencies.

C. Filters shall not exceed a flame spread rating of 25 and a smoke developed rating of 50, per ASTM Test Method E-84.

2.02 MEDIUM EFFICIENCY PLEATED AIR FILTERS

A. Filter media shall be a cotton and synthetic blend, lofted to a uniform depth of 0.15”, and formed into a uniform radial pleat. A welded wire grid, spot-welded on one-inch centers and treated for corrosion resistance shall be bonded to the downstream side of the media to maintain radial pleats and prevent media oscillation. An enclosing frame of no less than 28-point high wet-strength beverage board shall provide a rigid and durable enclosure. The frame shall be bonded to the media on all sides to prevent air bypass. Integral diagonal support members on the air entering and air exiting side shall be bonded to the apex of each pleat to maintain uniform pleat spacing in varying airflows.

B. The filter shall have a Minimum Efficiency Reporting Value of MERV 8 when evaluated under the guidelines of ASHRAE Standard 52.2-2007. It shall also have a MERV-A of 8 when tested per Appendix J of the same standard. The media shall maintain or increase in efficiency over the life of the filter. Initial resistance to airflow shall not exceed 0.23”, 0.31” or

0.27” w.g. at an airflow of 350, 500 or 500 fpm on 1”, 2” or 4” deep models respectively. The filter shall have an Energy Cost Index (ECI) value of five stars. The filter shall be classified by Underwriters Laboratories as UL Class 2. Manufacturer shall provide evidence of facility certification to ISO 9001:2000. Manufacturer shall guarantee the integrity of the filter pack to 2.0” w.g.

C. Filter Thickness: As indicated in other specification sections.

D. Basis of Design: Camfil-Farr 30-30.

E. Acceptable Makes: AAF, Airguard, Camfil-Farr, Flanders.

PART 3 - EXECUTION

3.01 FILTERS

A. Provide one set of spare filters for each type of system requiring a filter. Turn over to Owner at Substantial Completion.

B. Install first set of filters when units are initially installed, not when started. Change filters as required during construction period to maintain systems in a clean manner throughout the construction period. Remove dirty set and install one clean set prior to turning over to Owner. If original filters do not require replacement, deliver final set to Owner.

C. Install supports, filters and gauges in accordance with manufacturer’s instructions.

- - - END OF SECTION - - -

PART I - GENERAL

1.01 SUMMARY

A. Section includes packaged, small-capacity, rooftop air-conditioning units (RTUs) with the following components and accessories:
   1. Casings.
   2. Fans.
   3. Motors.
   4. Rotary heat exchangers.
   5. Coils.
   6. Refrigerant circuit components.
   7. Air filtration.
   8. Gas furnaces.
   9. Dampers.
   10. Electrical power connections.
   11. Controls.
   12. Accessories.
   13. Roof curbs.

1.02 ACTION SUBMITTALS

A. Product Data: For each RTU.

B. Shop Drawings:
   1. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   2. Include diagrams for power, signal, and control wiring.

1.03 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans and other details, drawn to scale and coordinated with each other, using input from installers of the items involved.

B. Product Certificates: Submit certification that specified equipment will withstand wind forces identified in "Performance Requirements" Article.

C. Field quality-control reports.

D. Sample warranty.

1.04 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.05 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of RTUs that fail in materials or workmanship within specified warranty period.

PART 2 - PRODUCTS

2.01 DESCRIPTION

A. AHRI Compliance:
1. Comply with AHRI 210/240 for testing and rating energy efficiencies for RTUs.
2. Comply with AHRI 340/360 for testing and rating energy efficiencies for RTUs.
3. Comply with AHRI 270 for testing and rating sound performance for RTUs.
4. Comply with AHRI 1060 for testing and rating performance for air-to-air exchanger.

B. AMCA Compliance:
1. Comply with AMCA 11 and bear the AMCA-Certified Ratings Seal for air and sound performance according to AMCA 211 and AMCA 311.
2. Damper leakage tested according to AMCA 500-D.
3. Operating Limits: Classify according to AMCA 99.

C. ASHRAE Compliance:
1. Comply with ASHRAE 15 for refrigeration system safety.
2. Comply with ASHRAE 33 for methods of testing cooling and heating coils.
3. Comply with applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

D. ASHRAE/IES Compliance: Comply with applicable requirements in ASHRAE/IES 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

E. NFPA Compliance: Comply with NFPA 90A or NFPA 90B.If retaining “UL Compliance” Paragraph below, delete compliance with ASHRAE 15 in “ASHRAE Compliance” Paragraph and compliance with NFPA 90A or NFPA 90B in “NFPA Compliance” Paragraph above. Some manufacturers test and label their equipment according to UL 1995, which requires compliance with ASHRAE 15, NFPA 90A, and NFPA 90B.

F. UL Compliance: Comply with UL 1995.

G. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.02 PERFORMANCE REQUIREMENTS

A. Wind-Restraint Performance:
1. Basic Wind Speed: 90 mph.
2. Building Classification Category: III.
3. Minimum 10 lb/sq. ft. multiplied by the maximum area of the mechanical component projected on a vertical plane that is normal to the wind direction, and 45 degrees either side of normal.

2.03 PACKAGED ROOFTOP AIR HANDLING UNITS

A. General:
1. The units shall be dedicated downflow or horizontal airflow. The operating range shall be between 115°F and 0°F in cooling as standard from the factory for all units. Cooling performance shall be rated in accordance with ARI testing procedures. All units shall be factory assembled, internally wired, fully charged with R-410A, and 100 percent run

tested to check cooling operation, fan and blower rotation and control sequence, before leaving the factory. Wiring internal to the unit shall be colored and numbered for simplified identification. Unit shall be UL listed.

B. Casing:
   1. Constructed of zinc coated, heavy gauge galvanized steel.
   2. Exterior surfaces shall be cleaned, phosphatized, and finished with a weather-resistant baked enamel finish. Unit's surface shall be tested 672 hours in a salt spray test in compliance with ASTM B117.
   3. Where top cover seams exist, they shall be double hemmed and gasket sealed to prevent water leakage.
   4. Cabinet construction shall allow for all maintenance on one side of the unit. Service panels shall be removable while providing water and air tight seal. Control box access shall be hinged.
   5. For units 10 tons and smaller, all exposed vertical panels and top covers in the indoor air section shall be insulated with a cleanable 1/2-inch, 1-pound density foil-faced, fire-resistant, permanent, odorless, glass fiber material for units. The unit base shall be insulated with a 1/8-in., foil faced closed-cell insulation. All insulation edges shall be either captured or sealed.
   6. For units 12.5 tons and larger, the indoor air section shall be completely insulated with a 1/2-inch, 1-pound density foil-faced, fire-resistant, permanent, odorless, glass fiber material for units
   7. The base of the unit shall have provisions for crane lifting.Retain one of two “Rotor” paragraphs below.

C. Refrigerant Circuits:
   1. Each refrigerant circuit shall have independent thermostatic expansion devices, service pressure ports, and refrigerant line filter driers factory installed as standard. An area shall be provided for replacement suction line driers.

D. Compressors:
   1. Units shall be provided with scroll compressors, operating with R-410a refrigerant. Compressors shall provide a completely enclosed compressor chamber with optimized scroll profiles, which leads to increased efficiency.
   2. Scroll compressors shall include a direct drive, 3600 RPM, suction gas cooled hermetic motor.
   3. On units 12.5 tons and larger, compressor shall include a centrifugal oil pump, scroll tip seals, internal heat shield, oil level sight glass and oil charge valve. Each compressor shall have a crankcase heater, properly sized to minimize the amount of liquid refrigerant present in the oil sump during off cycles.
   4. Provide dual compressors on units 7-1/2 to 10 tons in cooling capacity.
   5. Compressors shall have a voltage utilization range of plus/minus 10% of nameplate voltage, and internal overloads.

E. Evaporator and Condenser Coils:
   1. Condenser coils shall have all aluminum microchannel coils.
   2. Evaporator coils shall be internally finned copper tubes mechanically bonded to high performance aluminum plate fins. All dual circuited evaporator coils shall be of intermingled configuration.
   3. All coils shall be leak tested at the factory. Evaporator coil shall be leak tested to 450 psig and condenser coil at 650 psig.
   4. Provide dual-sloped drain pans at evaporator coils.

F. Gas Heating Section:
   1. The heating section shall have a drum and tube heat exchanger on units 12.5 tons and larger, designed with primary and secondary surfaces, using corrosion resistant aluminized steel. A forced combustion blower shall supply premixed fuel to a single burner ignited by a pilotless hot surface ignition system. On units 10 tons and smaller, the gas heating section shall have a progressive tubular heat exchanger constructed of stainless steel burners and corrosion resistant steel throughout. An induced draft blower shall pull the combustion products through the firing tubes.
   2. A regulated gas valve shall be used that requires blower operation to initiate gas flow. On an initial call for heat, the combustion blower shall purge the heat exchanger 45 seconds before ignition.
   3. After three unsuccessful ignition attempts, the entire heating system shall be locked out until manually reset at the thermostat.
   4. Units 12.5 tons and larger shall have modulating firing. Modulating gas turndown ratio on high fire units shall be accomplished by allowing the furnaces to act independently of one another. The modulating bank shall be activated first and is allowed to modulate itself to meet the heating needs. If the modulating bank is unable to meet the need at high fire, the second bank shall be turned on and then the first bank again modulates to the appropriate level.
   5. All gas heat units shall comply with California requirements for low NOx emissions.

G. Outdoor Condenser Fans:
   1. The outdoor fans shall be direct drive, statically and dynamically balanced, draw through configuration with vertical discharge.
   2. All motors shall be permanently lubricated and have built-in thermal overload protection.

H. Indoor Evaporator Fan:
   1. The indoor fans shall be belt driven, forward curved centrifugal fan with fixed motor sheaves, for units 12.5 tons and larger.
   2. The indoor fans shall be direct driven, plenum fans for units 10 tons and smaller. Plenum fans shall include a backward-curved fan wheel along with an external rotor direct drive variable speed indoor motor. All plenum fan designs shall have a variable speed adjustment potentiometer located in the control box.
   3. Supply fan motors shall be circuit breaker protected.

I. Power Exhaust Fan:
   1. Provide 100% powered exhaust fan, factory installed, to assist the barometric relief damper in maintaining building pressurization.
   2. Power exhaust shall modulate speed by tracking outdoor air damper position to maintain building pressurization.

J. Economizer:
   1. The return air and fresh air dampers shall be provided with airfoil blades and independent direct drive actuators.
   2. Dampers shall be fully modulating 0 – 100%, minimum position setting, preset linkage, wiring harness with plub, spring return actuator and fixed dry bulb control.
   3. The barometric relief shall provide a pressure operated damper that shall be gravity closing and prohibit the entrance of outside air during the equipment off cycle.
   4. Dampers shall be AMCA Class 1Alow leakage type, with a leakage rate no greater than 3 CFM/sq. ft. at 1.0 in. w.c. differential pressure. Dampers shall have a functional life of

60,000 opening and closing cycles, in accordance with AMCA Standard 500D, and have a five (5) year warranty.

K. Filtration:
1. Unit shall be provided with filtration rack upstream of coils, capable of accepting 2-in. thick MERV 8 filters.
2. Unit shall be provided with clogged filter switch, which indicates a trouble light at the space sensor when filter is dirty.

L. Electrical:
1. Units 12.5 tons and larger shall include factory-installed and tested variable frequency drives (VFD) to provide motor speed modulation. The VFD shall receive a 0-10 VDC speed signal from the unit controller. The drive shall respond to the signal by accelerating or decelerating to maintain the controlling setpoint. VFD shall include the following features:
   a. Designed, constructed and tested in accordance with NEMA ICS, NFPA and IEC standards, and housed in a plastic IP20 enclosure.
   b. DC link reactors on both the positive and negative rails of the DC bus equal to 3% impedance to minimize power line harmonics.
   c. Full rated output current continuously – 110% of rated current for 60 seconds and 160% of rated current for up to 0.5 seconds while starting.
   d. Isolation between the drive's power circuitry and control.
   e. Audible noise reduction through automatic adjustment of the carrier frequency and frequency avoidance.
   f. Rated at 104°F with a standard operating range of 14°F to 124°F ambient temperatures and 0 to 95% relative humidity.
   g. Self-diagnostics and motor protections, such as overload, phase loss and internal thermal overload.
   h. Off/Stop and Auto/Start selector switches to start and stop the AC Drive and determine the speed reference.
   i. On units with bypass, an AC Drive/Off/Bypass hand selector switch shall be provided in the unit control box.
   j. In 'Drive' mode, speed reference shall be provided by a 0-10 VDC analog input.
   k. A keypad interface, which shall be programmable by language and feature multiple lines of reading.
   l. Controlled and/or accessible points, such as AC Drive Start/Stop, speed reference and fault diagnostics.
   m. Meter points, such as motor power in HP, motor power in kW, motor kW-hr, motor current, motor voltage, hours run, DC link voltage, thermal load on motore, thermal load on AC, drive and heatsink temperature.
   n. Troubleshooting features:
      1) AC Drive memory storage of the last 10 faults and related operational data.
      2) Four simultaneous displays: frequency or speed, run time, output amps and output power.
      3) Keypad, which shall display reference signal value, output frequency in Hz or percent, output amps, motor HP, motor kW.
   o. Coated circuit boards for protection against corrosive environments.
   p. Field readable BACnet points to allow for communication of status, setpoints and diagnostics to the BMS.
2. High Fault Unit Interrupt Rating: A 25,000 Amp rating (600V) shall be applied to the unit enclosure using a non-fused circuit breaker for disconnect switch purposes. Fan motors, compressors and electric heat circuits shall be provided with series rated circuit breakers

that will provide the unit rated level of protection. The unit shall be marked with approved cULus markings and will adhere to cULus regulations.

3. A 115-volt, 15A ground fault interrupter convenience receptacle shall be factory installed. It shall be wired and powered from a factory mounted transformer on the line side of the RTU disconnect switch. Unit mounted non-fused disconnect with external handle shall be furnished with factory powered outlet.
4. Provide factory mounted and wired supply and return air smoke detectors. If smoke is detected, the unit shall shut down with manual reset.
5. All units shall have through-the-base electrical access for control and power connections inside the curb and through the base of the unit.
6. Units shall be provided with non-fused disconnect switch, 3-pole, in a water-tight enclosure.

M. Controls:
1. Unit shall be completely factory wired with necessary controls and terminal block for power wiring.
2. The resident control algorithms shall make all heating, cooling and/or ventilation decisions in response to electronic signals from sensors measuring indoor and outdoor temperatures. The control algorithm maintains accurate temperature control, minimizes drift from setpoint and provides better building comfort.
3. Controls shall provide anti-short cycle timing and time delay between compressors to provide a higher level of machine protection.
4. Provide room temperature sensor with timed override buttons to integrate into unit controls.
5. Unit shall be capable of BACnet communication through an interface to communicate directly with an open BACnet MS/TP protocol.
6. Unit shall be capable of accepting a 0-10VDC input signal from a wall-mounted carbon dioxide (CO_2) sensor.
7. Provide wall-mounted space temperature and space carbon dioxide sensors.

N. Manufacturers:
1. Basis of Design: Trane Precedent for units 10 tons and smaller, Trane Voyager for units 12.5 tons and larger.
2. Acceptable Makes: Carrier, Daikin Applied, Trane, York.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Roof Curb: Install on roof structure, level and secure. Install RTUs on curbs and coordinate roof penetrations and flashing with roof construction. Secure RTUs to upper curb rail, and secure curb base to roof framing with anchor bolts.

B. Zone Sensors: Mount zone space temperature and carbon dioxide sensors with wall junction box. Route wiring within flexible plastic conduit behind wall. Wiring above ceilings can be supported on bridle rings. Make final wiring connections between all sensors and unit.Retain “Unit Support” Paragraph below if unit is installed on field-fabricated curbs or steel supports.

3.02 CONNECTIONS

A. Comply with duct installation requirements specified in other HVAC Sections. Drawings indicate general arrangement of ducts. The following are specific connection requirements:

1. Install ducts to termination at top of roof curb.
2. Remove roof decking only as required for passage of ducts. Do not cut out decking under entire roof curb.
3. Connect supply ducts to RTUs with flexible duct connectors.
4. Install return-air duct continuously through roof structure.

B.

C. Install condensate drain, minimum connection size, with trap and indirect connection to nearest roof drain or area drain.

D. Where installing piping adjacent to RTUs, allow space for service and maintenance.
   1. Gas Piping: Connect gas piping to burner, full size of gas train inlet, and connect with union and shutoff valve with sufficient clearance for burner removal and service.

E. Complete connection of low voltage control wiring.

F. Install nameplate for each electrical connection indicating electrical equipment designation and circuit number feeding connection.

G. Mount and wire shipped loose economizer.

3.03 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:
   1. After installing RTUs and after electrical circuitry has been energized, test units for compliance with requirements.
   2. Inspect for and remove shipping bolts, blocks, and tie-down straps.
   3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
   4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. RTU will be considered defective if it does not pass tests and inspections.

3.04 CLEANING AND ADJUSTING

A. After completing system installation and testing, adjusting, and balancing RTU and air-distribution systems, clean filter housings and install new filters.

3.05 DEMONSTRATION AND SPARE PARTS

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain RTUs.

B. Turn over one (1) spare set of filters and fan belts to the Owner.

3.06 SEQUENCE OF OPERATION

A. The unit shall have factory controls.

B. Inputs:

1. The unit shall receive an analog space temperature input signal, as sensed by a wall-mounted space temperature sensor.
2. The unit shall receive an analog space carbon dioxide (CO_2) input signal, as sensed by a wall-mounted space CO_2 sensor.
3. The unit shall have a factory installed ambient air dry bulb temperature sensor.

C. Unoccupied Mode:
1. During unoccupied hours, the outdoor air and exhaust air dampers shall be fully closed and powered exhaust disabled. Cooling shall be disabled. The unit shall cycle the supply fan and gas heater to maintain unoccupied space setback temperature setpoint of 60°F (adjustable).

D. Occupied Mode:
1. During occupied hours, the supply fan shall run continuously.
2. The unit gas heater shall modulate to maintain space temperature heating setpoint of 70°F (adjustable).
3. The unit shall modulate fan speed and the refrigerant DX cooling section in conjunction with the outdoor and return air dampers, to maintain space temperature cooling setpoint of 75°F (adjustable).

E. Damper Control:
1. During the unoccupied mode, the outdoor air and exhaust air dampers shall be fully closed and return air damper fully open.
2. During the occupied mode, the outdoor air damper shall reset to its minimum position. The outdoor air and return air dampers shall modulate to maintain space carbon dioxide concentration setpoint of 500 ppm (adjustable).
3. During the occupied mode, the outdoor air and return air dampers shall modulate to maintain space temperature cooling setpoint when ambient dry bulb temperature is below space dry bulb temperature.
4. Power exhaust shall be enabled when the unit’s outdoor air damper is open.

- - - END OF SECTION - - -

PART I - GENERAL

1.01 SUMMARY

A. Section Includes:
1. Electric wall heaters.

1.02 WORK INCLUDED

A. Provide labor, materials, equipment and services for the complete installation.

1.03 ACTION SUBMITTALS

A. Provide product data, including heating capacities, power requirements, and dimensional drawings.

B. Provide wiring diagram.

1.04 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For electric wall heaters, operation and maintenance manuals.

PART 2 - PRODUCTS

2.01 ELECTRIC WALL HEATERS

A. Furnish and install heavy-duty forced air wall heaters.

B. Heaters shall be architectural styled, constructed of a 18-gauge steel housing with a 14-gauge extruded aluminum frame. The rugged steel grille and heater box are painted with a rust resistant dark brown baked enamel color finish.

C. Power wiring shall be connected through knockouts in the top of the heater and knockout on the bottom of the heater. Units are available in ratings from 1500 to 4800 watts at 240, 208 and 277 volts and 1500 watts at 120 volts.

D. The heaters shall have a low-speed, four-pole motor which drives a vane axial blower to deliver a quiet flow of air.

E. The heating element shall be of the sealed tubular type with large, parallel steel fins for quick heat transfer. Units shall have as standard, thermal overload cut-off for added safety, fan delay switch, manual tamper resistant disconnect switch and a tamper resistant thermostat which are calibrated to provide a range of 55 F to 85 F. All items shall be factory installed and wired.

F. All heaters shall be UL listed.

G. Basis of Design: Trane UHAA.

H. Acceptable Makes: Markel, QMark, Trane.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Set the electric wall heater within wall recess, level. Modify wall framing as required.

B. Make all final power wiring connections for a complete operation.

- - - END OF SECTION - - -

PART I - GENERAL

1.01 SUMMARY

A. Section Includes:
1. Common electrical installation requirements.

1.02 SUBMITTALS

A. N/A.

PART II - PRODUCTS

2.01 N/A.

PART III - EXECUTION

3.01 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

A. Comply with NECA, NFPA, and OSHA requirements.

B. All work shall be installed in a neat, workmanlike manner in accordance with ANSI/NECA 1 – 2015.

C. All materials and equipment provided under this contract shall be new (except where otherwise noted) and shall be listed, labeled or certified by a Nationally Recognized Testing Laboratory (NRTL) to meet Underwriters Laboratories, Inc. (UL), standards where test standards have been established. Materials and equipment which are not covered by UL standards will be accepted, providing that materials and equipment are listed, labeled, certified or otherwise determined to meet the safety requirements of a NRTL.
1. A Nationally Recognized Testing Laboratory is a testing laboratory which is recognized and approved by the Secretary of Labor in accordance with OSHA regulations.

D. All equipment of the same type and capacity shall be by the same manufacturer.

E. Where any device or part of equipment is referred to in these specifications in the singular number (e.g., "the switch"), this reference shall be deemed to apply to as many such devices as are required to complete the installation as shown on the drawings.

F. During construction the contractor shall at all times maintain electrical utilities of the building without interruption. Should it be necessary to interrupt any electrical service or utility, the contractor shall secure permission in writing from the owner for such Interruption at least ten (10) business days in advance. Any interruption shall be made with minimum amount of inconvenience to the owner and any shut-down time shall have to be on a premium time basis and such time to be included in the contractor's bid. Arrange to provide and pay for temporary power source as required by project conditions.

G. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounted items.

H. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom.

I. Working clearance around equipment shall not be less than that specified in the N.E.C. for all voltages specified.

J. The locations of switches, receptacles, lights, motors, etc. outlets shown are approximate. The contractor shall use good judgment in placing the preceding items to eliminate all interference with ducts, piping, etc. The contractor shall check all door swings so that light switches are not located behind doors. Relocate switches as required, with approval from the Design Professional.

K. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity. Normal maintenance shall not require the removal of protective guards from adjacent equipment. Install equipment as close as practical to the locations shown on the Drawings.

L. Right of Way: Give to piping systems installed at a required slope.

M. Firestopping shall be applied to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of the assembly according to Division 07 and 09 Sections.

N. Owner furnished equipment: Equipment furnished by the owner shall be received, stored, uncrated, protected, and installed by the Contractor with all appurtenances required to place the equipment in operation, ready for use. The Contractor shall be responsible for the equipment as if he had purchased the equipment himself and shall hold the warranty.

- - - END OF SECTION - - -

PART I - GENERAL

1.01 SUMMARY

A. This Section includes general requirements for renovation and demolition of electrical systems and materials.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.3 SUBMITTALS

A. N/A.

PART II - PRODUCTS

2.01 N/A.

PART III - EXECUTION

3.01 REQUIREMENTS FOR ELECTRICAL RENOVATION AND DEMOLITION

A. Comply with NECA, NFPA, and OSHA requirements, NEC-70 and -70E.

B. Protect adjacent building services and materials indicated to remain. Install and maintain barriers to keep dirt, dust and noise from being transmitted to adjacent areas. Remove protection and barriers after demolition is completed. If infiltration of dust or dirt results due to improper barriers, Contractor shall be responsible for all maintenance and cleaning.

C. Where electrical work to remain is damaged or disturbed in the course of the work, the Contractor shall remove damaged portions and provide new products of equal capacity, quality, and functionality at his own expense.

D. Unless otherwise noted, demolish and remove existing electrical materials and equipment only to the extent required by new construction and as indicated. Removal of equipment shall not interfere with existing operations.

E. Notify Architect of discrepancies between existing conditions and the Drawings before proceeding with demolition or renovation.

F. During construction the contractor shall at all times maintain electrical utilities of the building without interruption. Should it be necessary to interrupt any electrical service or utility, the contractor shall secure permission in writing from the Owner for such interruption at least ten (10) business days (or two calendar weeks) in advance. Any interruption shall be made with minimum amount of inconvenience and any shut-down time shall have to be on a premium time basis and such time to be included in the contractor's bid. Arrange to provide and pay for temporary power source if required by project conditions.

G. Contractor shall ensure that light switches within the Work area remain operational. Where temporary 120 volt light strings are installed, a switch shall be provided for the light strings near the Project entry door. Lights shall be switched off every day at the completion of the shift.

H. Turn off circuit breakers or switches serving abandoned circuits at the commencement of work and tag breaker or switch and label in panel schedule as “Spare”.

I. Remove conduit and wire back to panelboards or to nearest junction box that is not being removed and needs to remain in service. Wire shall be removed back to point of origin.

J. Conduit and Junction Boxes:
   1. Conduit and boxes in existing walls to be demolished shall be removed.
   2. Conduit and boxes in existing walls to remain (if not reused) shall be removed.
   3. Conduit in existing or new ceilings that is not intended for reuse shall be removed back to the panel from where it originates.
   4. Conduits that had been run in existing slabs shall be saw-cut off flush where they exit the slab and then be fire-sealed.

K. Conductors:

1. Conductors that are not to be reused shall be removed back to the nearest point-of-use. Where the entire circuit is to be removed, the conductors shall be removed back to the panelboard from which they originate.

L. Receptacles:
   1. Remove devices that are not installed at reusable locations. Boxes shall be blanked.

M. Lighting Fixtures:
   1. Lighting fixtures that cannot be reused shall be removed, including associated wiring to ceiling-mounted junction boxes.
   2. Fluorescent lighting fixtures shall not be reused or relocated and shall be replaced with LED types per Section 265100 requirements.

N. Relocation: Carefully remove, clean and restore items designated for relocation to a “like new” condition, and store them for reuse.

O. Demolished items, rubbish and debris shall be removed from the construction site daily, and at the completion of the work. Floors shall be swept clean daily. Failure to do so may result in the cleanup being performed by others and all costs thereof being deducted from the Contractor’s final payment.

P. All tools and ladders shall be locked up at the end of the work every day.

- - - END OF SECTION - -

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.

B. Related Sections include the following:

1. Division 27/28 Sections for cabling used for voice and data circuits.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by UL and marked for intended use.

B. Comply with ASTM.

C. Comply with UL 44, 83, and 486.

D. Comply with NFPA 70.

E. Comply with most current edition of the Northwestern University Design Standards.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Include data sheets for the following additional items:

1. Splices and terminations.
2. Pulling compounds.
3. Cable accessories.

C. Field quality-control test reports.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. General Cable Corporation.
2. Okonite Company.
3. Southwire Company.
4. Or equal approved in writing by the University's Chief Electrician.

B. Copper Conductors: Comply with NEMA WC 70.

1. Aluminum conductors shall not be used under any circumstances.

C. Conductor Insulation: Comply with NEMA WC 70 for Types THHN, THWN, *THWN-2*, XHHW-2 and SO.

1. Voltage rating: 600 Volts for 480/277V and 208/120V.

D. VFD Cable:

1. Comply with UL 1277, UL 1685, and NFPA 70 for Type TC-ER cable.
2. Type TC-ER with oversized cross-linked polyethylene insulation, and sunlight- and oil-resistant outer PVC jacket.
3. Comply with UL requirements for cables in applicable applications.

E. Multi-conductor Cable type MC and AC: Use of MC or AC cable is permitted.

F. Use of Nonmetallic sheathed (NM) cable is not permitted under any circumstances.

G. Flat or Under-carpet type cable is not permitted under any circumstances.

2.2 CONNECTORS AND SPLICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Burndy, Thomas & Betts.
2. O-Z/Gedney; EGS Electrical Group LLC.
3. 3M; Electrical Products Division.
4. Ilsco.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

1. Aboveground Circuits (No. 10 AWG and smaller):

a. Connectors: Solderless, screw-on, reusable pressure cable type, rated 600 V, 90˚ C, with integral insulation, approved for copper conductors.
b. The integral insulator shall have a skirt to completely cover the stripped wires.
c. The number, size, and combination of conductors, as listed on the manufacturer's packaging, shall be strictly followed.
d. Use of “push-in” type splice connectors is not permitted.

2. Aboveground Circuits (No. 8 AWG and larger

a. Cable termination lugs shall be made of high conductivity and corrosion-resistant material, electro-tin plated, listed for use with copper conductors only, rated for 600 V. Lugs shall be color coded by size.
b. Cable termination lugs shall be indent type, long barrel with chamfered entry, 2 – hole, compression type for 250 kcmil and above, 1 – hole for less than 250 kcmil.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Soft annealed Copper stranded, class B compressed.

B. Branch Circuits: Copper. Stranded for No. 12 AWG and larger.

C. Minimum Wire Size: #12 awg for power and lighting circuits, #14 awg for control circuits. In the case of “homeruns” over 125 feet in length, no conductor smaller than a No. 10 wire shall be used. The tap conductor from the J-box in the ceiling to the receptacle may be No. 12. Each 120-volt phase conductor shall have a neutral conductor of the same size. The sizing of all wire except remote control wire shall be accomplished in the case of both feeder and branch circuits by conforming to the following provisions. Only lighting circuits may share grounding conductors. All lighting circuits with shared grounding conductors shall be #10 AWG minimum.

3.2 CONDUCTOR INSULATION AND MULTI-CONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Exposed Branch Circuits, Including in Crawlspaces: Type MC, Multi conductor cable.

B. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Ty Type MC, Multi conductor cable.

C. VFD Output Circuits: Type TC-ER cable.

D. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, and strain relief device at terminations to suit application. Service voltage shall not exceed 240 VAC.

E. Recessed or Semi-recessed Lighting Fixture Whips: Type THHN-THWN (90 deg C), single conductors in FMC in lengths not to exceed six (6) feet.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Homeruns may not contain more than three circuits

B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

C. Use pulling means; including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or conduit.

D. Identify and color-code conductors and cables according to Division 26 Section "Identification for Electrical Systems" for secondary service, feeders and branch circuits.

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.

B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

C. Wiring at Outlets: Install conductor at each outlet or junction box with at least 6 inches (150 mm) of slack.

3.5 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Division 07 Sections and University Fire Protection Standards.

1. All penetrations shall be under constant visual surveillance until firestopping is applied.
2. Products: Cooper B –Line, 3m, Hilti, Specified Technologies, Inc.

3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Test Reports: Prepare a written report to record the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

C. Remove and replace non-compliant cables or wires and retest as specified above.

END OF SECTION 26 0519

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PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes: Grounding systems and equipment.

B. Section includes grounding systems and equipment, plus the following special applications:
   1. Underground distribution grounding.
   2. Ground bonding common with lightning protection system.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.04 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
   1. Instructions for periodic testing and inspection of grounding features at test wells, ground rings, and grounding connections for separately derived systems based on NFPA 70B.

a. Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.
b. Include recommended testing program and intervals.
c. Include test results and updated single line diagrams.

1.05 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with UL 467 for grounding and bonding materials and equipment.

C. Comply with NFPA 70.

PART II - PRODUCTS

2.01 CONDUCTORS

A. Insulated Conductors: Tinned-copper wire or cable insulated for 600 V with green colored insulation, UL 44 or UL 83 listed, unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:
1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.
4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.

2.02 CONNECTORS

A. Listed and labeled by an UL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, pressure type with at least two bolts.
   1. Pipe Connectors: Clamp type, sized for pipe.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

D. Bus-bar Connectors: Mechanical type, cast silicon bronze, solder-less compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

PART III – EXECUTION

3.01 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Grounding Bus: Install in electrical rooms, in rooms housing service equipment, and elsewhere as indicated.
   1. Install bus on insulated spacers 2 inches (50 mm) minimum from wall, 12 inches (300 mm) above finished floor unless otherwise indicated.

C. Conductor Terminations and Connections:
   1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.

2. Underground Connections: Exothermic welded connectors except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Exothermic welded connectors.

3.02 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.
   1. Conduit shall not be used as the ground conductor.
   2. Where required by Code, metallic conduit may be used as an additional means of grounding where the raceway system qualifies as a grounding conductor in accordance with NEC 250.118.

B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
   1. Feeders and branch circuits.
   2. Lighting circuits.
   3. Receptacle circuits.
   4. Single-phase motor and appliance branch circuits.
   5. Three-phase motor and appliance branch circuits.
   6. Flexible raceway runs.
   7. Armored cable runs.

C. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to first section of air duct and connected metallic piping.

D. Water Heater, Heat-Tracing, and Anti-frost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

E. conductor in addition to grounding conductor installed with branch-circuit conductors.

F. Outdoor metallic fences around electrical equipment shall be grounded and bonded to equipment grounding loops, coordinate with “Fencing” Specification Sections and installing Contractor.

3.03 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
   1. Where ground conductors are subject to physical damage, install in raceway.

B. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
   1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
   2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
   3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

C. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

D. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install tinned bonding jumper to bond across flexible duct connections to achieve continuity.

3.04 LABELING

A. Comply with requirements in Division 26 Section "Identification for Electrical Systems" Article for instruction signs. The label shall be green and its text shall be black.

3.05 FIELD QUALITY CONTROL

A. Perform tests and inspections.
   1. Tests and Inspections:
   2. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
   3. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.

B. Grounding system will be considered defective if it does not pass tests and inspections.

- - - END OF SECTION - - -

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:
   1. Hangers and supports for electrical equipment and systems.
   2. Construction requirements for concrete bases.

1.03 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. IMC: Intermediate metal conduit.

C. RMC: Rigid metal conduit.

1.04 PERFORMANCE REQUIREMENTS

A. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

C. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.05 ACTION SUBMITTALS

A. Product Data: For the following:
   1. Steel slotted support systems.
   2. Nonmetallic slotted support systems.

B. Shop Drawings: Show fabrication and installation details and include calculations for the following:

1. Trapeze hangers. Include Product Data for components.
2. Steel slotted channel systems. Include Product Data for components.
3. Nonmetallic slotted channel systems. Include Product Data for components.
4. Equipment supports.

1.06 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.07 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. All products shall be UL labeled for their intended use.

C. Comply with NFPA 70.

D. Comply with most current edition of the Northwestern University Design Standards.

1.08 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03 Sections.

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Sections.

PART II - PRODUCTS

2.01 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Cooper B-Line, Inc.; a division of Cooper Industries.
      b. Thomas & Betts Corporation.
      c. Unistrut; Tyco International, Ltd.
   2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
   3. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
   4. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
   5. Channel Dimensions: Selected for applicable load criteria.

B. Nonmetallic Slotted Support Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with 9/16-inch- (14-mm-) diameter holes at a maximum of 8 inches (200 mm) o.c., in at least 1 surface.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Allied Tube & Conduit.
      b. Cooper B-Line, Inc.; a division of Cooper Industries.
   2. Fittings and Accessories: Products of channel and angle manufacturer and designed for use with those items.
   3. Fitting and Accessory Materials: Same as channels and angles**,** except metal items may be stainless steel.
   4. Rated Strength: Selected to suit applicable load criteria.

C. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

D. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

E. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging p=lug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

2.02 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements in Division 05 Sections for steel shapes and plates.

PART III - EXECUTION

3.01 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.

C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
   1. Secure raceways and cables to these supports with single-bolt conduit clamps or single-bolt conduit clamps using spring friction action for retention in support channel.

D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch (38-mm) and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.02 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA70.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
   1. To Wood: Fasten with lag screws or through bolts.
   2. To New Concrete: Bolt to concrete inserts.
   3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
   4. To Existing Concrete: Expansion anchor fasteners.
   5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches (100 mm) thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches (100 mm) thick.
   6. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
   7. To Light Steel: Sheet metal screws.
   8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor bolts to elevations required for proper attachment to supported equipment.
3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.03 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
   1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).

B. Touchup: Comply with requirements in Division 09 Painting Sections for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A-780.

- - - END OF SECTION - - -

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
1. Identification for raceways.
2. Identification of power and control cables.
3. Identification for conductors.
4. Warning labels and signs.
5. Equipment identification labels.
6. Miscellaneous identification products.

1.03 ACTION SUBMITTALS

A. Product Data: For each electrical identification product indicated.

1.04 QUALITY ASSURANCE

A. Comply with ANSI A13.1.

B. Comply with NFPA 70.

C. Comply with NFPA 70E.

D. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

PART II - PRODUCTS

2.01 POWER RACEWAY IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.

B. Colors for Raceways Carrying Circuits at 120 V up to 240V: and conduits larger than two inches:
1. Black letters on a white field.
2. Legend: Indicate voltage and system or service type.

C. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

D. Snap-Around Labels for Raceways Carrying Circuits at 600 V or Less and conduits larger than two inches: Slit, pre-tensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

E. Colors for Raceways Carrying Circuits at 600 V or Less and conduits two inches and less:
   1. Comply with Section 26 0533.

2.02 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

2.03 CONDUCTOR IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tapes not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide.

B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

C. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

D. Write-On Tags: Polyester tag, 0.015 inch (0.38 mm) thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
   1. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

2.04 WARNING LABELS AND SIGNS

A. Comply with NFPA 70, 70E, and 29 CFR 1910.145.

B. Baked-Enamel Warning Signs:
   1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
   2. 1/4-inch (6.4-mm) grommets in corners for mounting.
   3. Nominal size, 7 by 10 inches (180 by 250 mm).

C. Metal-Backed, Butyrate Warning Signs:
   1. Weather-resistant, non-fading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch (1-mm) galvanized-steel backing; and with colors, legend, and size required for application.
   2. 1/4-inch (6.4-mm) grommets in corners for mounting.
   3. Nominal size, 10 by 14 inches (250 by 360 mm).

2.05 EQUIPMENT IDENTIFICATION NAMEPLATES

A. Engraved, Laminated Acrylic or Melamine Nameplate: Minimum letter height shall be ½ inch (13 mm). Refer to Drawings for Nameplate Detail.

B. Fasteners for nameplates: stainless steel screws that do not change the NEMA or NRTL rating of the enclosure, adhesive labels shall not be used.

2.06 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART III - EXECUTION

3.01 INSTALLATION

A. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

B. Apply identification devices to surfaces that require finish after completing finish work.

C. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

D. Attach signs and plastic labels with mechanical fasteners appropriate to the location and substrate.

E. System Identification Color-Coding Bands for Raceways Larger than Two Inches: Each color-coding band shall completely encircle conduit. Locate bands at changes in direction, at penetrations of walls and floors, at 30-foot maximum intervals in straight runs, in electrical rooms and vaults color shall be solid, see “Raceways” Section.

F. System Identification Labels for Raceways carrying circuits above 600V: Locate labels at changes in direction, at penetrations of walls and floors, at 30-foot maximum intervals in straight runs, at 10-foot maximum intervals in electrical rooms and vaults, and within six inches of pull or junction boxes.

G. System Identification Labels for Raceways carrying circuits 600V and less: Locate labels at changes in direction, at penetrations of walls and floors, at 30-foot maximum intervals in straight runs.

H. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 18 inches overall. Comply with Section 26 0543.

I. Painted Identification: Comply with requirements in painting Sections for surface preparation and paint application.

3.02 IDENTIFICATION SCHEDULE

A. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend, system voltage, and panel/circuit number. System legends shall comply with Section 26 0533 – 3.5.D.
   1. Normal power.
   2. Emergency power.
   3. UPS.

B. Power-Circuit Conductor Identification, 600 V or Less: .For conductors in electric rooms or vaults pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.
   1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed

below for ungrounded service, feeder, and branch-circuit conductors.

a. Color shall be factory applied.
b. Colors for 208/120-V Circuits:
   1) Phase A: Black.
   2) Phase B: Red.
   3) Phase C: Blue.
   4) Neutral: White.
   5) Ground: Green.
c. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.
d. Switch loops shall retain correct color code with a white tracer.
e. For new work in existing buildings, the existing identification method shall be used for new conductors provided it meets all requirements of this Section and the NEC.

C. Install instructional sign including the color code for grounded and ungrounded conductors using adhesive-film-type labels.

D. Emergency Sources: A sign shall be placed at the service entrance equipment indicating the type and location of on-site emergency power sources per NEC Art. 700.

E. Conductors to Be Extended in the Future: Attach write-on tags to conductors and list source.

F. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
   1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
   2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
   3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.

G. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

H. Arc Flash warning labels shall be provided on all new electrical equipment and existing equipment that has been modified a part of a project and conform to Arc Flash report.

I. Provide permanent nameplates for all pull and junction boxes identifying circuits, voltage, and source.

J. Wiring device identification: comply with Section 26 2726 – 3.2.B.

K. Equipment Identification Nameplates: On each unit of equipment, install unique designation nameplate that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply nameplates to Switchgears, Switchboards, Distribution Panels, Panelboards, Transformers, Individual Starters, Contactors, Disconnect Switches, Transfer Switches, Control Panels and Similar Equipment. Systems include power, lighting, and control systems unless equipment is provided with its own identification.
   1. Colors for equipment nameplates:
      a. NORMAL power system:
         1) 120V – 240V: black letters on white background.
      b. LIFE SAFETY loads as defined by NEC Art. 700: white letters on red background.
   2. Labeling Instructions:

a. Identify the piece of equipment, the source, voltage characteristics, and the load served
b. Indoor Equipment: Engraved, laminated acrylic or melamine nameplate. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where two lines of text are required, use labels 2 inches (50 mm) high.
c. Elevated Components: Increase sizes of nameplates and letters to those appropriate for viewing from the floor.
d. Fasten nameplates with appropriate stainless steel screws that do not change the NEMA or NRTL rating of the enclosure. Stick-on or adhesives are not acceptable unless the NEMA enclosure rating is compromised, then only epoxy adhesive shall be used to attach nameplates.

- - - END OF SECTION - - -

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
1. Receptacles, general purpose.
2. Receptacles with integral GFCI.
3. Tamper-resistant receptacles.
4. Pendant cord-connector devices.
5. Cord and plug sets.
6. Wall box dimmers.
7. Wall box dimmer/sensors.
8. Toggle Switches.
9. Associated device plates.

1.03 DEFINITIONS

A. EMI: Electromagnetic interference.

B. GFCI: Ground-Fault Circuit Interrupter.

C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

D. RFI: Radio-frequency interference.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by UL and marked for intended location and application.

B. Comply with NFPA 70.

C. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: List of legends and description of materials and process used for pre-marking wall plates.

1.7 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.8 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

B. Plan drawing(s) in AutoCAD format mapping all locations of all GFCI and AFCI receptacles and submitted on CD-ROM.

PART II - PRODUCTS

2.01 GENERAL WIRING-DEVICE REQUIREMENTS

A. Wiring Devices, Components, and Accessories: UL listed and labeled as defined in NFPA 70 and marked for intended location and application.

B. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:
1. Connectors shall comply with UL 2459 and shall be made with stranded building wire.
2. Devices shall comply with the requirements in this Section.

2.02 STRAIGHT-BLADE RECEPTACLES

A. Convenience Receptacles, 125 V, 20 A: Heavy duty specification grade complying with NEMA WD 1, NEMA WD 6 Configuration 5-20R, and UL 498.
1. Products: Subject to compliance with requirements, provide one of the following:
a. Hubbell; HBL5351 (single), HBL5352 (duplex).
b. Pass & Seymour; 5361 (single), 5362 (duplex).
c. Leviton; 5351 (single), 5352 (duplex)

2. Description: Straight blade; equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.

B. Tamper-Resistant, Duplex, Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, ANSI C-73, and UL 498.
1. Products: Subject to compliance with requirements, provide one of the following:
a. Hubbell CR20 - TR
b. Leviton; TCR – 20.
c. Pass & Seymour; TR5362
2. Description:
a. Built-in UL Listed, mechanical safety shutter mechanism prevents access to contacts unless a two-pronged plug is inserted to ensure that foreign objects are locked out.
b. “TR” mold mark designation provides visual identification when installed.
c. Self grounding clip for automatic grounding in grounded metal box.

2.03 GFCI RECEPTACLES

A. General Description:
1. Straight blade, non-feed through type.
2. Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and UL 943, Class A.
3. Include trip/reset buttons.
4. Include correct wiring/trip indicator LED light.

B. Tamper-Resistant GFCI, Duplex Convenience Receptacles, 125 V, 20 A:
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Hubbell; GFTR20.
      b. Pass & Seymour; 2095TR.
      c. Leviton; GFTN2

2.04 PENDANT CORD-CONNECTOR DEVICES

A. Description:
   1. Matching, locking-type plug and receptacle body connector.
   2. NEMA WD 6 Configurations L5-20P and L5-20R, heavy-duty grade, and FS W-C-596.
   3. Body: Nylon, with screw-open, cable-gripping jaws and provision for attaching external cable grip.
   4. External Cable Grip: Woven wire-mesh type made of high-strength, galvanized-steel wire strand, matched to cable diameter, and with attachment provision designed for corresponding connector.

2.05 CORD AND PLUG SETS

A. Description:
   1. Match voltage and current ratings and number of conductors to requirements of equipment being connected.
   2. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and ampacity of at least 130 percent of the equipment rating.
   3. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.06 WALL-BOX DIMMERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

   1. Lutron Electronics.

B. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on-off switches, with audible frequency and EMI/RFI suppression filters, compatible with 1% LED dimming-drivers.

C. Control: Continuously adjustable slide-to-off with single-pole or three-way switching. Comply with UL 1472.

D. LED Dimmer Switches: Modular; compatible with 1% LED dimming-drivers.
   1. Zero to 10 VDC for direct control of 3rd party LED drivers without use of separate power pack.

E. Finish: Color to be coordinated with the Architect from Manufacturer's standard colors.

2.07 WALL-BOX DIMMERS/SENSORS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Lutron Electronics.

B. LED Dimmer Switches: Modular; 0 – 10 VDC Dimmer/Sensor compatible with 3rd party LED drivers; dimmer-driver combination capable of consistent dimming with low end not greater than 1% of full brightness, with integral, quiet, continuously adjustable slide-to-off with single-pole or three-way switching. Comply with UL 1472
   1. Operating Environment: Operating temperature 32-104 degrees F with a relative humidity (non-condensing) of 0% to 95%.

C. Occupancy Switches:
   1. Description: Line Voltage type, 120/230/277 VAC, adjustable time delay 1, 5, 15, or 30 minutes, 180-degree field of view, UL Listed.
   2. Sensor: Passive infrared (PIR) with ambient light detection learning mode with a minimum PIR coverage area of 30 ft. x 30 ft.
   3. Operating Environment: Operating temperature 32-104 degrees F with a relative humidity (non-condensing) of 0% to 95%.

D. Finish: Color to be coordinated with the Architect from Manufacturer's standard colors.

E. Warranty: 5 Years.

2.08 TOGGLE SWITCHES

A. Comply with NEMA WD 1, UL 20, and FS W-S-896.

B. Switches, 120/277 V, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Single Pole:
      1) Hubbell; HBL1221.
      2) Pass & Seymour; CSB20AC1.
      3) Leviton; 1221
   b. Three Way:
      1) Hubbell; HBL1223.
      2) Pass & Seymour; CSB20AC3.
      3) Leviton; 1223

2.09 WALL PLATES

A. Single and combination types shall match corresponding wiring devices.
   1. Plate-Securing Screws: Metal with head color to match plate finish.
   2. Material for Finished Spaces:

a. Shall be same manufacturer as device
b. Offices and administrative areas: Painted steel, color selected by Architect from specified selections.
c. Laboratories, kitchens, food preparation: 0.035-inch- (1-mm-) thick, satin-finished, Type 302 stainless steel.

3. Material for Unfinished Spaces: Galvanized steel.
4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.
5. Receptacles dedicated for use with computers: Use engraved white plastic, self adhesive label with 0.188" high black-filled lettering on face of plate to read "COMPUTER ONLY".

2.10 FINISHES

A. Device Color:
1. Wiring Devices Connected to Normal Power System: Ivory, White, Blue, Gray, and Brown as selected by Architect or required by NFPA 70 or device listing.
2. Dedicated outlets: Grey.
3. Wiring Devices Connected to Essential Power System: Red.
4. Isolated-Ground Receptacles: Ivory with Orange triangle.
5. UPS: Blue.
6. Switched devices: Green.
7. Temporary devices: Black.

B. Wall Plate Color: Match device color.

PART III - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:
   1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
   2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
   3. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:
   1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
   2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking or cutting strands from stranded wire.
   3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
   4. Existing Conductors:
      a. Cut back and pigtail, or replace all damaged conductors.
      b. Straighten conductors that remain and remove corrosion and foreign matter.
      c. Pig-tailing existing conductors are permitted, provided the outlet box is large enough.

D. Device Installation:
   1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
   2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
   3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
   4. Connect devices to branch circuits using pigtails that extend not less than 6 inches (152 mm) from wall.
   5. “Daisy-chaining” of receptacles is not permitted.
   6. Use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
   7. Use a torque screwdriver when a torque is recommended or required by manufacturer.
   8. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
   9. Tighten unused terminal screws on the device.
   10. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:
   1. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the left.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Arrangement of Devices: mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multi-gang wall plates.

H. Adjust locations of floor service outlets to suit arrangement of partitions and furnishings.

3.2 IDENTIFICATION

A. Comply with Division 26 Section "Identification for Electrical Systems."

B. Identify each receptacle with panelboard identification and circuit number. Receptacles rated more than 120V shall have voltage identified. Use hot, stamped or engraved machine printing with black-filled lettering on white field for normal circuits, red-filled lettering on white field for essential circuits , self adhesive nameplate attached to face of plate, and durable wire markers or tags inside outlet boxes.

3.3 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:
1. Test Instruments: Use instruments that comply with UL 1436.
2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

B. Tests for Convenience Receptacles:
1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 20-A Load: A value of 6 percent or higher is unacceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.
6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

C. Wiring device will be considered defective if it does not pass tests and inspections.

- - - END OF SECTION - - -

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:

1. Interior solid-state luminaires that use LED technology.
2. Emergency lighting units.
3. Exit signs.
4. Luminaire supports.

B. Related Sections:

1. Section 26 2726 "Wiring Devices" for occupancy sensors and manual wall box dimmers.
2. Section 26 0519 “Low Voltage Electrical Power Conductors and Cables” for wire and cabling.

1.03 SYSTEM DESCRIPTION

A. Catalog numbers indicated in the Luminaire Schedule are a design series reference and do not necessarily represent the exact catalog number, size, voltage, wattage, type of light bar, driver, finish trim, ceiling type, mounting hardware or special requirements as specified or as required by the particular installations. Provide complete luminaire to correspond with the features, accessories, number of LED’s, wattage and/or size specified in the text description of each luminaire type. Additional features, accessories and options specified shall be included.

B. Provide all frames, supplementary support structures, hangers, spacers, stems, aligner canopies, auxiliary junction boxes and other hardware as required for a complete and proper installation. Recessed luminaires shall have frames that are compatible with the ceiling systems.

C. Luminaire voltage shall match the voltage of the circuit serving same.

1.04 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color-rendering index.

C. IP: International Protection or Ingress Protection Rating.

D. LED: Light-emitting diode.

E. LER: Luminaire efficacy rating.

F. Lumen: Measured output of lamp and luminaire, or both.

G. Luminaire: Complete lighting fixture, including lamp, reflector, and housing.

1.05 SUBMITTALS

A. Product Data: For each type of luminaire, arranged in order of luminaire designation. Include data on features, accessories, finishes, and the following:
   1. Material and physical description of luminaire including dimensions.
   2. Emergency lighting units including battery and charger.
   3. Energy-efficiency data.
   4. Life, output (lumens, CCT, and CRI), Kelvin temperature, and energy-efficiency data for LED light bars.
   5. Photometric data and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing & Calculation Guides, of each luminaire type. The adjustment factors shall be for light bars, drivers, and accessories identical to those indicated for the luminaire as applied in this Project.
      a. Testing Agency Certified Data: For indicated luminaires, photometric data shall be certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer. LM-79 and LM-80 data for solid state lighting.
      b. Manufacturer Certified Data: Photometric data shall be certified by a manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
   6. Photometric data, certified by a qualified independent testing agency, in IESNA format, based on certified results of laboratory tests of each luminaire type, outfitted with light bars, drivers and accessories identical to those indicated for the luminaire as applied in the Project.
   7. Low voltage transformers.
   8. LED power supplies.
   9. Types of LED's, including manufacturer, wattage, and Color Rendering Index (CRI) and color temperature in degrees Kelvin (K).

B. Shop Drawings shall:
   1. Show detail of nonstandard or custom luminaires.
   2. Indicate dimensions, weights, method of field assembly, components, features and accessories.
   3. For custom luminaires, modified luminaires or linear luminaires mounted in continuous rows, submit scaled drawings prepared by the manufacturer showing all details of construction, lengths in runs, pendant or power feed locations, accessories, finishes and lists of materials.
   4. This Contractor shall provide the manufacturer with accurate field dimensions where required.
   5. Include wiring diagrams, power and control wiring.

C. Wiring diagrams shall detail wiring for luminaires and differentiate between manufacturer installed and field installed wiring.

D. Product Certificates shall be signed by manufacturers of luminaires certifying that products comply with requirements.

E. Dimming Driver Compatibility Certificates shall be signed by the manufacturer of driver certifying that drivers are compatible with dimming systems and equipment with which they are used. Product Certificates signed by product manufacturer shall be provided for each type of driver for dimmer controlled luminaires.

F. Maintenance Data shall be provided for luminaires and equipment to include in emergency, operation and maintenance manuals specified in specifications section describing Operations and Maintenance Data.

G. Field quality control test reports.

H. Special Warranties specified in the Section.

I. Review of luminaire submittals which indicate voltage, mounting condition, or quantities shall not be considered to be approval of said voltage, mounting condition or quantities. This Contractor shall field verify voltage and actual mounting condition and method.

J. Product samples complete with housing, trim, specified lumen package, and 8’ cord with plug for 120 V shall be submitted if requested.

1.06 CUSTOM LUMINAIRES

A. All custom luminaires require a prototype to be submitted prior to commencement of fabrication. The purpose of the prototype will be to review construction, LED placement within luminaire, LED type, optical assembly, finishes, etc. Modifications may be required as a result of prototype review. These modifications and others that do not materially affect the cost of the luminaire shall be incorporated at no additional cost to the Owner, Architect, Lighting Designer, or Engineer.

1.07 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For lighting equipment and luminaires to include in emergency, operation, and maintenance manuals.
   1. Provide a list of all arrays and drivers types used on Project; use ANSI and manufacturers' codes.

1.08 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Glass, Plastic Diffusers and Lenses: 10% or one dozen (whichever is less) of each type and rating installed. Furnish at least one of each type.
   2. Globes and Guards: 5% of each type and rating installed. Furnish at least one of each type.

1.09 DELIVERY, STORAGE AND HANDLING

A. Deliver luminaires individually wrapped in factory fabricated fiberboard type containers.

B. Handle luminaires carefully to prevent breakage, denting and scouring of the luminaire finish.

C. Store product in a clean, dry space, protected from weather.

1.10 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to the Authorities Having Jurisdiction, and marked for intended use.

C. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.

D. Comply with NFPA 70.

E. Designated manufacturers are listed to define the requirements for quality and function of the specified product.

1.11 COORDINATION

A. Coordinate layout and installation of luminaires with ceiling system and other construction that penetrates ceilings or is supported by them including mechanical system, fire suppression, and technology and partition assemblies.

B. Provide all frames, supplementary support structures, hangers, spacers, stems, aligner canopies, auxiliary junction boxes and other hardware as required for a complete and proper installation.

C. Recessed luminaires shall have frames that are compatible with the ceiling system indicated on the Architectural Drawings.

D. Coordination Meetings: This Contractor shall meet at least twice with the ceiling installer. Hold first meeting before submittal of shop drawings to coordinate each luminaire mounting condition with ceiling type. During second meeting, coordinate luminaire layout in each area. This Contractor shall meet at least twice with the mechanical systems installer prior to fabrication and installation of ductwork. Coordinate depth and location of all luminaires with ductwork, fire suppression, and technology in all areas.

1.12 WARRANTY

A. Comply with Division 1 requirements.

PART II - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with requirements, provide products as listed in the Lighting Fixture Schedule or comparable products approved in writing by the Owner.

2.02 GENERAL REQUIREMENTS FOR LUMINAIRES AND COMPONENTS

A. Recessed Luminaires: Comply with NEMA LE 4 for ceiling compatibility for recessed luminaires.

B. Luminaires: Comply with UL 1598.

C. Metal Parts: Free of burrs, sharp corners and edges. Metal work shall be free of tool marks and dents and shall have accurate angles bent as sharply as compatible with the gauges of the required metal. Intersections and joints shall be formed true and of adequate strength and structural rigidity to prevent any distortion after assembly. All miters shall be in accurate alignment with abutting intersection members.

D. Sheet Metal Components: Steel unless otherwise indicated. Form and support to prevent warping and sagging. Luminaires to be painted after fabrication. Finish ferrous mounting hardware and accessories to prevent corrosion and discoloration to adjacent materials.

E. Luminaire hardware to comply with the following material standards: For steel and aluminum luminaires, all screws, bolts, nuts and other fastening and latching hardware shall be cadmium or equivalent plated. For stainless steel luminaires, all hardware shall be stainless steel.

F. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Safety devices shall be detachable if necessary and shall not interfere with luminaire performance, maintenance or the seating of any luminaire element. Safety device shall not be visible during normal luminaire operation and from normal viewing angles.

G. Luminaires provided shall have means for disconnection from power source during service, as required in NEC Article 410.

H. Reflecting Surfaces: Minimum reflectance as follows, unless indicated otherwise:
   1. White Surfaces: 85%
   2. Specular Surfaces: 90%
   3. Diffusing Specular Surfaces: 75%

I. Reflector cones shall adhere to the following:
   1. Cones shall provide a minimum of 50 degree cutoff to source and source image.
   2. Plastic material shall not be used for reflector cones.
   3. Cones shall not be permanently fastened to the housing and shall be removable without tools. Retention devices shall not deform the cone or be visible from normal viewing angles.
   4. Trim shall be flush to ceiling without gaps or light leaks. Where the flange trim is separate from the cone, it shall have the same finish as the reflector cone.
   5. Reflector cones shall be uniform gauge, not less than 0.032” thick, high purity aluminum Alcoa 3002 alloy. Cones shall be free from spin marks or other defects.
   6. Manufacture cones using the Alzak® process. Refer to Luminaire Schedule for cone color and finish, i.e., specular or diffuse requirements.

J. Lenses, Covers, Diffusers and Globes:
   1. Acrylic Lighting Diffusers: 100% virgin acrylic plastic. UV stabilized high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
      a. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.
      b. Lenses shall have uniform brightness throughout the entire visible area without LED pixelation.
   2. Glass Globes: Annealed crystal glass unless otherwise indicated.

K. Adjustable luminaires shall have positive locking devices to fix aiming angle. Luminaires shall be capable of being relamped without adjusting aiming angle.

L. Each luminaire that has an array with a beam pattern or a spread lens that defines beam orientation shall contain locking devices to insure the orientation is not disturbed during array replacement or cleaning.

M. All luminaires and drivers shall operate within the temperature limits of their design and as specified by UL in the applications and mounting conditions specified.

N. Luminaires recessed in suspended ceilings where the space above the ceiling is either an air supply or return plenum shall conform to NEC Article 300-22.

O. Provide plaster frame for recessed luminaires mounted in other than T-bar ceilings. Verify mounting with architectural reflected ceiling plan before ordering luminaires.

P. Fixtures installed in “hard” ceilings shall have all connections accessible through the luminaire.

Q. Provide wire guards on all open strip type luminaires in unfinished spaces.

R. Factory-Applied Labels: Comply with UL 1598. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when light bars are in place.

S. Luminaires shall be free of light leaks while providing sufficient ventilation of LED’s and drivers to provide the required photometric performance.

T. Luminaires shall hold LED arrays securely against normal vibration and maintenance handling.

2.03 LUMINAIRES

A. Housing shall be minimum code gauge steel construction painted after fabrication with high reflectance white paint unless otherwise indicated.

B. Shielding shall adhere to the following criteria:
1. Flat frosted diffuser shall be 100% virgin acrylic, pattern #12, and shall have matte finish on exterior side. Diffuser shall be of sufficient density to completely obscure LED image.
2. Flat clear lenses shall be injection molded 100% virgin acrylic.
3. Clear patterned lenses shall be injection molded 100% virgin acrylic, pattern #12.
4. Clear patterned lenses shall be polycarbonate, pattern #12.
5. Minimum thickness shall not be less than 0.125” with a minimum weight of 8 ounces per square foot.

C. Doorframes shall be supplied with concealed hinges and latches. Provide mitered corners with no gaps or light leaks.

2.04 LED LUMINAIRES AND DRIVERS

A. All Luminaires
1. Comply with IES LM-79-08 Approved Method for measuring lumen maintenance of LED light sources.
2. Comply with IES LM-80-08 Approved Method for electrical and photometric measurement of SSL product.
3. Comply with In-Situ testing for more reliable results.
4. LED's shall be Restriction of Hazardous Substances Directive (RoHS) compliant.
5. LED arrays shall be sealed, high performance, long life type; minimum 70% rated output at 50,000 hours. (L70)
6. LED luminaires shall deliver a minimum of 80 lumens per watt.

a. LED's shall be "Bin No. 1" quality.

7. Drivers shall be solid state and accept 120 through 277 VAC at 60 Hz input.
8. The LED light source shall be fully dimmable with use of compatible dimmers switch designated for low voltage loads.
9. LED color temperatures: as noted, +/- 275K.
10. Luminaires shall have internal thermal protection.
11. Luminaires shall not draw power in the off state. Luminaires with integral occupancy, motion, photo-controls, or individually addressable luminaires with external control and intelligence are exempt from this requirement. The power draw for such luminaires shall not exceed 0.5 watts when in the off state.
12. Color spatial uniformity shall be within .004 of CIE 1976 diagram.
13. Color maintenance over rated life shall be within .007 of CIE 1976.
14. Indoor luminaires shall have a minimum CRI of 85.
15. Luminaire manufacturers shall adhere to device manufacturer guidelines, certification programs, and test procedures for thermal management
16. LED package(s)/module(s)/array(s) used in qualified luminaires shall deliver a minimum 70% of initial lumens, when installed in-situ, for a minimum of 50,000 hours.
17. Luminaires shall be fully accessible from below ceiling plane for changing drivers, power supplies and arrays.

B. Power Supplies and Drivers

1. Power Factor: 0.90 or higher
2. Maximum driver case temperature not to exceed driver manufacturer recommended in-situ operation.
3. Output operating frequency: 60Hz.
4. Interference: EMI and RFI compliant with FCC 47 CFR Part 15.
5. Total Harmonic Distortion Rating: 20% Maximum.
6. Meet electrical and thermal conditions as described in LM-80 Section 5.0.
7. Fully dimmable, 0 – 10 VDC standard.
8. Secondary Current: Confirm secondary current specified by individual luminaire manufacturers.
9. Compatibility of dimming switches: Certified by manufacturer for use with individually specified luminaire and individually specified control components.

2.05 LED ARRAYS

A. All LED's of the same type are to be provided by the same manufacturer.

B. Equip each luminaire with the proper LED array of the type shown or specified in the Luminaire Schedule

2.06 WIRING

A. No internal wiring shall be visible at normal viewing angles.

2.07 LUMINAIRE SUPPORT COMPONENTS

A. Single-Stem Hangers shall be 1/2-inch steel tubing with swivel ball fitting and ceiling canopy. Finish shall be the same as the luminaire.

B. Twin-Stem Hangers shall be two, 1/2-inch steel tubes with single canopy arranged to mount a single fixture. Finish shall be the same as the luminaire.

C. Rod Hangers shall be 3/16-inch minimum diameter, cadmium-plated threaded steel rod.

D. Wires shall be ASTM A 641/A 641M, Class 3, soft temper, zinc coated steel, 12 gauge.

E. Wires for humid spaces shall be ASTM A 580/A 580M, composition 302 or 304, annealed stainless steel, 12 gauge.

F. Aircraft Cable Support shall use cable, anchorages, and intermediate supports recommended by luminaire manufacturer.

G. Hangers for pendant industrial luminaires shall be heavy duty No. 8 jack chain with hangers, "S" hooks, mounting straps, and all required accessories for complete installation.

2.08 EXIT SIGNS

A. General Requirements for Exit Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with Authorities Having Jurisdiction.

B. Internally Lighted Signs:
1. Products: Provide products as listed in the Lighting Fixture Schedule.
2. Steel Housing, 20 gauge, white finish.
3. Glass or plastic faceplate.
4. Red Letters on white field.
5. Directional chevrons as indicated.
6. *Field selectable full size arrow designations*
7. Light bars: LED, 70,000 hours minimum rated lamp life.
   a. Individual LED modules shall not be visible.
8. Maximum power consumption: 5 watts.
9. AC powered signs shall be 120/277V input.
10. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.
    a. LED, 70,000 hours minimum rated lamp life.
    b. Battery: Two hour capacity sealed, maintenance-free, Ni Cad type, five year manufacturer warranty.
    c. Charger: Fully automatic, solid-state type with sealed transfer relay.

d. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects light bars from battery, and battery is automatically recharged and floated on charger.
e. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
f. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
g. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

2.09 EMERGENCY LIGHTING UNITS

A. General Requirements for Emergency Lighting Units: Self-contained units complying with UL 924.
1. Housing: 20 ga. Steel.
2. Flexible cord and plug connections shall not be permitted.
3. Battery: Sealed, maintenance-free, lead-acid type.
4. Charger: Fully automatic, solid-state type with sealed transfer relay.
5. Lamping: Tungsten Halogen.
6. Operation: Relay automatically turns lamp on when power-supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
7. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
8. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
9. Wire Guard: Heavy-chrome-plated wire guard to protect lamp heads or units in areas where subject to physical damage.
10. Integral Time-Delay Relay: Holds unit on for fixed interval of 15 minutes when power is restored after an outage.
11. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.
12. Factory supplied molded plug and cord where indicated.

PART III - EXECUTION

3.1 INSTALLATION

A. Luminaires:
1. Set level, plumb, and square with ceilings and walls, and secure according to manufacturers written instructions and approved submittal materials, unless otherwise indicated.

B. Temporary Lighting: If it is necessary, and approved by Architect, to use permanent luminaires for temporary lighting, install and energize the minimum number of luminaires necessary. When construction is sufficiently complete, remove the temporary luminaires, disassemble, clean thoroughly, and reinstall.

C. Remote Mounting of Drivers: Distance between the driver and fixture shall not exceed that recommended by manufacturer. Verify, with manufacturers, maximum distance between driver and luminaire.

D. Mounting height indicated from finished floor to bottom of pendant luminaire or to the center of the outlet box for wall mounted luminaires unless otherwise noted. Verify mounting heights with Architect and Lighting Designer.

E. Mounting height may also be indicated as the length of the pendant below finished ceiling.

F. Lay-in Ceiling Luminaire Supports: Use grid as a support element.
   1. Luminaires of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support luminaires independently with at least two 3/4-inch metal channels spanning and secured to ceiling tees. In addition, provide slack earthquake safety wire hangers secured diagonally from opposite luminaire corners to structural members above suspended ceiling.

G. Suspended Luminaire Support:
   1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
   2. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers.
   3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of luminaire chassis, including one at each end.
   4. Do not use grid as support for pendant luminaires. Connect support wires or rods to building structure.
   5. All power feeds shall originate from the same location/end of each run.
   6. Where pendants or rods are longer than 48”, brace to limit luminaire swinging.

H. Provide all necessary hanging or mounting devices and accessories for all luminaires. Verify the types needed for various ceiling conditions. Plaster rings shall be provided where required.

I. Verify weight and mounting method of all luminaires prior to ordering and provide suitable support. Coordinate with General Contractor for luminaires that require additional blocking or support. Luminaire mounting assemblies shall comply with all local seismic codes and regulations.

J. Metal decking shall not be pierced for luminaire support.

K. Refer to architectural reflected ceiling plans for coordination of luminaire locations with mechanical, fire protection, technology and fire safety equipment. Where conflicts occur, coordinate with Architect, Engineer and Lighting Designer prior to installing any of the Systems.

L. In accessible suspended ceilings, luminaire wiring connections, including equipment grounding conductor, is to be through use of 72-inch (maximum) flexible conduit from a rigidly supported junction box.

M. Wire per requirements of branch circuit installation. Properly ground each luminaire.

N. Luminaires located in recessed ceilings with a fire resistive rating of 1 hour or more shall be enclosed in an approved fire resistive rated box equal to that of the ceiling. Acoustical ceiling tiles are not acceptable.

O. Install luminaires with vent holes free of air blocking obstacles.

P. This Contractor shall be responsible for adjusting aperture flanges or rings on all recessed luminaires to be flush with the finished ceiling. Trim shall completely conceal ceiling opening.

Q. Brace suspended luminaires installed near ducts or other elements so that they do not swing into obstructions.

R. Wall mounted luminaires shall be supported from four-square outlet box plaster ring and from wall at non-feed end with two 1/4-inch toggle bolts for gypsum board walls or 1/4-inch bolts to pre-set inserts for concrete wall.

S. Luminaires shall not be secured to ductwork or other Systems.

T. Adjust variable position lampholders for proper lamp position prior to luminaire installation.

U. Connect wiring according to Section 26 0519 "Low-Voltage Electrical Power Conductors and Cables."

3.2 DOWNLIGHT LUMINAIRES

A. Recessed Type in Accessible Ceilings: Mount in frames suitable for the ceiling with the recessed portion of the luminaire securely supported from the ceiling opening by use of a metal trim ring.

B. Recessed Type in Non-accessible Ceilings: As Specified for mounting in accessible ceilings, except provide access to wiring and driver through the ceiling opening for the luminaire.

3.3 LUMINAIRES

A. Recessed Type: Support luminaires independent of the ceiling suspension system. Provide four integral tabs (one at each corner) which rotate into position and lock on ceiling tees after luminaire is lifted into the ceiling cavity or provide four clips similar to Caddy #535. Provide mounting frames suitable for the ceiling type. In addition, provide slack earthquake safety wire hangers secured diagonally from opposite luminaire corners to structural members above suspended ceiling.

B. Wall Mounted Type: Support from four-square outlet box plaster ring and from wall at non-feed end with two ¼ inch toggle bolts for gypsum board walls or ¼ inch bolts to pre-set inserts for concrete wall.

C. If clearance above T-bar system is too restricted to "tip-in" luminaire, coordinate with acoustic ceiling installer by leaving one cross T-bar off until the cross T-bar shall be secured into its proper place. Luminaires installed in hidden-spline-type ceilings shall have supporting channels installed by Ceiling Contractor to adequately support the luminaire without providing additional hangers from the structural ceiling above the suspended ceiling.

D. Surface Mounted Type:

1. Where mounted on accessible ceilings, support from structural members above ceiling by means of hanger rods through ceiling or as approved.
2. Continuous Runs of Luminaires: Laser sight to insure luminaires are straight and true when sighting from end to end, regardless of irregularities in the ceiling. Where luminaires are so installed, omit ornamental ends between sections. All seams/ joints shall be tightly fitted.

E. Pendant Mounted Type:
1. Provide strong back channel entire luminaire length unless luminaire is designed specifically to be self-supporting.
2. Where suspended below accessible ceiling, provide structural support at suspended ceiling level from structural members above ceiling. Do not run hanger rods through ceiling.
3. Continuous Runs of Luminaires: Laser sight to insure luminaires are straight and true when sighting from end to end, regardless of irregularities in the ceiling. Where luminaires are so installed, omit ornamental ends between sections. All seams/joints shall be tightly fitted.
4. All power feeds shall originate from the same location/end of each run.

F. Install luminaire diffusers only after construction work, painting and clean up are completed.

3.4 LED LUMINAIRES

A. Adhere to manufacturers installation guidelines regarding proper thermal management.

3.5 LIGHTING CONTROL

A. Provide branch circuiting in coordination with the requirements of Division 26 Wiring Device Section and as indicated.

3.6 CLEANING AND ADJUSTING

A. Remove protective plastic covers from luminaires and luminaire diffusers only after construction work, painting and clean-up are completed. Remove, clean, and reinstall all dirty reflectors and diffusers.

B. Clean luminaires internally and externally after installation. Use methods and materials recommended by manufacturer for cleaning Alzak reflectors and other surfaces.

C. Make final adjustment of aimable luminaires and adjustable light settings under the direction of the Architect and/or Lighting Designer during a scheduled period of time prior to the completion of the Project, after normal business hours if required. Include all equipment and personnel expenses including overtime required for focusing.

D. Luminaires, reflectors, louvers and accessories which are damaged, blemished, or impregnated with fingerprints shall be replaced at this Contractor's expense. All finishes shall be unmarred upon Project completion.

3.7 IDENTIFICATION

A. Install labels with panel and circuit numbers on concealed junction and outlet boxes. Comply with requirements for identification specified in Section 26 0553 "Identification for Electrical Systems."

3.8 FIELD QUALITY CONTROL

A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery/generator and retransfer to normal. Walk test and verify foot-candle levels meet Code with meter.

B. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

C. Inspect each installed luminaire for damage. Replace damaged luminaires and components.

D. Advance Notice: Give dates and times for field tests.

E. Provide instruments to make and record test results.

F. Malfunctioning Luminaires and Components: Replace or repair, then retest. Repeat procedure until units operate properly.

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