SPECIFICATIONS FOR THE

RENOVATIONS AND ADDITION TO BULDING #7 AT CAMDEN COUNTY TECHNICAL SCHOOLS GLOUCESTER TOWNSHIP CAMPUS

343 Berlin Cross Keys Road
Sicklerville, New Jersey 08081

for

CAMDEN COUNTY TECHNICAL SCHOOLS
BOARD OF EDUCATION
GLOUCESTER TOWNSHIP CAMPUS
BUILDING NUMBER 12
343 Berlin Cross Keys Road
Sicklerville, New Jersey 08081

Architect:
Garrison Architects
713 Creek Road
Bellmawr, New Jersey 08031
(856) 396-6200
Fax (856) 396-6205

Structural Engineer:
Orndorf and Associates
8600 West Chester Pike Suite 201
Upper Darby, PA 19083
(610) 896-4500
Fax: (610) 896-4503

Mechanical, Electrical & Plumbing Engineer:
Mulhern Consulting Engineers
321 South York Road
Hatboro, PA 19040
(215) 293-9900
Fax (215) 441-5984

Issued for Bid: March 29, 2021
GA# 20-46
CCTS BID #20-08

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INVITATION TO BID

For the Renovations and Addition to Building #7 at Camden County Technical Schools, Gloucester Township Campus, 343 Berlin Cross Keys Road, Sicklerville, New Jersey 08081

Notice is hereby given that sealed bids for the Renovations and Addition to Building #7 at Camden County Technical Schools, Gloucester Township Campus, CCTS Bid #20-08, will be received, read and opened at the Camden County Technical Schools Board of Education, Gloucester Campus, Building 11 Business Conference Center, Sicklerville, New Jersey 08081, Tuesday, April 27, 2021 at 2:00 PM prevailing time by the Business Administrator / Board Secretary or his designee.

Electronic Copies of the Bid Documents may be obtained by contacting Garrison Architects via email at cmcbrearty@garrisonarch.com, Phone number (856) 396-6200. There is no charge for obtaining an electronic copy of the Bid Documents.

All bidders are strongly encouraged to attend a pre-bid meeting to be held at the Camden County Technical Schools, Gloucester Campus, Building 11 Business Conference Center, Sicklerville, New Jersey 08081, on Wednesday, March 31, 2021 at 3:00 P.M., prevailing time, to fully understand the specifications and conditions of work to be done under this bid. Masks will be required and social distancing will be observed. A tour of the location will take place after the pre-bid.

Bidders are required to comply with the requirements of P.L. 1975, c.127 (N.J.A.C. 17:27) and N.J.S.A 10:5-31 et seq.

Bidders are required to comply with the requirements of P.L. 1999, c. 238, (N.J.S.A. 34:11-56.48 to 57) where applicable.

In the event of any inconsistencies between this advertisement, as published, and the bid documentation, the bid documentation shall control.

By Order of the Camden County Technical Schools Board of Education
Camden County, New Jersey

Mr. Scott M. Kipers, Business Administrator/Board Secretary

Bid # 20-08 Renovations and Addition to Building #7 at
Camden County Technical Schools
Gloucester Campus (GA# 20-46)
Project Schedule / General Information

Monday	**03/29/21**	Advertisement
Wednesday	**03/31/21**	NON-MANDATORY Pre-Bid Meeting at 3:00 P.M. at Camden County Technical Schools, Gloucester Township Campus located at 343 Berlin Cross Keys Road, **Building No. 11 Business Conference Center**, Sicklerville, New Jersey 08081. Masks will be required and social distancing will be observed
Monday	**04/12/21**	Deadline for Questions at 5:00 P.M. (email cmcbrearty@garrisonarch.com)
Thursday	**04/15/21**	Addendum Faxed to Bidders, if necessary
Tuesday	**04/27/21**	Bids Due at 2:00 P.M. at Camden County Technical Schools, Gloucester Township Campus located at 343 Berlin Cross Keys Road, **Building No. 11 Business Conference Center**, Sicklerville, New Jersey 08081. Masks will be required and social distancing will be observed
Wednesday	**04/28/21**	Board Meeting
Friday	**08/20/21**	Project Completion

The Specialty Trades Required is C047 – Electrical; C030 - Plumbing and Gas Fitting and all Kindred Work; C032 - Steam Power Plants, Steam and Hot Water Heating and Ventilating Apparatus and Kindred Work; C047 – Electrical Work; and C029 – Structural Steel and Ornamental Iron Work.

CAMDEN COUNTY TECHNICAL SCHOOLS
BOARD OF EDUCATION
343 Berlin Cross Keys Road
Sicklerville, NJ 08081-4000
(856) 767-7000 ext. 5400

To: Prospective Bidders

From: Scott M. Kipers, School Business Administrator

Re: Legal and Other References

Please note all legal references in the attached Bid Documents to "N.J.S.A. 40A:11-1 et seq." should be interpreted, where applicable, to the corresponding legal reference found at N.J.S.A. 18A:18A-1 et seq."

Please note any references in the attached Bid Documents to the "Camden County Board of Freeholders," "Camden County," or "County," should be interpreted and understood as meaning the "Camden County Technical Schools Board of Education."

CAMDEN COUNTY TECHNICAL SCHOOLS
BOARD OF EDUCATION
343 Berlin Cross Keys Road
Sicklerville, NJ 08081-4000
856) 767-7000 ext. 5400

DATE: March 29, 2021

Bid No. and Title: GA# 20-08 Renovations and Addition to Building #7 at Camden County Technical Schools, Gloucester Campus

BIDS MUST BE RETURNED NO LATER THAN TWO O'CLOCK PM, PREVAILING TIME

ON APRIL 27, 2021.

1. PRICES MUST INCLUDE DELIVERIES TO ALL SITES SET FORTH HEREIN.

2. Quotations must be made on these sheets. Camden County Technical Schools Board of Education is not responsible for any expenses incurred by any firm in preparing or submitting a bid proposal.

3. Prices may be submitted on any or all the items listed unless otherwise specified. Award of contract for goods and services will be made based on the lowest responsible bid on each item or on an aggregate basis, whichever is in the best interest of Camden County Technical Schools Board of Education and System Members (if this is a Cooperative Pricing bid).

4. Insert NET UNIT PRICES. Bids must be firm for a minimum of 60 days. Contract prices may not be increased during the term of the contract.

5. Camden County Technical Schools Board of Education and System Members are exempt from sales tax.

6 The Camden County Technical Schools Board of Education reserves the right to accept or reject any part or parts of the responses to this bid in accordance with law.

7. To the extent that any of these instructions directly contradict the bid specifications, the bid specifications shall prevail.

8. The Camden County Technical Schools Board of Education shall only be responsible for the payment of interest or late fees as provided pursuant to N.J.S.A. 2A:30A-2(c).

9. Official Camden County Technical Schools Board of Education bid packages for routine goods and services are available from the Camden County Technical Schools Board of Education at no cost to the vendor. (Bids for highway projects are issued by that department for a fee). All addenda are issued by the Division of Purchasing (or Highway department if applicable). **Potential bidders are cautioned that they are bidding at their own risk if a third party supplied the bid specifications.** Such specifications may or may not be complete. The Camden County Technical Schools Board of Education is not responsible for third party supplied bid specifications.

10. Bidders are required to comply with the requirements of P.L. 1999, c. 238 (N.J.S.A. 34:11-56.25 et seq.) regarding prevailing wages, where applicable.

11. Bidders are hereby noticed that the Camden County Technical Schools Board of Education shall correct certain types of clerical errors if found in submitted bids. For example, if the quantity needed or the standard unit of measurement used, times the unit price, is incorrectly calculated in reaching a total or final price, the Camden County Technical Schools Board of Education will correct the computational mistake.

12. The Camden County Technical Schools Board of Education requires bidders to list any exceptions to the bid specifications. For any exceptions listed the Camden County Technical Schools Board of Education shall determine if it will accept an immaterial, or minor, deviation from its bid specifications as permitted by law. Material exceptions shall be cause for rejection of the bid. Bidders shall not be permitted to remove listed exceptions.

13. N.J.S.A. 40A:11-2.1 and 52:32-55 prohibits State and local public contracts with persons or entities engaging in certain investment activities in energy or finance sectors of Iran.

14. Official notification of contract awards authorized by Camden County Technical Schools Board of Education may be viewed on ccts.net. To review, click on the "School Board" tab. Meetings and agendas are found here. Click on the month you would like to view. Copies of resolutions and bid results require an OPRA request. Contact the Office of the School Business Administrator at (856) 767-7000 ext. 5400 for the OPRA Request Form.

15. Should any requirements or language contained in the contract documents/technical specifications be found to conflict with the County's general bid boilerplate (ITB pages), the requirements/language in the bid boilerplate shall prevail.

16. BIDDERS ARE REQUIRED TO USE THE CAMDEN COUNTY TECHNICAL SCHOOLS BOARD OF EDUCATION'S FORMS AND SHALL NOT RECREATE IN ANY WAY THE FORMS PROVIDED WITH THIS BID. FAILURE TO USE THE CAMDEN COUNTY TECHNICAL SCHOOLS BOARD OF EDUCATION'S FORMS OR ADDING TO, AMENDING, ALTERING, OR REVISING THE CAMDEN COUNTY TECHNICAL SCHOOLS BOARD OF EDUCATION'S FORMS, INCLUDING, BUT NOT LIMITED TO, CONVERTING THE CAMDEN COUNTY TECHNICAL SCHOOLS BOARD OF EDUCATION'S PDF OR HARDCOPY TO A WORD DOCUMENT, SHALL BE CAUSE FOR REJECTION OF THE BID.

WE SUBMIT HEREWITH our prices as indicated on the following bid.

Submitted on_____, 20_____ BY_____
(Name of Company)

Fax No._____ PER_____
(Signature and Title of Authorized Representative)

E-Mail: _____ Phone No._____

BIDDER'S CHECKLIST

THIS BIDDER'S CHECKLIST MUST BE COMPLETED, SIGNED AND SUBMITTED WITH YOUR BID PACKAGE.

1. Bid Guarantee deposit in the form of a certified check, cashier's check or bid bond. See Paragraph 4.1 and **Exhibit A**. (Must be submitted with bid) _____

2. Certificate from a Surety Company or Financial Institution stating that if bid is accepted, they will provide the required performance bond or Letter of Credit. See Paragraphs 4.2, 8.1 and 8.2, and **Exhibits B, C, and D**. (Must be submitted with bid, **must include originals – copies will not be accepted**) _____

3. Statement of Corporate Ownership listing the names and **HOME addresses** of all individuals owning ten percent (10%) or more of corporation, partnership or LLC. See **Exhibit E**. (Must be submitted prior to or with bid) _____

4. Non-collusion Affidavit properly notarized. See **Exhibit F**. _____

5. Affirmative Action Questionnaire with available evidence submitted. See Paragraph 5 and **Exhibit I**. _____

6. Affirmative Action MBE/WBE Tracking Form. See Paragraph 5 and **Exhibit J**. _____

7. Debarment Certification Form. See **Exhibit K**. _____

8. Extension or Non-Extension of Prices to Registered System Members (Other Agencies) See Paragraph 22.1 and **Exhibit L**. N/A

9. Textile/Apparel Subcontractor Disclosure Requirements

   For Bids for Textiles and/or Items of Apparel Only. Disclosure of all subcontractors and sites and Certification of Compliance for textile and apparel bids. See Paragraphs 23.1 and Paragraph 23.2 and **Exhibit M**. (Must be submitted with bid). N/A

[BIDDER'S CHECKLIST CONTINUED NEXT PAGE]

BIDDER'S CHECKLIST (cont'd)

10. Proof of compliance with The Public Works Contractor Registration Act, if applicable. See Paragraph 24. (Must be submitted prior to award of contract). _____

11. Construction Subcontractor Disclosure Requirements

    a. **For Bids for Construction Only.** Disclosure of subcontractors as required by N.J.S.A. 40A:11-16. See Paragraph 26 and **Exhibit N**. (Must be submitted with bid) _____

12. Proof of compliance with the requirements for significant public works projects, where applicable. See Paragraph 27 and **Exhibit O**. (Must be submitted with bid). _____

13. Proof of compliance with the State Contractor Business Registration Program. See Paragraph 31. _____

14. Acknowledgement of Receipt of Addenda, whether or not issued, N.J.S.A. 40A:11-23.2. See Paragraph 32 and **Exhibit Q**. (Form must be submitted with bid). _____

15. Uniformed Law Enforcement Officer requirement form. **Exhibit R.** N/A

16. Certification - Disclosure of Investment Activities in Iran, **Exhibit S.** (Must be submitted prior to award of contract). _____

17. NJ Worker & Community Right-to-Know Act Affidavit **(Exhibit U)** _____

18. No Material Change of Circumstances **(Exhibit V)** (Form Must be submitted with bid). _____

19. Notice of Classification Form issued by NJ Dept. of the Treasury/Division of Property Management and Construction (DPMC) (Form Furnished by Contractor) _____

20. Total Amount of Uncompleted Contracts Form issued by NJ Department of the Treasury **(Exhibit W)** (Form Must be submitted with bid) _____

21. Bid Proposal (Form of Proposal) – Price List (Form Must be submitted with bid) _____

_____

NAME OF BIDDER

_____ _____

SIGNATURE **DATE**

INSTRUCTIONS TO BIDDERS

1. RECEIPT, OPENING, WITHDRAWAL OF BIDS, AND FAILURE TO RESPOND

1.1 Sealed Bids will be received by the Camden County Technical Schools Board of Education on the date, time, location, and in the manner as listed in the advertisement.

1.2 Bids must be received at the Camden County Technical Schools Board of Education stipulated in the advertisement no later than the due date and time indicated therein. It is recommended that bids be hand delivered to that department. The Camden County Technical Schools Board of Education assumes no responsibility for delays in any form of courier or mail order delivery service causing the bid to be received at the Camden County Technical Schools Board of Education later than the due date and time. All late bids will be rejected in accordance with the law.

1.3 Any bid may be withdrawn prior to the time for openings of bids or the authorized postponement thereof. Any bid received after the opening of bids will not be considered. No bidder may withdraw a bid within sixty (60) days after the actual opening thereof.

2. QUALIFICATION OF BIDDERS

2.1 The Camden County Technical Schools Board of Education may make such investigation as it deems necessary to determine the ability of the bidder to perform the work and the bidder shall furnish to the Camden County Technical Schools Board of Education all such information and data for this purpose as the Camden County Technical Schools Board of Education may request. The Camden County Technical Schools Board of Education reserves the right to reject any bids if the evidence submitted by, or investigation of such bidder, fails to satisfy the Camden County Technical Schools Board of Education that such bidder is properly qualified to carry out the obligations of the contract and to complete the work contemplated herein.

3. PREPARATION OF BID

3.1 **Bids must be submitted on the prescribed form. ONE ORIGINAL (1) AND TWO (2) COPIES** of the bid should be submitted. The bidder shall fill in all blank spaces in ink or by typewriter, both in words and figures. Bids must be signed in ink by authorities with capacity to legally bind the bidder to its bid proposal.

3.2 Each bid shall be based upon the specifications prepared by the Camden County Technical Schools Board of Education. The bidder accepts the obligation to become familiar with the Camden County Technical Schools Board of Education's specifications.

3.3 Each bid must give the full business address of the bidder and be signed by an authorized representative. Bids by partnerships must furnish the full name of all partners and must be signed in the partnership name by one of the members of the partnership or by an authorized representative, followed by the signature and designation of the person signing. Bids by corporations must be signed in the legal name of the corporation, followed by the name of the State of Incorporation and must contain the signature and designation of the President, Secretary or other person authorized to bind the corporation in the matter. When requested by the Camden County Technical Schools Board of Education, satisfactory evidence of the authority of the officer signing on behalf of the corporation shall be furnished.

3.4 Bids containing any conditions, omissions, unexplained erasures or alterations, items not called for in the proposal form, attachment or additive information not required by the bid documents, or irregularities of any kind, may be rejected by the Camden County Technical Schools Board of Education. Any changes, white-outs, strike-outs, etc. on the proposal page must be clear as to meaning and initialed by the person responsible for signing the bid.

3.5 The Camden County Technical Schools Board of Education reserves the right to waive any minor informalities in the bids received as permitted by law or reject bids under certain circumstances as permitted by law.

3.6 All bids must be submitted in sealed envelopes bearing on the outside the name of the bidder, address and subject and title of the specifications. If forwarded by mail, the sealed envelope containing the bid must be enclosed in another envelope, addressed as set forth in the advertisement. The Camden County Technical Schools Board of Education assumes no responsibility for mailings not received on time at the department stipulated in the advertisement to receive bids. It is therefore recommended that bids be hand delivered.

3.7 Bidders must insert prices for furnishing all the materials and/or labor required by these specifications whether such requirement is specifically set forth. Prices shall be net, including any charges for packing, crating, containers, etc. and all transportation charges fully pre-paid by the contractor F.O.B. destination and placement at locations specified by the Camden County Technical Schools Board of Education. No additional charges will be allowed for any transportation costs resulting from partial shipments made at the contractor's convenience when single shipment is ordered.

3.8 Payments will be made upon the approval of vouchers submitted by the successful bidder in accordance with the requirements of the Board of Education and subject to the Camden County Technical Schools Board of Education 's customary billing procedures.

3.9 The Camden County Technical Schools Board of Education reserves the right to grant up to three (3) business days' additional time to bidders after the bid opening to provide the following documents required by the bid specifications:

a. Non-collusion affidavit. See **Exhibit F**;

b. Affirmative Action Questionnaire with available evidence submitted. See Paragraph 5 and **Exhibit I**;

c. Affirmative Action Plan MBE/WBE Tracking Form. See Paragraph 5 and **Exhibit J**;

d. Debarment Certification Form (Certification regarding the Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transactions). See **Exhibit K.**

Such additional time may not in any way affect the price or cost of the bid. All other documents required by the bid specifications must be submitted at the time of the bid opening specified herein or in accordance with law.

4. BID BOND/CONSENT OF SURETY OR LETTER OF CREDIT

4.1 BID BOND

Each bid must be accompanied by the Certified Check of the bidder or by a Cashier's Check, or by a Bid Bond prepared on the form of bid bond attached hereto as **Exhibit A**, duly executed by the bidder as principal, having surety thereon, a surety company approved by the Camden County Technical Schools Board of Education, in an amount not less than ten percent (10%) of the amount of the base bid submitted, said 10% not to exceed $20,000.00 pursuant to N.J.S.A. 40A:11-21, payable to the Camden County Technical Schools Board of Education. Only **originals** submitted on the Camden County Technical Schools Board of Education's form Exhibit A will be accepted.

4.2 CONSENT OF SURETY OR LETTER OF CREDIT

In addition, the bid must also be accompanied by a Certificate (Consent of Surety) from a Surety Company stating that it will provide said bidder with a Performance Bond in the full amount of the bid. Camden County Technical Schools Board of Education's forms are required to be used. A form of Consent of Surety is attached hereto as **Exhibit B**. Only **originals** submitted on the Camden County Technical Schools Board of Education's form Exhibit B will be accepted. A form of Performance Bond is attached hereto as **Exhibit C. Exhibit C must be signed by the successful bidder and bidder's surety after award of contract and must be returned with the contract**. As an alternative to the consent of surety, bidders may provide a letter from a bank or similar financial institution stating that it will issue a Letter of Credit in the full amount of the bid and pursuant to the terms of the Letter of Credit in the specifications (See **Exhibit D**). **This Letter of Credit option is not available on bids exceeding $100,000. Such bids require a Consent of Surety/Performance Bond. See N.J.S.A. 40A:11-22.**

4.3 Per N.J.S.A. 40A:11-24(a), All bid security, except the security of the three apparent lowest responsible bidders, shall be returned, unless otherwise requested by the bidder, within ten (10) days after the opening of bids, **Sundays and holidays excepted**, and the bids of such bidders shall be considered as withdrawn. Within three (3) days, **Sundays and holidays excepted**, after the awarding and signing of the contract, and the approval of the contractor's performance bond, the bid security of the remaining unsuccessful bidders shall be returned to them.

5. AFFIRMATIVE ACTION

5.1 The successful bidder shall adhere to the mandatory affirmative action language required by P.L. 1975, c.127 (N.J.A.C. 17:27) and N.J.S.A. 10:5-31 et seq.

5.2 For procurement, professional and service contracts, the above-referenced mandatory language shall be that set forth in **Exhibit G**.

5.3 For construction contracts, the above-referenced mandatory language shall be that set forth in **Exhibit H**.

5.4 All bidders should complete the Affirmative Action Questionnaire set forth in **Exhibit I** and follow its instructions.

5.5 All bidders should complete the Affirmative Action Plan MBE/WBE Tracking Form in **Exhibit J**.

6. ADDENDA AND INTERPRETATIONS

6.1 No interpretation of the meaning of any bid document will be made to any bidder orally. Any request for interpretation shall be in writing, addressed to the Camden County Technical Schools Board of Education's representative stipulated in the bid and must be received at least ten (10) days prior to the date fixed for the opening of bids. All such interpretations and any supplemental instructions will be in the form of written addenda to the specifications and will be distributed to all prospective bidders in accordance with N.J.S.A. 40A:11-23. Failure of any bidder to receive any such addendum or interpretation shall not relieve such bidder from any obligation under his bid as submitted. All addenda so issued shall become part of the contract documents.

7. MISCELLANEOUS

7.1 At the time of the opening of bids, each bidder will be presumed to have read and to be thoroughly familiar with the specifications and all other bid documents (including 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 to his bid.

7.2 In case of default by the successful bidder, the Camden County Technical Schools Board of Education may procure the articles or services from other sources and hold the successful bidder responsible for any excess cost occasioned thereby.

7.3 Camden County Technical Schools Board of Education is exempt from any State sales tax and Federal excise tax. In submitting this bid, the bidder certifies that its total bid price does not include any such taxes.

7.4 For purposes of evaluation where an equivalent is being furnished, the bidder must indicate any variation to the Camden County Technical Schools Board of Education 's specifications no matter how slight. If no variations are indicated, it will be construed that the bid fully and exactly complies with the Camden County Technical Schools Board of Education 's specifications.

7.5 All bids submitted shall include in price any applicable permits, or fees required by any other government entity that has jurisdiction to require the same.

7.6 In submitting its bid, the bidder certifies that the merchandise to be furnished will not infringe upon any valid patent or trademark and that the successful bidder shall, at its own expense, defend all actions or suits charging such infringement, and will save the Camden County Technical Schools Board of Education harmless from any damages resulting from such infringement.

7.7 The bidder understands and agrees that, if awarded any contract by the Camden County Technical Schools Board of Education, it shall be responsible for insuring that it and all subcontractors meet minimum safety, health and equipment requirements including provisions for protecting employees and the public from any hazards encountered in performing its obligations pursuant to this bid.

7.8 All Firms are advised that, pursuant to N.J.S.A. 19:44A-20.27, it is their responsibility to file an annual disclosure statement with the New Jersey Election Law Enforcement Commission ("ELEC") if, during the calendar year, they receive a contract(s) in excess of $50,000 from public entities, including Camden County and Camden County Technical Schools Board of Education. It is the firm's responsibility to determine if such filing is necessary. Additional information on this requirement is available from ELEC at 888-313-3532.

8. SECURITY FOR FAITHFUL PERFORMANCE

8.1 Simultaneously with its delivery of the executed contract, the successful bidder shall deliver to the Camden County Technical Schools Board of Education an executed bond in the amount of one hundred percent (100%) of the accepted bid as security for the faithful performance of this contract and for the payment of all persons performing labor or furnishing materials in connection therewith, prepared in the form of contract bond attached hereto and having a surety thereon such surety company or companies as are acceptable on bonds approved by the Camden County Technical Schools Board of Education, and as are authorized to transact business in this State.

8.2 In the event the successful bidder chooses to supply a Letter of Credit in lieu of the performance bond required by Section 8.1 above, said Letter of Credit shall be delivered to the Camden County Technical Schools Board of Education simultaneously with the delivery of the executed contract. The Letter of Credit shall be for the full amount of the bid and shall conform to the terms set forth in the terms of Letter of Credit in these specifications. **This Letter of Credit option is not available on construction projects exceeding $100,000. Such projects require a Performance Bond. See N.J.S.A. 40A:11-22.**

9. INSURANCE REQUIREMENTS

(Where applicable the following insurance requirements shall apply).

9.1 Workers Compensation and Employer's Liability Insurance

This insurance shall be maintained in force during the life of the contract and shall cover all employees engaged in the performance of the contract. This insurance shall comply with all applicable statutes and regulations. Minimum Employer's Liability insurance of $500,000.00.

9.2 General Liability Insurance

This insurance shall have limits of not less than $1,000,000.00 per occurrence and $3,000,000.00 aggregate for bodily injury and property damage and shall be maintained in force during the life of the contract.

9.3 Builders Risk Insurance

This insurance shall cover all building construction, reconstruction, alteration, or related work and shall have limits of not less than the agreed completed value of the project. The coverage shall be written on a replacement cost basis and a copy of such policy shall be provided to the Camden County Technical Schools Board of Education before construction commences. Coverage shall remain in force until a certificate of occupancy has been issued.

9.4 Automobile Liability Insurance

This insurance shall cover the Contractor for claims arising from owned, hired and non-owned vehicles and shall have limits of not less than $1,000,000.00 per occurrence for bodily injury and property damage. Coverage shall be maintained in force during the life of the contract.

9.5 Insurance Requirements for Subcontractors

On any construction, reconstruction, alteration, or similar project, the Contractor shall require each Subcontractor to carry insurance coverage equal to or exceeding the type and level of coverage required to be carried by the Contractor. This coverage shall be in addition to the coverage carried by the Contractor.

9.6 Certificates of the Required Insurance

Certificates for the above listed insurance shall be submitted along with the signed contract as evidence that such insurance is in force and shall name **the Camden County Technical Schools Board of Education and the County of Camden as additional insured.** The notice to proceed and/or purchase order will not be issued by the Camden County Technical Schools Board of Education until the certificate of insurance is provided with the signed contract. Such coverage shall be with acceptable insurance companies operating on an admitted basis in the State of New Jersey.

9.7 Cancellation

Certificates for the above-listed insurance shall contain a provision that coverage afforded under the policies will not be cancelled without at least thirty (30) days prior written notice to the Camden County Technical Schools Board of Education.

10. INDEMNIFICATION

10.1 The contractor shall assume all risk of and responsibility for, and agrees to indemnify, defend, and save harmless the Camden County Technical Schools Board of Education and its officials and employees from and against any and all claims, demands, suits, actions, recoveries, judgments and costs and expenses in connection therewith on account of the loss of life, property or injury or damage to the person, body or property of any person or persons whatsoever, which shall arise from or result directly or indirectly from the work and/or materials supplied under this contract. This indemnification obligation is not limited by but is in addition to the insurance obligations contained in this agreement.

11. AWARD

11.1 Award of contract will be made by the Camden County Technical Schools Board of Education within sixty (60) days after the bid opening or within the time allowed by law.

11.2 Upon award of the contract, appropriate documents shall be forwarded to the successful bidder. N.J.S.A. 40A:11-24(b) requires the contract to be signed by all parties within the time set forth in the specifications, which shall not exceed twenty-one (21) days, Sundays and holidays excepted, after the making of the award. At the expiration of such time, the Camden County Technical Schools Board of Education may elect to award the bid to the next lowest responsible bidder and accept as liquidated damages the bid security.

12. QUANTITIES

12.1 Quantities shown are approximate and the Board reserves the right to increase or decrease them to the extent of twenty percent (20%) at the unit price bid. If the number of units in the total is less than ten (10), the Camden County Technical Schools Board of Education shall have the right to increase or decrease the quantity to not more than ten (10) or less than one at same unit price. Such change, however, will only be upon the written order of the Camden County Technical Schools Board of Education.

13. PREVAILING WAGE ACT / CERTIFIED PAYROLL SUBMISSIONS

13.1 Pursuant to N.J.S.A. 34:11-56.25 et seq., P.L. 2009, c.249, and as amended, successful bidders on projects for public work shall adhere to all requirements of the New Jersey Prevailing Wage Act.

13.2 The contractor on any public works project for the Camden County Technical Schools Board of Education shall be required to submit a certified payroll record to the Business Administrator. Such certified payroll record must be submitted within ten (10) days of the payment of the wages. The contractor is also responsible for obtaining and submitting all subcontractors' certified payroll records within the aforementioned time period. The contractor shall submit said certified payrolls in the form set forth in N.J.A.C. 12:60 Appendix A. It will be the contractor's responsibility to obtain any additional copies of the certified payroll form to be submitted by contacting the Office of Administrative Law, CN 049, Trenton, New Jersey 08625 or the New Jersey Department of Labor, Division of Workplace Standards.

14. METHOD OF AWARD

14.1 For goods and services contracts the Camden County Technical Schools Board of Education may award the work based on the lowest responsible Base Bid or may elect to award the work based on the line items or unit prices, whichever is in the best interest of the Camden County Technical Schools Board of Education.

14.2 For construction contracts, the Camden County Technical Schools Board of Education will award the contract to the lowest responsible bidder whose base bid is the lowest.

14.3 If Alternates are provided for in the bid and the Camden County Technical Schools Board of Education determines it has sufficient funds to award some or all of the Alternates, the lowest responsible Base Bid combined with such Alternates as selected will be awarded until a net amount is reached which is within the funds available. Alternate(s) may also be deferred and awarded at a later date in the sole discretion of the Camden County Technical Schools Board of Education. **The cost of any Alternate(s) included in the bid shall not be combined with the Base Bid for purposes of determining the lowest responsible bidder for award of contract.**

15. TERM OF CONTRACT

15.1 The term of the contract to be awarded as the result of this bid shall be for one (1) year from the date of execution of the agreement unless otherwise stated.

16. TERMINATION

16.1 The Camden County Technical Schools Board of Education may terminate the agreement for any reason upon thirty (30) days written notice to the contractor. The Camden County Technical Schools Board of Education shall only be responsible for payment up to the effective date of termination.

17. AMERICAN GOODS AND PRODUCTS TO BE USED WHERE AVAILABLE

17.1 Pursuant to N.J.S.A. 40A:11-18, only manufactured and farm products of the United States wherever available, shall be used in the execution of the work or supply of goods as specified herein.

18. AVAILABILITY OF FUNDS

18.1 Pursuant to N.J.S.A. 40A:11-15 any contract resulting from this bid shall be subject to the availability and appropriation of sufficient funds annually.

19. PURCHASING FROM STATE CONTRACT

19.1 The Camden County Technical Schools Board of Education reserves the right to purchase, during the term of any contract to be awarded, any of the specified materials and/or services through the New Jersey State Cooperative Purchasing Agreement (State Contract) if it is in the Camden County Technical Schools Board of Education 's best interest to do so.

20. BRAND NAMES AND/OR PRODUCT DESCRIPTION

20.1 Pursuant to N.J.S.A. 40A:11-13, brand names and/or descriptions used in this specification for bid proposal are to acquaint prospective bidders with the type of equipment (or commodity) described and will be used as a standard by which alternate or competitive materials offered will be judged. Competitive items must be equal to the standard described and be of the same reputation for quality and workmanship. Variations between the equipment described and material offered are to be fully explained by the bidder in an accompanying letter. In the absence of any changes by the bidder, it will be presumed and required that materials as described in these specifications be delivered.

It is recognized that no two pieces of equipment and no two products are engineered or designed the same. Trade names, brand names and models specified herein are provided to establish a minimum standard of quality acceptable to the Camden County Technical Schools Board of Education for this bid. Substitute brands, makes and models shall be considered and reviewed based on its ability to perform the specified tasks or provide the same quality of goods as specified in the Camden County Technical Schools Board of Education 's bid. This is known as an "Equivalent".

If the bidder seeks to provide an Equivalent product or good, the bidder shall with its bid, submit specifications or cut sheets for such proposed Equivalent product or good. The Camden County Technical Schools Board of Education 's Architect/Engineer, or specifications writer, for the bid shall review the submission provided by the bidder to determine whether the product or good is an Equivalent to the bid specification. The Camden County Technical Schools Board of Education 's Architect/Engineer or specifications writer shall have the final decision on whether a bidder's submitted product specifications are an Equivalent to the named product(s) or good(s) in the bid.

21. WORKER AND COMMUNITY RIGHT TO KNOW

21.1 The successful bidder shall comply with all provisions of the Worker and Community Right to Know Act, N.J.S.A. 34:5A-1 et seq., as well as the regulations under the Act (N.J.A.C. 8:59-1.1 et seq.).

22. COOPERATIVE PRICING

22.1 If this bid is being issued under the **Camden County Cooperative Pricing System, System Identifier No. 57-CCCPS**, then each bidder must read the **Rules and Instructions for Bids Under the Camden County Cooperative Pricing System** attached hereto and indicate on **Exhibit L** whether its bid proposal is extended or not extended to registered system members (other agencies) by checking the appropriate box.

IMPORTANT NOTICE: A bidder's failure to complete Exhibit L in the case of a bid for the Camden County Cooperative Pricing System shall be deemed to be an extension of prices by that bidder to registered system members (other agencies).

23. BIDS FOR THE PURCHASE OF TEXTILES AND ITEMS OF APPAREL

In accordance with Resolution No. 55 of the Camden County Board of Commissioners adopted on May 21, 1998, the following terms and conditions shall apply to all bids for the purchase of textiles and/or items of apparel:

23.1 Disclosure of all subcontractors and sites

Each bidder shall set forth in **Exhibit M** of its bid response the name and address of each subcontractor to be used in the provision of the goods or services which are the subject of this bid. Additionally, each bidder shall set forth in **Exhibit M** of its bid the name and address of all locations, including subcontractor locations, substantially involved in the production of the goods or services which are the subject of this bid. Such information shall be considered public information.

23.2 Certification of Compliance.

Bidders shall certify in **Exhibit M** that each location, including subcontractor locations, substantially involved in producing or distributing such goods meet the following standards:

a. Compensation. Wage and benefit levels must be sufficient to meet basic needs and provide some discretionary income for a family of 4 (a "living wage"). For employment within the United States, this shall mean wages of at least $7 per hour in 1997 dollars, along with affordable family health benefits and company-paid pension benefits typical of responsible employers.

b. Rights. The company respects workers' rights to speak up about working conditions without fear of retaliation, and to form unions of their own choosing without employer resistance. Due process and just cause procedures are used for discipline or discharge. The company complies with all laws, regulations, and ILO standards governing the workplace. The company does not use child labor, forced labor, or corporal punishment. The company does not discriminate in hiring, promotion or compensation based on race, national origin, religion, gender, sexual preference, union affiliation, or political affiliation.

c. Safety and Health. The company provides a safe and healthy work environment.

23.3 Correction and remediation of violations; Proof of compliance

The County may, at its discretion, require correction and remediation of violations of the standards listed above prior to renewing commerce with the contractor. The County may require further proof of compliance with the aforementioned standards. Upon the County's request, the contractor or subcontractor shall make all relevant records available to the County or its designee.

24. COMPLIANCE WITH PUBLIC WORKS CONTRACTOR REGISTRATION ACT

The bidder shall comply with The Public Works Contractor Registration Act, P.L. 1999, c. 238 on all bids for public works as defined in the law. Proof of compliance with this law, when applicable, must be submitted prior to award of contract. The bidder and its named specialty trade sub-contractor(s) listed in Exhibit N (see below), shall provide proof of compliance prior to award of contract or bid will be rejected as non-compliant. Questions regarding this law may be directed to the New Jersey Department of Labor and Workforce Development, Contractor Registration Unit at 609-292-9464. The Camden County Technical Schools Board of Education **strongly recommends that each bidder provide its public works contractor registration certificate (and certificates for each Exhibit N subcontractor) with submission of bids.**

25. REQUEST FOR TAXPAYER IDENTIFICATION NUMBER AND CERTIFICATION

Upon execution of the contract with the Camden County Technical Schools Board of Education, the successful bidder shall be required to complete and submit IRS Form W-9, Request For Taxpayer Identification Number And Certification to the Camden County Technical Schools Board of Education's Division of Accounts Payable, 343 Cross Keys Road, Building No. 12 Administration, Sicklerville, New Jersey 08081. This requirement shall only apply to the successful bidder. Failure by the successful bidder to meet this requirement shall result in the Camden County Technical Schools Board of Education withholding such funds as required by IRS regulations.

26. BIDS FOR CONSTRUCTION/DISCLOSURE OF SUBCONTRACTORS

26.1 Definition of Construction Bid.

"Construction" means construction, alteration or repair of any public building when the entire cost of the work will exceed the bid threshold. In addition to construction bids, the Camden County Technical Schools Board of Education specifically requires that bidders identify all subcontractors in specialty trade categories for all bids where such specialty trades may be required (see below and Section 35).

26.2 Disclosure of Subcontractors.

a. Bidders must list in **Exhibit N**, all subcontractors that they intend to use in the specialty trade categories of: Plumbing and Gas Fitting, and All Kindred Work; Steam Power Plants, Steam and Hot Water Heating and Ventilating Apparatus, and All Kindred Work; Electrical Work; and Structural Steel and Ornamental Iron Work, as required to be listed by N.J.S.A. 40A:11-16. **FAILURE TO LIST THESE REQUIRED SUBCONTRACTORS SHALL BE CAUSE FOR REJECTION OF BID.** Bidders with questions regarding this process should consult their counsel.

b. Substitution of subcontractors shall be permitted only in cases of impossibility, e.g., the death of the subcontractor or where the subcontractor goes out of business.

c. The bidder's proposal will be rejected if the subcontractors listed do not comply with the requirements for the designated work tasks.

d. A general contractor that intends to utilize a specific subcontractor to perform work in one or more of the above-referenced specialty trade categories set forth in N.J.S.A. 40A:11-16 (See **Exhibit N**), shall provide the required information about that subcontractor in the appropriate spaces for each specialty trade category applicable to the contract.

A general contractor that intends to perform work in one or more of the above-referenced specialty trade categories set forth in N.J.S.A. 40A:11-16 (See **Exhibit N**) through the use of its own employees or the general contractor himself rather than through utilization of a subcontractor shall write the word "In-House" next to each applicable category and then insert the name, and the license number where required, of each such employee of the general contractor or the general contractor himself in the appropriate spaces for each specialty trade category applicable to the contract.

If the contract does not involve any of the above-referenced specialty trade categories set forth in N.J.S.A. 40A:11-16, the contractor shall insert the word "None" in each appropriate space provided.

e. If the bidder proposes to perform **plumbing, gas fitting and all kindred work** with its own personnel, it shall follow the requirements of N.J.S.A. 45:14C-1 et seq. and N.J.A.C. 13:32-1.1 et seq.

f. If the bidder proposes to perform **electrical work** with its own personnel, it shall follow the requirements of N.J.S.A. 45:5A-1 et seq. and N.J.A.C. 13:31-1.1 et seq.

27. SIGNIFICANT PUBLIC WORKS PROJECTS

By Resolution No. 71 adopted June 17, 2004, the Board of Chosen Freeholders of the County of Camden (Board) set the following bid specification requirements for significant County public works projects:

a. "Significant Public Works Project" means construction, reconstruction, demolition, alteration, or repair work, or maintenance work, including painting and decorating, done under contract and paid for in whole or in part out of Camden County funds which equal or exceed the sum of $25,000.00, which sum shall be adjusted in accordance with the bid threshold provision of N.J.S.A. 40A:11-3 as amended from time to time.

b. All bids on significant public works projects shall include an apprenticeship program in the appropriate trade(s), registered in the State of New Jersey, with the United States Department of Labor, Bureau of Apprenticeship and Training or contain a statement of agreement not to employ any worker of less than journeyman status on the project; and

c. A detailed statement of compliance shall be completed by the bidder and the specialty trade subcontractors set forth in Paragraph 26 above and identified in Exhibit N and submitted as a material requirement of the bid for the bid to be accepted. This statement shall be made in **Exhibit O**. Additionally, the successful bidder must submit a detailed statement of compliance as set forth in **Exhibit O** for **all other subcontractors** prior to the commencement of work by said subcontractors.

d. The County of Camden may refuse to award a contract to a person or entity submitting a bid or proposal if that person or entity has filed or submitted false information or failed to file or submit the information required by Resolution No. 71 adopted by the Board on June 17, 2004. The County may require further proof of compliance with the standards set forth above. Upon request, the contractor shall make all relevant records available to the County or its designee.

28. NO DAMAGES FOR DELAY

Extension of the contract time shall be the sole remedy of the Contractor for any: (1) delay in the commencement, prosecution or completion of the work; (2) hindrance or obstruction in the performance of the work; (3) loss of productivity; or (4) other similar claims whether or not such delays are foreseeable, unless such delay is due to the Camden County Technical Schools Board of Education's negligence, bad faith, active interference, tortious conduct or other reasons uncontemplated by the parties that delay the contractor's performance, in accordance with the provisions of N.J.S.A. 40A:11-16.7. The aforementioned shall apply to any contract awarded as the result of this bid including but not limited to contracts for construction, goods, or services.

29. ALTERNATIVE DISPUTE RESOLUTION

For construction contracts, as defined in N.J.S.A. 40A:11-50, disputes arising under the contract shall be submitted to mediation or non-binding arbitration pursuant to industry standards prior to being submitted to a court for adjudication.

30. COMPLIANCE WITH THE AMERICANS WITH DISABILITIES ACT

The successful bidder shall comply with the mandatory language of the Americans With Disabilities Act as set forth in **Exhibit P** attached hereto.

31. COMPLIANCE WITH CONTRACTOR BUSINESS REGISTRATION PROGRAM

Pursuant to N.J.S.A. 52:32-44, Camden County Technical Schools Board of Education is prohibited from entering into a contract with an entity unless the bidder/proposer/contractor, and each subcontractor that is required by law to be named in a bid/proposal/contract has a valid Business Registration Certificate on file with the Division of Revenue and Enterprise Services within the Department of the Treasury.

Prior to contract award or authorization, the contractor shall provide the Contracting Agency with its proof of business registration and that of any named subcontractor(s).

Subcontractors named in a bid or proposal shall provide proof of business registration to the bidder, who in turn, shall provide it to the Contracting Agency prior to the time of contract, purchase order, or other contracting document is awarded or authorized.

During the course of contract performance:

(1) The contractor shall not enter into a contract with a subcontractor unless the subcontractor first provides the contractor with a valid proof of business registration.

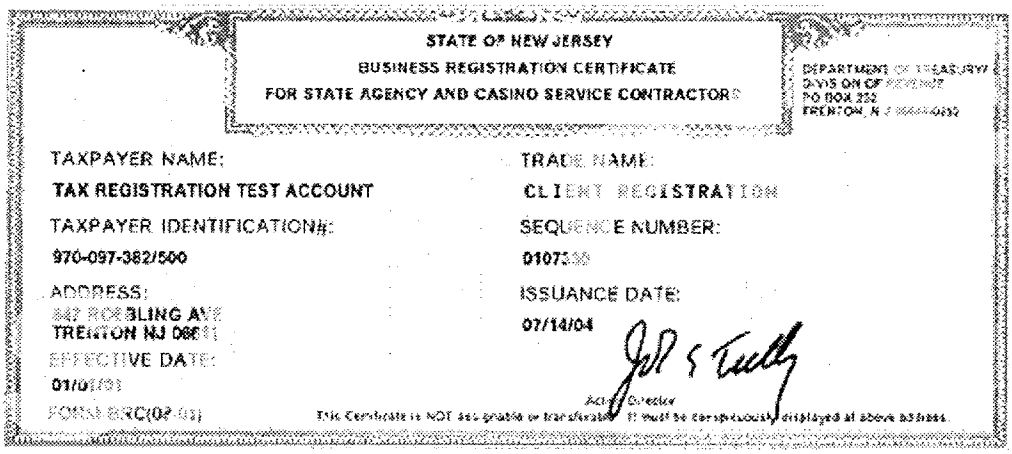
(2) The contractor shall maintain and submit to the Contracting Agency a list of subcontractors and their addresses that may be updated from time to time.

(3) The contractor and any subcontractor providing goods or performing services under the contract, and each of their affiliates, shall collect and remit to the Director of the Division of Taxation in the Department of Treasury, the use tax due pursuant to the Sales and Use Tax Act, (N.J.S.A. 54:32B-1 et seq.) on all sales of tangible personal property delivered in the State. Any questions in this regard can be directed to the Division of Taxation at (609) 292-6400. Form NJ-REG can be filed online at www.state.nj.us/treasury/revenue/busregcert.shtml.

Before final payment is made under the contract, the contractor shall submit to the Contracting Agency a complete and accurate list of all subcontractors used and their addresses.

Pursuant to N.J.S.A. 54:49-4.1, a business organization that fails to provide a copy of a business registration as required, or that provides false business registration information, shall be liable for a penalty of $25 for each day of violation, not to exceed $50,000, for each proof of business registration not properly provided under a contract with a contracting agency.

The Camden County Technical Schools Board of Education strongly recommends that each bidder provide its BRC (and BRC's for each subcontractor) with submission of bids.



STATE OF NEW JERSEY
BUSINESS REGISTRATION CERTIFICATE
FOR STATE AGENCY AND CASINO SERVICE CONTRACTORS

DEPARTMENT OF TREASURY
DIVISION OF REVENUE
PO BOX 252
TRENTON, NJ

TAXPAYER NAME:
TAX REGISTRATION TEST ACCOUNT

TRADE NAME:
CLIENT REGISTRATION

TAXPAYER IDENTIFICATION#:
970-097-382/500

SEQUENCE NUMBER:
0107

ADDRESS:
847 ROEBLING AVE
TRENTON NJ 0861

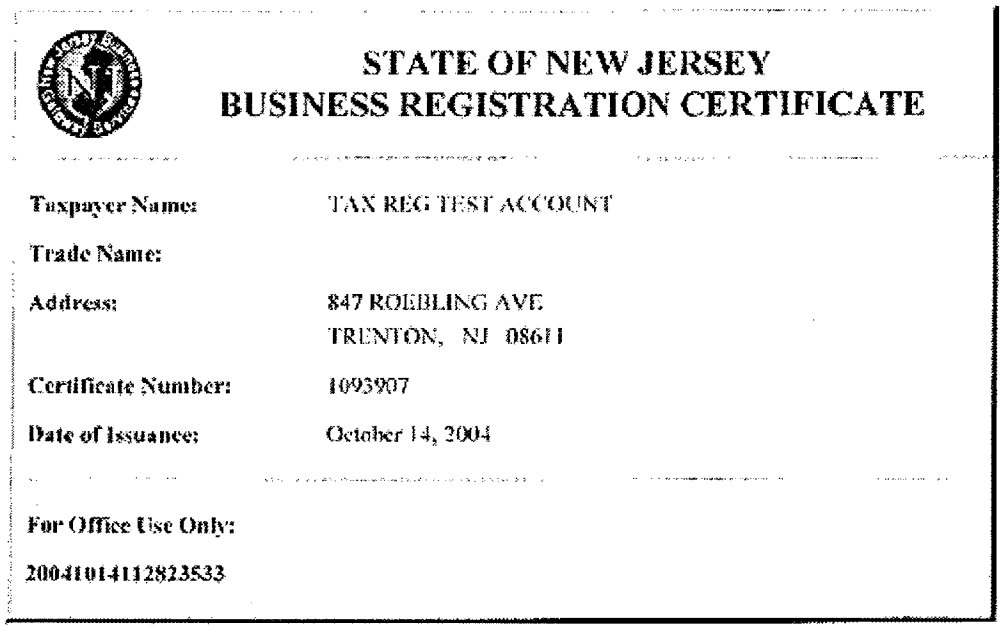
ISSUANCE DATE:
07/14/04

EFFECTIVE DATE:
01/01/

FORM BRC(02-04)

Acting Director

This Certificate is NOT assignable or transferable. It must be conspicuously displayed at above address.



STATE OF NEW JERSEY
BUSINESS REGISTRATION CERTIFICATE

Taxpayer Name: TAX REG TEST ACCOUNT

Trade Name:

Address: 847 ROEBLING AVE
TRENTON, NJ 08611

Certificate Number: 1093907

Date of Issuance: October 14, 2004

For Office Use Only:

20041014112823533

32. ACKNOWLEDGEMENT OF RECEIPT OF ADDENDA

The bidder shall complete, sign and return with bid **Exhibit Q** attached hereto. Form must be completed and returned with bid regardless of whether addenda were issued by the Camden County Technical Schools Board of Education.

33. UNIFORMED LAW ENFORCEMENT OFFICERS REQUIREMENT FORM

Pursuant to N.J.S.A. 40A:11-23.1(c) if uniformed law enforcement officers are required for the project, **Exhibit R** will be completed by the County and indicate a good faith estimate of the total cost of traffic control personnel, vehicles, equipment, administrative, or any other costs associated with additional traffic control requirements as determined by the County with input from any other public entity affected by the project. These estimated amounts reflect those costs above and beyond the bidder's traffic control costs.

34. APPROVAL AND CERTIFICATION OF BILLING

Authorization for payment of periodic billing, final payments or retainage monies requires approval and certification by formal resolution of the Camden County Technical Schools Board of Education. Pursuant to P.L. 2006, c. 96, all billing amounts due under a contract with the successful bidder and all required purchasing documents must be received at least ten (10) days in advance of the next scheduled public meeting of the Board of Education for the month in which payment is requested. Approved and certified amounts due will be paid during the Camden County Technical Schools Board of Education's subsequent payment cycle.

35. PROPRIETARY GOODS

_____ County to Check if applicable

If checked off above, the goods set forth in the technical specifications have been certified as proprietary goods in accordance with the Local Public Contracts Law, N.J.S.A. 40A:11-1 et seq. No substitutions or equivalents will be accepted. Please see the technical specifications attached hereto.

36. CONTRACTS WHERE ASPHALT WORK IS INCLUDED IN SPECIFICATIONS

P.L. 2015, c.201 requires the inclusion of a pay item for an asphalt price adjustment for any bid specification that includes the purchase or use of hot mix asphalt; provides for application of a fuel price adjustment where a pay item is eligible (see NJDOT Section 160.03.01, where applicable); for contracts issued for more than 1,000 tons, requires the price adjustment pay item be applied to each ton of hot mix asphalt purchased and used, not just the tonnage exceeding the 1,000 ton threshold; clarifies that the term "hot mix asphalt" includes equivalent asphalt cement-based products (e.g. warm mix asphalt); prohibits disaggregation of quantities to avoid compliance with P.L. 2015, c.201.

37. Pursuant to N.J.S.A. 40A:11-16.6, all construction contracts issued by the Camden County Technical Schools Board of Education when the total price of the originally awarded contract equals or exceed $5,000,000.00, shall allow for value engineering construction change orders to be approved after the award of the contract.

38. PERMISSION FOR BIDDER TO WITHDRAW A PUBLIC WORKS BID DUE TO A MISTAKE IN CERTAIN CIRCUMSTANCES

Effective March 4, 2011, N.J.S.A. 40A:11-23.3 authorizes a bidder to request withdrawal of a **public works bid** due to a mistake on the part of the bidder. A mistake is defined by N.J.S.A. 40A:11-2(42) as a clerical error that is an **unintentional and substantial computational error** or **an unintentional omission of a substantial quantity of labor, material, or both, from the final bid computation.**
A bidder claiming a mistake under N.J.S.A. 40A:11-23.3 must submit a request for withdrawal, **in writing,** by certified or registered mail to the Camden Technical Schools Board Secretary, 343 Berlin Cross Keys Road, Sicklerville, New Jersey, 08081-4000. Written requests must be provided within five business days after the receipt and opening of the bids. The bid withdrawal shall be effective as of the postmark of the certified or registered mailing.

A bidder's request to withdraw the bid shall contain evidence, including any pertinent documents, demonstrating that a mistake was made. Such documents and relevant written information **shall** be reviewed and evaluated by the public owner's designated staff pursuant to the statutory criteria of N.J.S.A. 40A:11-23.3.

The Camden Technical Schools Board Secretary, 343 Berlin Cross Keys Road, Sicklerville, New Jersey, 08081-4000 will not consider any written request for a bid withdrawal for a mistake as defined by N.J.S.A. 40A:11-2(42), by a bidder in the preparation of a bid proposal unless the postmark of the certified or registered mailing is within five business days following the opening of bids.

If a bidder is granted a bid withdrawal, the bidder shall be disqualified from future bidding on the same project, including whenever all bids are rejected pursuant to N.J.S.A. 40A:11-13.2

39. N.J.A.C. § 17:44-2.2 AUTHORITY TO AUDIT OR REVIEW CONTRACT RECORDS

(a) Relevant records of private vendors or other persons entering into contracts with covered entities are subject to audit or review by OSC pursuant to N.J.S.A. 52:15C-14(d).

(b) The contract partner shall maintain all documentation related to products, transactions or services under this contract for a period of five years from the date of final payment. Such records shall be made available to the New Jersey Office of the State Comptroller upon request."

40. NEW JERSEY ANTI-DISCRIMINATION PROVISIONS: N.J.S.A. 10:2-1 et seq.

If awarded a contract, the contractor agrees to abide by the New Jersey anti-discrimination provisions contained in N.J.S.A. 10:2-1 et seq. See Exhibit T.

END OF INSTRUCTIONS TO BIDDERS / EXHIBITS BEGIN ON NEXT PAGE

EXHIBIT A
FORM OF BID BOND

A. We, the undersigned

_____ as Principal and

_____ as Surety, are hereby held and firmly bound unto

_____ in the penal sum of _____Dollars

($_____), lawful money of the United States for the payment of which well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns. Signed this _____ day of _____, 20 _____.

B. THE CONDITION of the above obligation is such that whereas the Principal has submitted to the_____,
a certain bid attached hereto and hereby made a part of hereto and hereby made a part of hereof, to enter into a contract in writing for the (insert type of work)
_____.

C. **NOW THEREFORE:**

If said bid shall be rejected, or in the alternate, if said bid shall be accepted and the Principal shall execute and deliver a contract in the form of Agreement required by the Bid Documents and for the payment of all persons performing labor or furnishing materials in connection therewith, and shall in all respects perform the agreement created by the acceptance of said bid. Then this obligation shall be void, otherwise the same shall remain in force and effect, it being expressly understood and agreed that the liability of the surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

D. THE SURETY for value received, hereby stipulates and agrees that the obligations of said Surety and its bond shall in no way be impaired or affected by an extension of the time within the "OBLIGEE" may accept such bid. And said Surety does hereby waive notice of any such extension.

E. IN WITNESS, WHEREOF, the Principal and the Surety have hereunto set their hands and seals, and such of them as corporations have caused their corporate seals to be hereto fixed and these presents to be signed by their proper officers, the day and year set forth above.

_____(L.S.)
PRINCIPAL

_____
SURETY

(SEAL)

_____
BY

NOTE: **Bid Bond must be signed by an authorized agent or representative of a surety company and not by the individual or company submitting the bid.**

EXHIBIT B

FORM OF CONSENT OF SURETY

BOND NO._____
(INSERT YOUR BOND NO. HERE)

The _____, a Corporation organized and
(NAME OF YOUR INSURANCE COMPANY)

existing under the laws of the State of _____,

and licensed to do business in the State of New Jersey, hereby consents and agrees that if the

contract for: _____ (INSERT BID NO.)

_____AND ITEMS
WHICH YOU ARE BIDDING).

be awarded to _____.
(NAME OF YOUR COMPANY)

the undersigned Corporation agrees with the said Camden Technical Schools Board of Education, 343 Berlin Cross Keys Road, Sicklerville, NJ 08081-4000 to execute the final bond as required by the specifications and to become the surety in the full amount of the price bid for the faithful performance of the contract.

In Witness, Whereof, the undersigned Corporation has caused this agreement to be signed by its duly authorized representative and its Corporate Seal to be hereto affixed this_____ day of _____, 20 ____.

The_____
(NAME OF INSURANCE COMPANY)

By _____
(ATTORNEY-IN-FACT)

Countersigned by:

NOTE: **Consent of Surety must be signed by an authorized agent or representative of a surety company and not by the individual or company submitting the bid.**

EXHIBIT C

FORM OF PERFORMANCE BOND
(to be executed by the successful bidder)

We, the Undersigned

_____

as Principal, and_____

_____

a Corporation organized and existing under the laws of the State of_____ and authorized to do business in the State of New Jersey as surety are held and firmly bound unto _____hereinafter called the Owner as hereinafter set forth, in the full and just several sums of

(a)_____

_____Dollars ($_____)
for faithful performance of the contract as hereinafter designated in Paragraph "A" and

(b)_____

_____Dollars ($_____)
for payment of labor and material as hereinafter designated in Paragraph "B" and

(c)_____

_____Dollars ($_____)
for maintenance as hereinafter designated in Paragraph "C"; lawful money of the United States of America; to be paid to the Owner, or its Assigns, to which payment well and truly to be made and done, we bind ourselves, our heirs, executors, administrators and successors, jointly and severally, firmly by these presents.

Sealed with our respective seals and dated this _____day of _____, 20 .

WHEREAS, the above bonded Principal has entered into a contract with the

Owner dated the _____day of _____, 20

for_____

_____

upon certain terms and conditions in said contract more particularly mentioned; and

WHEREAS, it is one of the conditions of the award of the Owner pursuant to which said contract is about to be entered into, that these presents be executed.

(Form of Performance Bond – continued)

NOW, THEREFORE, THE CONDITIONS OF THIS OBLIGATION ARE SUCH:

A. That if the Principal shall faithfully perform the contract on its part to be performed according to the terms of said contract, or any changes or modifications therein made as therein provided; and shall indemnify and save harmless the party of the first part mentioned in the contract aforesaid, its officers, agents and servants, and each and every one of them against and from all suits and costs of every kind and description and from all damages which the said party of the first part in said contract mentioned, or any of its officers, agents or servants may be put by reason of injury to the person or property of others resulting from the performance of said work or through the negligence of the said party of the second part to said contract, or through any improper or defective machinery, implements or appliances used by the said party of the second part in the aforesaid work or through any act or omission on the part of the said party of the second part of its agents, servants or employees, and shall further indemnify and save harmless the party of the first part mentioned in the contract aforesaid its officers, agents and servants from all suits and actions of any kind or character whatsoever, which may be brought or instituted by any subcontractor, materialman or laborer who has performed work or furnished materials in or about the work required to be done pursuant to the said contract or by or on account of, any claims or amount recovered for any infringement of patent, trademark, or copyright; then this part of this obligation designated as part "A" shall be void; otherwise the same shall remain in full force and effect, it being expressly understood and agreed that the liability of the surety for any and all claims hereunder shall in no event exceed the penal amount of this obligation as herein stated.

B. That if the said Principal shall pay all lawful claims of subcontractors, materialmen, laborers, persons, firms or corporations for labor performed or materials, provisions, provender or other supplies or items, fuels, oils, implements or machinery furnished, used or consumed in the carrying forward, performing or completing of said contract; we agreeing and assenting that this undertaking shall be for the benefit of any subcontractor, materialman, laborer, person, firm or corporation having a just claim, as well as for the obligee herein; whether or not the said material and labor enter into and become component parts of the work or improvement or in any amendment, extension or addition to said contract, then this part of this obligation designated part "B", shall be void, otherwise the same shall remain in full force and effect.

C. That if the said Principal shall well and truly keep and perform all the obligations, agreements, terms, and conditions of such contract, on the Principal's part to be kept and performed and said Principal shall be responsible for poor workmanship done or poor materials furnished under said contract for a period of one year from the date of the completion and final acceptance by the party of the first part and mentioned in the contract, and said Principal shall pay for all labor performed and furnished and for all materials used in correcting any poor workmanship done and replacing any poor materials furnished, then this part of this obligation designated part "C", shall be void; otherwise the same shall remain in full force and effect.

It is further agreed that any alterations which may be made in the terms of the contract or in the work to be done or materials to be furnished or labor to be supplied or performed under it or the giving by the Owner of any extension of time for the performance of the Contract or the reduction of the retained percentages as permitted by the Contract or any other forbearance on the part of either the Owner or the Principal to the other, shall not in any way release the Principal and the Surety or Sureties or either or any of them, their heirs, executors, administrators, successors or assigns, from their liability hereunder, notice to the Surety or Sureties of any alterations, extension or forbearance being hereby waived.

(Form of Performance Bond – continued)

It is further agreed that in case of default in, and/or any action arising out of rights and liabilities secured by this obligation or any part hereto or any person claiming by or through it, either may use for the purpose of establishing its, or their claim, a copy of this obligation certified by the Owner, and the action, or actions, if any, arising on the within bond, shall not be a bar to any subsequent action that may arise through any liability incurred in any other action herein and based upon any other part of this obligation.

IN WITNESS, WHEREOF, the said Principal and Surety have duly executed this bond under their seals the day and year above written.

If Principal is an individual:

Witness:

_____ By_____(SEAL)

_____
Surety

_____ By_____
Attorney-in-fact
(Corporate Seal)

If Principal is a partnership:

Witness:

_____
Principal

_____ _____(SEAL)
Partner

_____ _____(SEAL)
Partner

_____
Surety

By_____
Attorney-in-fact
(Corporate Seal)

(Form of Performance Bond – continued)

If Principal is a corporation:
Attest:

_____
Secretary

_____
Principal

By_____
President

Corporate Seal:
Attest:

_____

_____

_____

By_____
Attorney-in-fact
(Corporate Seal)

Approved as to Form_____,20_____

_____
Business Administrator/Board Secretary

EXHIBIT D
SAMPLE FORM OF TERMS OF LETTER OF CREDIT

1. **AMOUNT:** The amount of this letter of credit shall be for the sum of _____.
(Amount of Contract)

2. **TERM:** The term of this letter of credit shall be in effect and irrevocable for a period commencing on the date of execution of the agreement between the Camden Technical Schools Board of Education, 343 Berlin Cross Keys Road, Sicklerville, NJ 08081-4000 and_____.
(Name of Contractor)

and terminating one (1) year after the date of completion and final acceptance by the Camden Technical Schools Board of Education of the work performed pursuant to Camden Technical Schools Board of Education Bid No.: _____.
(Bid No. and description of services/material to be provided)

3. **CAUSES FOR PROCEEDING AGAINST LETTER OF CREDIT:** The Camden Technical Schools Board of Education shall have the absolute right to proceed against this letter of credit if:

(a) Contractor shall fail to faithfully perform according to the terms of the contract and Camden County Technical Schools Board of Education Bid No._____, or any changes or modifications therein made as therein provided; or Contractor shall fail to indemnify and save harmless the Camden Technical Schools Board of Education, its officers, agents and servants, and each and every one of them against and from all suits and costs of every kind and description and from all damages which the Camden Technical Schools Board of Education, or any of its officers, agents or servants may be put by reason of injury to the person or property of others resulting from the performance of said work or through the negligence of Contractor, or through any improper or defective machinery, implements or appliances used by contractor in the aforesaid work or through any act or omission on the part of Contractor, its agents, servants or employees; or contractor shall fail to further indemnify and save harmless the Camden Technical Schools Board of Education, its officers, agents and servants from all suits and actions of any kind or character whatsoever, which may be brought or instituted by any subcontractors, materialman or laborer who has performed work or furnished materials in or about the work required to be done pursuant to said contract, or by or on account of, any claims or amount recovered for any infringement of patent, trademark, or copyright; or

_____
(Name of Bank)

agreeing and assenting that this undertaking shall be for the benefit of any subcontractor, materialman, laborer, person, firm or corporation having a just claim, as well as for the Camden County Technical Schools Board of Education, whether or not the said material and labor enter into and become component parts of the work or improvement or in any amendment, extension or addition to said contract; or

(b) Contractor shall fail to pay all lawful sums of subcontractors, materialman, laborers, persons, firms or corporations for labor performed or materials, provisions, provender or other supplies or teams, fuels, oils, implements or machinery furnished, used or consumed in the carrying forward, performing or completing of said contract; or

(c) Contractor shall fail to well and truly keep and perform all the obligations, agreements, terms and conditions of such contract, on its part to be kept and performed and Contractor shall be responsible for poor workmanship done or poor materials furnished under said contract for a period of one (1) year from the date of the completion and final acceptance by the Camden County Technical Schools Board of Education, and Contractor shall pay for all labor performed and furnished and for all materials used in correcting any poor workmanship done and replacing any poor materials furnished.

It is further agreed that any alterations which may be made in the terms of the contract or in the work to be done or materials to be furnished or labor to be supplied or performed under it or the giving by the Camden County Technical Schools Board of Education of any extension of time for the performance of the contract shall not in any way release Contractor, its heirs, executors, administrators, successors or assigns, from its liability hereunder.

NOTE: **Letter of Credit must be signed by an authorized agent or representative of a bank or similar financial institution and not by the individual or company submitting the bid.**

EXHIBIT E
STATEMENT OF OWNERSHIP DISCLOSURE

N.J.S.A. 52:25-24.2 (P.L. 1977, c.33, as amended by P.L. 2016, c.43)

This statement shall be completed, certified to, and included with all Bid and Competitive Contracting RFP submissions. Failure to submit the required information is cause for automatic rejection of the bid or proposal.

Name of Organization: _____

Organization Address: _____

Part I **Check the box that represents the type of business organization:**

☐Sole Proprietorship (skip Parts II and III, execute certification in Part IV)

☐Non-Profit Corporation (skip Parts II and III, execute certification in Part IV)

☐For-Profit Corporation (any type) ☐Limited Liability Company (LLC)

☐Partnership ☐Limited Partnership ☐Limited Liability Partnership (LLP)

☐Other (be specific): _____

Part II

☐ The list below contains the names and **HOME addresses** of all individual stockholders in the corporation who own 10 percent or more of its stock, of any class, or of all individual partners in the partnership who own a 10 percent or greater interest therein, or of all members in the limited liability company who own a 10 percent or greater interest therein. (**COMPLETE THE LIST BELOW IN THIS SECTION**)

OR

☐ No one stockholder in the corporation owns 10 percent or more of its stock, of any class, or no individual partner in the partnership owns a 10 percent or greater interest therein, or no member in the limited liability company owns a 10 percent or greater interest therein. (**SKIP TO PART IV**)

(Please attach additional sheets if more space is needed):

Name of Individual or Business Entity	Must list Home Address for Individuals

Part III DISCLOSURE OF 10% OR GREATER OWNERSHIP IN THE STOCKHOLDERS, PARTNERS OR LLC MEMBERS LISTED IN PART II

If a bidder has a direct or indirect parent entity which is publicly traded, and any person holds a 10 percent or greater beneficial interest in the publicly traded parent entity as of the last annual federal Security and Exchange Commission (SEC) or foreign equivalent filing, ownership disclosure can be met by providing links to the website(s) containing the last annual filing(s) with the federal Securities and Exchange Commission (or foreign equivalent) that contain the name and address of each person holding a 10% or greater beneficial interest in the publicly traded parent entity, along with the relevant page numbers of the filing(s) that contain the information on each such person. **Attach additional sheets if more space is needed**.

Website (URL) containing the last annual SEC (or foreign equivalent) filing	Page #'s

Please list the names and **HOME addresses** of each stockholder, partner or member owning a 10 percent or greater interest in any corresponding corporation, partnership and/or limited liability company (LLC) listed in Part II **other than for any publicly traded parent entities referenced above**. The disclosure shall be continued until names and addresses of every noncorporate stockholder, and individual partner, and member exceeding the 10 percent ownership criteria established pursuant to N.J.S.A. 52:25-24.2 has been listed. **Attach additional sheets if more space is needed.**

Stockholder/Partner/Member and Corresponding Entity Listed in Part II	Home Address (for Individuals) Business Address (for Corporate Entity)

Part IV Certification

I, being duly sworn upon my oath, hereby represent that the foregoing information and any attachments thereto to the best of my knowledge are true and complete. I acknowledge: that I am authorized to execute this certification on behalf of the bidder/proposer; that **Camden County Technical Schools Board of Education** is relying on the information contained herein and that I am under a continuing obligation from the date of this certification through the completion of any contracts with **Camden County Technical Schools Board of Education** to notify **Camden County Technical Schools Board of Education** in writing of any changes to the information contained herein; that I am aware that it is a criminal offense to make a false statement or misrepresentation in this certification, and if I do so, I am subject to criminal prosecution under the law and that it will constitute a material breach of my agreement(s) with **Camden County Technical Schools Board of Education** permitting **Camden County Technical Schools Board of Education** to declare any contract(s) resulting from this certification void and unenforceable.

Full Name (Print):		Title:	
Signature:		Date:	

EXHIBIT F

NON-COLLUSION AFFIDAVIT

STATE OF)
COUNTY OF)

I, of the City of in the County of,

and the State of of full age, being dully sworn according to law on my oath depose and say that: I am of the firm of the bidder making this Proposal for the above named project, and that I executed the said Proposal with full authority to do so; that said bidder had not, directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free, competitive bidding in connection with the above named project; and that all statements contained in said Proposal and in this affidavit are true and correct, and made with full knowledge that the State of New Jersey relies upon the truth of the statements contained in said Proposal and in the statements contained in this affidavit in awarding the contract for the said project.

I further warrant that no person or selling agency has been employed or retained to solicit or secure such contract upon an agreement or understanding for a commission, percentage, brokerage or contingent fee, except bona fide employees or bona fide established commercial or selling agencies maintained by_____ (N.J.S.A. 52:34-15)

(Name of Contractor)

Subscribed and sworn to
before me this _____ day
of _____, 20__

_____
Notary Public

_____
(Also type or print name of bidder under signature)

EXHIBIT G

MANDATORY EQUAL EMPLOYMENT OPPORTUNITY LANGUAGE
N.J.S.A. 10:5-31 et seq. (P.L. 1975, C. 127)
N.J.A.C. 17:27

GOODS, PROFESSIONAL SERVICE AND GENERAL SERVICE CONTRACTS

During the performance of this contract, the contractor agrees as follows:

The contractor or subcontractor, where applicable, will not discriminate against any employee or applicant for employment because of age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex. Except with respect to affectional or sexual orientation and gender identity or expression, the contractor will ensure that equal employment opportunity is afforded to such applicants in recruitment and employment, and that employees are treated during employment, without regard to their age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex. Such equal employment opportunity shall include, but not be limited to the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the Public Agency Compliance Officer setting forth provisions of this nondiscrimination clause.

The contractor or subcontractor, where applicable will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex.

The contractor or subcontractor will send to each labor union, with which it has a collective bargaining agreement, a notice, to be provided by the agency contracting officer, advising the labor union of the contractor's commitments under this chapter and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

The contractor or subcontractor, where applicable, agrees to comply with any regulations promulgated by the Treasurer pursuant to N.J.S.A. 10:5-31 et seq., as amended and supplemented from time to time and the Americans with Disabilities Act.

The contractor or subcontractor agrees to make good faith efforts to meet targeted Camden Technical Schools Board of Education employment goals established in accordance with N.J.A.C. 17:27-5.2.

The contractor or subcontractor agrees to inform in writing its appropriate recruitment agencies including, but not limited to, employment agencies, placement bureaus, colleges, universities, and labor unions, that it does not discriminate on the basis of age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex, and that it will discontinue the use of any recruitment agency which engages in direct or indirect discriminatory practices.

The contractor or subcontractor agrees to revise any of its testing procedures, if necessary, to

assure that all personnel testing conforms with the principles of job-related testing, as established by the statutes and court decisions of the State of New Jersey and as established by applicable Federal law and applicable Federal court decisions.

In conforming with the targeted employment goals, the contractor or subcontractor agrees to review all procedures relating to transfer, upgrading, downgrading and layoff to ensure that all such actions are taken without regard to age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex, consistent with the statutes and court decisions of the State of New Jersey, and applicable Federal law and applicable Federal court decisions.

The contractor shall submit to the public agency, after notification of award but prior to execution of a goods and services contract, one of the following three documents:

1. Letter of Federal Affirmative Action Plan Approval

2. Certificate of Employee Information Report

3. Employee Information Report Form AA302 (electronically provided by the Division and distributed to the public agency through the Division's website at www.state.nj.us/treasury/contract_compliance)

The contractor and its subcontractors shall furnish such reports or other documents to the Division of Purchase & Property, CCAU, EEO Monitoring Program as may be requested by the office from time to time in order to carry out the purposes of these regulations, and public agencies shall furnish such information as may be requested by the Division of Public Contracts Equal Employment Opportunity Compliance for conducting a compliance investigation pursuant to N.J.A.C. 17:27-1.1 et seq.

EXHIBIT H

MANDATORY EQUAL EMPLOYMENT OPPORTUNITY LANGUAGE
N.J.S.A. 10:5-31 et seq. (P.L. 1975, C. 127)
N.J.A.C. 17:27

CONSTRUCTION CONTRACTS

During the performance of this contract, the contractor agrees as follows:

The contractor or subcontractor, where applicable, will not discriminate against any employee or applicant for employment because of age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex. Except with respect to affectional or sexual orientation and gender identity or expression, the contractor will ensure that equal employment opportunity is afforded to such applicants in recruitment and employment, and that employees are treated during employment, without regard to their age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex. Such equal employment opportunity shall include, but not be limited to the following: employment, up-grading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the Public Agency Compliance Officer setting forth provisions of this nondiscrimination clause.

The contractor or subcontractor, where applicable will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex.

The contractor or subcontractor will send to each labor union, with which it has a collective bargaining agreement, a notice, to be provided by the agency contracting officer, advising the labor union or workers' representative of the contractor's commitments under this act and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

The contractor or subcontractor, where applicable, agrees to comply with any regulations promulgated by the Treasurer, pursuant to N.J.S.A. 10:5-31 et seq., as amended and supplemented from time to time and the Americans with Disabilities Act.

When hiring or scheduling workers in each construction trade, the contractor or subcontractor agrees to make good faith efforts to employ minority and women workers in each construction trade consistent with the targeted employment goal prescribed by N.J.A.C. 17:27-7.2; provided, however, that the Division may, in its discretion, exempt a contractor or subcontractor from compliance with the good faith procedures prescribed by the following provisions, A, B and C, as long as the Dept. of LWD, Construction EEO Monitoring Program is satisfied that the contractor or subcontractor is employing workers provided by a union which provides evidence, in accordance with standards prescribed by the Dept. of LWD, Construction EEO Monitoring Program, that its percentage of active "card carrying" members who are minority and women workers is equal to or greater than the targeted employment goal established in accordance with N.J.A.C. 17:27-7.2. The contractor or subcontractor agrees that a good faith effort shall include compliance with the following procedures:

(A) If the contractor or subcontractor has a referral agreement or arrangement with a union for a construction trade, the contractor or subcontractor shall, within three business days of the contract award, seek assurances from the union that it will cooperate with the contractor or subcontractor as it fulfills its affirmative action obligations under this contract and in accordance with the rules promulgated by the Treasurer pursuant to N.J.S.A. 10:5-31 et. seq., as supplemented and amended from time to time and the Americans with Disabilities Act. If the contractor or subcontractor is unable to obtain said assurances from the construction trade union at least five business days prior to the commencement of construction work, the contractor or subcontractor agrees to afford equal employment opportunities minority and women workers directly, consistent with this chapter. If the contractor's or subcontractor's prior experience with a construction trade union, regardless of whether the union has provided said assurances, indicates a significant possibility that the trade union will not refer sufficient minority and women workers consistent with affording equal employment opportunities as specified in this chapter, the contractor or subcontractor agrees to be prepared to provide such opportunities to minority and women workers directly, consistent with this chapter, by complying with the hiring or scheduling procedures prescribed under (B) below; and the contractor or subcontractor further agrees to take said action immediately if it determines that the union is not referring minority and women workers consistent with the equal employment opportunity goals set forth in this chapter.

(B) If good faith efforts to meet targeted employment goals have not or cannot be met for each construction trade by adhering to the procedures of (A) above, or if the contractor does not have a referral agreement or arrangement with a union for a construction trade, the contractor or subcontractor agrees to take the following actions:

(1) To notify the public agency compliance officer, the Dept. of LWD, Construction EEO Monitoring Program, and minority and women referral organizations listed by the Division pursuant to N.J.A.C. 17:27-5.3, of its workforce needs, and request referral of minority and women workers;

(2) To notify any minority and women workers who have been listed with it as awaiting available vacancies;

(3) Prior to commencement of work, to request that the local construction trade union refer minority and women workers to fill job openings, provided the contractor or subcontractor has a referral agreement or arrangement with a union for the construction trade;

(4) To leave standing requests for additional referral to minority and women workers with the local construction trade union, provided the contractor or subcontractor has a referral agreement or arrangement with a union for the construction trade, the State Training and Employment Service and other approved referral sources in the area;

(5) If it is necessary to lay off some of the workers in a given trade on the construction site, layoffs shall be conducted in compliance with the equal employment opportunity and non-discrimination standards set forth in this regulation, as well as with applicable Federal and State court decisions;

(6) To adhere to the following procedure when minority and women workers apply or are referred to the contractor or subcontractor:

(i) The contactor or subcontractor shall interview the referred minority or women worker.

(ii) If said individuals have never previously received any document or certification signifying a level of qualification lower than that required in order to perform the work of the construction trade, the

contractor or subcontractor shall in good faith determine the qualifications of such individuals. The contractor or subcontractor shall hire or schedule those individuals who satisfy appropriate qualification standards in conformity with the equal employment opportunity and non-discrimination principles set forth in this chapter. However, a contractor or subcontractor shall determine that the individual at least possesses the requisite skills, and experience recognized by a union, apprentice program or a referral agency, provided the referral agency is acceptable to the Dept. of LWD, Construction EEO Monitoring Program. If necessary, the contractor or subcontractor shall hire or schedule minority and women workers who qualify as trainees pursuant to these rules. All of the requirements, however, are limited by the provisions of (C) below.

(iii) The name of any interested women or minority individual shall be maintained on a waiting list and shall be considered for employment as described in (i) above, whenever vacancies occur. At the request of the Dept. of LWD, Construction EEO Monitoring Program, the contractor or subcontractor shall provide evidence of its good faith efforts to employ women and minorities from the list to fill vacancies.

(iv) If, for any reason, said contractor or subcontractor determines that a minority individual or a woman is not qualified or if the individual qualifies as an advanced trainee or apprentice, the contractor or subcontractor shall inform the individual in writing of the reasons for the determination, maintain a copy of the determination in its files, and send a copy to the public agency compliance officer and to the Dept. of LWD, Construction EEO Monitoring Program.

(7) To keep a complete and accurate record of all requests made for the referral of workers in any trade covered by the contract, on forms made available by the Dept. of LWD, Construction EEO Monitoring Program and submitted promptly to the Dept. of LWD, Construction EEO Monitoring Program upon request.

(C) The contractor or subcontractor agrees that nothing contained in (B) above shall preclude the contractor or subcontractor from complying with the union hiring hall or apprenticeship policies in any applicable collective bargaining agreement or union hiring hall arrangement, and, where required by custom or agreement, it shall send journeymen and trainees to the union for referral, or to the apprenticeship program for admission, pursuant to such agreement or arrangement. However, where the practices of a union or apprenticeship program will result in the exclusion of minorities and women or the failure to refer minorities and women consistent with the targeted Camden Technical Schools Board of Education employment goal, the contractor or subcontractor shall consider for employment persons referred pursuant to (B) above without regard to such agreement or arrangement; provided further, however, that the contractor or subcontractor shall not be required to employ women and minority advanced trainees and trainees in numbers which result in the employment of advanced trainees and trainees as a percentage of the total workforce for the construction trade, which percentage significantly exceeds the apprentice to journey worker ratio specified in the applicable collective bargaining agreement, or in the absence of a collective bargaining agreement, exceeds the ratio established by practice in the area for said construction trade. Also, the contractor or subcontractor agrees that, in implementing the procedures of (B) above, it shall, where applicable, employ minority and women workers residing within the geographical jurisdiction of the union.

After notification of award, but prior to signing a construction contract, the contractor shall submit to the public agency compliance officer and the Dept. of LWD, Construction EEO Monitoring Program an initial project workforce report (Form AA 201) electronically provided to the public agency by the Dept. of LWD, Construction EEO Monitoring Program, through its website, for distribution to and completion by the contractor, in accordance with N.J.A.C. 17:27-7. The contractor also agrees to submit a copy of the Monthly Project Workforce Report once a month thereafter for the duration of

this contract to the Division and to the public agency compliance officer.

The contractor agrees to cooperate with the public agency in the payment of budgeted funds, as is necessary, for on-the-job and/or off-the-job programs for outreach and training of minorities and women.

(D) The contractor and its subcontractors shall furnish such reports or other documents to the Dept. of LWD, Construction EEO Monitoring Program as may be requested by the Dept. of LWD, Construction EEO Monitoring Program from time to time in order to carry out the purposes of these regulations, and public agencies shall furnish such information as may be requested by the Dept. of LWD, Construction EEO Monitoring Program for conducting a compliance investigation pursuant to N.J.A.C. 17:27-1.1 et seq.

EXHIBIT I

QUESTIONNAIRE ON SUPPLY/SERVICE CONTRACTS

Please complete this questionnaire and submit it with your bid. Any necessary forms will be sent to you by the Camden County Technical Schools Board of Education upon award.

1. Our Company has a Federal Affirmative Action Plan Approval.

   YES_____ NO_____

   A. If yes, submit a photostatic copy of said approval.

   B. If no, submit a photostatic copy of the New Jersey Certificate of Employee Information Report.

   NONE OF THE ABOVE_____

2. We have neither State nor Federal Affirmative Action evidence. Please send us Form AA-302 (Affirmative Action Employee Information Report application). (Check if applicable _____).

I certify that the above information is correct to the best of my knowledge.

NAME: _____

SIGNATURE: _____

TITLE: _____

DATE: _____

AN EQUAL OPPORTUNITY EMPLOYER

EXHIBIT J

AFFIRMATIVE ACTION PLAN MBE/WBE TRACKING FORM

Definitions:

A **Minority Business Enterprise (MBE)** is defined in the Camden County Affirmative Action Plan as "a business which is independently owned and operated and is at least 51% owned and controlled by minority group members". Minority group members are defined in the Camden County Affirmative Action Plan as "persons who are Black, Hispanic, Portuguese, Asian-American, American Indian or Alaskan Natives"

A **Women Business (WBE)** is defined in the Camden County Affirmative Action Plan as "a business which is independently owned and operated and is at least 51% owned and controlled by women".

Using the definitions above, please check the following space which best describes your firm:

_____ **Minority Business Enterprise (MBE)**

_____ **Women Business Enterprise (WBE)**

_____ **Neither**

EXHIBIT K

CERTIFICATION REGARDING DEBARMENT & SUSPENSION AND OTHER RESPONSIBILITY MATTERS

This certification is required by the regulations implementing Executive Order 12549, Debarment and Suspension, 29 CFR Part 98, Section 98.510, titled Participants' Responsibilities. The Regulations were published as Part VII of the May 26, 1988 Federal Register (pages 19160-19211).

The prospective primary participant certifies to the best of his / her knowledge and belief, that its principals:

a. Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any federal department or agency;

b. Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offence in connection with obtaining, attempting to obtain, or performing a public (federal, state, or local) transaction or contract under a public transaction; violation of federal or state antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction or records, making false statements, or receiving stolen property;

c. Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (federal, state, or local) with commission of any of the offenses enumerated in paragraph (b) of this certification;

d. Have not within a three-year period preceding this application / proposal had one or more public transactions (federal, state, or local) terminated for cause of default.

e. Acknowledge that all sub-contractors selected for this project must be in compliance with paragraphs (1) (a – d) of this certification.

_____ _____

Name and Title of Authorized Agent Date

_____

Signature of Authorized Agent

_____ I am unable to certify to the above statements. My explanation is attached.

INSTRUCTIONS FOR CERTIFICATION

1. By signing and submitting this certification, the contracting firm is providing the certification as set out below.

2. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the contracting firm knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government and/or State Government, the Camden County Technical Schools Board of Education. may pursue available remedies including suspension and/or debarment.

3. The contracting firm shall provide immediate written notice to the Camden County Technical Schools Board of Education. if at any time, it learns that its certification was erroneous when submitted or has become erroneous because of changed circumstances.

4. The terms "covered transaction", "debarred", "suspended", "ineligible", "lower tier covered transaction", "participant", "person", "primary covered transaction", "principal", and "voluntarily excluded", as used in this clause, have the meanings set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact the Camden County Technical Schools Board of Education. for assistance in obtaining a copy of those regulations.

5. The contracting firm agrees by submitting this certification that, should the covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction.

6. The contracting firm further agrees by submitting this certification that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transaction," without modification, in all subcontracts to this agreement as authorized by the Camden County Technical Schools Board of Education.

EXHIBIT L

EXTENSION OF PRICES TO REGISTERED SYSTEM MEMBERS (OTHER AGENCIES)

The undersigned is further:
(ONE BOX ONLY MUST BE CHECKED)

☐ WILLING to provide the item(s) herein bid upon to registered system members of the **Camden County Cooperative Pricing System, System Identifier No. 57-CCCPS**, without substitution or deviation from specifications, size, features, quality, price or availability as herein set forth. It is understood that orders will be placed directly by the registered members identified herein by separate contract, subject to the overall terms of the Master Contract to be awarded by the County of Camden, and that no additional service or delivery charges will be allowed except as permitted by these specifications.

☐ NOT WILLING to extend prices to registered system members of the **Camden County Cooperative Pricing System, System Identifier No. 57-CCCPS**, who have submitted estimates as described above. It is understood that this will not adversely affect consideration of this bid with respect to the needs of Camden County as the Lead Agency.

EXHIBIT M

DISCLOSURE OF SUBCONTRACTORS AND SITES AND CERTIFICATION OF COMPLIANCE

(FOR BIDS FOR TEXTILES AND/OR ITEMS OF APPAREL ONLY)

1. DISCLOSURE OF SUBCONTRACTORS AND SITES – SEE PARAGRAPH 23.1

a. List the name and address of each subcontractor to be used in the provision of the goods or services which are the subject of this bid. If extra space is required, please attach additional pages as needed.

_____

_____

_____

_____

_____

b. List the name and address of all locations, including subcontractor locations, substantially involved in the production of the goods or services which are the subject of this bid. If extra space is required, please attach additional pages as needed.

_____

_____

_____

_____

2. CERTIFICATION OF COMPLIANCE – SEE PARAGRAPH 23.2

I hereby certify that each of the above-referenced locations, including subcontractor locations, substantially involved in producing or distributing the goods or services which are the subject of this bid, meet the standards set forth in Paragraph 23.2 of these specifications.

_____
(Signature)

_____
(Type Name & Title)

_____
(Date)

EXHIBIT N

BIDS FOR CONSTRUCTION
DISCLOSURE OF SUBCONTRACTORS

Please list the subcontractors for the specialty trade categories listed below. If you intend to perform the work through your own employees or by yourself rather than through utilization of a subcontractor, write the word "In-House" next to each applicable category and insert the name, and license number where required, of each person in the appropriate spaces. If the contract does not involve a specialty trade listed below, write the word "None" in the appropriate space. For further instructions, see Paragraph 26 herein. **DO NOT LEAVE ANY SPACE BLANK.**

1. **Plumbing and Gas Fitting and All Kindred Work:**

   Name: _____
   Address: _____

   License Number: _____

2. **Steam Power Plants, Steam and Hot Water Heating and Ventilating Apparatus, and All Kindred Work:**

   Name: _____
   Address: _____

   License Number: Not Applicable

3. **Electrical Work:**

   Name: _____
   Address: _____

   License Number: _____

4. **Structural Steel and Ornamental Iron Work:**

   Name: _____
   Address: _____

   License Number: Not Applicable

EXHIBIT O

AFFIDAVIT OF COMPLIANCE WITH INSTRUCTIONS TO BIDDERS PARAGRAPH 27 – SIGNIFICANT PUBLIC WORKS PROJECTS

NOTE: THE BIDDER AND EACH SPECIALTY TRADE SUBCONTRACTOR AS DEFINED IN PARAGRAPHS 26 & 27 ABOVE MUST EACH COMPLETE A SEPARATE AFFIDAVIT TO BE SUBMITTED WITH THE BID. ALL OTHER SUBCONTRACTORS MUST EACH COMPLETE THIS FORM PRIOR TO COMMENCING WORK. USE AS MANY COPIES OF THIS AFFIDAVIT FORM AS NECESSARY. Must be submitted with the bid or bid will be deemed noncompliant. Failure to submit required Exhibit O(s) is a material defect causing the bid to be rejected.

STATE OF NEW JERSEY:

SS:

COUNTY OF CAMDEN:

The undersigned, of full age, being duly sworn according to law, upon his oath, deposes and says:

1. I have read the specifications for this bid, including Instructions To Bidders, Paragraph 27 – Significant Public Works Projects, and I am aware that Camden County has adopted a resolution establishing workforce standards for significant public works projects. **I am aware that these workforce standards make the following a material requirement of this bid:**

All workers employed on this significant public works project, whether employees of the contractor or any subcontractor, shall have the benefit of the availability of an apprentice training program in the appropriate trade(s), registered in the State of New Jersey, with the United States Department of Labor, Bureau of Apprenticeship and Training.

2. **You MUST choose one of the following:**

a. _____My company has an apprentice training program in the appropriate trade(s), registered in the State of New Jersey, with the United States Department of Labor, Bureau of Apprenticeship and Training. The registration number for this apprentice training program is NJ (or other State) # _____ ; or

b. _____My company will not employ any worker of less than journeyman status on this project.

Note: Camden County Technical Schools Board of Education will monitor the worksite to ensure compliance with this material provision and may, in its sole discretion, terminate the contract of any company found to be in violation.

Sworn to and Subscribed

before me this day

of , 20____.

_____ _____

NOTARY PUBLIC MY SIGNATURE

_____

MY NAME (PRINT OR TYPE)

_____

COMPANY NAME

EXHIBIT P

AMERICANS WITH DISABILITIES ACT
Mandatory Language

Equal Opportunity for Individuals with Disabilities.

The Contractor and the Camden County Technical Schools Board of Education do hereby agree that the provisions of Title II of the Americans With Disabilities Act of 1990 (the "Act") (42 U.S.C. s12101 et seq.), which prohibits discrimination on the basis of disability by public entities in all services, programs, and activities provided or made available by public entities, and the rules and regulations promulgated pursuant thereunto, are made a part of this contract. In providing any aid, benefit, or service on behalf of the Camden County Technical Schools Board of Education pursuant to this contract, the Contractor agrees that the performance shall be in strict compliance with the Act. In the event that the Contractor, its agents, servants, employees, or subcontractors violate or are alleged to have violated the Act during the performance of this contract, the Contractor shall defend the Camden County Technical Schools Board of Education in any action or administrative proceeding commenced pursuant to this Act. The Contractor shall indemnify, protect, and save harmless the Camden County Technical Schools Board of Education, its agents, servants, and employees from and against any and all suits, claims, losses, demands, or damages of whatever kind or nature arising out of or claimed to arise out of the alleged violation. The Contractor shall, at its own expense, appear, defend, and pay any and all charges for legal services and any and all costs and other expenses arising from such action or administrative proceeding or incurred in connection therewith. In any and all complaints brought pursuant to the Camden County Technical Schools Board of Education's grievance procedure, the Contractor agrees to abide by any decision of the Camden Technical Schools Board of Education, which is rendered pursuant to, said grievance procedure. If any action or administrative proceeding results in an award of damages against the Camden County Technical Schools Board of Education or if the Camden County Technical Schools Board of Education incurs any expense to cure a violation of the ADA which has been brought pursuant to its grievance procedure, the Contractor shall satisfy and discharge the same at its own expense.

The Camden County Technical Schools Board of Education shall, as soon as practicable after a claim has been made against it, give written notice thereof to the Contractor along with full and complete particulars of the claim. If any action or administrative proceeding is brought against the Camden County Technical Schools Board of Education or any of its agents, servants, and employees, the Camden County Technical Schools Board of Education shall expeditiously forward or have forwarded to the Contractor every demand, complaint, notice, summons, pleading, or other process received by the Camden County Technical Schools Board of Education or its representatives.

It is expressly agreed and understood that any approval by the Camden County Technical Schools Board of Education of the services provided by the Contractor pursuant to this contract will not relieve the Contractor of the obligation to comply with the Act and to defend, indemnify, protect, and save harmless the Owner pursuant to this paragraph.

It is further agreed and understood that the Owner assumes no obligation to indemnify or save harmless the Contractor, its agents, servants, employees and subcontractors for any claim which may arise out of their performance of this agreement. Furthermore, the Contractor expressly understands and agrees that the provisions of this indemnification clause shall in no way limit the Contractor's obligations assumed in this agreement, nor shall they be construed to relieve the Contractor from any liability, nor preclude the Owner from taking any other actions available to it under any other provisions of this agreement or otherwise at law.

EXHIBIT Q

CAMDEN COUNTY TECHNICAL SCHOOLS BOARD OF EDUCATION

ACKNOWLEDGEMENT OF RECEIPT OF ADDENDA

BIDDER REQUIRED TO COMPLETE AND RETURN FORM WITH BID REGARDLESS OF WHETHER ADDENDA WAS ISSUED.
FAILURE TO COMPLETE AND RETURN FORM IS A FATAL DEFECT WHICH CANNOT BE CURED AND BID WILL BE REJECTED.

A. Bidder hereby acknowledges receipt of the following Addenda:

Addendum Number	Dated	Initial
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

OR:

B. Bidder acknowledges to the best of his/her knowledge no addendum has been issued by the Camden County Technical Schools Board of Education: _____ Dated _____ Initial _____

Bidder is required to complete, sign and submit form with bid regardless of whether addenda were issued. Failure to complete and return form is a fatal defect which cannot be cured and bid will be rejected. See: N.J.S.A. 40A:11-23.2

By: _____
(Print or Type Name of Authorized Individual)

Signature: _____

Title: _____

EXHIBIT R

COUNTY OF CAMDEN
UNIFORMED LAW ENFORCEMENT OFFICERS REQUIRMENT

Pursuant to N.J.S.A. 40A:11-23.1(c), the County has determined the following:

( ) Uniformed law enforcement officers **are not required** for the project.

( ) Uniformed law enforcement officers **are required** for the project.

Reasonable estimate of costs for the following:

traffic control personnel	$ _____
vehicles	$ _____
equipment	$ _____
administrative	$ _____
other (specify)	
_____	$ _____
_____	$ _____
_____	$ _____
_____	$ _____
Total costs	$ _____

The above costs associated with additional traffic control required by the County have been reasonably estimated in cooperation and consultation with the following municipalities affected by the project.

Name of Municipality	Contact person
_____	_____
_____	_____
_____	_____
_____	_____

EXHIBIT S
DISCLOSURE OF INVESTMENT ACTIVITIES IN IRAN
PART 1: CERTIFICATION

BIDDERS/PROPOSERS COMPLETE PART 1 BY CHECKING EITHER BOX. THE COMPLETED AND SIGNED CERTIFICATION MUST BE PROVIDED PRIOR TO AWARD OF CONTRACT.

Pursuant to N.J.S.A. 40A:11-2.1(a), citing N.J.S.A. 52:32-55, any person or entity that submits a bid or proposal or otherwise proposes to enter into or renew a contract must complete the certification below to attest, under penalty of perjury, that neither the person or entity, nor any of its parents, subsidiaries, or affiliates, is identified on the Department of Treasury's Chapter 25 list (N.J.S.A. 51:32-57) as a person or entity engaging in investment activities in Iran. The Chapter 25 list is found on the Division's website at: http://www.state.nj.us.treasury/purchase/pdf/Chapter25List.pdf

Bidders **must** review this list prior to completing the below certification. **A completed certification must be provided prior to the award of contract.** If the Director finds a person or entity to be in violation of law, s/he shall take action as may be appropriate and provided by law, rule or contract, including but not limited to, imposing sanctions, seeking compliance, recovering damages, declaring the party in default and seeking debarment or suspension of the party.

PLEASE CHECK THE APPROPRIATE BOX:

☐ **I certify, pursuant to N.J.S.A. 52:32-55, that neither the bidder listed above nor any of the bidder's parents, subsidiaries, or affiliates is listed** on the N.J. Department of the Treasury's list of entities determined to be engaged in prohibited activities in Iran pursuant to the statute and the Chapter 25 List. I further certify that I am the person listed above, or I am an officer or representative of the entity listed above and am authorized to make this certification on its behalf. I will skip Part 2 and sign and complete the Certification below.

OR

☐ **I am unable to certify as above because the bidder and/or one or more of its parents, subsidiaries, or affiliates is listed on the Department's Chapter 25 List. I will provide a detailed, accurate and precise description of the activities in Part 2 below and sign and complete the Certification below.** Failure to provide such prior to award of contract will render the proposal as non-responsive and appropriate penalties, fines and/or sanctions will be assessed as provided by law.

PART 2: PLEASE PROVIDE FURTHER INFORMATION RELATED TO INVESTMENT ACTIVITIES IN IRAN - add additional sheets if necessary.

You must provide a detailed, accurate and precise description of the activities of the bidding person/entity, or one of its parents, subsidiaries or affiliates, engaging in the investment activities in Iran outlined above by completing below:

Name of Entity: _____; Relationship to Bidder: _____

Description of
Activities: _____

_____

_____

Duration of Engagement: _____Anticipated Cessation Date: _____

Bidder/Offeror Contact Name: _____; Contact Phone: _____

Sign Certification - next page

EXHIBIT S - continued

DISCLOSURE OF INVESTMENT ACTIVITIES IN IRAN

BIDDER: _____

Certification:

I, being duly sworn upon my oath, hereby represent that the foregoing information and any attachments thereto to the best of my knowledge are true and complete. I acknowledge that I am authorized to execute this certification on behalf of the bidder, that the Camden County Technical Schools Board of Education is relying on the information contained herein and that I am under a continuing obligation from the date of this certification through the completion of any contracts with the Camden County Technical Schools Board of Education to notify the Camden County Technical Schools Board of Education in writing of any changes to the information contained herein; that I am aware that it is a criminal offense to make a false statement or misrepresentation in this certification, and if I do so, I am subject to criminal prosecution under the law and that it will constitute a material breach of my agreement(s) with the Camden County Technical Schools Board of Education, permitting the Camden County Technical Schools Board of Education to declare any contract(s) resulting from this certification void and unenforceable.

Full Name (Print): _____

Signature: _____

Title: _____

Date: _____

EXHIBIT T

NEW JERSEY ANTI-DISCRIMINATION PROVISIONS
N.J.S.A. 10:2-1 et seq.

Pursuant to N.J.S.A. 10:2-1, if awarded a contract, the contractor agrees that:

a. In the hiring of persons for the performance of work under this contract or any subcontract hereunder, or for the procurement, manufacture, assembling or furnishing of any such materials, equipment, supplies or services to be acquired under this contract, no contractor, nor any person acting on behalf of such contractor or subcontractor, shall, by reason of race, creed, color, national origin, ancestry, marital status, gender identity or expression, affectional or sexual orientation or sex, discriminate against any person who is qualified and available to perform the work to which the employment relates;

b. No contractor, subcontractor, nor any person on his behalf shall, in any manner, discriminate against or intimidate any employee engaged in the performance of work under this contract or any subcontract hereunder, or engaged in the procurement, manufacture, assembling or furnishing of any such materials, equipment, supplies or services to be acquired under such contract, on account of race, creed, color, national origin, ancestry, marital status, gender identity or expression, affectional or sexual orientation or sex;

c. There may be deducted from the amount payable to the contractor by the contracting public agency, under this contract, a penalty of $50.00 for each person for each calendar day during which such person is discriminated against or intimidated in violation of the provisions of the contract; and

d. This contract may be canceled or terminated by the contracting public agency, and all money due or to become due hereunder may be forfeited, for any violation of this section of the contract occurring after notice to the contractor from the contracting public agency of any prior violation of this section of the contract.

No provision in this section shall be construed to prevent a board of education from designating that a contract, subcontract or other means of procurement of goods, services, equipment or construction shall be awarded to a small business enterprise, minority business enterprise or a women's business enterprise pursuant to P.L.1985, c.490 (C.18A:18A-51 et seq.).

EXHIBIT U

NEW JERSEY WORKER AND COMMUNITY RIGHT-TO-KNOW AFFIDAVIT

Contractor shall submit to Owner's representative all product information sheets in accordance with federal, state and/or local laws pertaining to hazardous materials used on the site. All documentation related to this "Right-To-Know" materials data shall be submitted two weeks prior to materials presence on site. All Contractors shall be required to submit Material Safety Data Sheets (MSDS) if requested by Engineer/Owner. All parameters that apply to the Owner shall govern the Contractors.

AHERA

All Contractors are hereby given notice that the Asbestos Hazard Emergency Response Act (AHERA), as it applies to the Owner, shall be complied with, in all respects.

The Owner has, on site for review, an AHERA Management Plan. The plan outlines the probable locations of asbestos containing materials and assumed asbestos containing materials. All Contractors are responsible for obtaining and reviewing the AHERA Management Plan, and to determine if any asbestos containing materials are located in areas of Work included in this project, whether or not indicated in the Contract Documents, and if so, to remove those materials and dispose of offsite as part of this Work, in compliance with federal, state and local regulations for removal and disposal of hazardous materials.

I, the Undersigned, have read and understand the above statements concerning the AHERA and Right-To-Know requirements.

Full Name of Contractor: _____

Business Address

_____

_____

Telephone Number ( )_____

Project Description: _____

Officer Signature: _____

Print Name: _____ **Date:**_____

Witness Signature: _____

Print Name: _____ **Date:**_____

EXHIBIT V
NO MATERIAL CHANGE OF CIRCUMSTANCES
AFFIDAVIT

I, _____ being of full age under oath depose and say:

1. I am a(n) owner, partner, shareholder or officer of the company set forth below and am duly authorized to execute this affidavit on its behalf.

2. A statement as to the financial ability, adequacy of plant and equipment, organization and prior experience of [Bidder], as required by N.J.S.A. 18A:18A-28 has been submitted to the Department of Treasury within one (1) year preceding the date of opening of bids for this contract.

3. I certify, as required by N.J.S.A. 18A:18A-32 that there has been no material adverse change in the qualification information of [Bidder] since such statement was submitted to the Department of Treasury except: _____

_____.

SEAL

_____
SIGNATURE

_____
TITLE

_____
COMPANY

Sworn to and subscribed
before me this day
of , 20____.

_____
Notary Public

State of New Jersey

DEPARTMENT OF THE TREASURY
DIVISION OF PROPERTY MANAGEMENT AND CONSTRUCTION
33 W. STATE STREET
PO BOX 034
TRENTON, NEW JERSEY 08625-0034

REPLY TO:
TEL: (609) 943-3400
FAX: (609) 292-7651

TOTAL AMOUNT OF UNCOMPLETED CONTRACTS

(This form is to be used with the NOTICE OF CLASSIFICATION when submitting bids to the Department of Education.)

I Certify that the amount of uncompleted work on contracts is $ _____ .

The amount claimed includes uncompleted portions of all currently held contracts from all sources (public and private) in accordance with N.J.A.C. 17:19-2.13.

I further certify that the amount of this bid proposal, including all outstanding incomplete contracts does not exceed my prequalification dollar limit.

Affix corporate seal here

Respectfully submitted,

By _____
Name of Firm

_____
Signature

_____
Title

_____
Business Address

_____

_____

_____
Phone

Sworn to and subscribed before me
This day of
20

Notary Public

DPMC 701 (3/15)

Supplemental Information to Bidders

1. BIDDING PROCEDURES

1.1 The district reserves the right to grant up to three (3) business days' additional time to bidders after the bid opening to provide the following documents required by the bid specifications:

(A) NJ Worker & Community Right-to-Know Act Affidavit **(Exhibit U)**

(B) Notice of Classification Form issued by the NJ Dept. of the Treasury/Division of Property Management and Construction (DPMC) (Form Furnished by the Contractor)

Such additional time may not in any way affect the price or cost of the bid. All other documents required by the bid specifications must be submitted at the time of the bid opening specified herein or in accordance with law. However, the bidders must be pre-qualified by the DPMC on the date that the bid is open.

1.2 NEW JERSEY WORKER AND COMMUNITY RIGHT TO KNOW

All containers shipped or delivered to the site in connection with this bid, shall bear a label indicating the chemical name(s) and chemical abstract service number(s) CAS number(s) of all hazardous substances in the container, and all other substances which are among the five most predominant substances in the container, or their trade secret registry number(s), pursuant to (NJAC 8:59-5). "Container" means a receptacle used to hold a liquid, solid, or gaseous substance such as bottles, bags, barrels, boxes, cans, cylinders, drums, and shipping cartons. (8:59-1.3)

NOTE: Any chemical containing products without the above "Universal Labeling" will be returned to the sender for a full refund including all shipping costs.

Construction or Renovation Contractor's NOTE: Any chemical substances that are delivered to the site to be used in connection with any construction or renovation contract shall be labeled in accordance with the N.J. Worker and Community Right to Know Laws. Failure to comply may be cause to find the Contractor in default of contract.

Pursuant to N.J.S.A. 52:32-44g, the Contractor and any Subcontractor providing goods or performing services under the Contract for work on a School Facilities Project, and each of their affiliates, shall, during the term of the Contract, collect and remit to the Director of the Division of Taxation in the Department of the Treasury the use tax on all their sales of tangible personal property delivered into the State.

1.3 SINGLE CONTRACT

Wherever reference is made to a particular contractor such as "Mechanical Contractor," "Plumbing Contractor," "Electrical Contractor," "Steel Contractor," "General Contractor," or any other contractors; it shall be synonymous with, and mean the same as, the Contractor bidding the project and who will be executing the Agreement with the Owner, and he shall be fully responsible for any and all work required to be performed, unless specifically stated "N.I.C.", "NOT IN CONTRACT", or "BY OTHERS".

1.4 The Contractor agrees to comply with all requirements imposed upon the Owner and Contractor by the New Jersey Department of Education.

1.5 Contractor Performance Evaluation: In accordance with N.J. S.A. 18A:18A-15, when the entire cost of the Project will exceed $20,000.00, the Board, through its authorized agent, shall upon the completion of the contract report to the department as to the contractor's performance, and shall also furnish such report from time to time during performance if the contractor is then in default.

1.6 District officials and / or employees are precluded from taking part in the negotiations or the awarding of contracts to companies with which they may have a financial or personal interest.

1.7 The District represents that none of its employees, and to the best of its knowledge, none of its Contracted Parties or employees of its Contracted Parties, are engaged in any conduct that would constitute a conflict of interest or a violation of the School Ethics Act.

1.8 The Contractor and its Subcontractors may be debarred, suspended or disqualified from contracting and/or working on the School Facilities Project if found to have committed any of the acts listed in N.J.A.C. 17:19-3.1 et seq and 6:20-6.7 et seq.

1.9 The Contracts awarded by the District in connection with this School Facilities Project requires that the Owner, the New Jersey State Police, the New Jersey Department of Education (Department), the New Jersey Department of Community Affairs (DCA) and the Department of Labor (DOL) and their duly authorized agents may, at their discretion and cost, investigate, audit, examine and inspect the activities, documents, work product arising from audits, records and accounts (pertaining to the School Facilities Project) of the District, the Contractor, Subcontractors and all other parties involved with the School Facilities Project. The Contractor further agrees to include in all of its contracts with subcontractors a clause incorporating the requirements of this.

1.10 The District shall keep those records and accounts and shall require all Contracted Parties including the Contractor and Subcontractors to keep those records and accounts for the School Facilities Projects as necessary in order to evidence compliance with the Public Schools Contract Law (PSCL).

1.11 The Contractor agrees to retain during the term of the Contract and for 10 years after closeout thereafter all financial records, supporting documents and other records which relate in any way to the work. If any litigation, claim or audit is commenced prior to the expiration date, such records and documents shall be retained by the Contractor until all litigation, claims or audit findings involving the records have been resolved.

2. Maintenance Bond:

The bidder to whom the contract has been awarded shall be required to provide the Owner with a two-year Maintenance Bond in the stated amount of one hundred percent (100%) of the contract amount.

Prior to the start of the guaranty period and before the final Payment is made to the Contractor, the Contractor shall provide the Owner with a Maintenance Bond in the amount of one hundred percent (100%) of the contract amount, to ensure the replacement or repair of defective materials or workmanship during the two-year guaranty period.

The cost of all bonds shall be paid for by the Contractor and shall be included as part of the Contractor's bid price.

BID FORM

DATE: _____

Bidder's Information: (Print or Type)

Company Name: _____

Contact Name: _____

Contact Email Address: _____

Company Address: _____

_____

Telephone Number: _____ Fax Number: _____

FOR: BID# 20-08: Renovations and Addition to Building #7 at
Camden County Technical Schools Gloucester Township Campus
343 Berlin Cross Keys Road
Sicklerville, New Jersey 08081

TO: Camden County Technical Schools Board of Education
Gloucester Township Campus
343 Berlin Cross Keys Road
Building No. 12 Administration
Sicklerville, New Jersey 08081

The undersigned, having familiarized themselves with the local conditions affecting the cost of the work and with the Project Manual/Specifications (including Invitation to Bid, Instructions to Bidders, this Bid, the form of Bid Bond, the Form of Agreement, the Form of Performance Bond, the General Conditions, the Supplementary General Conditions, the Technical Specifications; and the Drawings and Addenda thereto, if any, as prepared by GARRISON ARCHITECTS, located at 713 Creek Road, Bellmawr, New Jersey 08031, dated March 29, 2021) hereby proposes to furnish all labor, materials, equipment, and services required to construct and complete all work as required in the Contract Documents.

The award of the contract will be based on the TOTAL BASE BID.

A. BID AMOUNT $_____

B. PLUS CASH ALLOWANCE $ 25,000.00

TOTAL BASE BID (In Numbers)
(A+B) $_____

(In words)_____
Amount shall be shown in both words and figures. In case of discrepancy, the amount shown in words shall govern.

ALLOWANCES: The Allowance listed above is to be included in the Base Bid. Also refer to Specifications Section 01210- Allowances

Allowances:
The Allowance amount herein specified us the net amount available for purchase of materials, including taxes (if any), and, unless otherwise noted in the allowance, the installation/labor cost of any Owner approved changes that will be applied against the allowance amount. The approved amount of each allowance change will be the **net** cost only; insurance, bond, coordination, supervision, project management and overhead/profit are in the contractor's base bid. Changes will be applied to the allowance strictly at the Owner's discretion. The contractor shall provide a full credit for unused amounts remaining in the Cash Allowance to the Owner by a CREDIT Change Order

ALTERNATE: The award of the contract will be based on the base bid amount. If significant funds are available, Camden County Technical Schools reserves the right to award the Add Alternate. The Add Alternate may also be deferred and awarded at a later date in the sole discretion of the Camden County Technical Schools Board of Education. **The cost of any Alternate(s) included in the bid shall not be combined with the Base Bid for purposes of determining the lowest responsible bidder for award of contract.**

1. As part of the Base Bid provide an extension of the underground electrical service to Building #7 as indicated on the Electrical Site Plan. Alternate #1 is to provide complete new wiring (4 # 4/0, 1 # 4G, 2 ½"C) to Building #7 from the bus plug in Building #6. All wiring shall be new. Include all excavation and backfill costs in the Alternate #1 price.

   Add Alternate #1 (in numbers) $_____

   (In words)_____
   Amount shall be shown in both words and figures. In case of discrepancy, the amount shown in words shall govern.

If the Contractor fails to complete the project and each and every part and appurtenance thereof fully, entirely and in conformity with the provisions of the contract within the times stated in the contract, or within such further time as may have been granted in accordance with the provisions of the contract, then the County may withhold permanently from the Contractor's total compensation the appropriate amount of **$500.00** for each and every day that the work remains incomplete, which said amount shall not be considered a penalty, but liquidated damages for the loss, inconvenience and extra expense to the County by such delays.

It is recognized that no two pieces of equipment and no two products are engineered or designed the same. Trade names, brand names and models specified herein are provided to establish a minimum standard of quality acceptable to the Camden County Technical Schools Board of Education for this bid. Substitute brands, makes and models shall be considered and reviewed based on its ability to perform the specified tasks or provide the same quality of goods as specified in the Camden County Technical Schools Board of Education 's bid. This is known as an "Equivalent".

If the bidder seeks to provide an Equivalent product or good, the bidder shall with its bid, submit specifications or cut sheets for such proposed Equivalent product or good. The Camden County Technical Schools Board of Education 's Architect/Engineer, or specifications writer, for the bid shall review the submission provided by the bidder to determine whether the product or good is an Equivalent to the bid specification. The Camden County Technical Schools Board of Education 's Architect/Engineer or specifications writer shall have the final decision on whether a bidder's submitted product specifications are an Equivalent to the named product(s) or good(s) in the bid.

Should any requirements in the contract documents be found to conflict with the County's general bid boilerplate (the ITB pages) the general bid boilerplate provisions and language shall prevail.

_____

NAME OF BIDDER

_____ _____

SIGNATURE DATE

AIA® Document A201™ – 2017

General Conditions of the Contract for Construction

for the following PROJECT:
(Name and location or address)

Bid #20-08
Renovations and Addition to Building #7 at Camden County Technical Schools
Gloucester Township Campus
343 Berlin Cross Keys Roade
Sicklerville, New Jersey 08081

THE OWNER:
(Name, legal status and address)

Camden County Technical Schools Board of Education
Gloucester Township Campus
Building Number 12
343 Berlin Cross Keys Road
Sicklerville, New Jersey 08081

THE ARCHITECT:
(Name, legal status and address)

Garrison Architects
713 Creek Road
Bellmawr, New Jersey 08031

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

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

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Should any requirements in the contract documents be found to conflict with the owner's general bid boilerplate the general bid boilerplate shall prevail.

ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions - Throughout this document the Term "Construction Manager" shall mean a "Construction Manager" or any other person designated by The Owner to represent them.

§ 1.1.1 The Contract Documents

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions) Camden County Boiler Plate (Pages ITB-0 through ITB-57), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement, and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive, or (4) a written order for a minor change in the Work issued by the Architect.

§ 1.1.2 The Contract

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

§ 1.1.3 The Work

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

It is strongly recommended that the Contractor visit the site of the Project before submitting a bid. Such site visit shall be for the purpose of familiarizing the Contractor with the conditions as they exist and the character of the operations to be carried on under the Contract Documents, including all existing site conditions, access to the site, physical characteristics of the site and surrounding areas.

Nothing in these General Conditions shall be interpreted as imposing on either the Owner or Architect, or their respective agents, employees, officers, directors, or consultants, any duty, obligation or authority with respect to any items that are not intended to be incorporated into the completed project, including but not limited to shoring, scaffolding, hoists, temporary weatherproofing, or any temporary facility or temporary activity, since these are the sole responsibility of the Contractor.

§ 1.1.4 The Project

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

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

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

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

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

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

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

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

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

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

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

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

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

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7 and 1.8, solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants. ***Drawings, specifications and other documents, including those in electronic form, prepared by the Architect and the Architect's consultants are Instruments of Service for use solely with respect to this Project, except that Owner shall be authorized to use any Instruments of Service for future additions or alterations to this Project or for other Projects. The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service and shall retain all common law, statutory and other reserved rights, including copyrights.***

§ 1.5.3 The Contractor will be furnished free of charge two (2) sets of signed and sealed drawings and specifications. If more documents are required by the Contractor, the additional documents may be obtained at the cost of $1.00 per drawing.

§ 1.6 Notice

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

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

§ 1.7 Digital Data Use and Transmission

The parties shall agree upon protocols governing the transmission and use of Instruments of Service or any other information or documentation in digital form.

§1.8 Procurement will be by Public Bidding Only.

§ 1.9 EXECUTION OF CONTRACT DOCUMENTS

§ 1.9.1 The Contract Documents shall be signed by the Owner and Contractor. If either the Owner or Contractor or both do not sign all the Contract Documents, the Architect shall identify such unsigned Documents upon request. The Agreement shall be signed in not less than triplicate by the Owner and Contractor.

§ 1.9.2 Execution of the Contract by the Contractor is a representation that said Contract Documents are full and complete, are sufficient to have enabled the Contractor to determine the cost of the Work therein to enter into the Contract and that the Contract Documents are sufficient to enable it to construct the Work outlined therein, and

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otherwise to fulfill all its obligations hereunder, including, but not limited to, Contractor's obligation to construct the Work for an amount not in excess of the Contract Sum on or before the date(s) of Substantial Completion established in the Agreement. The Contractor further acknowledges and declares that it has visited and examined the site, examined all physical, legal, and other conditions affecting the Work and is fully familiar with all of the conditions thereon and thereunder affecting the same. In connection therewith, Contractor specifically represents and warrants to Owner that it has, by careful examination, satisfied itself as to: (1) the nature, location and character of the Project and the site, including, without limitation, the surface and subsurface conditions of the site and all structures and obstructions thereon and thereunder, both natural and man-made, and all surface and subsurface water conditions of the site and the surrounding area; (2) the nature, location, and character of the general area in which the Project is located, including without limitation, its climatic conditions, available labor supply and labor costs, and available equipment supply and equipment costs; and (3) the quality and quantity of all materials, supplies, tools, equipment, labor, and professional services necessary to complete the Work in the manner and within the cost and time frame required by the Contract Documents. In connection with the foregoing, and having carefully examined all Contract Documents, as aforesaid, and having visited the site, the contractor acknowledges and declares that it has no knowledge of any discrepancies, omissions, ambiguities, or conflicts in said Contract Documents and that if it becomes aware of any such discrepancies, omissions, ambiguities, or conflicts, it will promptly notify Owner and Architect of such fact.

§ 1.9.3 The Contract Documents include all items necessary for the proper execution and completion of the Work by the Contractor. The Work shall consist of all items specifically included in the Contract Documents as well as all additional items of work which are reasonable inferable from that which is specified in order to complete the Work in accordance with the Contract Documents. The Contract Documents are complementary, and what is required by any one Contract Document shall be as binding as if required by all. Any differences between the requirements of the Drawings and the Specifications or any differences noted within the Drawings themselves or within the Specifications themselves have been referred to the Owner and Architect by Contractor prior to the submission of bids and have been clarified by an Addendum issued to all bidders.

If any such differences or conflicts were not called to the Owner's and Architect's attention prior to submission of bids, the Architect shall decide which of the conflicting requirements will govern based upon the most stringent of the requirements, and, subject to the approval of the Owner, the Contractor shall perform the Work at no additional cost and/or time to the Owner in accordance with the Architect's decision. Work not covered in the Contract Documents will not be required unless it is consistent therewith and is reasonable inferable therefrom as being necessary to produce the intended results.

1.9.3.1 The term "reasonably inferable" includes work necessary to "provide" work indicated or specified, as defined in section: Definitions and Standards; that is: furnish and install, complete, in place and ready for use.

1.9.3.2 Details referenced to portions of the Work shall apply to other like portions of the Work not otherwise detailed.

1.9.3.3 The Contractor shall request, from the Architect/Engineer's interpretation of apparent discrepancies, conflicts, or omissions in the Specifications and Drawings. Subcontractors shall forward such requests through the Contractor. Such requests, and the Architect/Engineer's interpretation, shall be in written form; other forms of communications shall be used to expedite resolution of concerns, but will not be binding.

§1.9.4 Explanatory notes shall take precedence over conflicting drawn note indications. Large scale drawings shall take precedence over small scale drawings. Figured dimensions shall take precedence over scaled measurements. Should contradictions be found, the Architect shall determine which indication is correct.

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§1.9.5 When more than one material, brand, or process is specified for a particular item of Work, the choice shall be the Contractor's. Contractor may, after notifying the Architect and Owner, select the one it considers to be the best. Approval by Architect or Owner of materials, suppliers, processes, or Subcontractors does not imply a waiver of any Contract requirements including, without limitation, Contractor's warranty.

§1.9.6 In all cases, the details, drawings, and specifications shall be checked with existing conditions and with work in place, and variations, if any, shall be referred by the Contractor to the Architect for adjustment, as the Contractor will be responsible for the fit or work in place.

§1.9.7 When a profile, section or other finished condition is shown, furring or other method of obtaining such finished conditions shall be provided. The drawings may show work fully drawn out or only a portion thereof, the remainder being in outline. The drawn-out portions apply to other like or similar places.

§1.9.8 Where it is required in the specifications that materials, products, processes, equipment, or the like be installed or applied in accordance with manufacturers' instructions, directions, or specifications, or words to this effect, it shall be construed to mean that said application or installation shall be in strict accordance with printed material concerned for use under conditions similar to those at the job site. Three copies of such instructions shall be furnished to the Architect and his written approval thereof obtained before work is begun.

§1.9.9 Any material specified by reference to the number, symbol, or title of a Commercial Standard, Federal Specification, ASTM Specification, trade association standard, or other similar standards, shall comply with the requirements in the latest revision thereof and any amendments or supplements thereto in effect one month prior to the date on which bids are opened and read, except as limited to type, class, or grade, or modified in such reference. The standards referred to, except as modified in the specifications, shall have full force and effect as though printed in the specifications. The Architect will furnish upon request information as to how copies of the standards referred to may be obtained.

ARTICLE 2 OWNER

§ 2.1 General

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

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

~~§ 2.2 Evidence of the Owner's Financial Arrangements~~

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

~~§ 2.2.2 Following commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract only if (1) the Owner fails to make payments to the Contractor as the Contract~~

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

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

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

§ 2.3 Information and Services Required of the Owner

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

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

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

§ 2.3.4 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work. ***The furnishing of these surveys and the legal description of the site shall not relieve the Contractor from its duties under the Contract Documents. Neither Owner nor the Architect shall be required to furnish Contractor with any information concerning subsurface characteristics, utilities or conditions of the areas where the Work is to be performed. When the Owner or Architect has made investigations of subsurface characteristics or conditions of the areas where the Work is to be performed, such investigations, if any, were made solely for the purposes of Owner's study and Architect's design. Neither such investigations nor the records thereof are a part of the Contract between Owner and Contractor. To the extent such investigations or the records thereof are made available to Contractor by the Owner or Architect, such information is furnished solely for the convenience of Contractor. Neither Owner nor Architect assumes any responsibility whatsoever in respect of the sufficiency or accuracy of the investigations thus made, the records thereof, or of the interpretations set forth therein or made by the Owner or Architect in its use thereof, and there is no warranty or guaranty, either express or***

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implied, that the conditions indicated by such investigations or records thereof are representative of those existing throughout the areas where the Work is to be performed, or any part thereof, or that unforeseen developments may not occur, or that materials other than or in proportions different from those indicated may not be encountered. The Contractor shall undertake such further investigations and studies as may be necessary or useful to determine subsurface characteristics and conditions. In connection with the foregoing, Contractor shall be solely responsible for locating (and shall locate prior to performing any Work) all utility lines, telephone company lines and cables, sewer lines, water pipes, gas lines, electrical lines, including, without limitation, all buried pipelines and buried telephone cables and shall perform the Work in such a manner so as to avoid damaging any such lines, cables, pipes, and pipelines.

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

§ 2.3.6 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2 ***and 1.5.3***.

§ 2.4 Owner's Right to Stop the Work

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or ~~repeatedly~~ fails to carry out Work in accordance with the Contract Documents, ***or fails or refuses to provide a sufficient amount of properly supervised and coordinated labor, materials, or equipment so as to be able to complete the Work within the Contract Time or fails to remove and discharge (within ten days) any lien filed upon Owner's property by anyone claiming by, through, or under Contractor, or disregards the instructions of Architect or Owner when based on the requirements of the Contract Documents,*** the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity., ~~except to the extent required by Section 6.1.3.~~

§ 2.5 Owner's Right to Carry Out the Work

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

§ 2.5.1 The Owner shall have the authority to immediately correct, service, repair, replace or otherwise make operational any component of their facilities including equipment if in the sole discretion of the owner the damaged component is a threat to education, safety or security. The Owner is obligated to put the Contractor on notice of the issue threatening education, safety or security, and their intent to remedy immediately with other

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resources and to back charge the contractor for the cost of said service, but there are no notice provisions required for the corrective actions necessary to protect the Owner.

ARTICLE 3 CONTRACTOR

§ 3.1 General

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative. ***The Term "Contractor" shall mean the respective Prime Contract person or entity identified as such in the Owner Contractor Agreement, for each respective Prime Construction Contract, as responsible for the supervisory control over allocation, coordination of all Subcontractors or trades, performance and completion of all portions of the Work, including cooperation with those doing portions of the Work under Separate Contract with the Owner.***

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

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

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed, and correlated personal observations with requirements of the Contract Documents. ***Execution of the Contract by the Contractor is also a representation that said Contract Documents are full and complete, are sufficient to have enabled the Contractor to determine the cost of the Work therein to enter into the Contract and that the Contract Documents are sufficient to enable it to construct the Work outlined therein, and otherwise to fulfill all its obligations hereunder, including, but not limited to, Contractor's obligation to construct the Work for an amount not in excess of the Contract Sum on or before the date(s) of Substantial Completion established in the Agreement. The Contractor further acknowledges and declares that it has visited and examined the site, examined all physical, legal, and other conditions affecting the Work and is fully familiar with all of the conditions thereon and thereunder affecting the same. In connection therewith, Contractor specifically represents and warrants to Owner that it has, by careful examination, satisfied itself as to: (1) the nature, location and character of the Project and the site, including, without limitation, the surface and subsurface conditions of the site and all structures and obstructions thereon and thereunder, both natural and man-made, and all surface and subsurface water conditions of the site and the surrounding area; (2) the nature, location, and character of the general area in which the Project is located, including without limitation, its climatic conditions, available labor supply and labor costs, and available equipment supply and equipment costs; and (3) the quality and quantity of all materials, supplies, tools, equipment, labor, and professional services necessary to complete the Work in the manner and within the cost and time frame required by the Contract Documents. In connection with the foregoing, and having carefully examined all Contract Documents, as aforesaid, and having visited the site, the contractor acknowledges and declares that it has no knowledge of any discrepancies, omissions, ambiguities, or conflicts in said Contract Documents and that if it becomes aware of any such discrepancies, omissions, ambiguities, or conflicts, it will promptly notify Owner, Construction Manager and Architect of such fact.***

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

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the information furnished by the Owner pursuant to Section 2.3.4, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents. ***In addition to and not in derogation of Contractor's duties under Paragraphs 1.9.2 and 1.9.3, the Contractor shall carefully study and compare the Contract Documents with each other and shall at once report to the Architect errors, inconsistencies or omissions discovered. The Contractor shall not be liable to the Owner or Architect for damage resulting from errors, inconsistencies or omissions in the Contract Documents that could not have been discovered by a prudent and experienced contractor in advance and that are not in the nature of items described in and intended to be covered in Paragraphs 1.9.2 and 1.9., unless the Contractor recognized or reasonably should have recognized such error, inconsistency or omission and failed to report it to the Architect. If the Contractor performs any construction activity involving an error, inconsistency or omission in the Contract Documents that the Contractor recognized or reasonably should have recognized without such notice to the Architect, the Contractor shall assume complete responsibility for such performance and shall bear the full amount of the attributable costs for correction.***

§ 3.2.2.1 If any errors, inconsistencies, or omissions in Contract Documents are recognized or reasonably should have been recognized by the Contractor, any member of its organization, or any of its Subcontractors, the Contractor shall be responsible for notifying the Architect in writing of such error, inconsistency, or omission before proceeding with the Work. The Architect will take such notice under advisement and within a reasonable time commensurate with job progress render a decision. If Contractor fails to give such notice and proceeds with such Work, it shall correct any such errors, inconsistencies, or omissions at no additional cost to the Owner.

Deviations from the construction documents must be noted by the Prime Contractor at the time of bidding. Failure to do so will result in the implication of the above Sections 3.2, 3.2.1, 3.2.2 and 3.2.2.1.

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

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

§ 3.2.5 Typographical and spelling errors will be interpreted by the Architect for their intended meaning and the interpretations of the Architect shall be final and binding.

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§ 3.2.6 Contractor, as bidder, was afforded the opportunity and encouraged to visit the project site and contractor shall be held responsible for cognizance and knowledge of existing features and conditions ascertainable by such site visit, and costs of the work associated therewith.

§ 3.3 Supervision and Construction Procedures

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

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

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

§ 3.3.4 The Contractor, when requested by the Architect or Construction Manager, shall meet with representative of the Architect and/or Construction Manager at all times and furnish all information requested; he shall allow the Architect and Construction Manager to inspect the work at all times. Neither the Owner, Construction Manager or the Architect shall be liable to the Contractor for extra compensation or damages for interference or delays on account of any such meetings, information, or inspections so requested or other acts of the Architect and/or Construction Manager done in good faith and within the scope of their employment by the Owner. In addition, the Contractor is entrusted with the oversight, management control, and general direction of this project to ensure that all contract completion dates are met. In the event that there are any delays caused to any subcontractor on this project, liability shall lie with the Contractor and not with the Owner.

§ 3.3.5 The Contractor has the responsibility to ensure that all material suppliers and Subcontractors, their agents, and employees adhere to the Contract Documents, and that they order materials on time, taking into account the current market and delivery conditions and that they provide materials on time. The Contractor shall coordinate its Work with that of all others on the Project including deliveries, storage, installations, and construction utilities. The Contractor shall be responsible for the space requirements, locations, and routing of its equipment. In areas and locations where the proper and most effective space requirements, locations and routing cannot be made as indicated, the Contractor shall meet with all others involved, before installation, to plan the most effective and efficient method of overall installation.

§ 3.3.6 The Contractor shall establish and maintain benchmarks and all other grades, lines, and levels necessary for the Work, report errors or inconsistencies to the Architect before commencing Work and review the placement of the building(s) and permanent facilities on the site with the Owner and Architect after all lines are staked out and before foundation Work is started. Contractor shall provide access to the Work for the Owner, the Architect, other persons designated by Owner, and governmental inspectors. Any encroachments made by

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Contractor or its Subcontractor (of any tier) on adjacent properties due to construction as revealed by an improvement survey, except for encroachments arising from errors or omissions not reasonably discoverable by Contractor in the Contract Documents, shall be the sole responsibility of the Contractor, and Contractor shall correct such encroachments within thirty (30) days of the improvement survey (or as soon thereafter as reasonably possible), at Contractor's sole cost and expense, either by the removal of the encroachment (and subsequent reconstruction on the Project site) or agreement with the adjacent property owner(s) (in form and substance satisfactory to Owner in its sole discretion) allowing the encroachments to remain.

§ 3.3.7 Coordination:

1. *The Lump Sum Single Prime Contractor "The Contractor" is the sole responsible party for the coordination of the entire project.*
2. *The Contractor shall be responsible to coordinate and expedite the total construction process and all of its parts. The Owner relies upon the organization, management, skill, cooperation and efficiency of the Contractor to supervise, direct, control and manage the work and to coordinate and expedite the efforts of the other prime contractors and subcontractors so as to deliver the work conforming to the contract within the scheduled time. The Contractor is responsible for proper sequence and coordination. It shall determine the location of work and resolve conflicts amongst Contractors.*
3. *The Owner has hired a Construction Manager to provide on-site Project Management services. The Construction Manager will be the Owner's Representative/Agent for this Project. The Construction Manager and the Architect will share administrative duties, which will be delineated at the Pre-construction conference. The Construction Manager will essentially be the single point of contact, defer to the Contractor for means and methods and will defer to the Architect for final clarifications and determinations of disputes, design issues, and aesthetics. The Construction Manager, along with the Architect, will manage the following processes - shop drawings, change orders, payments, correspondence, RFI's, construction schedules, documentation, job meetings, quality assurance, punchlists, etc.*
4. *The Contractor shall provide a qualified full-time staff member or members to manage the project. THIS PROJECT MANAGER shall coordinate, organize and manage the project from the contractor's main office and oversee the shop drawing process signing off for quality assurance and conformance with the Contract Documents on each shop drawing. The Project Manager shall be subject to the approval of the Owner, Construction Manager and Architect who at all times have the right to require the contractor to replace this Project Manager if they fail to perform. The Project Manager shall conduct an onsite meeting at least once a week with the construction superintendent and all other prime and/or subcontractors in attendance to coordinate the project and review the schedule. The Construction Manager will attend but is not responsible for organizing or taking minutes. The Project Manager shall provide a meeting agenda and issue minutes within four (4) working days of each meeting.*
5. *The Contractor shall provide a qualified full-time staff member or members to manage the project on site. THIS CONSTRUCTION SUPERINTENDENT shall coordinate, organize and manage the project from the contractor's on-site field office and oversee their own work and the work of their sub-contractors. Should the prime contractor be responsible for multiple projects at different sites, or multiple locations on one large site, then the contractor shall provide a separate qualified superintendent for each of the projects or locations. This determination shall be made by and subject to the approval of the Owner, Construction Manager and Architect who at all times may require additional manpower. The superintendent shall be responsible for onsite safety, quality assurance, conformance with the Contract Documents and perform coordination with all on site construction personnel and/or subcontractors. The Construction superintendent shall be subject to the approval of the Owner, Construction Manager and Architect who at all times have the right to*

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require the contractor to replace this Construction superintendent if they fail to perform.

6. *The other subcontractors shall also have a designated superintendent and/or foreman who will at all times be subject to the approval of the Owner, Construction Manager and Architect. The Owner, Construction Manager and Architect reserves the right to require the contractor to replace the superintendent and/or foreman if, in the opinion of the Owner, Construction Manager and Architect, the superintendent and/or foreman is not performing satisfactorily.*
7. *Each prime subcontractor shall coordinate his activities with the activities of other contractors.*
8. *All questions pertaining to the work are to be made to the Architect sufficiently in (via an RFI Form) advance of construction to permit comparisons investigation or references to drawings and shop drawings as necessary.*
9. *The Contractor is required to submit a site logistics plan coordinating all Owner or Construction Manager functions with the access and safety of the job site.*
10. *The Contractor is required to coordinate all the inspection and material testing to meet the contract documents specifications.*
11. *The Contractor has full and sole responsibility for construction methods and implementation of a "quality control system" to insure coordination.*
12. *The Contractor is responsible for field verification of all dimensions/measurements for the coordination of materials and trades. Check field dimensions, clearances, relationships to available space, and anchors.*
13. *The Contractor shall make all necessary arrangements to conduct work so that all parts shall be carried on harmoniously and simultaneously or sequentially, so as components or increments of the same shall not interfere or retard the progress of others.*
14. *Minor changes in locations of equipment, parts, etc. due to field conditions shall be made, if so directed, at no additional cost.*
15. *The Contractor shall coordinate the delivery, unloading, movement, relocation, storage and protection of all materials.*
16. *The Contractor shall examine the drawings and dimensions and is responsible for satisfactory joining and fitting of all parts of the work.*
17. *Accurate dimensions, sleeved and opening drawings are to be submitted prior to placement in the field.*
18. *The Contractor shall prepare coordination drawings for all above ceiling areas throughout the entire project. Drawings showing all piping, duct, cable trays, electrical duct banks, and similar items, but not electrical conduit less than 4 inches in diameter. Complete architectural, mechanical and electrical reflected ceiling layouts, (including ductwork, conduits, piping, lighting, etc.).*
19. *The Contractor is responsible for any omissions of the subcontractors and is required to provide a complete operating facility.*
20. *The Contractor shall be responsible for preserving the integrity of ceiling heights and room sizes and shall:*
    a. *Check compatibility with equipment, other work, electrical characteristics, and operational control requirements. Check motor voltages and control characteristics. Coordinate controls, interlocks, wiring of pneumatic switches, and relays. Coordinate wiring and control wiring diagrams. Review the effect of changes on other work. Obtain and distribute installation data on each item of equipment requiring mechanical or electrical connections;*
    b. *Coordinate and observe start-up and demonstration of equipment and systems. Observe and maintain record of tests and inspections. Coordinate maintenance of record documents;*
    c. *Assist the Consultant and Construction Manager with final inspections.*
    d. *Inform the Owner via the Construction Manager when coordination of his work is required;*

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e. Coordinate all mechanical, plumbing, electrical, food service and equipment/furnishings work, and coordinate that work with all other work.

21. Where space is limited, coordinate arrangement of mechanical, electrical, and other work to fit, show plan and cross-section dimensions of space available, including structural obstructions and ceilings as applicable.

22. Coordinate cutting and patching activities and sequencing.

22. The Architect, Construction Manager and Owner shall assist in resolution of any coordination items.

§ 3.4 Labor and Materials

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

§ 3.4.2 Except in the case of minor changes in the Work approved by the Architect in accordance with Section 3.12.8 or ordered by the Architect in accordance with Section 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive ***and the provisions of Section 01300 of the Contract Specifications***.

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

§ 3.4.4 The Contractor must provide suitable storage facilities at the site for the proper protection and safe storage of his materials. Such storage facilities must be approved in advance in writing by the Architect.

§ 3.4.5 All materials delivered to the premises which are to form a part of the work are to be considered the property of the Owner and must not be removed without the Architect's consent; but the Contractor shall remove all surplus materials upon completion of each phase of the work and as directed by the Architect.

§ 3.4.6 When any room is used as a shop, storeroom, etc., during the progress of the work, the Contractor making use of the space will be responsible for any repairs, patching, or cleaning arising from such use. Prior approval of the Construction Manager or Architect for use of such areas is mandatory.

§ 3.4.7 Not later than seven (7) days from the Notice to Proceed, the Contractor shall provide a list showing the name of the manufacturer proposed to be used for each of the products identified in the Specifications Divisions 1-16, and if applicable, the installing Subcontractor's name.

§ 3.4.8 The Contractor will be held to be thoroughly familiar with all conditions affecting labor in the locale of the Project, including, but not limited to, trade jurisdictions and agreements, incentive and premium time, pay, procurement, living and commuting conditions. Contractor shall assume responsibility for costs resulting from his failure to verify conditions affecting his labor.

§ 3.4.9 Contractor shall be responsible for labor peace on the Project and shall at all times make its best efforts and judgment as an experienced contractor to adopt and implement policies and practices designed to avoid work stoppages, slowdowns, disputes, or strikes where reasonably possible and practical under the circumstances, and shall at all times maintain Project-wide labor harmony. Except as specifically provided in Subparagraph 8.3.1,

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Contractor shall be liable to Owner for all damages suffered by Owner occurring as a result of work stoppages, slowdowns, disputes, or strikes.

§ 3.5 Warranty

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

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

§ 3.5.3 The Contractor represents that all manufacturer and supplier warranties shall run directly to or be specifically assignable to the Owner. The Contractor warrants that all portions of the work that will be covered by a manufacturer's or supplier's warranty shall be performed in such a manner so as to preserve all rights under such warranties. The Contractor hereby assigns to the Owner effective upon the termination of this contract all manufacturer's and supplier's warranties relating to the Work, and the Contractor shall upon request of the Owner, execute any document reasonably requested by Owner to effectuate such assignment. If the Owner attempts to enforce a claim based upon a manufacturer's or supplier's warranty and such manufacturer or supplier refuses to honor such warranty based in whole or in part on a claim of defective installation by the Contractor, the Contractor shall be responsible for any resulting loss or damages incurred by the Owner as a result of the manufacturer's or supplier's refusal to honor such warranty. The Contractor's obligations under this Subparagraph 3.5.2 shall survive the expiration or earlier termination of the Contract. The warranty period for all work of each Contractor shall be two (2) years from the date of final inspection and acceptance by the Owner unless otherwise specified.

§ 3.5.4 The Contractor shall forward the guarantee and warranty registration cards to the manufacturers in the name of the Owner showing date of acceptable substantial completion of the work as the beginning date for guarantee and warranty periods. All warranties and guarantees shall be in accordance with the requirements indicated in the applicable sections of the Contract Documents.

§ 3.6 Taxes

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

§ 3.6.1 The owner is exempt from all taxes including Federal Excise Tax, fuel tax, transportation taxes and State Sales or Use Tax.

§ 3.7 Permits, Fees, Notices and Compliance with Laws

§ 3.7.1 The Contractor shall be required to secure AND PAY FOR permits or government approvals necessary for the proper execution and completion of the work. The Contractor shall obtain business licenses required by

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the State, County and/or City and shall give all notices and comply with all laws, ordinances, rules, regulations and orders of any public authority bearing on the performance of the work. The required Building Permit or Permits shall be secured by the Contractor for the entire project. This shall include permits required for any Trailers required for the project.

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

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

§ 3.7.4 Concealed or Unknown Conditions

If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than ~~14 days~~ ***three (3) days*** after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may submit a Claim as provided in Article 15.

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

§ 3.8 Allowances (See Specification "Section 01210 – Allowances")

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

§ 3.8.2 Unless otherwise provided in the Contract Documents,

.1 allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;

.2 ~~Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and~~

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.3 whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 ~~and (2) changes in Contractor's costs under Section 3.8.2.2~~.

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

§ 3.9 Superintendent

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

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

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

§ 3.9.4 A Superintendent and a Foreman for the contractor shall be required for the project. If, in the Construction Manager's, Architect's or Engineer's opinion, the quality or progress of the work are adversely affected by lack of adequate supervision, the Contractor shall be required to increase the number of supervisory personnel at no increase in the Contract sum.

§ 3.10 Contractor's Construction and Submittal Schedules *(See Specification Section 01310 – Construction Progress Documentation)*

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to completion and shall not exceed time limits current under the Contract Documents. The schedule shall be revised at appropriate intervals as required by the conditions of the Work and Project. ***The schedule which is prepared by the Contractor shall indicate the proposed starting and completion date for the various subdivisions of the Work as well as the totality of the Work. The schedule shall be updated every thirty (30) days and must be submitted to the Architect with Contractor's Applications for Payment. If the schedule is not submitted with the payment application, no payment will be processed. Each schedule shall contain a comparison of actual progress with the estimated progress for such point in time started in the original schedule. If any schedule submitted sets forth a date for Substantial Completion for the Work or any phase of the Work beyond the Date(s) of Substantial Completion established in the Contract (as the same may be extended as provided in the Contract Documents), then Contractor shall submit to Architect and Owner for their review and approval a description of the means and methods which Contractor intends to employ to expedite the progress of the Work to ensure timely completion of the various phases of the Work as well as the totality of the Work. To ensure such timely completion, Contractor shall take all necessary action including, without limitation, increasing the number of***

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personnel and labor on the Project and implementing overtime and double shifts. In that event, Contractor shall not be entitled to an adjustment in the Contract Sum or the schedule.

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

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

§ 3.10.4 Schedules shall comply with the requirements of the Division 1 "Section 01040 - Project Coordination," Section 01310, "Construction Progress Documentation."

§ 3.11 Documents and Samples at the Site

The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Architect and Owner, and delivered to the ~~Architect for submittal to~~ the Owner upon completion of the Work as a record of the Work as constructed. ***See Specification "Section 01300 - Submittals," and "Section 01700 - Project Closeout," for specific details and requirements.***

§ 3.12 Shop Drawings, Product Data and Samples

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

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

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

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

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

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the Owner or of Separate Contractors. ***Submittals which are not marked as reviewed for compliance with the Contract Documents and approved by the Contractor may be returned by the Architect without action.***

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

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

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

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

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

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

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

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§ 3.12.11 Detailed requirements are specified in Specification "Section 01300 - Submittals."

§3.12.12 All shop drawings are to include manufacturer's data. All shop drawings and samples are to be submitted by the Contractor to the Architect for review. Each sheet of the shop drawings shall identify the project, contractor, subcontractor, and fabricator or manufacturer and the date of the drawings. All shop drawings shall be numbered in consecutive sequence and each sheet shall indicate the total number of sheets in the set.

§ 3.13 Use of Site

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

§ 3.13.1 Location and weights of all equipment and materials and the Contractor intends to place on the slab shall be submitted to the Architect for review.

§ 3.13.2 Only materials and equipment which are to be used directly in the Work shall be brought to and stored on the Project site by the Contractor. After equipment is no longer required for the Work, it shall be promptly removed from the Project site. Protection of construction materials and equipment stored at the Project site from weather, theft, damage and all other adversity is solely the responsibility of the Contractor.

§ 3.13.3 The Contractor and any entity for whom the Contractor is responsible shall not erect any sign on the Project site without the prior written consent of the Owner with the exception of those directed to be erected through the contract documents and those necessary for site safety or in an emergency.

§ 3.13.4 Contractor shall ensure that the Work, at all times, is performed in a manner that affords reasonable access, both vehicular and pedestrian, to the site of the Work and all adjacent areas. The Work shall be performed, to the fullest extent reasonably possible, in such a manner that public areas adjacent to the site of the Work shall be free from all debris, building materials and equipment likely to cause hazardous conditions. Without limitation of any provision of the Contract Documents, Contractor shall use its best efforts to minimize any interference with the occupancy or beneficial use of (1) any areas and buildings adjacent to the site of the Work or (2) the Building in the event of partial occupancy, as more specifically described in Paragraph 9.9.

§ 3.13.5 Without prior approval of the Owner, the Contractor shall not permit any workers to use any existing facilities at the Project site, including without limitation, lavatories, toilets, entrances and parking areas other than those designated by the Owner. Without limitation of any other provision of the Contract Documents, the Contractor shall use its best efforts to comply with all rules and regulations promulgated by the Owner in connection with the use and occupancy of the Project site and the Building, as amended from time to time.

The Contractor shall immediately notify the Owner in writing if during the performance of the Work, the Contractor finds compliance with any portion of such rules and regulations to be impracticable, setting forth the problems of such and suggest alternatives through which the same results can be achieved. The Owner may, in the Owner's sole discretion, adopt such suggestions, develop new alternatives or require compliance with the existing requirement of the rules and regulations. The Contractor shall also comply with all insurance requirements and collective bargaining agreements applicable to use and occupancy of the Project site and the Building.

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§3.13.6 The Contractor shall provide a temporary construction fence whether shown on the contract documents or not as required to separate the area or areas under construction from the Owners area or areas used by the public. The temporary fencing shall be approved by the Owner prior to installation. The fence shall be 6' high and have vinyl privacy fabric obstructing views into the construction area.

§ 3.14 Cutting and Patching (See Specification "Section 01045 – Cutting and Patching")

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

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

§ 3.15 Cleaning Up

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

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

§ 3.15.3 The Contractor shall perform all daily clean up and removal of debris from the site including that of his subcontractors. The Contractor shall maintain an adequate supply of laborers to accomplish daily clean up and removal of debris from the site and work areas. No debris will be allowed to accumulate in or around the building including masonry debris. The building site must be maintained free of all litter, dirt, dust and debris on a daily basis. The Owner's Team may stop all work and require all personnel on site to clean up. No accumulation of flammable material is permitted. Prior to installation of finishes the floors will be swept or vacuumed and kept free of dust and dirt until turned over to the Owner.

§ 3.15.4 Cleaning and debris removal may be considered a safety concern by judgment of the Owner or his agents and as such the work may be stopped to provide time and labor for immediate clean up.

§ 3.15.5 Final Clean-Up: The Contractor has the responsibility for the final clean-up and policing of the entire site after other contractors have removed their own waste materials, rubbish, equipment, tools and plant. In addition, thereto, the General Construction Contractor shall have a professional cleaning company perform the following immediately prior to the Architect's inspection for Substantial Completion:

- *.1 Removal of all manufacturer's temporary labels from materials, equipment and fixtures.*
- *.2 Removal of all stains from glass and mirrors; wash, polish, inside and outside.*
- *.3 Removal of marks, stains, fingerprints, other soil, dust, dirt, from painted, decorated, or stained woodwork, plaster or plasterboard, metal, acoustic tile, and equipment surfaces.*
- *.4 Remove spots, paint, soil, from resilient flooring.*

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.5 Remove temporary floor protections; clean, strip and provide three (3) coats of wax on new VCT floors or otherwise treat as directed by the material manufacturers recommendation, all finished floors. Final vacuum all carpet.

.6 Clean all interior finished surfaces, including doors and window frames, and hardware required to have a polished finish, of oil, stains, dust, dirt, paint, and the like; leave without fingerprints, blemishes.

.7 Final site clean-up shall extend beyond the Contract Limit Lines as reasonably required to insure the complete removal of all construction debris from the entire site, including staging areas.

§ 3.16 Access to Work

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

§ 3.16.1 The Contractor shall promptly notify the Architect/Engineer/Construction Manager and Owner of the presence of hazardous conditions at the site, including the start of hazardous operations or the discovery or exposure of hazardous substances.

§ 3.16.2 Contractor shall be responsible for snow plowing and snow removal as required to maintain access/egress to construction area.

§ 3.16.3 Contractor shall keep only necessary equipment on site and shall cooperate with the Owner regarding location of stored material.

§ 3.16.4 The Contractor is to maintain reasonable access to site for structural steel erection including crane, steel deliveries, etc. The Contractor will be responsible to coordinate requirements with the Construction Manager a minimum of 21 days prior to deliveries.

§ 3.17 Royalties, Patents and Copyrights

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

§ 3.18 Indemnification

See the Camden County Boiler Plate, page ITB-10.

ARTICLE 4 ARCHITECT

§ 4.1 General

§ 4.1.1 The Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement. ***The term "Architect" means the Architect or the Architect's authorized representative.***

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

§ 4.1.3 If the employment of the Architect is terminated, the Owner shall employ a successor architect whose status under the Contract Documents shall be that of the Architect.

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§ 4.2 Administration of the Contract

§ 4.2.1 ***The Architect and Construction Manager will provide administration of the Contract as described in the Contract Documents, and will be the Owner's representatives (1) during construction, (2) until final payment is due and (3) with the Owner's concurrence, from time to time during the two-year period for correction of Work described in Paragraph 12.2. The Architect and Construction Manager will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents, unless otherwise modified in writing in accordance with other provisions of the Contract. The Owner has hired a Construction Manager to provide onsite Project Management services. The Construction Manager will be the Owner's Representative for this Project. The Construction Manager and the Architect will share administration duties, which will be delineated at the Pre-construction meeting. The Construction Manager will essentially be the single point of contact, defer to the Contractors for means and methods and will defer to the Architect for final clarifications and determinations of disputes, design issues, and aesthetics.***

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

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

§ 4.2.4 Communications

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

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

§ 4.2.6 The Architect ***and Construction Manager*** has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections ***13.4.1,*** 13.4.2 and 13.4.3, whether or not the Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the

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Contractor, Subcontractors, suppliers, their agents or employees, or other persons or entities performing portions of the Work.

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

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

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

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

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

§ 4.2.12 Interpretations and decisions of the Architect will be consistent with the ***language and*** intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings.

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

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

§ 4.2.15 ***The Owner has hired a Construction Manager to provide on-site Project Management services. The Construction Manager will be the Owner's Representative/Agent for this Project. The Construction Manager and the Architect will share administrative duties, which will be delineated at the Pre-construction conference. The***

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Construction Manager will essentially be the single point of contact, defer to the Contractor for means and methods and will defer to the Architect for final clarifications and determinations of disputes, design issues, and aesthetics. The Construction Manager, along with the Architect, will manage the following processes - shop drawings, change orders, payments, correspondence, RFI's, construction schedules, documentation, job meetings, quality assurance, punchlists, etc.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a Separate Contractor or the subcontractors of a Separate Contractor.

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

§ 5.2 INTENTIONALLY OMITTED

§ 5.3 Subcontractual Relations

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

§ 5.3.1 The Contractor shall obligate each subcontractor specifically to comply with the New Jersey Plan of Affirmative Action to avoid discriminatory practice in employment.

§ 5.3.2 The Contractor shall obligate each subcontractor to comply with the applicable prevailing wage schedule of the Department of Labor of the State of New Jersey.

§ 5.3.3 The Contractor shall obligate each Sub-Contractor to comply with the Public Works (the Public Works Contractor Registration Act of the State of New Jersey).

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ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

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

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

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

§ 6.1.3 ~~The Owner shall provide for coordination of the activities of the Owner's own forces and of each Separate Contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with any Separate Contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to its construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, Separate Contractors, and the Owner until subsequently revised.~~ ***THE CONTRACTOR SHALL BE RESPONSIBLE TO COORDINATE ALL WORK. All trades have a mutual obligation to coordinate their work with the other trades and cooperate as necessary with the Contractor, Construction Manager and the Construction schedule – to complete the work as required by the Owner. The Construction Manager will provide assistance to the Contractor for coordination between their work and the Owner. The Contractor is required to have their superintendent or foreman on site at all times when their work or that of their subs is in progress***

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

§ 6.2 Mutual Responsibility

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

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a Separate Contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Architect ***and Construction Manager*** of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Architect of apparent discrepancies or defects prior to proceeding with the Work shall constitute an acknowledgment that the Owner's or Separate Contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractor that are not apparent. ***Should the Contractor be damaged by any other separate Contractor on the work by reason of such other Contractor's failure to perform properly his Contract with the Owner, no action will lie against the Owner and the Owner shall have no liability therefore, but the Contractor may assert his claim for damage against such separate Contractor as a third party beneficiary under the Contract between such other Contractor and the Owner.***

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

§ 6.2.4 The Contractor shall promptly remedy damage that the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or Separate Contractor as provided in Section 10.2.5 ***or to other completed or partially completed construction or property on the site or to property of any adjourning Owner or other party.***

6.2.4.1 Should the Contractor cause damage to the work or property of any separate Contractor on the Project, the Contractor shall, upon due notice, settle with such other Contractor by agreement or Court of Law if he will so settle. If such separate Contractor sues the Owner, or the Architect or initiates a Court of Law proceeding on account of any damage alleged to have been so sustained, the Contractor agrees that he will hold the Owner or Architects harmless against any such suit, and that he will reimburse to the Owner or Architect, as the case may be, the cost of defending such suit, including reasonable attorney's fee and if judgment against Owner or Architect arises therefrom, the Contractor shall pay all judgment cost incurred by the Owner or Architect.

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

§ 6.3 Owner's Right to Clean Up

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

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

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

7.1.1.1 A field directive or field order shall not be recognized as having any impact upon the Contract Sum or the Contract Time and the Contractor shall have no claim therefor unless it shall, prior to complying with same and in no event no later than five (5) working days from the date such direction or order was given, submit to the Owner's Team its change proposal for the Owner's approval.

7.1.1.2 When submitting its change proposal, the Contractor shall include and set forth in clear and precise detail breakdowns of labor and materials for all trades involved and the estimated impact on the construction schedule including a specific number of days for a time extension. If the Change Order Request does not provide an additional time request, the Contractor shall not be entitled to an extension of time. The Contractor shall furnish spread sheets from which the breakdowns were prepared, plus spread sheets if requested of any Subcontractors. The Contractor may not claim additional time at a later date and shall remove any language to that effect from his/her Change Order Request.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor, and Architect. A Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the

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Contractor. An order for a minor change in the Work may be issued by the Architect alone ***in accordance with Paragraph 7.4.***

§ 7.1.2.1 Neither this Contract nor the Work to be performed hereunder can be changed by oral agreement. No course of conduct or dealings between the parties, nor express or implied acceptance of alterations or additions to the Work and no claims that the Owner has been unjustly enriched by any alteration or addition to the Work, whether there is, in fact, any unjust enrichment to the Work, shall be the basis for any alleged implied agreement by the Owner to the change, any alleged waiver of the Owner's right under this Contract or any increase in any amounts due under the Contract or any or a change in any time period provided for in the Contract Documents.

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

§ 7.1.4 A directive or order from the Owner or the Architect, other than a Change Order, a Construction Change Directive or any Order for a minor change pursuant to this Article 7, shall not be recognized as having any impact on the Contract Sum or the Contract Time and the Contractor shall have no claim therefore. If the Contractor believes that a directive or order would require it to perform work not required by the Contract Documents, the Contractor shall so inform the Owner and Architect in writing prior to complying with the same and in no event, any later than five (5) working days from the day such direction or order was given, and shall submit to the Owner and Architect for the Owner's and Architect's approval its change proposal.

§ 7.2 Change Orders

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

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

§ 7.2.2 Methods used in determining adjustments to the Contract Sum include those listed in Subparagraph 7.3.4 The total for overhead and profit shall NOT exceed 15%.

§7.2.3 Any change in work authorized in writing by the Owner and Architect that will require a change in the cost of the work, whether an additive or deductive change in cost, shall show a complete cost breakdown of labor, material, appropriate overhead and profit (15% maximum) and contract time.

§7.2.4 When a Change Order involves both additions and deletions in material, the net quantity is to be determined and the 15% overhead and profit is to be applied to the net quantity.

§7.2.5 When any change in the Work, regardless of the reason therefore, requires or is alleged to require an adjustment in Contract Time, such request for time adjustment shall be submitted by the Contractor as part of the change proposal. Any Change Order approved by the Owner and for which payment is accepted by the Contractor, in which no adjustment in Contract Time is stipulated, shall be understood to mean that no such adjustment is required by reason of the change, and any and all rights of the Contractor or any subsequent request for adjustment of Contract Time by reason of the change is waived.

§7.2.6 Request by the Contractor for adjustment of the Contract Amount regardless of the reason therefore, shall be submitted to the Architect and the Owner with itemized labor and material quantities and unit prices to permit

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proper evaluation of the request. A submission by the Contractor containing unsubstantiated lump sum requests for adjustment of the Contract Amount will not be considered by the Owner and Architect. The Owner and Architect will not be liable for any delay incurred by reason of the Contractor's failure to submit satisfactory justification and back-up with any request for adjustment to the Contract Amount.

§7.2.7 Agreement on any Change Order shall constitute a final settlement of all matters relating to the change in the initial Work which is the subject to the Change Order, including, but not limited to, all direct, indirect and impact costs associated with such change and any and all adjustment to the Contract Sum and the Construction Schedule. The Contractor will not be entitled to any compensation for additional work, impact costs or delays in the Construction Schedule not included in the Change Order.

§ 7.3 Construction Change Directives

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

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

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

.1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;

.2 Unit prices stated in the Contract Documents or subsequently agreed upon;

.3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or

.4 As provided in Section 7.3.4

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement ***not to exceed 15%.*** ~~or if no such amount is set forth in the Agreement, a reasonable amount.~~ In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to the following:

.1 Costs of labor ***shall be in accordance with the New Jersey Prevailing Wage Rates at the time of the Contract commencement with no additional "labor burden", future increases or any other considerations.*** ~~including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect~~;

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

.3 Rental costs of machinery and equipment, exclusive of hand tools, ***only when machinery or equipment is not already on site*** ~~whether rented from the Contractor or others~~;

.4 Costs of premiums for all bonds and insurance ***shall be limited to 1.5%***, ~~permit fees, and sales, use, or similar taxes,~~ directly related to the change; ~~and~~

.5 Costs of supervision and field office personnel directly attributable to the change ***WILL NOT BE PERMITTED!***

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§ 7.3.4.1 The allowance for overhead and profit combined, included in the total cost to the Owner, may only include a Contractor, his Subcontractor and shall be limited to a total of 15% of the cost.

§7.3.4.2 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 subcontracts. Labor and materials shall be itemized in the manner prescribed above. Where major cost items are subcontractors, they shall be itemized.

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

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

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

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

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

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

§ 7.4 Minor Changes in the Work

The Architect ***and/or the Construction Manager*** may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's ***and/or the Construction Manager's*** order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Architect/***Construction Manager within five (5) calendar days*** and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's ***and/or Construction Manager's*** order for a minor change without prior notice to the Architect/***Construction Manager*** that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

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ARTICLE 8 TIME

§ 8.1 Definitions

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

§ 8.1.2 ~~The date of commencement of the Work is the date established in the Agreement.~~ ***The work to be performed under this Contract shall commence after the required insurance has been obtained and approved and within three days after issuance of the notice to proceed by the Owner. The Contract Time shall commence as of the date of the Notice to Proceed unless otherwise specified in the agreement.***

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

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

§ 8.2 Progress and Completion

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

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

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

§ 8.2.4 Owner, or his/her representative, in coordination with the Contractor, shall set work hours. Contractor may be required to work nights, weekends or holidays as necessary to complete the work in accordance with the Schedule or in coordination with the Owner's activities. Under no circumstances shall the Contractor begin or continue with work that is adversely impacting the Owner's activities or operations. All utility shutdowns, interruptions, work in or adjacent to existing buildings will be coordinated through the Owner, or his representative, and may have to be performed during hours when the Building is not in operation. All cutting, hammering or other activity that is noisy, produces smoke or fumes or is otherwise disruptive to the Owner's operations may have to be done during hours when the Building is not in operation. Work required to be performed during non-building operating hours, as determined by the Owner or his representative will be performed at no additional cost to the Owner.

§ 8.3 Delays and Extensions of Time

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner or Architect, of an employee of either, or of a Separate Contractor; (2) by changes ordered in the Work; ***or by occurrences beyond the control and without the fault or negligence of the Contractor and which by the exercise of reasonable diligence the Contractor is unable to prevent or provide against, including labor disputes (other than disputes limited to the work force of, or provided by, the Contractor or its Subcontractors), fire, unusual delay in deliveries not reasonably anticipatable, unavoidable casualties, or by other occurrences which the Architect, subject to the Owner's approval, determines may justify delay, then, provided that the Contractor is in compliance with Subparagraph 8.3.3 hereof, the Contract Time shall be extended by Change Order or Construction Change Directive for the length of time actually and directly caused by such occurrence as determined by the Architect and approved by the Contractor and Owner (such approval not to be unreasonably withheld, delayed, or conditioned); provided, however, that such extension of Contract Time shall be net of any delays caused by or due to the fault or negligence of the Contractor or which are otherwise the responsibility of***

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the Contractor and shall also be net of any contingency or "float" time allowance included in the Contractor's construction schedule. The Contractor shall, in the event of any occurrence likely to cause a delay, cooperate in good faith with the Architect and Owner to minimize and mitigate the impact of any such occurrence and do all things reasonable under the circumstances to achieve this goal ~~(3) by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner pending mediation and binding dispute resolution; or (5) by other causes that the Contractor asserts, and the Architect determines, justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine~~.

§ 8.3.2 ~~Claims relating to time shall be made in accordance with applicable provisions of Article 15~~. *Any claim for extension of time shall be made in writing to the Architect not more than five (5) days after the commencement of the delay, otherwise, it shall be waived. The Contractor shall provide an estimate of the probable effect of such delay on the progress of the work. No claim made beyond the five (5) days shall be considered valid.*

§ 8.3.2.1 The Contractor agrees that if any delay in the Contractor's works unnecessarily delays the work of any other Contractor or Contractors, the Contractor shall in that case pay all costs and expenses incurred by such parties due to such delays and hereby authorizes the Owner to deduct the amount of such costs and expenses from any moneys due or to become due the Contractor under this Contract. The Architect shall be responsible for ascertaining whether the Contractor is responsible for delaying any of the work of any other Contractor. His decision shall be final.

§ 8.3.3 *Notwithstanding anything to the contrary in the Contract Documents, any extension of the Contract Time, to the extent permitted under Paragraph 8.3.1., shall be the sole remedy of the Contractor for any (1) delay in the commencement, prosecution or completion of the Work, (2) hindrance or obstruction in the performance of the Work, (3) loss of productivity or (4) other similar claims (collectively referred to in this Paragraph 8.3.3. as "delays"), whether or not such delays are foreseeable, unless a delay is caused by acts of the Owner constituting active interference with the Contractor's performance of the Work and only to the extent such acts continue after the Contractor furnishes the Owner with written notice of such interference. In no event shall the Contractor be entitled to any compensation or recovery of any damages in connection with any delay including without limitation consequential damages, lost opportunity cost, impact damages or other similar remuneration. The Owner's exercise of any of its rights or remedies under the Contract Documents (including without limitation ordering changes in the Work or directing suspension, rescheduling or correction of the Work) regardless of the extent or frequency of the Owner's exercise of such rights or remedies shall not be construed as an act of interference with the Contractor's performance of the Work.* This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

§ 8.3.4 The Contractor agrees that the Owner can deduct from the Contract Sum, any wages paid by the Owner to any Inspector or Architect or other professional necessarily employed by the Owner for any number of days in excess of the number of days allowed in the specifications for completion of work.

§ 8.3.5 Where the cause of delay is due to weather conditions, an extension of time shall be granted only for unusually severe weather, as determined by reference to historical data. The term "historical data" as used in the previous sentence shall be construed according to this formula: Average rainfall (or snow or low temperature) for the past five years.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

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

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

§ 9.1.3 Payment procedures shall be as follows:

1. *Contractor shall submit Schedule of Values to the Construction Manager and Architect for review*
2. *Prior to end of each pay period, Contractor shall submit a rough draft ("pencil copy") for their payment application for review and approval by the Construction Manager and the Architect.*
3. *Upon approval of pencil copy, Contractor shall submit at least four copies of their payment application to the Architect for approval along with their certified payrolls and monthly manning reports.*
4. *Architect and Construction Manager will approve payments and forward to the Owner.*

§ 9.2 Schedule of Values

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit a schedule of values to the Architect before the first Application for Payment, allocating the entire Contract Sum to the various portions of the Work ***which in the aggregate equals that total Contract Sum, divided so as to facilitate payments to Subcontractors, supported by such evidence of correctness as the Architect may direct or as required by the Owner. It will be necessary for all Contractors to divide their contract into a separate schedule for the work performed at the project. These schedules, when approved by the Architect, Construction Manager and Owner, shall be used to monitor the progress of the Work and as a basis for Certificates for Payment. All items with entered values will be transferred by the Contractor to the "Applications and Certificate for Payment," and shall include the latest approved Change Orders and Construction Change Directives. Change Order values and Construction Change Directive values shall be broken down to show the various subcontracts. The Application for Payment shall be on AIA Document G702 and G703 and the approved Voucher obtainable from the Owner. Each item shall show its total scheduled value, value of previous applications, value of the application, percentage completed, value completed and value yet to be completed. All blanks and columns must be filled in, including every percentage complete figure*** . The schedule of values shall be prepared in the form, and supported by the data to substantiate its accuracy, required by the Architect. ~~This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. Any changes to the schedule of values shall be submitted to the Architect and supported by such data to substantiate its accuracy as the Architect may require, and unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment.~~

§ 9.2.2 The Contractor shall include the following separate items in his/her schedule of values:

Punch List Work - Minimum of 1% of contract value
Value for testing
Value for Record Drawings and manuals
Value for final clean-up
Value for professional cleaning vendor (to be performed daily) for project duration
Value for equipment start-up and commissioning
Value for shop drawings
Value for coordination drawings
Value for Owner's attic stock
Safety protections
Approved Project Baseline Schedule
Project Schedule Updates

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Winter Protection
Allowance(s)
TAB coordination shiv, belts and modifications as required

§ 9.3 Applications for Payment

§ 9.3.1 The *Contractor shall submit to the Architect an itemized Application for Payment for their Contract on AIA Document G702 and G703 and the approved Voucher obtainable from the Owner. Payroll Certification for all employees of all of the workers on the project shall be submitted as well as other such data for the purposes of summarizing the work and tracking the project. The Architect and the Construction Manager will process the application and forward it with his recommendations to the Owner* ~~At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner or Architect require, such as copies of requisitions, and releases and waivers of liens from Subcontractors and suppliers, and shall reflect retainage if provided for in the Contract Documents~~.

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

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

§ 9.3.1.3 Until substantial completion, the Owner will pay 98% of the amount due the Contractor on account of progress payments until a balance of $500,000 is due the Contractor. The retainage will then be increased to Five Percent (5%) of the $500,000.00 balance of the contract until final completion. The retainage will be held until final acceptance of the project by the Architect and the Owner. The Contractor shall submit a separate voucher for the full amount of the retainage along with the Consent of Surety, A.I.A. Form G707A and the Contractor shall be required to furnish a Maintenance Bond for 100% (One Hundred Percent) of the Project Cost for a period of two (2) years from the Date of Final Acceptance.

§ 9.3.1.4 Upon acceptance of the work performed pursuant to this Contract for which the Contractor has agreed to the withholding of payments pursuant to Article 9 of this Contract, all amounts being withheld by the Owner shall be paid in accordance with Paragraph 9.3.1.3 without further withholding of any amounts for any purposes whatsoever, provided that the Contract has been satisfactorily completed.

§ 9.3.1.5 Each application for payment shall be accompanied by the following, all in form and substance satisfactory to the Owner and Architect:

1. *A current contractor's lien waiver and duly executed and acknowledged sworn statement by an officer of the Contractor showing all subcontractors and materialmen with whom the Contractor has entered into subcontracts, the amount of each such subcontract, the amount requested for any subcontractor and materialmen in the requested progress payment and the amount to be paid to the Contractor from such progress payment.*
2. *A Purchase Order or Voucher if required by the Owner.*
3. *A Schedule Update approved by the Construction Manager and Architect.*
4. *A Third Party (not the General Contractor) written Field Safety Inspection Report.*
5. *An updated Shop Drawing Log showing the status of all of the required Shop Drawings.*

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§ 9.3.2 ~~Unless otherwise provided in the Contract Documents,~~ ***At the Owner's Option,*** payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with ~~procedures~~ ***Paragraphs 9.3.2.1, 9.3.2.2, 9.3.2.3 and 9.3.2.4 and*** satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage, and transportation to the site, for such materials and equipment stored off the site.

§ 9.3.2.1 With each Application for Payment the Contractor shall submit to the Architect and Owner a written list identifying each location where materials are stored off the Project site and the value of materials at each location. The Contractor shall procure insurance satisfactory to the Owner for materials stored off the Project site in an amount not less than the total value thereof.

§ 9.3.2.2 The consent of any surety shall be obtained to the extent required prior to the payment for any materials stored off the Project site.

§ 9.3.2.3 Representatives of the Owner shall have the right to make inspections of the off-site storage areas at any time.

§ 9.3.2.4 Materials stored off site shall be protected from diversion, destruction, theft and damage to the satisfaction of the Owner, shall specifically be marked for use on the Project and shall be segregated from other materials at the storage facility.

§ 9.3.3 ***The Contractor warrants and agrees that title to all Work will pass to the Owner either by incorporation in the construction or upon receipt of payment therefor by the Contractor, whichever occurs first, free and clear of all liens, claims, security interests, or encumbrances whatsoever, that the vesting of such title shall not impose any obligation on Owner or relieve Contractor of any of its obligations under the Contract, that the Contractor shall remain responsible for damages to or loss of the Work, whether completed or under construction, until responsibility for the Work has been accepted by Owner in the manner set forth in the Contract Documents, and that no Work covered by an Application for Payment will have been acquired by the Contractor, or by any other person performing Work at the site or furnishing materials and equipment for the Project, subject to an agreement under which an interest therein or an encumbrance thereon is retained by the seller or otherwise imposed by the Contractor or such other person*** ~~The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information, and belief, be free and clear of liens, claims, security interests, or encumbrances, in favor of the Contractor, Subcontractors, suppliers, or other persons or entities that provided labor, materials, and equipment relating to the Work.~~

§ 9.4 Certificates for Payment

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

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Section 9.5.1. ***The Architect must receive this information in accordance with the schedule set forth at the Pre-Construction Meeting***

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

§ 9.5 Decisions to Withhold Certification

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

.1 defective Work not remedied;

.2 third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;

.3 failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;

.4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;

.5 damage to the Owner or a Separate Contractor;

.6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or

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

.8 The failure of any Contractors to comply with mandatory requirements for maintaining record drawings. The Contractor shall be required to check record drawings each month. Written confirmation that the record drawings are up-to-date shall be required by the Architect before approval of the Contractor's monthly payment requisition will be considered.

.9 The Contractor shall provide a third-party Insurance Safety Site Inspection Report monthly and remedy all issues promptly.

.10 Shop drawings not submitted as required by the Contract Documents.

.11 Failure to cooperate with Owner, Construction Manager or Architect relative to construction schedule, material storage, coordination with the Owner, clean up or safety.

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

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

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

§ 9.6 Progress Payments

§ 9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect. ***Notwithstanding Certification by the Architect, the Owner may refuse to make payment based on any default by the Contractor including, but not limited to those defaults set forth in Subparagraphs 9.5.1 through 9.5.1.11. The Owner shall not be deemed in default by reason of withholding payment while any of such defaults by the Contractor remain uncured.***

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

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

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

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

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

§ 9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors or provided by suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, create any

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fiduciary liability or tort liability on the part of the Contractor for breach of trust, or entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

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

§ 9.6.9 The ***Owner will issue timely payments to the Contractor in accordance with the requirements of "The Prompt Payment Act", N.J.S.A. 2A:30A-1, et seq. The Contractor is hereby notified that the Owner, as a public entity, requires all payments to be approved at scheduled public meetings. The vote on authorization for payments will be made at the first public meeting of the Owner, following the Owner's receipt of the Architect's authorization for payment, and paid during the subsequent payment cycle.***

§ 9.7 Failure of Payment

Authorization for payment of periodic billing, final payments or retainage monies requires approval and certification by formal resolution of the Camden County Technical Schools Board of Education. Pursuant to P.L. 2006, c. 96, all billing amounts due under a contract with the successful bidder and all required purchasing documents must be received at least ten (10) days in advance of the next scheduled public meeting of Camden County Technical Schools Board of Education for the month in which payment is requested. Approved and certified amounts due will be paid during the Camden County Technical Schools Board of Education's subsequent payment cycle.

§ 9.8 Substantial Completion

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof ***which the Owner agrees to accept separately*** is sufficiently complete in accordance with ***this definition and*** the Contract Documents so that the Owner can occupy or utilize the Work for its intended use. ***The Work will not be considered substantially complete until all project systems included in the Work are operational as designed and scheduled, all designated or required inspections, certifications, permits, approvals, licenses and other documents from any governmental authority having jurisdiction thereof necessary for the beneficial use and occupancy of the Project are received, designated instruction of Owner's personnel has been completed, and all final finishes within the Contract are in place. In general, the only remaining Work shall be minor in nature, so that the Owner can occupy the building on that date and the completion of the Work by the Contractor would not materially interfere or hamper the Owner's (or those claiming by, through or under the Owner) normal operations. Contractor recognizes that normal operations requires the use and occupancy of the Work by students and faculty without interruption and that any punchlist or corrective work shall be done at times when the Work is not so occupied. As a further condition of substantial completion acceptance, the Contractor shall certify that all remaining Work will be completed within thirty (30) consecutive calendar days or as agreed upon following the date of substantial completion. In addition to any other definitions of Substantial Completion as defined by the contract documents, the following is required before the project is considered "Substantially Complete":***

In addition to the above the following items must be completed in order to deem the work Substantially Complete:

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1. ***All required final inspections have been completed by the authority having jurisdiction resulting in a TCO or CO.***
2. ***Written certification from a qualified, AHC (Certified Architectural Hardware Consultant) that the hardware, cores and keying has been installed and tested in every door and is 100% complete for each phase or the total project whichever comes first.***

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

§ 9.8.2.1 The Contractor shall perform a Quality Control / Quality Assurance QC/QA Punchlist of all work prior to requesting Substantial Completion and a punch list from the Owners Team. The Contractor's Project Manager shall take the lead and conduct an onsite review with the Contractor's superintendent and representation from every major sub prime contractor. Notification of this onsite walk thru shall be provided in writing to all members of the Owners Team who may or may not choose to attend. The Contractor's Project Manager shall record and distribute this QC/QA Punchlist in a matrix that provides an additional column for the Contractor to document the completion of the work and the date. After successful completion of the Contractor's QC/QA Punchlist and all work, the Contractor shall request the Owners Team perform a Punchlist. Substantial Completion shall be requested in accordance with paragraph 9.8.1.

§ 9.8.3 Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents ***and the requirements above*** so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit ***in writing*** a request for another inspection by the Architect to determine Substantial Completion.
§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.4.1 The Architect's Certificate of Substantial Completion shall be subject to the Owner's final approval.

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

§ 9.9 Partial Occupancy or Use

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have

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accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

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

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

§ 9.9.4 The occupancy of any portion of the Work shall not constitute acceptance of any Work, except as hereinafter stated, nor does it waive the Owner's right to Liquidated Damages. Final Acceptance of the Work shall be for the whole Work only and not part.

§ 9.10 Final Completion and Final Payment

§ 9.10.1 Upon receipt of the Contractor's notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled. ***All warranties and guarantees required pursuant to the Contract Documents shall be assembled and delivered by the Contractor to the Owner as part of the final application for payment. The final Certificate for Payment will not be issued by the Architect until all warranties and guarantees have been received and accepted by the Owner.***

§ 9.10.1.1 The Architect's Certificate of Final Completion shall be subject to the Owner's final approval.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment, (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6) ***evidence of compliance with all requirements of the Contract Documents: notices, certificates, affidavits, other requirements to complete obligations under the Contract Documents: including but not limited to (a) instruction of Owner's representatives in the operation of mechanical, electrical, plumbing and other systems, (b) delivery of keys to Owner with keying schedule: master, sub-master and special keys, (c) delivery to the Construction Manager of Contractor's General Warranty (as described in Paragraph 3.5) and each written warranty and assignment thereof prepared in duplicate, certificates of inspections, and bonds for the Construction Manager's review and***

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delivery to Owner, (d) delivery to the Construction Manager a printed or typewritten operating, servicing, maintenance and cleaning instructions for all Work; parts lists and special tools for mechanical and electrical Work, in approval form, (e) delivery to the Construction Manager of specified Project record documents and (f) delivery to Owner of a Final Waiver of Liens (AIA Document G-706 or other form satisfactory to Owner), covering all Work including that of all Subcontractors, vendors, labor, materials and services, executed by an authorized officer and duly notarized. In addition to the foregoing, all other submissions required by other articles and paragraphs of the Specifications including final construction schedule shall be submitted to the Architect before approval of final payment ~~if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner.~~ If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees.

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

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

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

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

9.11 LIQUIDATED DAMAGES

§9.11.1 If the Contractor fails to complete the project and each and every part and appurtenance thereof fully, entirely and in conformity with the provisions of the contract within the times stated in the contract, or within such further time as may have been granted in accordance with the provisions of the contact, then the County may withhold permanently from the Contract's total compensation the appropriate amount of $500.00 for each and every day that the work remains incomplete, which said amount shall not be considered a penalty, but liquidated damages for the loss, inconvenience and extra expense to the County by such delays. This provision shall apply to any milestone completion dates that may be in the specifications.

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ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

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

§ 10.1.1

1. ***The Contractor must fully comply with the job safety requirements in addition to all Federal, State and Local safety guidelines. All cost associated with complying with all safety requirements shall be included in each contractor's base bid.***
2. ***The Contractor will serve as the overall Project Safety Coordinator and shall be responsible for all issues of safety and protection. The Contractor shall designate a safety person at the job site while the contractor is working on the project site. The designated safety person shall be responsible for the safety of their work and for their workers and to make continuous inspections for all safety issues relating to his work. The Architect and/or the Construction Manager are not responsible for safety on this project but will endeavor to promote safety. Each Contractor must comply with job Safety Requirements in addition to OSHA and local agency requirements. Failure to comply with safety issues will be grounds for withholding of payments.***
3. ***Contractor will comply with all reasonable requests of the Owner and Construction Manager with respect to additional security and protections required for work interfacing with Facility Operations. Safety is of utmost importance on this project and all issues relative to safety and protection of the Facility, Staff and Occupants will be treated as emergency needs and will not be subject to the 7-day notice requirements of Article 14.***

    A. ***The Contractor shall provide, maintain, relocate and remove in coordination with the Construction Manager, a 6' high, perimeter security fence. The Contractor is responsible for opening and securing the site each day.***
    B. ***This is a hard hat job. Identifying hard hats shall be worn at all times.***

4. ***The proper execution of the required safety provisions is directly related to the general condition safety line item on the schedule of values. The failure to provide a competent person on site to properly identify and take immediate corrective action may result in deductions to the general condition safety line item of the schedule of values.***
5. ***The Contractor shall be responsible for the immediate investigation and resolution of all safety and environmental complaints / issues generated by contractor employees, owners, owner's representatives or members of the public.***
6. ***Contractor shall maintain all egress routes throughout building. Contractor shall post exit signs as coordinated with the Construction Manager. Contractor shall provide wall hung fire extinguishers throughout building as deemed necessary by the Construction Manager and fire officials.***
7. ***Contractor's safety representative shall perform a daily safety inspection walk through to ensure that all requirements of the OSHA Standards, Fire Protection Standards and Safe Work Practices are being with and/or corrected. The responsibility of the Contractor is to provide a safe and healthy work environment for construction personnel, Owner's personnel and representative, and the public.***
8. ***Upon written receipt of safety concerns and /or issues, the Contractor shall respond in writing addressing how the safety concerns or issues were resolved. The Construction Manager shall be copied on all safety-related correspondence.***
9. ***The Contractor's response and compliance with correction of deficiencies noted in the safety concerns notice issued by the Authority having jurisdiction is mandatory. Failure to comply will be grounds for withholding of progress payments until the conditions are acceptable to O.S.H.A or Authority having local jurisdiction.***

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10. *The Contractor shall submit to the Construction Manager, a copy of all licenses (welding, power nailers, asbestos, etc.) as required by applicable agencies.*
11. *Contractor shall have all required personal protective equipment and materials available for use by each employee as required by Federal, State and Local guidelines.*
12. *Contractor shall supply proper equipment and crew sizes as necessary to safely complete the work.*
13. *Contractor shall provide documented safety training for each of their employees and subcontractor's employees no later than the first day they arrive on site. The training shall be documented and signed by the trainer and employee. A copy of all safety-training documents is to be provided to the Owner and updated as manpower loading increases.*
14. *The Contractor shall supply (2) two OSHA approved means of access/egress to each floor and roof for the course of the entire project for use by all applicable parties. The Contractor shall erect and maintain OSHA approved pedestrian walking bridges, for emergency access/egress and as necessary to protect personnel from overhead work*
15. *The Contractor shall be responsible for providing and maintaining all temporary emergency egress routes. The Contractor shall obtain the approval of the Building and Fire Departments for all temporary emergency egress routes. General Contractor to provide for fire separation walls between occupied areas as required by local officials.*
16. *Contractor shall provide, relocate and /or maintain barricades, signage, provide flagmen etc. as necessary to ensure public safety and safe egress. Contractor to provide, maintain, relocate and remove in coordination with the Construction Manager, the perimeter security fence.*
17. *Notify the Construction Manager, immediately upon arrival of OSHA to the site.*
18. *Contractor shall submit to the Construction Manager all MSDS sheets and shall cooperate in the posting of all required notifications relative to the use of hazardous substances on the property. Contractor to comply with NJ Law regarding the use or storage of hazardous substances in Public Buildings. MSDS sheets shall be posted prior to product being delivered to site.*
19. *Contractor, subcontractor, vender, etc. should enforce a full time no smoking or alcohol use policy for all employees during the entire course of the project. Any worker found violating these reflections, or being belligerent, will be subject to removal from the site at the sole discretion of Owner.*
20. *Contractor shall be responsible to secure the site at the end of each workday by an effective means and maintain until all parties determine no longer required.*
21. *For the safety of occupants, staff, and the public, the steel erection must be scheduled and coordinated with the Construction Manager. Swinging of steel and crane boom over occupied space will not be allowed. Steel contractor shall provide additional barricades and fencing around his crane and steel at all times.*
22. *Contractor must submit an acceptable OSHA compliant site specific written safety plan to the Construction Manager for review within fourteen (14) days from the notice to proceed or prior to mobilizing on site, whichever comes first. The written safety plan shall include (as applicable to their work) but is not limited to the following:*
    - Full time no smoking policy or alcohol use is allowed on the project. Any worker found violating these restrictions, or being belligerent, will be subject to removal from the site. (Contractors shall post required signs).
    - Full time hard hat policy (identifying hard hats shall be worn at all times).
    - Site specific emergency action plan with contractor phone numbers, active 24 hours a day, 7 days a week.
    - Competent on-site safety representative, named and active (Provide alternate)
    - Scaffold erection plan, including a log of daily inspections.
    - Full time fall protection plan for exposures over 6'-0".
    - Job site signage plan (Perimeter fence warning signs posted 50'-0" o/c.
    - First aid and CPR provisions.

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- OSHA 200 log and Job Safety and Health Protection poster.
- Daily clean up.
- Hazard Communication Program with MSDS logged and maintained.
- Hazard Communication program.
- Daily diary of work, issues, and incident, etc.
- Sheeting, shoring and excavations protection line.
- GFI safety program.
- Hazardous Energy Control Lock out tag out program.
- Required safety clothes; Eye & ear protection, respirators, boots, belts, gloves etc. as appropriate to their work requirement.
- Fire Extinguishers.
- Removal guard rail and protection at material loading areas, 200lb force minimum requirement.
- All stairs and platforms must have railings, 200lb force minimum requirement. Stair pains and landings must be filled prior to their use.
- Daily inspection of tools and equipment; verify safety devises are operational.
- Ladder usage plan.
- Weekly toolbox meetings, documented and signed by each employee
- Temporary heat procedures.

23. *Contractor shall maintain and submit a complete copy of the written safety plan, logs, diaries, plans and programs on site for the project files.*
24. *The Contractor shall provide a third-party Insurance Safety Site Inspection Report monthly and remedy all issues promptly.*

The speed limit within the project property is 5MPH. Contractor employees operating vehicles in excess of the speed limit or in any otherwise unsafe manner will be directed to leave the site and not permitted to return.

§ 10.2 Safety of Persons and Property

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

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

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

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

.4 *The Contractor shall provide a third-party Insurance Safety Site Inspection Report monthly and remedy all issues promptly.*

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

§ 10.2.2.1Contractor shall comply with all regulations required by the Federal Occupational Safety and Health Act (OSHA).

§ 10.2.2.2 The Contractor shall conform to all applicable New Jersey Department of Environmental Protection regulations.

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§ 10.2.2.3 Contractors must comply with construction and environmental standards contained in Federal and State Regulations and other applicable laws.

§ 10.2.2.4 It is the Contractor's responsibility to determine the existence of potentially hazardous materials, including lead, and to protect his workmen and the work area.

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

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

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

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

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

§ 10.2.8 Injury or Damage to Person or Property

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

§ 10.2.9 The Contractor shall provide and maintain in good operating condition suitable and adequate fire protection equipment and shall comply with all reasonable recommendations regarding fire protection made by the representatives of the fire insurance company carrying insurance on the Work or by the local fire chief or fire marshal. The area within the site limits under the Contractor's control shall be kept orderly and clean, and all combustible rubbish shall be promptly removed from the site. Contractor will comply with all reasonable requests of the Owner and Construction Manager with respect to additional security and protections required for work interfacing with the Owner's Operations. Safety is of utmost importance on this project and all issues relative to safety and protection of the Public and Employees will be treated as emergency needs and will not be subject to the 7-day notice requirements of Article 14.

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§ 10.2.10 The Contractor shall remove snow or ice which may accumulate on the site within areas under his control which might result in damage or delay.

§ 10.2.11 The Contractor shall take all precautions necessary to prevent loss or damage caused by vandalism, theft, burglary, pilferage, or unexplained disappearance of property of the Owner and Contractor, whether or not forming part of the Work, located within those areas of the Project to which the Contractor has access. Whenever unattended, including nights and weekends, mobile equipment and operable machinery shall be kept locked and made inoperable and immovable.

§ 10.2.12 Neither the Owner nor the Construction Manager nor the Architect shall be responsible for providing a safe working place for the Contractor, the Subcontractors or their employees, or any individual responsible to them for the work.

§ 10.2.13 The Contractor shall conform to requirements of OSHA, the Construction Safety Code of the State Department of Labor and those of the AGC Manual. The requirements of the New Jersey and Local Building Construction Codes shall apply where there are equal to or more restrictive than the requirements of the Federal Act.

§ 10.2.14 When all or a portion of the Work is suspended for any reason, the Contractor shall securely fasten down all coverings and protect the Work as necessary from injury or any cause.

§ 10.2.15 The Contractor shall promptly report in writing to the Owner, Construction Manager and Architect all accidents arising out of or in connection with the Work which caused death, personal injury or property damage giving full details and statements of any witnesses. In addition, if death, serious personal injury or serious property damage is caused, the accident shall be reported immediately by telephone or messenger to the Owner, Construction Manager and Architect.

§ 10.2.16 Contractor is required to follow and enforce the work rules set forth below. Failure to comply with or enforce any of these rules will be grounds for suspension and/or termination of this Contract:

- *.1 No use of alcoholic beverages prior to or during working hours. Anyone found impaired after lunch will be escorted from the Project site.*
- *.2 No use of illegal drugs or prescription medications which could induce drowsiness or otherwise impair perception or performance. Use of illegal drugs may result in prosecution to the fullest extent of the law. Any warning associated with use of prescription drugs must be complied with, particularly warning against operation of machinery and equipment.*
- *.3 No horseplay or rough-housing will be allowed.*
- *.4 No sexual, racial, or ethnic harassment, or similar conduct will be tolerated.*
- *.5 All employees shall use proper sanitation habits including use of toilet facilities and garbage cans.*
- *.6 All employees shall dress in clothing appropriate for the work they are to perform. All personnel are to wear hardhats, safety shoes, glasses, gloves, masks or respirators, noise protection devices, and other protective clothing and equipment as required by OSHA standards.*
- *.7 All equipment is to be property stored and/or secured at the end of the workday or if it is to remain idle for greater than one hour.*
- *.8 All personnel are to be made aware of the availability of Material Safety Data Sheets for materials used at the Project site. This information is available from the Contractor using the product. The Contractor shall maintain a copy of all MSDS forms at the construction site office for all personnel to review.*

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§ 10.3 Hazardous Materials and Substances

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

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor, ***Construction Manager*** and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor, ***Construction Manager*** and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor, ***Construction Manager*** or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor ***Construction Manager*** and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up ***adjustments shall be accomplished as provided in Article 7.***

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

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

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

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

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§ 10.3.7 The Contractor shall submit to the Owner/Construction Manager all MSDS sheets and shall cooperate in the posting of all required notifications relative to the use of hazardous materials. Contractor to comply with NJ Law regarding the use or storage of hazardous materials.

§ 10.4 Emergencies

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

§ 10.4.1 – EMERGENCY/SAFETY PLAN

All parties involved in the construction process should be aware of emergency services that may be required during the construction process.

Contractor shall establish the site-specific Emergency Action Plan and, after approval by the owner, and local authorities, shall display at site trailers and various locations at the site.

In case of an accident, emergency, or injury on the job site, the Contractor shall immediately follow the Site-Specific Emergency Action Plan. Following the incident, the Contractor shall submit to the Construction Manager a complete written accident report detailing the circumstances which caused the accident, extent of injuries, damage to the building, time of accident, corrective action required, etc.

ARTICLE 11 INSURANCE AND BONDS (SEE THE INSTRUCTIONS TO BIDDERS FOR ALL INSURANCE REQUIREMENTS)

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

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

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

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense. ***If prior to the date of Substantial Completion, the Contractor, a subcontractor or anyone for whom either is responsible, uses or damages any portion of the Work, including without limitation, mechanical, electrical, plumbing and other building systems, machinery, equipment or other mechanical device, the Contractor shall cause each such item to be restored to "like new condition" at no expense to the Owner.***

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§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within ~~one-year~~ ***two (2) years*** after the date of ~~Substantial Completion~~ ***Final Acceptance*** of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. ~~During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty~~. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.5.

.1 ***The obligations under Item 12.2 shall cover any repairs and replacement to any part of the Work or other property caused by the defective Work.***

.2 ***Upon completion of any work under or pursuant to Item 12.2., the two-year correction period in connection with the work requiring correction shall be renewed and recommenced.***

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

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

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

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

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

§ 12.3 Acceptance of Nonconforming Work

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made. ***This paragraph relates exclusively to the knowing acceptance of nonconforming work by the Owner. It has no applicability to work accepted by the Owner or Architect without the knowledge that such work fails to conform to the requirements of the Contract Documents.***

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ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

§ 13.1.1 The Contract shall be governed by the laws of the State of New Jersey. For construction contracts, as defined in N.J.S.A. 40A:11-50, disputes arising under the contract shall be submitted to mediation or non-binding arbitration pursuant to industry standards prior to being submitted to a court for adjudication. In the event, any claim arising out of this Contract is brought, all parties shall be responsible for their own attorneys' fees and costs.

§ 13.2 Successors and Assigns

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

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

§ 13.3 Rights and Remedies

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

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

§ 13.4 Tests and Inspections

§ 13.4.1 ***The Owner shall provide and contract for "structural tests and special inspections" as required by the NJ DCA Bulletin 03-5. The Contractor shall coordinate, schedule, and provide on-site supervision and man-power to facilitate the testing. All other Tests, inspections and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of (1) tests, inspections or approvals that do not become requirements until after bids are received or negotiations concluded, and (2) tests, inspections or approvals where building codes or applicable laws or regulations prohibit the Owner from delegating their cost to the Contractor. The Architect, Owner and Contractor shall be afforded a reasonable opportunity to attend, observe, and witness all inspections and tests of the Work. The Architect or Owner may at any time request and receive from the Contractor satisfactory evidence that materials, supplies or equipment are in conformance with the Contract Documents. The Conduct of any inspection of test and the receipt of any approval shall not operate to relieve the Contractor from its obligations under the Contract Documents unless specifically so stated by Owner in writing.*** ~~Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or~~

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~~lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.~~

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

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Architect's services and expenses, shall be at the Contractor's expense. ***The Contractor also agrees that the cost of testing services required for the convenience of the Contractor in his scheduling and performance of the Work and the cost of testing services related to remedial operations performed to correct deficiencies in the Work shall be borne by the Contractor.***

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

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

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

§ 13.5 Interest (NOT APPLICABLE)

§ 13.5.1. The Contractor shall not be entitled to any payment of interest for any reason, action or inaction by the Architect or the Owner unless required by law.

§ 13.5.2 Any payments withheld for time delays, faulty materials, or workmanship, shall not bear interest for period of delay or non-acceptance.

§ 13.6 WRITTEN NOTICE
Written notice shall be deemed to have been duly served if delivered in person to the individual, to a member of the firm or entity, or to an officer of the corporation for which it was intended; or if delivered at, or sent by registered or certified mail or by courier service providing proof of delivery to, the last business address known to the party giving notice.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

§ 14.1.1 The Contractor may terminate the Contract ***in the manner provided in Subparagraph 14.1.2 if repeated suspensions, delays or interruptions by the Owner as described in Paragraph 14.3 constitute in the aggregate***

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more than 100% of the total number of days scheduled for completion or 120 days in any 365-day period, whichever is less, or if ***all*** the Work is ***entirely*** stopped for a ***continuous*** period of ~~30~~ ***60*** consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, for any of the following reasons:

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

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

.3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment ***(without cause)*** within the time stated in the Contract Documents; or

§ 14.1.2 ***If one of the above reasons exist, the Contractor may, upon fourteen (14) days written notice to the Owner and Architect, terminate the Contract, unless this reason is cured prior to the expiration of the notice, and recover from the Owner payment of work properly executed in accordance with the Contract Documents (the basis for such payment shall be as provided in the Contract) and for payment for cost directly related to work thereafter performed by Contractor in terminating such work including reasonable demobilization and cancellation charges provided said work is authorized in advance by Architect and Owner.*** ~~The Contractor may terminate the Contract if, through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, repeated suspensions, delays, or interruptions of the entire Work by the Owner as described in Section 14.3, constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.~~

§ 14.1.3 ***The Owner shall not be responsible for damages for loss of anticipated profits on work not performed on account of any termination described in Subparagraph 14.1.1 and 14.1.2.***
~~If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such termination.~~

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

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

.1 Refuses or fails to supply enough properly skilled workers or proper materials ***and/or equipment***;

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

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

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

.5 ***Disregards the instructions of Architect or Owner (when such instructions are based on the requirements of the Contract Documents).***

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.6 ***Is adjudged bankrupt or insolvent, or makes a general assignment for the benefit of Contractor's creditors, or a trustee or a receiver is appointed for Contractor or for any of its property, or files a petition to take advantage of any debtor's act, or to recognize under bankruptcy or similar laws; or***

.7 ***Breaches any warranty made by the Contractor under or pursuant to the Contact Documents.***

.8 ***Fails to furnish the Owner with assurances satisfactory to the Owner evidencing the Contractor's ability to complete the Work in compliance with the requirements of the Contract Documents.***

.9 ***Fails after the commencement of the Work to proceed continuously with the construction and completion of the work for more than 10 days except as permitted under the Contract Documents.***

.10 ***Otherwise does not fully comply with the Contract Documents.***

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

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

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

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

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

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

§ 14.3 Suspension by the Owner for Convenience

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

§ 14.4 Termination by the Owner for Convenience

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

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

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

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

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

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

§ 14.4.4 If Owner terminates the Contract for cause pursuant to Paragraph 14.2 and it is subsequently determined that the Owner was not authorized to terminate the Contract as provided in Paragraph 14.2, the Owner's termination shall be treated as a termination for convenience under this Paragraph 14.4 and the rights and obligations of the parties shall be the same as if the Owner has issued a notice of termination to the Contractor as provided in this Paragraph 14.4.

§ 14.5 Contractor shall promptly pay to Owner all costs and reasonable attorney's fees incurred in connection with any action or proceeding in which Owner prevails, based on a breach of the Contract or other dispute arising out of or in connection with the Contract.

§ 14.6 In the event of the appointment of a trustee and/or receiver or any similar occurrence affecting the management of the account of the Contractor pertaining to the Work, it shall be the obligation of the Contractor, its representatives, receivers, sureties, or successors in interest to continue the progress of the Work without delay and specifically to make timely payment to Subcontractors and Suppliers of all amounts that are lawfully due them and to provide the Owner and all Subcontractors and Suppliers whose work may be affected with timely notice of the status of receivership, bankruptcy, etc., and the status of their individual accounts.

§ 14.7 Regularly scheduled job meetings shall be held at a location and time convenient to the Owner's representatives, the Architect and the Contractor. The Contractor shall attend such meetings or be represented by a person in authority who can speak for and make decisions for the Contractor.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

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

§ 15.1.2 Time Limits on Claims

Issues involving the applicable statute of limitations shall be governed by New Jersey Law.

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party under this Section 15.1.3.1 shall be initiated within ~~21~~ ***5*** days after occurrence of the event giving rise to such Claim or within ~~21~~ ***5*** days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3.2 Injury or Damage to Person or Property. If either party to the Contract suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, written notice of such injury or damage, whether or not insured, shall be given to the other

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party within a reasonable time not exceeding five (5) days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

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

§ 15.1.4 Continuing Contract Performance

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

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

§ 15.1.4.3 Claims for Concealed or Unknown Conditions. Subject to the Contractor's obligations under Articles 1.9.2 and 2.3.4, if conditions are encountered at the site which are (1) subsurface or otherwise concealed physical conditions which differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature, which differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, then notice by the observing party shall be given to the other party promptly before conditions are disturbed and in no event later than five (5) days after first observance of the conditions. The Architect will promptly investigate such conditions and, if they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend an equitable adjustment in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall so notify the Owner and Contractor in writing, stating the reasons. Claims by either party in opposition to such determination must be made within 5 days after the Architect has given notice of the decision. If the conditions encountered are materially different, the Contract Sum and Contract Time shall be equitably adjusted, but if the Owner and Contractor cannot agree on an adjustment in the Contract Sum or Contract Time, the adjustment shall be referred to the Architect for initial determination, subject to further proceedings pursuant to Section 15.2.5.1.

§ 15.1.5 Claims for Additional Cost

If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided ~~in Section 15.1.3~~ ***herein*** shall be given ***to the Owner, Construction Manager and Architect*** before proceeding to execute the portion of the Work that is the subject of the Claim ***and within five (5) days after the occurrence of the event giving rise to such Claim for increase in the Construct Sum. The foregoing written notice shall contain a written statement from the Contractor setting forth in detail the nature and cause of the Claim and an itemized statement of the increase requested. No such written notice shall form the basis of an increase to the Contract Sum unless and until such increase has been authorized by a written Change Order executed and issued according to the terms and conditions set forth herein. The Contractor hereby acknowledges that the Contractor shall not have any right to and the Owner will not consider any requests for an increase in the Contract Sum that is not submitted in compliance with the foregoing requirements***. . Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

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§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.1.3 shall be given. ***Said notice shall itemize all claims and shall contain sufficient detail and substantiating data to permit evaluation of same by Owner and Architect. No such claim shall be valid unless so made*** The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary. ***Any change in the Contract Sum resulting from such claim shall be authorized only by Change Order or Construction Change Directive, as the case may be. All required notices for additional costs shall be made by Certified Mail.***

§ 15.1.6.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated, and had an adverse effect on the scheduled construction ***as determined by reference to historical data. The term "historical data" as used in the previous sentence shall be construed according to this formula: Average rainfall (or snow or low temperature) for the past five years.***

§ 15.2 Initial Decision

The Contract shall be governed by the laws of the State of New Jersey. For construction contracts, as defined in N.J.S.A. 40A:11-50, disputes arising under the contract shall be submitted to mediation or non-binding arbitration pursuant to industry standards prior to being submitted to a court for adjudication.

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

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

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

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

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receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

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

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

§ 15.2.7 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines ***prior to resolution of the claim by the Architect.***

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User Notes: (1245071953)

SECTION 01010 - SUMMARY OF WORK

1.1 GENERAL

A. The Project consists of Renovations and an addition to Building #7 at Camden County Technical Schools, Gloucester Township Campus, located at 343 Berlin Cross Keys Road, Building 4, Sicklerville, New Jersey 08081.

1. Owner: Camden County Technical Schools Board of Education, 343 Berlin Cross Keys Road, Building No. 12 Administration, Sicklerville, New Jersey 08081.

B. Contract Documents were prepared for the Project by Garrison Architects, 713 Creek Road, Bellmawr, NJ 08031.

C. The Work consists of Renovations and an addition to Building #7 at Camden County Technical Schools, Gloucester Township Campus including but not limited to the following, (see the construction documents for details):

1. The contractor shall provide **temporary construction barriers at all times** where work is being performed. The contractor will coordinate with the Owner areas and times which construction barriers are required. At no time will any construction barrier block any existing egress path from the building. The barrier shall be temporary construction fencing or other non-combustible construction which is approved by the architect and owner. The contractor will coordinate with the Owner areas and times which construction barriers are required. At no time, will any construction barrier block any existing egress path from the building.

2. The work shall include:

Renovating and addition to building #7 to form 3 new Classrooms and new toilet rooms: The complete renovation of the existing building and a addition to form 2 classrooms, 1 science lab, boys' toilet, girls,' toilet staff toilet, office, and a corridor to include, but not limited to:

a. The removal of finishes, walls, partitions, doors, windows, existing toilet rooms with fixtures and casework and prepare surface for new classrooms and corridor. Provide new spaces as shown on drawings. infill exterior wall at existing door being removed. Replace existing window with new storefront with doors. Provide new window. Provide new finishes and ceiling.
b. The removal of existing mechanical systems and replacement of mechanical systems.
c. The removal of existing electrical power and lighting and replacement of electrical power and lighting.
d. An addition for the toilet rooms and corridor space.
e. At the building addition the contractor shall perform a soil exchange under the new building addition. Remove the existing soil to an elevation of -4 foot below the finished floor elevation and replace the soil with imported certified clean engineered fill. Place engineered fill in 6" lifts compacted to 95%.

3. Dispose of material according to state and local code and Section 01524 – Construction Waste Management.

4. Restore all grades, lawns and pavement to pre-construction condition.

D. Schedule of work sequence:

1. No work can be started until all permits are received. The existing school must be completely operational during the school year. This project must be completed on or before **August 20, 2021.**

   a. All construction preparation work, project startup, submittals, schedules, approvals, procurement, coordination and other preparatory tasks must commence immediately upon receipt of the Notice to Proceed or the date of the fully executed Owner/Contractor Contract, whichever comes first. The Awarded Contractor must be fully prepared to deliver and install all materials and equipment on the first day of the scheduled on-site Construction period.

E. The Work will be constructed under one lump sum prime contract.

F. Cooperate with separate contractors so that work under those contracts may be carried out smoothly, without interfering with or delaying work under this Contract.

G. Future Contracts: The Owner may award separate contracts for work to be performed following Substantial Completion. Completion of that work depends on completion of work under this Contract. The schedule of this work will be coordinated with the contractor to assure the smooth, successful completion of the project.

H. Contractor Use of Premises: During construction the Contractor shall only have use of the Cafeteria inside the existing school, including use of the site inside the construction limit fence. The Contractor's use of premises is limited by the Owner's school calendar. Any time there is a necessity to enter the existing school, the contractors shall coordinate with the Owner's on site representative. **No unauthorized entry will be permitted.**

I. Use of the Site: Limit use of premises to areas indicated inside of the construction limit fence. Do not disturb portions of the site beyond the areas indicated. Areas which will be disturbed shall also be fenced in during construction. All construction traffic shall be stopped during **STUDENT ARRIVAL AND DISMISSAL TIMES** for school bus operating time during every school day which is subject to change. All other times during the school day, the construction traffic will operate with extra precaution to avoid conflict with school operations and public traffic.

1. The Contractor will have full use of areas within designated "Contract Limits" for performance of the work of this contract, including storage, staging, and field office.
2. Existing utilities will be identified for the Contractors use, subject to conditions and requirements indicated elsewhere in the Project Documents.
3. Access to other areas of the building will not be allowed except as required and specifically authorized in advance to complete individual items of work under this contract. Where so authorized, restrict access to the immediate area of work and only for the time it takes to complete the items of work.

a. When it is necessary to perform work within the occupied portion of the building, the Contractor shall first advise the Owner Representative at least 48 hours prior to the requested time so that security precautions can be made. This applies to all weekends (Saturday and Sunday).
b. Provide daily cleaning of facilities; restore any damage at completion of the specific item of work to the complete satisfaction of the Owner's Representative.
c. Remove all ladders, tools scaffolding, equipment, and material at the completion of the specific item of work, at the end of each day, and which may interfere with scheduled activities.

4. Allow for Owner occupancy and use by the public. Provide safety barriers for students, faculty, and the public.
5. Keep driveways and entrances clear. Do not use these areas for parking or material storage. Schedule deliveries to minimize on-site storage of materials and equipment.
6. All oversized deliveries must be scheduled in coordination with the owner. Site limitations during school hours restricts maneuvering of oversized (tractor trailer) vehicles.
7. It is the Contractor's responsibility to provide safe, protected egress from all existing exits from the existing building as directed by the Building Official and the Fire Marshal.
8. Contractor's personnel are not permitted to wear on-site any clothing with wording or graphics that may be construed as offensive, profane or obscene; with wording, graphics or advertising for tobacco or alcoholic products, or attire that appears provocative. The Owner's Representative and/or Principal at the school will be the sole judge of what is appropriate or inappropriate.
9. Verbal and visual comments to school staff and students will not be tolerated and will be cause for removal from the site.
10. The use of drugs, tobacco, or alcohol anywhere on the grounds or in the building will not be permitted and will be cause for removal from the site.
11. The use of radios without earphones will not be permitted at any time

J. Use of the Existing Building: Maintain building weather tight. Repair damage caused by construction. Protect the building and its occupants during construction.

K. Full Owner Occupancy: The Owner will occupy the site and existing building during construction. Cooperate with the Owner to minimize conflicts and facilitate Owner usage. Do not interfere with the Owner's operations. The Owner will partially occupy the buildings during the summer for summer programs.

L. Partial Owner Occupancy: The Owner reserves the right to occupy and to place and install equipment in completed areas of the building prior to Substantial Completion. Placing equipment and partial occupancy do not constitute acceptance of the Work.

1. The Architect will prepare a Certificate of Substantial Completion after the Contractor obtains a Certificate of Occupancy from Building Officials for each portion of Work occupied prior to Owner occupancy.

2. Mechanical and electrical systems shall be operational and required inspections and tests completed prior to partial Owner occupancy. Upon occupancy, the Owner will operate and maintain systems serving occupied portions of the building.
3. The Owner will be responsible for maintenance and custodial service for occupied portions of the building.

M. Fees, Permits and Taxes: The Contractor is advised that a Building Permit is required for this project. The plans have been submitted to the Construction Official. Upon contract award, it shall be the responsibility of the **Contractor** to secure all required permits. It shall be the **Owner's** responsibility to pay for all fees and permit costs if required. It shall be the **Contractor's** responsibility to pay for all fees and permit costs for the jobsite trailer if required.

N. **SAFETY**: The Contractor is responsible to provide and enforce all safety onsite and conform with all OSHA regulations, codes and standards. The Owner, Construction Manager, Clerk of the Works and Architect have no responsibility to provide for the safety or protection of the trades. The Contractor shall submit a site specific Emergency Action Safety Plan and review this with all onsite personnel. The Contractor shall conduct periodic (as needed at least one a month) site safety inspections and issue a report on the conditions. The Contractor shall maintain a first aid kit onsite.

O. The Contractor shall not use any product containing asbestos and all plumbing shall be lead free. The Contractor shall provide a notarized letter stating: " No asbestos containing materials were provided on the project and the plumbing is lead free."

P. The Contractor is required to purchase all long lead items within (30) days of the award of the contract. The Owner will pay for stored material in accordance with the General Conditions. Delays caused by the failure of the Contractor to adhere to this requirement will not be cause for a time extension. **NO TIME EXTENSIONS WILL BE GRANTED!**

Q. Contractor shall furnish a letter agreeing to provide complete parts and labor service and maintenance of all HVAC systems, equipment, devices, controls, etc., for 2 years from date of substantial completion as determined by architect. The letter shall also affirm that the Contractor will provide scheduled maintenance service quarterly (3-month interval) as the maximum time period between scheduled service.

END OF SECTION 01010

SECTION 01040 – COORDINATION

1.1 GENERAL

A. This Section includes requirements for coordinating construction operations including, but not necessarily limited to, the following:

1. Coordination drawings and Specifications with all subcontractors.
2. Administrative and supervisory personnel.
3. Cleaning and protection is the responsibility of the Contractor.

1.2 COORDINATION

A. Coordinate construction to assure efficient and orderly installation of each part of the Work. Coordinate operations that depend on each subcontractor for proper installation, connection, and operation. The Contractor shall be responsible for the following:

1. Schedule operations in the sequence required to obtain the best results where installation of one part depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to assure maximum accessibility for maintenance, service, and repair.
3. Make provisions to accommodate items scheduled for later installation.
4. Coordination with the school for furniture and equipment which shall be relocated to new facilities.

B. Where necessary, prepare memoranda for distribution to each party involved, outlining procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.

1. Prepare similar memoranda for the Owner and his contractors where coordination of their work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required procedures with other activities to avoid conflicts and assure orderly progress. Such activities include, but are not limited to, the following:

1. Preparation of schedules.
2. Delivery and processing of submittals.
3. Progress meetings.
4. Project closeout activities.

D. Conservation: Coordinate construction to assure that operations are carried out with consideration for conservation of energy, water, and materials.

1. Salvage materials and equipment involved in performance of, but not incorporated in, the Work.

E. Coordination Drawings: Prepare coordination drawings for installation of products and materials fabricated by separate entities. Prepare coordination drawings where limited space necessitates maximum utilization of space for efficient installation of different components.

1. Show the relationship of components shown on separate shop drawings.
2. Indicate required installation sequences.
3. Comply with requirements contained in Section "Submittals."

F. Staff Names: **The Contractor shall** Within 7 days of commencement of construction, submit a list of the Contractor's staff assignments, including the superintendent and other personnel at each Project Site. Identify individuals and their responsibilities. List their addresses and telephone numbers.

1. Post copies in the Project meeting room, the temporary field office, and each temporary telephone.

1.3 PRODUCTS (Not Applicable)

1.4 EXECUTION

A. Inspection of Conditions: Require Installers of major components to inspect substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected.

B. Coordinate temporary enclosures with inspections and tests to minimize the need to uncover completed construction.

C. Clean and protect construction in progress and adjoining materials, during handling and installation. Apply protective covering to assure protection from damage.

D. Clean and maintain completed construction as necessary through the construction period. Adjust and lubricate operable components to assure operability without damaging effects.

E. Limiting Exposures: Supervise construction to assure that no part is subject to harmful, dangerous, or damaging exposure. Such exposures include, but are not limited to, the following:

1. Excessive static or dynamic loading.
2. Excessive internal or external pressures.
3. Excessively high or low temperatures.
4. Water or ice.
5. Solvents and chemicals.
6. Abrasion.
7. Soiling, staining, and corrosion.
8. Combustion.
9. Excessive dust.

END OF SECTION 01040

SECTION 01045 - CUTTING AND PATCHING

1.1 GENERAL

A. Cutting and Patching Proposal: The General Contractor shall be responsible for arranging and providing the necessary cutting and patching that is required to furnish and install all work connected with this project. The General Contractor shall submit a proposal describing procedures in advance of the time cutting and patching will be performed. Request approval from the Owner / Architect before proceeding. Include the following:

1. Describe extent of cutting and patching. Show how it will be performed and indicate why it cannot be avoided.
2. Describe changes to existing construction. Include changes to structural elements and operating components and changes in the building's appearance and other significant visual elements.
3. List products to be used and firms that will perform Work.
4. Indicate dates when cutting and patching will be performed.
5. Utilities: List utilities that will be disturbed or relocated and those that will be temporarily out-of-service. Indicate how long service will be disrupted. Arrange utility work during the Summer for minimum impact to the Schools' normal functions.
6. Where cutting and patching involves adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with the original structure.
7. Approval to proceed does not waive the Architect's right to later require complete removal and replacement of unsatisfactory work.

B. Requirements for Structural Work: Do not cut and patch structural elements in a manner that would change their load-carrying capacity or load-deflection ratio.

1. Obtain approval before cutting and patching the following structural elements:
   a. Foundation construction.
   b. Existing exterior door system
   c. Bearing and retaining walls
   d. Existing roof system

C. Operational Limitations: Do not cut and patch operating elements in a manner that would reduce their capacity to perform as intended. Do not cut and patch operating elements in a manner that would increase maintenance or decrease operational life or safety.

1. Obtain written approval before cutting and patching the following operating elements or safety related systems:
   a. Primary operational systems and equipment.
   b. Fire protection systems.
   c. Electrical wiring systems.
   d. Water and sewer systems.
   e. H.V.A.C. systems.
   f. Cutting and patching work which affects the operation of the school must be performed after 3:00 P.M. or before 7:30 A.M. so as not to interfere with the schools' operations.
   g. Security System.
   h. Computer System.
   i. Telephone and Cable TV System.

D. Visual Requirements: Do not cut and patch exposed construction in a manner that would, in the Architect's opinion, reduce the building's aesthetic qualities. Do not cut and patch in a manner that would result in visual evidence of cutting and patching. Remove and replace construction cut and patched in a visually unsatisfactory manner.

1. Retain the original Installer to cut and patch the exposed Work listed below. If it is impossible to engage the original Installer, engage a recognized experienced and specialized firm.

a. Ornamental metal.
b. Casework.
c. Window system.
d. Roof system
e. Brick veneer work (except size as noted on the drawings).

E. Existing Warranties: Replace, patch, and repair material and surfaces cut or damaged in such a manner as not to void warranties.

1.2 PRODUCTS

A. Use materials identical to existing materials. Use materials that visually match adjacent surfaces to the fullest extent possible if identical materials are unavailable. Use materials whose performance will equal that of existing materials.

1.3 EXECUTION

A. Examine surfaces to be cut and patched and conditions under which work is to be performed before cutting. If unsafe or unsatisfactory conditions are encountered, take corrective action.

1. Before proceeding, meet with parties involved. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

B. Temporary Support: Provide temporary support of work to be cut.

C. Protection: Protect existing construction to prevent damage. Provide protection from adverse weather conditions for portions that might be exposed during cutting and patching operations.

D. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

E. Avoid cutting pipe, conduit, or ductwork serving the building but scheduled to be removed or relocated until provisions have been made to bypass them.

F. Performance: Employ skilled workmen. Proceed at the earliest feasible time and complete without delay.

1. Cut construction to install other components or perform other construction and subsequent fitting and patching required to restore surfaces to their original condition.

G. Cutting: Cut using methods that will not damage elements retained or adjoining construction. Comply with the original Installer's recommendations.

1. Use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. To avoid marring finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.
3. Cut through concrete and masonry using a cutting machine, such as a Carborundum saw or a diamond-core drill.
4. Comply with requirements of applicable Division 2 Sections where cutting and patching requires excavating and backfilling.
5. Where services are required to be removed, relocated, or abandoned, by-pass utility services before cutting. Cut-off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal the remaining pipe or conduit to prevent entrance of moisture or other foreign matter after by-passing and cutting.

H. Patching: Patch with durable seams that are as invisible as possible. Comply with specified tolerances.

1. Inspect and test patched areas to demonstrate integrity of the installation.
2. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
3. Where removing walls or partitions extends one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform color and appearance. Remove floor and wall coverings and replace with new materials to achieve uniform color and appearance.

    a. Where patching occurs in a smooth painted surface, extend final paint coat over entire surface containing the patch after the area has received primer and second coat.

4. Patch, repair, or rehang ceilings as necessary to provide an even-plane surface of uniform appearance.

I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar items. Clean piping, conduit, and similar features before applying paint or finishing materials. Restore damaged pipe covering to its original condition.

END OF SECTION 01045

SECTION 01095 - REFERENCE STANDARDS AND DEFINITIONS

1.1 GENERAL

A. Definitions: Basic Contract definitions are included in the Conditions of the Contract.

B. Indicated refers to graphic representations, notes, or schedules on the Drawings, paragraphs or Schedules in the Specifications, and similar requirements in the Contract Documents. Terms such as shown, noted, scheduled, and specified are used to help the reader locate the reference. Location is not limited.

C. Directed, requested, authorized, selected, approved, required, and permitted mean directed by the Architect, requested by the Architect, and similar phrases.

D. Approved, when used in conjunction with the Architect's action on submittals, applications, and requests, is limited to the Architect's duties and responsibilities as stated in the Conditions of the Contract.

E. Regulations include laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.

F. Furnish means supply and deliver to the Project Site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. Install describes operations at the Project Site including unloading, unpacking, assembly, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

H. Provide means to furnish and install, complete and ready for the intended use.

I. Installer is the Contractor or another entity engaged by the Contractor, either as an employee, subcontractor, or contractor of lower tier, to perform a particular construction activity, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform.

1. The term experienced, when used with the term Installer, means having a minimum of 5 previous projects similar in size and scope to this Project, being familiar with the special requirements indicated, and having complied with requirements of the authorities having jurisdiction.

J. Project Site is the space available for performing construction activities, either exclusively or in conjunction, with others performing work as part of the Project. The extent of the Project Site is shown on the Drawings and may or may not be identical with the description of the land on which the Project is to be built.

K. Testing Agency is an independent entity engaged to perform specific inspections or tests, either at the Project Site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

L. Specifications are organized into Divisions and Sections based on the Construction Specifications Institute's 16-Division format and MASTERFORMAT numbering system.

1. Abbreviated Language: Language used in Specifications is abbreviated. Implied words and meanings shall be interpreted as appropriate. Singular words shall be interpreted as plural and plural words interpreted as singular where applicable as the context of the Contract Documents indicates.
2. Imperative and streamlined language is used. Requirements expressed in the imperative mood are to be performed by the Contractor. At certain locations in the Text, subjective language is used for clarity to describe responsibilities that must be fulfilled indirectly by the Contractor, or by others when so noted.

    a. The words "shall be" are implied where a colon (:) is used within a sentence or phrase.

M. Abbreviations and Names: Where acronyms or abbreviations are used in the Specifications or other Contract Documents, they mean the recognized name of the trade association, standards-generating organization, authorities having jurisdiction, or other entity applicable to the context of the text provision. Refer to the "Encyclopedia of Associations," published by Gale Research Co., available in most libraries.

AA
Aluminum Association
900 19th St., NW, Suite 300
Washington, DC 20006
(202) 862-5156

AAMA
American Architectural Manufacturers Assoc.
1540 E. Dundee Road, Suite 310
Palatine, IL 60067
(708) 202-1350

ACI
American Concrete Institute
P.O. Box 19150
Detroit, MI 48219-0150
(313) 532-2600

ACIL
American Council of Independent Laboratories
1725 K St., NW, Suite 412
Washington, DC 20006
(202) 887-5872

ADC
Air Diffusion Council
One Illinois Center, Suite 200
111 East Wacker Drive
Chicago, IL 60601
(312) 616-0800

AGA
American Gas Assoc.
1515 Wilson Blvd.
Arlington, VA 22209
(703) 841-8400

AIA	American Institute of Architects 1735 New York Ave., NW Washington, DC 20006 (202) 626-7300
A.I.A.	American Insurance Assoc. 1130 Connecticut Ave., NW, Suite 1000 Washington, DC 20036 (202) 828-7100
AISC	American Institute of Steel Construction One East Wacker Drive, Suite 3100 Chicago, IL 60601-2001 (312) 670-2400
AISI	American Iron and Steel Institute 1101 17th Street, NW, Suite 1300 Washington, DC 20036 (202) 452-7100
AMCA	Air Movement and Control Assoc. 30 W. University Drive Arlington Heights, IL 60004 (708) 394-0150
ANSI	American National Standards Institute 11 West 42nd Street, 13th Floor New York, NY 10036 (212) 642-3300
APA	American Plywood Assoc. P.O. Box 11700 Tacoma, WA 98411 (206) 565-6600
ARI	Air Conditioning and Refrigeration Institute 1501 Wilson Blvd., 6th Floor Arlington, VA 22209 (703) 524-8800
ASC	Adhesive and Sealant Council 1627 K Street, NW, Suite 1000 Washington, DC 20006 (202) 452-1500
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers 1791 Tullie Circle, NE Atlanta, GA 30329 (404) 636-8400

ASME	American Society of Mechanical Engineers 345 East 47th St. New York, NY 10017 (212) 705-7722
ASPE	American Society of Plumbing Engineers 3617 Thousand Oaks Blvd., Suite 210 Westlake, CA 91362 (805) 495-7120
ASSE	American Society of Sanitary Engineering P.O. Box 40362 Bay Village, OH 44140 (216) 835-3040
ASTM	American Society for Testing and Materials 1916 Race St. Philadelphia, PA 19103 (215) 299-5400
AWI	Architectural Woodwork Institute P.O. Box 1550 13924 Braddock Rd., Suite 100 Centreville, VA 22020 (703) 222-1100
AWPA	American Wood Preservers' Assoc. P.O. Box 849 Stevensville, MD 21666 (301) 643-4163
AWPB	American Wood Preservers Bureau P.O. Box 5283 Springfield, VA 22150 (703) 339-6660
AWS	American Welding Society 550 LeJeune Road, NW P.O. Box 351040 Miami, FL 33135 (305) 443-9353
AWWA	American Water Works Assoc. 6666 W. Quincy Ave. Denver, CO 80235 (303) 794-7711
BHMA	Builders' Hardware Manufacturers Assoc. 355 Lexington Ave., 17th Floor New York, NY 10017 (212) 661-4261

BIA	Brick Institute of America 11490 Commerce Park Drive, Suite 300 Reston, VA 22091 (703) 620-0010
BOCA	Building Officials and Code Administrators International 4051 West Flossmoor Road Country Club Hills, IL 60478 (708) 799-2300
CDA	Copper Development Assoc. Box 1840, Greenwich Office Park 2 Greenwich, CT 06836 (203) 625-8210
CFR	Code of Federal Regulations Available from Government Printing Office; Washington, DC 20402 (usually first published in Federal Register)
CISPI	Cast Iron Soil Pipe Institute 5959 Shallowford Road, Suite 419 Chattanooga, TN 37421 (615) 892-0137
CRSI	Concrete Reinforcing Steel Institute 933 Plum Grove Rd. Schaumburg, IL 60173-4758 (708) 517-1200
CS	Commercial Standard of NBS (U.S. Department of Commerce) Governmental Printing Office; Washington, DC 20402
DHI	Door and Hardware Institute 14170 New Brook Drive Chantilly, VA 22021-2223 (703) 222-2010
EIA	Electronic Industries Assoc. 2001 Pennsylvania Ave., NW, Suite 1100 Washington, DC 20006 (202) 457-4900
FCC	Federal Communications Commission 1919 M Street, NW Washington DC 20006 (202) 632-7000
FCI	Fluid Controls Institute P.O. Box 9036 Morristown, NJ 07960 (201) 829-0990

FGMA	Flat Glass Marketing Assoc. White Lakes Professional Bldg. 3310 S.W. Harrison Topeka, KS 66611-2279 (913) 266-7013
FM	Factory Mutual Research Organization 1151 Boston-Providence Turnpike P.O. Box 9102 Norwood, MA 02062 (617) 762-4300
FS	Federal Specification (General Services Admin.) Obtain from your Regional GSA Office, or purchase from GSA Specification Unit (WFSIS); 7th and D Streets, SW, Washington, SC 20406 (202) 472-2205 or 2140
FTI	Facing Tile Institute P.O. Box 8880 Canton, OH 44711 (216) 488-1211
GA	Gypsum Association 810 First Street, NE, Suite 510 Washington, DC 20002 (202) 289-5440
HPMA	Hardwood Plywood Manufacturers Assoc. 1825 Michael Farraday Drive P.O. Box 2789 Reston, VA 22090-2789 (703) 435-2900
ICC	International Code Council, Inc. 5203 Leesburg Pike, Suite 708 Falls Church, VA 22041 (703) 931-4533
IEEE	Institute of Electrical and Electronic Engineers 345 E. 47th St. New York, NY 10017 (212) 705-7900
IESNA	Illuminating Engineering Society of North America 345 E. 47th St. New York, NY 10017 (212) 705-7926

ILI	Indiana Limestone Institute of America Stone City Bank Building, Suite 400 Bedford, IN 47421 (812) 275-4426
IRI	Industrial Risk Insurers 85 Woodland St. Hartford, CT 06102 (203) 520-7300
ISA	Instrument Society of America P.O. Box 12277 67 Alexander Drive Research Triangle Park, NC 27709 (919) 549-8411
MCAA	Mechanical Contractors Association of America 1385 Piccard Dr. Rockville, MD 20832 (301) 869-5800
MIA	Marble Institute of America 33505 State St. Farmington, MI 48024 (313) 476-5558
MSS	Manufacturers Standardization Society of the Valve and Fittings Industry 127 Park St., NE Vienna, VA 22180 (703) 281-6613
NAAMM	National Association of Architectural Metal Manufacturers 200 S. Federal St., Suite 400 Chicago, IL 60605 (312) 922-6222
NAPF	National Association of Plastic Fabricators (Now DLPA)
NBGQA	National Building Granite Quarries Assoc. c/o Rock of Ages Corp. P.O. Box 482 Barre, VT 05641 (802) 476-3115
NBS	National Bureau of Standards (U.S. Dept. of Commerce) Gaithersburg, MD 20234 (301) 921-1000

NCMA National Concrete Masonry Assoc.
2302 Horse Pen Road
Herndon, VA 22071
(703) 713-1900

NEC National Electric Code (from NFPA)

NECA National Electrical Contractors Assoc.
7315 Wisconsin Ave., Suite 1300 W
Bethesda, MD 20814
(301) 657-3110

NEII National Elevator Industry, Inc.
185 Bridge Plaza, North
Fort Lee, NJ 07024
(201) 944-3211

NEMA National Electrical Manufacturers Assoc.
101 L St., NW, Suite 300
Washington, DC 20037
(202) 457-8400

NFPA National Fire Protection Assoc.
One Batterymarch Park
P.O. Box 9101
Quincy, MA 02269-9101
(617) 770-3000

N.F.P.A. National Forest Products Assoc.
1250 Connecticut Ave., NW, Suite 200
Washington, DC 20036
(202) 463-2700

NHLA National Hardwood Lumber Assoc.
P.O. Box 34518
Memphis, TN 38184-1818
(901) 377-1818

NPA National Particleboard Assoc.
18928 Premiere Court
Gaithersburg, MD 20879
(301) 670-0604

NRCA National Roofing Contractors Assoc.
One O'Hare International Center
10255 W. Higgins Rd., Suite 600
Rosemont, IL 60018-5607
(708) 299-9070

NSF	National Sanitation Foundation 3475 Plymouth Rd. P.O. Box 130140 Ann Arbor, MI 48105 (313) 769-8010
NTMA	National Terrazzo and Mosaic Assoc. 3166 Des Plaines Ave., Suite 132 Des Plaines, IL 60018 (708) 635-7744
NWMA	National Woodwork Manufacturers Assoc. (Now NWWDA)
NWWDA	National Wood Window and Door Assoc. 1400 E. Touhy Ave., #G54 Des Plaines, IL 60018 (708) 299-5200 (800) 223-2301
OSHA	Occupational Safety Health Administration (U.S. Dept. of Labor) Government Printing Office; Washington, DC 20402
PDI	Plumbing and Drainage Institute c/o Sol Baker 1106 W. 77th St., South Dr. Indianapolis, IN 46260-3318 (317) 251-6970
PS	Product Standard of NBS (U.S. Department of Commerce) Government Printing Office; Washington, DC 20402
RFCI	Resilient Floor Covering Institute 966 Hungerford Drive, Suite 12-B Rockville, MD 20805 (301) 340-8580
SDI	Steel Deck Institute P.O. Box 9506 Canton, OH 44711-9506 (216) 493-7886
S.D.I.	Steel Door Institute c/o A. P. Wherry & Assoc. 30200 Detroit Road Cleveland, OH 44145 (216) 889-0010

SHLMA Southern Hardwood Lumber Manufacturers Assoc.
(Now HMA)

SIGMA Sealed Insulating Glass Manufacturers Assoc.
401 N. Michigan
Chicago, IL 60611-4206
(312) 644-6610

SJI Steel Joist Institute
1205 48th Avenue North, Suite A
Myrtle Beach, SC 29577
(803) 449-0487

SMACNA Sheet Metal and Air Conditioning
Contractors National Association
P.O. 221230
Chantilly, VA 22022-1230
(703) 803-2980

SSPC Steel Structures Painting Council
4400 Fifth Ave.
Pittsburgh, PA 15213-2683
(412) 268-3327

TCA Tile Council of America
P.O. Box 326
Princeton, NJ 08542
(609) 921-7050

TIMA Thermal Insulation Manufacturers Assoc.
29 Bank Street
Stamford, CT 06901
(203) 324-7533
(Standards now issued by NAIMA)

UL Underwriters Laboratories, Inc.
333 Pfingsten Rd.
Northbrook, IL 60062
(708) 272-8800

N. Permits, Licenses, and Certificates: For the Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established in conjunction with compliance with standards and regulations bearing upon performance of the Work.

2.1 PRODUCTS (Not Applicable)

3.1 EXECUTION (Not Applicable)

END OF SECTION 01095

SECTION 01200 - PROJECT MEETINGS

1.1 GENERAL

A. It is the responsibility of the Contractor to set up, run and record the minutes for the meetings.

B. This Section specifies administrative and procedural requirements for project meetings, including, but not limited to, the following:

1. Preconstruction conferences.
2. Preinstallation conferences.
3. Progress meetings.

C. Preconstruction Conference: A preconstruction conference shall be scheduled before starting any construction to review responsibilities and personnel assignments.

D. Attendees: Authorized representatives of the Owner, Architect, and their consultants; the Contractor and his superintendent; major subcontractors; and other concerned parties shall attend.

1. Participants shall be familiar with the Project and authorized to conclude matters relating to the Work.

E. Agenda: Discuss items that could affect progress, including the following:

1. Tentative construction schedule.
2. Critical work sequencing.
3. Submittal of Shop Drawings, Product Data, and Samples.
4. Use of the premises.
5. Product delivery dates.
6. Job site safety.

F. Preinstallation Conferences: The Contractor shall conduct a conference before each activity that requires coordination with other operations.

G. Attendees: The Installer, the Contractor, the Subcontractors related to the work, and representatives of manufacturers and fabricators involved in or affected by the installation shall attend.

1. Review the progress of other operations and preparations for the activity under consideration at each preinstallation conference, including requirements for the following:

a. Compatibility problems and acceptability of substrates.
b. Time schedules and deliveries.
c. Manufacturer's recommendations.
d. Warranty requirements.
e. Inspecting and testing requirements.

2. The Contractor shall record significant discussions and agreements and disagreements, and the approved schedule. Promptly distribute the record of the meeting to everyone concerned, including the Owner and the Architect.

3. Do not proceed with the installation if the conference cannot be successfully concluded. Initiate actions necessary to resolve problems and reconvene the conference.

H. Progress Meetings: The Contractor shall conduct progress meetings at the construction site every two weeks. The Contractor will notify the Owner, the Architect and all subcontractors of scheduled dates. Coordinate meeting dates with preparation of the payment request. It is the Owner / Architect's option to require weekly job site coordination meetings at each job site in addition to the bi-weekly progress meeting.

I. Attendees: The Owner, Architect, Contractor, and other entities concerned with current progress or involved in planning, coordination, or future activities shall be represented. Participants shall be authorized to conclude matters relating to the Work.

J. Agenda: Review and correct or approve minutes of the previous meeting. Review items of significance that could affect progress. Include topics for discussion appropriate to Project status.

1. Contractor's Construction Schedule: The Contractor shall review the progress since the last meeting. Determine where each activity is in relation to the Contractor's Construction Schedule. Determine how to expedite construction behind schedule; secure commitments from parties involved to do so. Discuss revisions required to insure subsequent activities will be completed within the Contract Time.

2. Review the present and future needs of each entity present, including the following:

a. Time.
b. Sequences.
c. Status of submittals.
d. Deliveries and off-site fabrication problems.
e. Temporary facilities and services.
f. Quality and work standards.
g. Change Orders.
h. Coordinate with school schedule and programs.

3. Reporting: Distribute meeting minutes to each party present and to parties who should have been present. Include a summary of progress since the previous meeting and report.

4. Schedule Updating: Revise the Contractor's Construction Schedule after each meeting where revisions have been made. Issue the revised schedule concurrently with the report of each meeting.

1.2 PRODUCTS (Not Applicable)

1.3 EXECUTION (Not Applicable)

END OF SECTION 01200

SECTION 01210 - ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements governing allowances.

1. A Lump Sum Amount is specified in this Section of the Contract Documents. This amount shall be included as a separate line item in the Schedule of Values for the Project.

1.3 SELECTION AND PURCHASE

A. At the earliest practical date after award of the Contract, the contractor shall advise the Architect of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.

B. At the Architect's request, the contractor shall provide a Change Order proposal for additional work to be deducted from the allowance. Include recommendations that are relevant to performing the Work. The Change Order Proposal shall include all material and labor with sufficient breakdown for review.

C. Purchase products and systems selected by Architect from the designated supplier, "or equal" substitutions are not applicable.

1.4 SUBMITTALS

A. Submit proposals for purchase of products or systems included in the cash allowance, in the form specified for Change Order Requests.

B. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.

C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.5 COORDINATION

A. Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

1.6 CASH ALLOWANCES (Overhead and profit are permitted totaling a maximum of 15% per the AIA Contract. Supervision, bond and insurance are not permitted)

A. Cash allowance shall be used only as directed and approved by the Architect for the Owner's purposes.

B. The Change Order Request format shall be used to request authorization for use of funds from the cash allowance. The Contractor's overhead and profit margins are fixed to a maximum of 15% per the AIA Contract. The contractor is not permitted to charge for additional supervision, bond and insurance as these costs are included in the Base Contract Sum.

C. At Project closeout, the contractor shall provide a full credit for unused amounts remaining in the cash allowance to the Owner by Change Order.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

A. $25,000.00 cash allowance.

END OF SECTION 01210

SECTION 01300 – SUBMITTALS

1.1 GENERAL

A. The Contractor shall use the enclosed Cover Page form for **every copy** of every shop drawings submitted with the exception of full size drawings that have a title block for custom or project specific materials or systems. The Contractor's Cover Page form shall be signed by the Project Manager with an original signature indicating that the information has been reviewed and coordinate.

B. Submittal Procedures (Contractor): Coordinate submittal and preparation with construction, fabrication, other submittals, and activities that require sequential operations with all Sub-Contractors. Transmit in advance of construction operations to avoid delay.

1. Coordinate submittals for related operations to avoid delay because of the need to review submittals concurrently for coordination. The Architect reserves the right to withhold action on a submittal requiring coordination until related submittals are received.
2. Processing: Allow 2 weeks for initial review to coordinate with all other Prime Contractors. Allow more time if the Architect must delay processing to permit coordination with other trades or Owner's contractors. Allow 2 weeks for reprocessing.

    a. No extension of Contract Time will be authorized because of failure to transmit submittals sufficiently in advance of the Work to permit processing.
    b. **All Shop Drawings, product data and samples shall be submitted within forty-five (45) days of Notice of Award. No Payments will be approved if the Shop Drawings process is not completed within this time schedule.**

C. Contractor's Construction Schedule (Contractor): Prepare a horizontal bar-chart-type, contractor's construction schedule. Provide a separate time bar for each activity and a vertical line to identify the first working day of each week. Use the same breakdown of Work indicated in the "Schedule of Values." Indicate estimated completion in 10 percent increments. As Work progresses, mark each bar to indicate actual completion.

1. Submit within 14 days of the date established for "Commencement of the Work."
2. Prepare the schedule on stable transparency, or other reproducible media, of width to show data for the entire construction period.
3. Secure performance commitments from parties involved. Coordinate each element with other activities; include minor elements involved in the Work. Show each activity in proper sequence. Indicate sequences necessary for completion of related Work.
4. Coordinate with the Schedule of Values, list of subcontracts, Submittal Schedule, payment requests, and other schedules.
5. Indicate completion in advance of Substantial Completion. Indicate Substantial Completion to allow time for the Architect's procedures necessary for certification of Substantial Completion.
6. Phasing: Show how phased completion affects the Work.
7. Work Stages: Indicate important stages for each portion of the Work.

8. Area Separations: Provide a separate time bar to identify each construction area for each portion of the Work. Indicate where each element must be sequenced with other activities.

D. The Contractor shall receive the schedule from each Sub-Contractor. The Contractor shall coordinate with all Sub-Contractors and prepare an overall construction schedule in five (5) days to submit to the Owner / Architect for approval.

E. Submittal Schedule (Contractor): After developing the Contractor's Construction Schedule, prepare a schedule of submittals. Submit the Submittal Schedule to indicate compliance with Item A, Paragraph 2b, on page one of this section.

1. Coordinate with list of subcontracts, Schedule of Values, list of products, and the Contractor's Construction Schedule.
2. Prepare the schedule in chronological order. Provide the following information:

    a. Date for first submittal.
    b. Related details on drawings.
    c. Related Section number in the Specifications.
    d. Submittal category (Shop Drawings, Product Data, or Samples).
    e. Name of the subcontractor.
    f. Description of the Work covered.
    g. Date for the Architect's final approval.

3. Schedule Distribution: Distribute copies of the Contractor's Construction Schedule and the Submittal Schedule to the Architect, Owner, subcontractors, and parties required to comply with submittal dates. Post copies in the field office.

    a. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their Work and are no longer involved in construction activities.
    b. Updating: Revise the schedule after each meeting or activity where revisions have been made. Issue the updated schedule concurrently with the report of each meeting.

F. Daily Construction Reports: The Contractor shall prepare a daily report recording events at the site and submit copies to the Architect on a monthly basis or upon request. Include the following information:

1. List of subcontractors at the site.
2. High and low temperatures, general weather conditions.
3. Accidents and unusual events.
4. Stoppages, delays, shortages, and losses.
5. Meter readings and similar recordings.
6. Emergency procedures.
7. Orders and requests of governing authorities.
8. Services connected, disconnected.
9. Equipment or system tests and startups.

10. Substantial Completions authorized.
11. A list of all visitors indicating the nature of their visit, the company they represent and the person with whom they spoke.

G. Color Selection Schedule: The Contractor shall submit a color selection schedule providing a listing of every product that requires color selections and categorized by exterior colors, interior colors and by room. The Contractor is responsible to coordinate meeting times with the Owner and Construction Manager (if applicable) to select colors so as not to effect the overall construction schedule or material procurement. All color samples shall be delivered to the job site trailer. **Do not submit color samples with shop drawings to the Architect.** Provide actual material color samples as reproduced color charts are not acceptable.

H. Shop Drawings: The Contractor shall submit newly prepared information drawn to scale. Indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information. Include the following information:

1. Dimensions.
2. Identification of products and materials included by sheet and detail number.
3. Compliance with standards.
4. Notation of coordination requirements.
5. Notation of dimensions established by field measurement.
6. Sheet Size: Except for templates, **submit at least seven (7)** prints on sheets at least 8-1/2 by 11 inches (215 by 280 mm) **but no larger than 30 by 42 inches**. The Prime Contractor shall then copy if required and forward the reviewed prints to all other Prime Contractors.

    a. Do not use Shop Drawings without an appropriate final stamp indicating action taken.

I. Product Data (Contractor): Collect Product Data into a single submittal for each element of construction. Mark each copy to show applicable choices and options. Where Product Data includes information on several products, mark copies to indicate applicable information.

1. Include the following information:

    a. Manufacturer's printed recommendations.
    b. Compliance with trade association standards.
    c. Compliance with recognized testing agency standards.
    d. Application of testing agency labels and seals.
    e. Notation of dimensions verified by field measurement.
    f. Notation of coordination requirements.

2. Preliminary Submittal: Submit a preliminary single copy of Product Data where selection of options is required.
3. Submittals: Submit 7 copies. The Architect will retain one and return the other marked with action taken.

a. Unless noncompliance with Contract Documents is observed, the submittal serves as the final submittal.

4. Distribution: Furnish copies to installers, subcontractors, suppliers, and others required for performance of construction activities. Show distribution on Cover Page forms. Do not proceed with installation until a copy of Product Data is in the Installer's possession.

a. Do not use unmarked Product Data for construction.

J. Samples (Contractor): Submit full-size Samples cured and finished as specified and identical with the material proposed. Mount Samples to facilitate review of qualities.

1. Include the following:

a. Specification Section number and reference.
b. Generic description of the Sample.
c. Sample source.
d. Product name or name of the manufacturer.
e. Compliance with recognized standards.
f. Availability and delivery time.

2. Submit Samples for review of size, kind, color, pattern, and texture, for a check of these characteristics, and for a comparison of these characteristics between the final submittal and the actual component as delivered and installed. Where variations are inherent in the material, submit at least 3 units that show limits of the variations.

a. Refer to other Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar characteristics.
b. Refer to other Sections for Samples to be incorporated in the Work. Samples must be undamaged at time of use. On the Cover Page, indicate special requests regarding disposition of Sample submittals.
c. Samples not incorporated into the Work, or designated as the Owner's property, are the Contractor's property and shall be removed from the site.

3. Submittals: Except for Samples illustrating assembly details, workmanship, fabrication techniques, connections, operation, and similar characteristics, submit 3 sets. One set will be returned marked with the action taken. Maintain sets of Samples, at the Project Site, for quality comparison.

a. Unless noncompliance with Contract Documents is observed, the submittal may serve as the final submittal.
b. Sample sets may be used to obtain final acceptance of the construction associated with each set.

4. Distribution of Samples: Distribute additional sets to subcontractors, manufacturers, and others as required for performance of the Work. Show distribution on Cover Page forms.

K. Quality Assurance Submittals (Contractor): Submit quality-control submittals, including design data, certifications, manufacturer's instructions, and manufacturer's field reports required under other Sections of the Specifications.

1. Certifications: Where certification that a product or installation complies with specified requirements is required, submit a notarized certification from the manufacturer certifying compliance.

a. Signature: Certification shall be signed by an officer authorized to sign documents on behalf of the company.

L. Architect's Action: Except for submittals for the record or information, where action and return are required, the Architect will review each submittal, mark to indicate action taken, and return. Compliance with specified characteristics is the Contractor's responsibility.

1. Action Stamp: The Architect will stamp each submittal with an action stamp. The Architect will mark the stamp appropriately to indicate the action taken.
2. Unless requested and paid by the submission contractor, all submittals will be returned by U.S. standard mail or United Parcel Service. All review times start when the Architect receives the submission in his office.
3. "Corrections or comments made on the shop drawings during this review do not relieve the contractor from compliance with requirements of the drawings and specifications. This check is only for the review of general conformance with the design concept of the project and general compliance with the information given in the contract documents. The contractor is responsible for verifying quantities, dimensions, field conditions and coordinating all work, information that pertains solely to the fabrication processes or to the means, methods, techniques, sequences and procedures of construction; coordination of the work of all trades; and for performing work in a safe and satisfactory manner. Review does not authorize changes to contracts sum, or project completion date unless stated on separate letter or change order.

M. **The Contractor shall be responsible to note in the Cover Page of the shop drawings any changes or deviations from the contract documents. This is to include but is not limited to manufacturers, electrical, plumbing, mechanical and structural requirements. The Contractor shall be responsible to distribute to all effected contractors and subcontractors all shop drawings which may affect their work.**

N. Deviations from the construction documents must be noted by the Contractor at the time of shop drawing submission. Failure to do so will result in the implication of Section 3.2 of the General Conditions and Paragraphs 3.2.1, 3.2.2 and 3.2.2.1.

O. Approval of shop drawings is conditional upon the contractor fully and completely complying with all review comments by the Owner, Architect, and Engineer. Where the contractor fails to or is unable to fully and completely comply with every review comment, then the shop drawings are *disapproved* (whether or not they are stamped or noted as "approved" in any manner in any review comment) and must be resubmitted as within seven (7) days. Immediately upon receipt of shop drawing review comments, the contractor is responsible for carefully reviewing all comments in detail and for complying with comments. Where unable to fully satisfy any comment or where the contractor takes exception to any comment, revise and resubmit acceptable shop drawings (or, where taking exception, notify the Architect / Engineer in writing) within seven (7) days. Where the contractor fails to comply with these requirements (including resubmitting/notifying within the seven (7) day period specified), the contractor shall provide acceptable equipment meeting all specified requirements and all review comments (including removing unacceptable equipment [if installed] and replacing with acceptable equipment) at no cost to the Owner.

P. No extra claims, time or compensation shall be granted under any circumstance associated with any party's failure or delay in properly submitting, transmitting, obtaining, reviewing, and/or coordinating shop drawings.

2.1 - SUBSTITUTIONS

A. It is recognized that no two pieces of equipment and no two products are engineered or designed the same. Trade names, brand names and models specified herein are provided to establish a minimum standard of quality acceptable to the Camden County Technical Schools Board of Education for this bid. Substitute brands, makes and models shall be considered and reviewed based on its ability to perform the specified tasks or provide the same quality of goods as specified in the Camden County Technical Schools Board of Education 's bid. This is known as an "Equivalent".

B. If the bidder seeks to provide an Equivalent product or good, the bidder shall with its bid, submit specifications or cut sheets for such proposed Equivalent product or good. The Camden County Technical Schools Board of Education 's Architect/Engineer, or specifications writer, for the bid shall review the submission provided by the bidder to determine whether the product or good is an Equivalent to the bid specification. The Camden County Technical Schools Board of Education 's Architect/Engineer or specifications writer shall have the final decision on whether a bidder's submitted product specifications are an Equivalent to the named product(s) or good(s) in the bid.

END OF SECTION 01300

Contractor's Letterhead
Contractor's Letterhead to Include Name, Physical Address, Telephone Number and Fax Number
SHOP DRAWING COVER PAGE

Project Name
Date

Garrison Architects
Architect's Name
713 Creek Road
Bellmawr, NJ 08031

Sub Contractor's Name, Physical Address, Telephone Number and Fax Number
Supplier's Name, Physical Address, Telephone Number and Fax Number
Manufacturer's Name, Physical Address, Telephone Number and Fax Number
Specification Number and Specification Title and Section
Construction Document Plan Drawing Number and Detail Reference
Contractor's Quality Assurance Signature

Check one of the following:

☐ The signature above certifies that the enclosed submittal is in conformance with the construction documents and in fact is the **exact** product and manufacturer specified. The signature confirms that the Contractor is responsible for dimensions and quantities that have been field verified and that the Shop Drawing will be distributed to all affected Contractors whose work may be affected by the material or equipment enclosed.

☐ The signature above certifies that the enclosed submittal is in conformance with the construction documents and in fact a **substitution** of the product and manufacturer specified. The Contractor shall provide all Substitutions no later than thirty (30) days from Notice to Proceed and fully comply with page 01300, paragraph 2.1. A complete comparison document must be provided. The signature confirms that the Contractor is responsible for dimensions and quantities that have been field verified and that the Shop Drawing will be distributed to all affected Contractors whose work may be affected by the material or equipment enclosed.

The Contractor assumes responsibility to fully comply with Specification Section 01300, Submittals," and note below any changes or deviations that have resulted from the proposed product substitution. The Contractor also is solely responsible to communicate these changes to all other Prime Contractor and Sub Contractors following review by the Architect / Engineer.

SHOP DRAWING NO Date Reviewed By

RECEIVED FROM GC		Reviewed	
SENT TO ENGINEER		Provide as Corrected	
RETURN FROM ENG		Revise and Resubmit	
RETURN TO GC		Rejected	

Corrections or comments made on the shop drawings during this review do not relieve contractor from compliance with requirements of the drawings and specifications. The contractor is responsible for all corrections indicated. This check is only for the review of general conformance with the design concept of the project and general compliance with the information given in the contract documents. The contractor is responsible for verifying quantities, dimensions, field conditions and coordinating all work; including all electric for all HVAC and all other equipment; information that pertains solely to the fabrication processes or to the means, methods, techniques, sequences and procedures of construction; coordination of the work of all trades; and for performing work in a safe and satisfactory manner. Review does not authorize changes to contracts sum, or project completion date. Refer to the A201 contract, including but not limited to sections 3.2, 3.3, 3.5, 3.12, and 4.27. The contractor shall provide all portions of the work per the manufacture's installation recommendations and instructions.

SECTION 01500 - CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

1.1 GENERAL

A. Summary: This Section specifies construction facilities and temporary controls, including temporary utilities, support facilities, and security and protection facilities.

B. Regulations: Comply with industry standards and applicable laws and regulations of authorities having jurisdiction including, but not limited to, the following:

1. Building code requirements.
2. Health and safety regulations.
3. Utility company regulations.
4. Police, fire department. and rescue squad rules. Local traffic requirement.
5. Environmental protection regulations.
6. New Jersey Department of Education.
7. ADA requirements.
8. OSHA.
9. PEOSH Indoor Air Quality Standard (enclosed for contractor reference).
10. PEOSH Policy on Building Renovation (enclosed for contractor reference).

The Contractor may be required to obtain building permits as required by the local construction code office.

C. Standards: Comply with NFPA 241 "Standard for Safeguarding Construction, Alterations, and Demolition Operations," ANSI A10 Series standards for "Safety Requirements for Construction and Demolition," and NECA Electrical Design Library "Temporary Electrical Facilities."

1. Electrical Service: Comply with NEMA, NECA, and UL standards and regulations for temporary electric service. Install service in compliance with NFPA 70 "National Electric Code."

D. Inspections: Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.

E. Temporary Utilities: Prepare a schedule indicating dates for implementation and termination of each temporary utility. Submit reports and tests, inspections, meter readings, and procedures performed on temporary utilities. At the earliest time, change over from use of temporary service to use of permanent service.

1.2 PRODUCTS

A. Materials: Provide new materials. If acceptable to the Architect, the Contractor may use undamaged, previously used materials in serviceable condition. Provide materials suitable for use intended.

1. Lumber and Plywood: Comply with Division 6 Section "Rough Carpentry." Provide UL-labeled, fire-treated lumber and plywood for temporary offices and sheds. Provide exterior, Grade B-B high density concrete form overlay plywood for signs. Provide 5/8" (16 mm) thick exterior plywood for other uses.
2. Roofing Materials: Provide UL Class A standard-weight asphalt shingles or UL Class C mineral-surfaced roll roofing on roofs of job-built temporary offices, shops, and sheds.

3. Paint: Comply with requirements of Division 9 Section "Painting."

    a. For exposed lumber and plywood, provide exterior-grade acrylic-latex emulsion over exterior primer.
    b. For sign panels and applying graphics, provide exterior-grade alkyd gloss enamel over exterior primer.
    c. For interior walls of temporary offices, provide 2 coats interior latex-flat wall paint.

4. Tarpaulins: Provide waterproof, fire-resistant, UL-labeled tarpaulins with flame-spread rating of 15 or less. For temporary enclosures, provide translucent, nylon-reinforced, laminated polyethylene or polyvinyl chloride, fire-retardant tarpaulins.
5. Water: Provide potable water approved by local health authorities.

B. Equipment: Provide new equipment. If acceptable to the Architect, the Contractor may use undamaged, previously used equipment in serviceable condition. Provide equipment suitable for use intended.

1. Water Hoses: Provide 3/4-inch (19-mm), heavy-duty, abrasion-resistant, flexible rubber hoses 100 feet (30 m) long, with pressure rating greater than the maximum pressure of the water distribution system. Provide adjustable shutoff nozzles at hose discharge.
2. Electrical Outlets: Provide properly configured, NEMA-polarized outlets to prevent insertion of 110- to 120-Volt plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button, and pilot light for connection of power tools and equipment.
3. Electrical Power Cords: Grounded extension cords. Use hard-service cords where exposed to abrasion and traffic.
4. Lamps and Light Fixtures: Provide general service incandescent lamps of wattage required for adequate illumination. Provide guard cages or tempered-glass enclosures where exposed to breakage. Provide exterior fixtures where exposed to moisture.
5. Heating Units: Provide temporary heating units that have been tested and labeled by UL, FM, or another recognized trade association related to the type of fuel being consumed.
6. Fire Extinguishers: Provide hand-carried, portable, UL-rated, Class A fire extinguishers for temporary offices and similar spaces. In other locations, provide hand-carried, portable, UL-rated, Class ABC, dry-chemical extinguishers or a combination of extinguishers of NFPA-recommended classes for the exposures.

    a. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

1.3 EXECUTION

A. Installation, General: Use qualified personnel for installation of temporary facilities. Locate facilities where they will serve the Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.

1. **Provide each facility ready for use when needed to avoid delay.** Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.
2. Conditions of Use: Keep temporary facilities clean and neat in appearance,. Operate safely and efficiently. Relocated as the Work progress. Do not overload facilities or permit them to interfere with progress. Take necessary fire prevention measures. Do not allow hazardous, dangerous, or unsanitary conditions, or public nuisances to develop or persist on-site.
3. **CONTRACTOR SHALL BE PERMITTED TO CONNECT TO THE OWNER'S EXISTING POWER AND WATER SERVICE. OWNER AGREES TO PAY FOR ALL USAGE TO BE BILLED VIA THEIR EXISTING SERVICE. CONTRACTOR IS RESPONSIBLE FOR COORDINATION AND ANY COSTS (OTHER THAN USAGE) ASSOCIATED WITH TEMPORARY MEASURES.**

B. Temporary Utility Installation: The Contractor shall Engage the local utility company to install temporary service or connect to existing service. Where company provides only part of the service, provide the remainder with matching, compatible materials and equipment. Comply with company recommendations.

1. Arrange with company and existing users for a time when service can be interrupted, if necessary, to make connections for temporary services.
2. Provide adequate capacity at each stage of construction. Prior to temporary utility availability, provide trucked-in services.
3. Obtain easements to bring temporary utilities to the site where the Owner's easements cannot be used for that purpose.
4. Use Charges: **EXCEPTION: USAGE BILLED VIA THE OWNER'S EXISTING POWER AND WATER SERVICE AS PERMITTED BY PARAGRAPH 3 OF PREVIOUS SECTION 1.3.A.**
5. Temporary Water Service: Install temporary water service and distribution piping of sizes and pressures adequate for construction until permanent water service is in use.
6. Temporary Electric Power Service: Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period. Include meters, transformers, overload-protected disconnects, automatic ground-fault interrupters, and main distribution switch gear.

    a. Power Distribution System: Install wiring overhead and rise vertically where least exposed to damage.
    b. Temporary Lighting: Provide temporary lighting with local switching to fulfill security requirements and illumination for construction operations and traffic conditions.
    c. If temporary power/lighting connect to the Owner's panel, the Contractor shall compensate the Owner for the electrical usage.

C. Temporary Telephones: The Contractor shall be responsible for their own telephone service.

D. Sanitary Facilities: **(CONTRACTOR WILL BE PERMITTED TO USE EXISTING BUILDING SANITARY FACILITIES IN THE BOILER ROOM ONLY)**

E. Support Facilities Installation: Locate field offices, storage sheds, and other temporary construction and support facilities for easy access. Maintain facilities until near Substantial Completion. Remove prior to Substantial Completion.

1. Contractor's Field Office: Provide services and conditions as required to complete construction **WITHOUT THE USE OF THE OWNER'S TELEPHONE, COPY, FAX, ETC. NO EXCEPTIONS.**
   a. Owner's Field Office: **(NOT REQUIRED)**

2. It is the Contractor's option to provide incombustible construction for offices, shops, and sheds located within the construction area or within 30 feet (9 m) of building lines. Comply with requirements of NFPA 241.
3. Storage and Fabrication Sheds: (Contractors): Install storage and fabrication sheds sized, furnished, and equipped to accommodate materials and equipment involved, including temporary utility service. Sheds may be open shelters or fully enclosed spaces within the building or elsewhere on-site.
4. Temporary Enclosures: (by Contractor). Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Where heat is needed and the permanent building enclosure is not complete, provide temporary enclosures where there is no other provision for containment of heat. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.

   a. Install tarpaulins securely, with incombustible wood framing and other materials. Close openings of 25 sq. ft. (2.3 sq. m) or less with plywood or similar materials.
   b. Close openings through floor or roof decks and horizontal surfaces with load-bearing, wood-framed construction.

5. Temporary Lifts and Hoists: The Contractor shall provide facilities for hoisting their own materials.
6. Collection and Disposal of Waste: (Contractor). The Contractor shall collect their own waste from construction areas and elsewhere daily. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce requirements strictly.

   a. Do not hold materials more than 7 days during normal weather or 3 days when the temperature is expected to rise above 80 deg F (27 deg C).

G. Security and protection facilities installation: (by Contractor). Except for use of permanent fire protection as soon as available, do not change over from use of temporary security and protection facilities to permanent facilities until Substantial Completion, or longer, as requested by the Architect.

1. Temporary Fire Protection: (by Contractor). Until fire-protection needs are supplied by permanent facilities, install and maintain temporary fire-protection facilities of the types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 10 "Standard for Portable Fire Extinguishers" and NFPA 241 "Standard for Safeguarding Construction, Alterations, and Demolition Operations."

    a. Locate fire extinguishers where convenient and effective for their intended purpose, but not less than one extinguisher on each floor at or near each usable stairwell.
    b. Store combustible materials in containers in fire-safe locations.
    c. Prohibit smoking in hazardous fire-exposure areas.
    d. Provide supervision of welding operations, combustion-type temporary heating units, and similar sources of fire ignition.

2. Permanent Fire Protection: At the earliest feasible date in each area of the Project, complete installation of the permanent fire-protection facility, including connected services, and place into operation and use. Instruct key personnel on use of facilities.
3. Barricades, Warning Signs, and Lights: Comply with standards and code requirements for erection of structurally adequate barricades. Paint with appropriate colors, graphics, and warning signs to inform personnel and the public of the hazard being protected against. Where appropriate and needed, provide lighting, including flashing red or amber lights.
4. Security Enclosure and Lockup: Install substantial temporary enclosure of partially completed areas of construction. Provide locking entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.
5. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations, and minimize the possibility that air, waterways, and subsoil might be contaminated or polluted or that other undesirable effects might result. Avoid use of tools and equipment that produce harmful noise. Restrict use of noise-making tools and equipment to hours that will minimize complaints from persons or firms near the site.

H. Operation: The Contractor shall be responsible to enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.

I. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage by freezing temperatures and similar elements. Maintain temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

J. Protection: Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.

K. Termination and Removal: Unless the Architect requests that it be maintained longer, remove each temporary facility when the need has ended, when replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of

interference with the temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are the Contractor's property. The Owner reserves the right to take possession of project identification signs.
2. At Substantial Completion, clean and renovate permanent facilities used during the construction period including, but not limited to, the following:

    a) Replace air filters and clean inside of ductwork and housings of existing HV/AC equipment.
    b) Replace significantly worn parts and parts subject to unusual operating conditions.
    c) Replace lamps burned out or noticeably dimmed by hours of use.

3. Prior to Final Completion, restore site damages resulting from construction activities. This includes, but is not limited to: removal of temporary fencing; restoring site disturbance resulting from contractor parking, trailers, sanitary facilities, dumpsters, construction equipment, etc. Site restoration to include fine grading with approved topsoil and reseeding with approved seed.

END OF SECTION 01500

SECTION 01524 - CONSTRUCTION WASTE MANAGEMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for the following:

1. Salvaging nonhazardous construction waste.
2. Recycling nonhazardous construction waste.
3. Disposing of nonhazardous construction waste.

1.3 DEFINITIONS

A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

B. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

C. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

D. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

E. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.4 PERFORMANCE GOALS

A. General: Develop waste management plan that results in end-of-Project rates for salvage/recycling of 50 percent by weight of total waste generated by the Work.

B. Salvage/Recycle Goals: Owner's goal is to salvage and recycle as much nonhazardous construction waste as possible including the following materials:

1. Construction Waste:

a. Site-clearing waste.
b. Masonry and CMU.
c. Lumber.

d. Wood sheet materials.
e. Wood trim.
f. Metals.
g. Roofing.
h. Insulation.
i. Carpet.
j. Gypsum board.
k. Piping.
l. Electrical conduit.
m. Packaging: Regardless of salvage/recycle goal indicated above, salvage or recycle 100 percent of the following uncontaminated packaging materials:

1) Paper.
2) Cardboard.
3) Boxes.
4) Plastic sheet and film.
5) Polystyrene packaging.
6) Wood crates.
7) Plastic pails.

1.5 SUBMITTALS

A. Waste Management Plan: Submit 3 copies of plan within 30 days of date established for the Notice to Proceed.

B. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit three copies of report. Include the following information:

1. Material category.
2. Generation point of waste.
3. Total quantity of waste in tons (tonnes).
4. Quantity of waste salvaged, both estimated and actual in tons (tonnes).
5. Quantity of waste recycled, both estimated and actual in tons (tonnes).
6. Total quantity of waste recovered (salvaged plus recycled) in tons (tonnes).
7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.

C. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

1.6 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Waste Management Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to waste management including, but not limited to, the following:

1. Review and discuss waste management plan including responsibilities of Waste Management Coordinator.
2. Review requirements for documenting quantities of each type of waste and its disposition.
3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
5. Review waste management requirements for each trade.

1.7 WASTE MANAGEMENT PLAN

A. General: Develop plan consisting of waste identification, waste reduction work plan, and cost/revenue analysis. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.

B. Waste Identification: Indicate anticipated types and quantities of site-clearing and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.

C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.

1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
6. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location on Project site where materials separation will be located.

D. Forms: Prepare waste management plan on forms included at end of Part 3.

SECTION 01524 - CONSTRUCTION WASTE MANAGEMENT

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

A. General: Implement waste management plan as approved by Architect. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.

1. Comply with Division 1 Section "Construction Facilities and Temporary Controls" for operation, termination, and removal requirements.

B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan. Coordinator shall be present at Project site full time for duration of Project.

C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.

1. Distribute waste management plan to everyone concerned within three days of submittal return.
2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.

D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
2. Comply with Division 1 Section "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.2 SALVAGING DEMOLITION WASTE

A. Salvaged Items for Reuse in the Work:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until installation.
4. Protect items from damage during transport and storage.
5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.

B. Salvaged Items for Sale and Donation: Not permitted on Project site.

C. Salvaged Items for Owner's Use:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area on-site.
5. Protect items from damage during transport and storage.

D. Doors and Hardware: Brace open end of door frames. Except for removing door closers, leave door hardware attached to doors.

3.3 RECYCLING CONSTRUCTION WASTE, GENERAL

A. General: Recycle paper and beverage containers used by on-site workers.

B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Contractor.

C. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical.

1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.

    a. Inspect containers and bins for contamination and remove contaminated materials if found.

2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.
5. Remove recyclable waste off Owner's property and transport to recycling receiver or processor.

3.4 RECYCLING DEMOLITION WASTE

A. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.

1. Pulverize concrete to maximum 4-inch (100-mm) size.

B. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.

1. Pulverize masonry to maximum 4-inch (100-mm) size.

    a. Crush masonry and screen to comply with requirements in Division 2 Section "Earthwork" for use as general fill.

2. Clean and stack undamaged, whole masonry units on wood pallets.

C. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.

D. Metals: Separate metals by type.

1. Structural Steel: Stack members according to size, type of member, and length.
2. Remove and dispose of bolts, nuts, washers, and other rough hardware.

E. Gypsum Board: Stack large clean pieces on wood pallets and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.

F. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.

1. Separate suspension system, trim, and other metals from panels and tile and sort with other metals.

G. Carpet: Roll large pieces tightly after removing debris, trash, adhesive, and tack strips.

1. Store clean, dry carpet in a closed container or trailer provided by Carpet Reclamation Agency or carpet recycler.

H. Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.

I. Conduit: Reduce conduit to straight lengths and store by type and size.

3.5 RECYCLING CONSTRUCTION WASTE

A. Packaging:

1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
2. Polystyrene Packaging: Separate and bag materials.
3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

B. Site-Clearing Wastes: Chip brush, branches, and trees on-site.

C. Wood Materials:

1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.

D. Gypsum Board: Stack large clean pieces on wood pallets and store in a dry location.

1. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.

3.6 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

C. Disposal: Transport waste materials off Owner's property and legally dispose of them.

END OF SECTION 01524

SECTION 01600 - MATERIALS AND EQUIPMENT

1.1 GENERAL

A. "Products" are items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock.

1. "Named Products" are items identified by the manufacturer's product name, including make or model number or designation, shown or listed in the manufacturer's published product literature.

B. "Materials" are products substantially shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form a part of the Work.

C. "Equipment" is a product with operational parts, whether motorized or manually operated, that requires service connections, such as wiring or piping.

D. Product List: Products required are included in all sections of these specifications. Provide the manufacturer's name and proprietary product names for each item. Coordinate product list with the Contractor's Construction Schedule and Submittal Schedule.

1. Form: Prepare product list with information on each item tabulated under the following column headings:

a. Related Specification Section number.
b. Generic name used in Contract Documents.
c. Proprietary name, model number, and similar designations.
d. Manufacturer's name and address.
e. Supplier's name and address.
f. Installer's name and address.
g. Projected delivery date or time span of delivery period.

2. Within 30 days after date of commencement of the Work, submit 3 copies of the product list. Provide a written explanation for omissions of data and variations from Contract requirements.
3. The Architect will respond within 2 weeks of receipt of the list. No response within this period constitutes no objection to listed manufacturers or products but does not waive the requirement that products comply with Contract Documents. The Architect's response will include a list of unacceptable products.

E. Source Limitations: To the fullest extent possible, provide products of the same kind from a single source.

1. When the Contractor is given the option of selecting between 2 or more products for use on the Project, the product selected shall be compatible with products previously selected.

F. Nameplates: Except for required labels and operating data, do not attach manufacturer's nameplates or trademarks on surfaces exposed to view in occupied spaces or on the exterior.

1. Labels: Locate required product labels and stamps on concealed surfaces or, where required for observation after installation, on accessible surfaces that are not conspicuous.
2. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on an easily accessible surface that is inconspicuous in occupied spaces. The nameplate shall contain the following information and other essential operating data:

    a. Name of product and manufacturer.
    b. Model and serial number.
    c. Capacity.
    d. Speed.
    e. Ratings.

G. Deliver, store, and handle products according to the manufacturer's recommendations, using means and methods that will prevent damage, deterioration, and loss, including theft.

1. Schedule delivery as early as possible. Coordinate with installation to assure safety for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
2. Deliver products in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
3. Inspect products upon delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
4. Store products to facilitate inspection and measurement of quantity or counting of units. Store heavy materials away from the structure in a manner that will not endanger the supporting construction.
5. Store products subject to damage by the elements aboveground, under cover in a weathertight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instructions.

1.2 PRODUCTS

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, new at the time of installation.

1. Provide products complete with accessories, trim, finish, safety guards, and other devices and details needed for a complete installation and the intended use and effect.
2. Standard Products: Where available, provide standard products of types that have been produced and used successfully in similar situations on other projects.

B. Product Selection Procedures: Procedures governing product selection include the following:

1. Proprietary Specification Requirements: Where products are specified by name, accompanied by the term "or equivalent" comply with specified product standards and data to obtain approval for use of an unnamed product. See Specification Section 01300, "Submittals," page 01300-6, Paragraph 2.1 for specific Substitution requirements.
2. Nonproprietary Specifications: When Specifications list products or manufacturers that are available and may be incorporated in the Work, but do not restrict the Contractor to use of these products only, the Contractor may propose any available product that complies with Contract requirements. Comply with Contract Document provisions concerning submissions to obtain approval for use of an unnamed product.
3. Descriptive Specification Requirements: Where Specifications describe a product, listing characteristics required, with or without use of a brand name, provide a product that provides the characteristics and otherwise complies with requirements.
4. Performance Specification Requirements: Where Specifications require compliance with performance requirements, provide products that comply and are recommended for the application. Manufacturer's recommendations may be contained in product literature or by the manufacturer's certification of performance.
5. Compliance with Standards, Codes, and Regulations: Where Specifications only require compliance with an imposed code, standard, or regulation, select a product that complies with the standards, codes, or regulations specified.
6. Visual Matching: Where Specifications require matching a Sample or existing building items, the Architect's decision on whether a product matches will be final.
7. Visual Selection: Where requirements include the phrase "... as selected from manufacturer's standard colors, patterns, textures ..." or a similar phrase, select a product that complies with other requirements. The Architect / Owner will select the color, pattern, and texture from the product line selected.

1.3 EXECUTION

A. Comply with manufacturer's instructions for installation of products. Anchor each product securely in place, accurately located and aligned with other Work. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

END OF SECTION 01600

SECTION 01700 - CONTRACT CLOSEOUT

1.1 GENERAL

A. Please refer to the **"PROJECT CLOSEOUT CHECKLIST"** at the end of this section for the summary of materials required to complete the contract obligation. Closeout requirements for specific construction activities are included in the appropriate Sections in Divisions 2 through 16.

B. Substantial Completion: The Contractor shall request the Owner, Construction Manager (if applicable) and Architect to inspect the job and perform a punch list to certify Substantial Completion. Refer to Specification Section AIA 201 General Conditions of the Contract for Construction, paragraph 9.8, for the definition of Substantial Completion. Before requesting inspection for certification of Substantial Completion, the Contractor shall complete the following:

1. "PUNCH LIST": Before the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list (PUNCH LIST) of items to be completed or corrected. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

2. The Contractor shall perform a Quality Control / Quality Assurance QC/QA Punchlist of all work prior to requesting Substantial Completion and a punch list from the Owners Team. The Contractor's Project Manger shall take the lead and conduct an onsite review with the Contractor's superintendent and representation from every major sub prime contractor. Notification of this onsite walk thru shall be provided in writing to all members of the Owners Team who may or may not choose to attend. The Contractor's Project Manager shall record and distribute this QC/QA Punchlist in a matrix that provides an additional column for the Contractor to document the completion of the work and the date. After successful completion of the Contractor's QC/QA Punchlist and all work, the Contractor shall request the Owners Team perform a Punchlist. Substantial Completion shall be requested in accordance with paragraph 9.8.1 of Specification Section AIA 201 General Conditions of the Contract for Construction,

3. In the Application for Payment that coincides with, or first follows, the date Substantial Completion is claimed, show 100 percent completion for the Work claimed as substantially complete.

    a. Include supporting documentation for completion and an accounting of changes to the Contract Sum.

4. Advise the Owner of pending insurance changeover requirements.
5. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications, and similar documents.
6. Submit record drawings, maintenance manuals, and, if specified elsewhere, final project photographs, damage or settlement surveys, property surveys, and similar final record information.
7. Deliver tools, spare parts, extra stock, and similar items.

8. Changeover locks and transmit keys to the Owner.
9. Changeover temporary construction utilities to Owner including electric, water, gas, sewer, storm, fire protection, etc.
10. Complete startup testing of systems and instruction of operation and maintenance personnel. Remove temporary facilities, mockups, construction tools, and similar elements.
11. Complete final cleanup requirements, including touchup painting.
12. Touch up and repair and restore marred, exposed finishes.
13. Submit Certificate of Occupancy/Approval
12. Remove temporary covered walkway, fence, and complete all curbs, paving, concrete walks, etc.

C. Inspection Procedures: On receipt of a request for inspection, the Construction Manager will proceed or advise the Contractor of unfilled requirements. The Architect will prepare the Certificate of Substantial Completion following inspection or advise the Contractor of construction that must be completed or corrected before the certificate will be issued.

1. The Construction Manager (if applicable) or Architect will repeat inspection when requested and assured that the Work is substantially complete.
2. Results of the completed inspection will form the basis of requirements for final acceptance.

D. Final Acceptance: Please refer to the **"FINAL PAYMENT CHECKLIST"** at the end of this section for the summary of materials required to complete the contract obligation. All **"PROJECT CLOSEOUT CHECKLIST"** items shall be completed before requesting Final Acceptance or Final Payment.

E. Reinspection Procedure: The Construction Manager will reinspect the Work upon receipt of notice that the Work has been completed, except for items whose completion is delayed under circumstances acceptable to the Owner, Construction Manager and Architect.

1. Upon completion of reinspection, the Architect will prepare a certificate of final acceptance. If the Work is incomplete, the Architect will advise the Contractor of Work that is incomplete or obligations that have not been fulfilled but are required.
2. If necessary, one (1) reinspection will be provided free of cost to the Contractor. If the Contractor fails to complete the work and a third or subsequent inspections are required, then the Contractor agrees to have the Liquidated Damages Daily Amount deducted from his Contract to pay for all extra inspections.

F. Record Document Submittals: Do not use record documents for construction. Protect from loss in a secure location. Provide access to record documents for the Construction Manager's (if applicable) / Architect's reference.

G. Record Drawings: Maintain a set of Original Signed and Sealed Prints of Contract Documents and Shop Drawings in the job trailer accessible to the Local Authority having jurisdiction, Owner, Construction Manager and/or Architect. The drawings shall be updated daily and subject to the penalty of non-payment if they are not up to date. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark the drawing most capable of showing conditions fully and accurately. Give attention to concealed elements.

1. Mark sets with red pencil. Use other colors to distinguish between variations in separate categories of the Work.
2. Organize record drawing sheets into manageable sets. Bind with durable-paper cover sheets; print titles, dates, and other identification on the cover of each set.

H. Maintenance Manuals: Organize operation and maintenance documents into two (2) sets of manageable size. Bind in individual, heavy-duty, 2-inch (51-mm), 3-ring, binders, with pocket folders for folded sheet information. Mark identification on front and spine of each binder. Include all the information required in the **"PROJECT CLOSEOUT CHECKLIST." Project Closeout Checklist Documents including these Maintenance Manuals shall be delivered to the OWNER OR CONSTRUCTION MANAGER (if applicable).**

I. Record RFIs (Request for Information): The Contractor shall maintain a complete record of all RFIs in the job trailer accessible to the Local Authority having jurisdiction, Owner, Construction Manager and/or Architect. The RFI Logbook shall be updated daily and subject to the penalty of non-payment if it is not up to date.

1.2 PRODUCTS (Not Applicable)

1.3 EXECUTION

A. Operation and Maintenance Instructions: The Contractor shall coordinate and a arrange for each Installer/Manufacturer to provide instruction in proper operation and maintenance to the Owner's Staff. Refer to the applicable Specification Section for the requirements of Owner Instruction. The Owner, Construction Manager (if applicable), and Architect shall be notified of this instructional meeting 3 days in advance. The instructional meeting shall include a detailed review, but not be limited to, the following items:

1. Maintenance manuals.
2. Spare parts, tools, and materials.
3. Lubricants and fuels.
4. Identification systems.
5. Control sequences.
6. Hazards.
7. Warranties and bonds.
8. Maintenance agreements and similar continuing commitments.

B. As part of instruction for operating equipment, demonstrate the following:

1. Startup and shutdown.
2. Emergency operations and safety procedures.
3. Noise and vibration adjustments.

C. Final Cleaning: Employ experienced cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Complete the following operations before requesting inspection for certification of Substantial Completion.

1. Remove labels that are not permanent labels.
2. Clean transparent materials, including mirrors and glass. Remove glazing compounds. Replace chipped or broken glass.
3. Clean exposed finishes to a dust-free condition, free of stains, films, and foreign substances. The Contractor shall clean vinyl composite tile, ceramic tile, terrazzo, sealed concrete, etc. "mop clean." Strip all VCT flooring and apply three coats of wax. Vacuum carpeted surfaces.
4. Wipe surfaces of mechanical and electrical equipment to a dust free condition. Remove excess lubrication. Clean plumbing fixtures. Clean light fixtures and lamps.
5. Clean the site of rubbish, litter, and foreign substances. Sweep paved areas; remove stains, spills, and foreign deposits. Rake grounds to a smooth, even-textured surface.

D. Removal of Protection: Remove temporary protection and facilities.

E. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Remove waste materials and dispose of lawfully.

F. Contractor shall provide an as-built survey of all installed utilities, as well as existing utility features to remain that are uncovered during construction, including locations and elevations. The as-built survey shall be provided as a hard copy plan sheet and in electronic format (AutoCAD or similar file type) on a CD, flash drive or similar acceptable electronic media.

END OF SECTION 01700

PROJECT CLOSEOUT CHECKLIST

CONTRACTOR MUST COMPLETE AND SUBMIT (1) ONE SET OF AS-BUILT DOCUMENTS, TWO (2) SETS OF CLOSEOUT BINDERS AND ONE (1) TRAINING VIDEO TO THE OWNER OR CONSTRUCTION MANAGER WITH AN ELECTRONIC COPY OF THE AS-BUILT DOCUMENTS EMAILED TO THE OWNER, CONSTRUCTION MANAGER (if applicable) AND ARCHITECT

Complete,
Incomplete or
N/A _____

AS-BUILT DOCUMENTS - ONE SET per Building Location

* All As-Built Documents must be clearly labeled "AS-BUILT" with a date and Contractor's signature. If the Owner has contracted with a Construction Manager, the Contractor must review all As-Built notations with the C.M. prior to delivering to Owner.

1. Record "as-built" contract drawings. (1 paper copy & PDF files emailed to the Owner, Construction Manager (if applicable) and Architect. In lieu of emailing the file, the Contractor can provide a flash drive of the PDF.)

2. Record "as built" shop drawings. (1 paper copy & PDF files emailed to the Owner, Construction Manager (if applicable) and Architect. In lieu of emailing the file, the Contractor can provide a flash drive of the PDF.)

CLOSE-OUT BINDERS - TWO SETS per Building Location

* All items shall be in a 3-ring loose leaf binder, clearly labeled (minimum: building, discipline/trade & year) on Front and Side Spine. Include a helpful table of contents and index tabs. Also provide this information in a PDF File emailed to the Owner and Construction Manager (if applicable.)

1. Maintenance manuals/operating and maintenance instruction. See Specification Section 01700.

2. Warranties and bond manual. See Specification Section 01740.
   * WARRANTY CLARIFICATION: Contractor shall separately identify any warranty that requires execution by Owner or otherwise. "Copies" of warranties should be included in the close-out "binder". "Original" warranties requiring execution should be sent under a separate cover. The separate cover should clearly identify the action required to execute the warranty.

3. List of contact persons for the Contractor and all sub-contractors. Include contract responsibility, name of company, name of person, street address, mailing address (if different), telephone and email address.

4. Copy of final inspection reports / permit closeout document.

5. Attic Stock, Special tools, spare parts, extra stock materials, etc. shall be turned over to Owner. Include a list in the closeout binder.

OWNER TRAINING VIDEO – ONE COPY per Building Location
FINAL PAYMENT CHECKLIST

Complete, Incomplete or N/A

*** DO NOT submit Final Payment until all items can be included.**

CONTRACTOR MUST COMPLETE AND SUBMIT (3) THREE SETS OF COLLATED, NOTARIZED ORIGINALS & (1) ONE COMPLETE ELECTRONIC COPY VIA EMAIL TO THE ARCHITECT WITH FINAL PAYMENT APPLICATION:

1. An Index of Documents Included on the Contractor's Letterhead.
2. Owner Payment Voucher (if required by Owner).
3. AIA Payment Application.
4. AIA Document G706 – 1994 Contractor's Affidavit of Payment of Debts and Claims
5. AIA Document G706A – 1994 Contractor's Affidavit of Release of Liens
6. Contractor's Certification of Completion
7. AIA Document G707 – 1994 Consent of Surety to Final Payment
8. Maintenance Bond for 100% of the Project Cost for a warranty period of two (2) years from the Date of Final Acceptance.
9. The Contractor shall not use any product containing asbestos and all plumbing shall be lead free. The Contractor shall provide a notarized letter stating: " No asbestos containing materials were provided on the project and the plumbing is lead free."
10. Contractor shall furnish a letter agreeing to provide complete parts and labor service and maintenance of all HVAC systems, equipment, devices, controls, etc., for 2 years from date of substantial completion as determined by architect. The letter shall also affirm that the Contractor will provide scheduled maintenance service quarterly (3-month interval) as the maximum time period between scheduled service.
11. Certificate of Occupancy or Acceptance by the Local Construction Official.
12. Provide a Fire Alarm System NFPA Record of Inspection and Testing Certification Form.

ADDITIONAL REQUIREMENTS TO BE SATISFIED PRIOR TO CERTIFICATION OF FINAL PAYMENT:

1. Project Closeout Documents (submit separately as indicated on the Project Closeout Checklist).

SECTION 01740 - WARRANTIES AND BONDS

1.1 GENERAL

A. Standard product warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.

B. Special warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.

1. Refer to the General Conditions for terms of the Contractor's period for correction of the Work.
2. Requirements for Warranties and Bonds for products and installations that are specified are included in the individual sections of these specifications.

C. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products. Manufacturer's disclaimers and limitations on product warranties do not relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

D. Related Damages and Losses: When correcting failed or damaged warranted construction, remove and replace construction that has been damaged as a result of such failure or must be removed and replaced to provide access for correction of warranted construction.

E. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

F. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of the Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefitted from use of the Work through a portion of its anticipated useful service life.

G. Owner's Recourse: Expressed warranties made to the Owner are in addition to implied warranties and shall not limit the duties, obligations, rights, and remedies otherwise available under the law. Expressed warranty periods shall not be interpreted as limitations on the time in which the Owner can enforce such other duties, obligations, rights, or remedies.

1. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
2. Where the Contract Documents require a special warranty, or similar commitment, the Owner reserves the right to refuse to accept the Work, until the Contractor presents evidence that entities required to countersign such commitments are willing to do so.

H. Submit written warranties to the Architect prior to the date certified for Substantial Completion. If the Architect's Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion, submit written warranties upon request of the Architect.

1. When a designated portion of the Work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Architect within 15 days of completion of that designated portion of the Work.

I. When the Contract Documents require the Contractor, or the Contractor and a subcontractor, supplier or manufacturer to execute a special warranty, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner, through the Architect, for approval prior to final execution.

1. Refer to Divisions 2 through 16 Sections for specific content requirements and particular requirements for submitting special warranties.

J. Bind warranties and bonds in heavy-duty, commercial-quality, durable 3-ring, vinyl-covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (115-by-280-mm) paper.

1. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address, and telephone number of the Installer.
2. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project title or name, and name of the Contractor.
3. When warranted construction requires operation and maintenance manuals, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

1.2 PRODUCTS (Not Applicable)
1.3 EXECUTION (Not Applicable)

END OF SECTION 01740

SECTION 01770 - SELECTIVE DEMOLITION

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 this Section.

1.2 Summary

A. This Section requires the selective removal, salvage to Owner and/or subsequent offsite disposal of the following:

1. Existing utilities, electrical feeders and circuits, etc., as indicated on drawings.

2. Paving, sidewalks concrete and infrastructure as indicated on drawings and as required to accommodate new construction.

3. Relocation of pipes, conduits, ducts and other mechanical and electrical work is specified in other Divisions.

4. Cutting and removal of structural and nonstructural building elements as required to complete the work. See Structural Drawings for modifications to all structural building elements.

1.3 Submittals

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Section: SUBMITTALS.

B. Schedule indicating proposed sequence of operations for selective demolition work to Owner's Representative for review prior to start of work. Include coordination for shutoff, capping, and continuation of utility services as required, together with details for dust and noise control protection.

1. Provide a detailed sequence of demolition and removal work to ensure uninterrupted progress of Owner's on-site operations.

2. Coordinate with Owner's continuing occupation of portions of existing building and with Owner's partial occupancy of the work area.

C. Photographs of existing conditions of structures, site equipment and adjacent improvements that might be misconstrued as damage related to removal operations. File with Owner's Representative prior to start of work.

D. Project scope of work will require excavation within close proximity to existing building foundations and other structures. Without limitation of means and methods of contracts, contractor shall provide a report certified by New Jersey licensed Professional Engineer certifying to methods of foundation and building protection during construction including design of sheet piling as required.

1.4 Job Conditions

A. Condition of Structures: Owner assumes no responsibility for actual condition of structures to be demolished.

1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner insofar as practicable. However, variations within structure may occur by Owner's removal and salvage operations prior to start of demolition work.

B. Partial Demolition and Removal: Items indicated to be removed but of salvageable value to Contractor may be removed from structure as work progresses. Transport salvaged items from site as they are removed.

1. Storage or sale of removed items will not be permitted on site.

C. Protections: Provide temporary barricades and other forms of protection to protect Owner's personnel and general public from injury due to selective demolition work.

1. Provide interior and exterior shoring, bracing, or support to prevent movement, settlement, or collapse of structures to be demolished and adjacent facilities to remain.

2. Protect from damage existing finish work that is to remain in place that becomes exposed during selective demolition operations.

3. Protect floors with suitable coverings when necessary.

4. Construct temporary insulated dust-proof partitions where required to separate areas where noisy or extensive dirt or dust operations are performed. Equip partitions with dust-proof doors and security locks.

5. Provide temporary weather protection during interval between demolition and removal of existing construction on exterior surfaces and installation of new construction to ensure that no water leakage or damage occurs to structure or interior areas of existing building.

6. Remove protections at completion of work.

7. Provide protective measures as required to provide free and safe passage of Owner's personnel and general public to occupied portions of building.

D. Damages: Promptly repair damages caused to adjacent facilities by selective demolition operations.

E. Traffic: Conduct selective demolition operations and debris removal of to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.

1. Do not close, block or otherwise or obstruct streets, walks, or other occupied or used facilities without permission from authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.

F. Flame Cutting: Do not use cutting torches for removal until work area is cleared of flammable materials. At concealed spaces, such as interior of ducts and pipe spaces, verify condition of hidden space before starting flame-cutting operations. Maintain portable fire suppression devices during flame-cutting operations.

G. Utility Services: Maintain existing utilities indicated to stay in service and protect against damage during selective demolition operations.

1. Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to governing authorities. **WATER SERVICE MUST REMAIN UNINTERRUPTED TO ALL PORTIONS OF THE BUILDING(S) AND SITE.**

2. Maintain fire protection services during selective demolition operations.

H. Environmental Controls: Use water sprinkling, temporary enclosures and other methods to limit dust and dirt migration. Comply with governing regulations pertaining to environmental protection.

1. Do not use water when it may create hazardous or objectionable conditions such as ice, flooding and pollution.

I. Occupancy: Owner will occupy portions of the building immediately adjacent to areas of selective demolition. Conduct selective demolition work in manner that will minimize need for disruption of Owner's normal operations. Provide minimum of 72 hours advanced notice to Owner of demolition activities that will affect Owner's normal operations.

PART 2 - ITEMS TO BE SALVAGED AND RETAINED AS PROPERTY OF THE OWNER

2.1 General

A. Items to be relocated/reset shall be safely stored by the Contractor until relocation is possible.

B. All items to be salvaged and turned over to the Owner shall be cleaned and safely stored by the Contractor until the Owner takes possession.

PART 3 – EXECUTION

3.1 Preparation

A. General: Provide interior and exterior shoring, bracing or support to prevent movement, settlement or collapse of areas to be demolished and adjacent facilities to remain.

1. Cease operations and notify Owner's Representative immediately if safety of structure appears to be endangered. Take precautions to support structure until determination is made for continuing operations.

2. Cover and protect furniture, equipment and fixtures from spoilage or damage when demolition work is performed in areas where such items have not been removed.

3. Erect and maintain dust-proof partition and closures as required to prevent spread of dust or fumes to occupied portions of the building.

a. Provide weatherproof closures for exterior openings resulting from demolition work.

b. Where selective demolition occurs immediately adjacent to occupied portions of the building, construct dust-proof partitions of minimum 4-inch studs, ⅝-inch drywall (joints taped) on occupied side, ½-inch fire retardant plywood on demolition side. Fill partition cavity with sound deadening insulation.

4. Locate, identify, stub off and disconnect utility services that are not indicated to remain.

a. Provide bypass connections as necessary to maintain continuity of service to occupied area of building. Provide minimum of 72 hours advance notice to Owner if shutdown of service is necessary during changeover.

3.2 Demolition

A. General: Perform selective demolition work in a systematic manner. Use such methods as required to complete work indicated on Drawings in accordance with demolition schedule and governing regulations.

1. Demolish concrete and masonry in small sections. Cut concrete and masonry at junctures with construction to remain using power-driven masonry saw or hand tools; do not use power-driven impact tools.

2. Locate demolition equipment throughout structure and promptly remove debris to avoid imposing excessive loads on supporting walls, floors, or framing.

3. Provide services for effective air and water pollution controls as required by local authorities having jurisdiction.

4. Demolish foundation walls to a depth of not less than 12 inches below existing ground surface. Demolish and remove below-grade wood or metal construction; break up below-grade concrete slabs.

5. For interior slabs on grade, use removal methods that will not crack or structurally disturb adjacent slabs or partitions. Use power saw where possible.

6. Completely fill below-grade areas and voids resulting from demolition work. Provide fill consisting of approved earth, gravel or sand, free of trash and debris, stones over 6-inches in diameter, root or other organic material.

B. If unanticipated mechanical, electrical or structural elements that conflict with intended function or design are encountered, investigate and measure both nature and extent of the conflict. Submit report to Owner's Representative in written accurate detail. Pending receipt of directive from Owner's Representative, rearrange selective demolition schedule as necessary to continue overall job progress without undue delay.

C. Vermin Control: Employ a certified, licensed exterminator and treat entire area of building demolition and removal as well as entire area of all building additions in accordance with governing health regulations for rodent and insect control.

3.3 Salvaged Materials

A. General: Salvaged Items are those so indicated on Drawings or Schedules, or as listed in this Section. Carefully remove salvaged items; clean and protect until disposition.

1. Items to be incorporated into new work: Store until required for installation or for required modification or restoration.

2. Other salvage items: Turn over to Owner as soon as practical and obtain receipt.

B. Historic artifacts, including cornerstones and their contents, commemorative plaques and tablets, antiques and other articles of historic significance, remain property of Owner. Notify Owner's Representative if such items are encountered and obtain acceptance regarding method of removal and salvage for Owner.

C. Salvage items damaged during demolition shall be replaced by the Contractor with equivalent new items at no cost to the Owner.

3.4 Disposal of Demolished Materials

A. General: Remove from building site debris, rubbish and other materials resulting from demolition operations. Transport and legally dispose off-site.

1. If hazardous materials are encountered during demolition operations, comply with applicable regulations, laws and ordinances concerning removal, handling and protection against exposure or environmental pollution.

2. Burning of removed materials is not permitted on project site.

3.5 Cleanup and Repair

A. General: Upon completion of demolition work, remove tools, equipment and demolished materials from site. Remove protections and leave interior areas broom clean.

1. Repair demolition performed in excess of that required. Return elements of construction and surfaces to remain to condition existing prior to start of operations. Repair adjacent construction or surfaces soiled or damaged by selective demolition work.

END OF SECTION 01770

SECTION 03300 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mix design, placement procedures, and finishes.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume.

1.4 SUBMITTALS

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

B. Design Mixes: For each concrete mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments. Do not start concrete production until data has been reviewed and approved by the engineer.

C. 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.

D. Welding Certificates: Copies of certificates for welding procedures and personnel.

E. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated, based on comprehensive testing of current materials:

F. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements:

1. Cementitious materials and aggregates.
2. Form materials and form-release agents.
3. Steel reinforcement and reinforcement accessories.
4. Admixtures.
5. Curing materials.

6. Floor and slab treatments.
7. Vapor retarders.
8. Epoxy joint filler.
9. Joint-filler strips.
10. Repair materials.
11. Form liners
12. Reglets
13. Vapor retarder/barrier

1.5 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.

C. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.

1. Manufacturer must be certified according to the National Ready Mixed Concrete Association's Certification of Ready Mixed Concrete Production Facilities.

D. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548. Contractor shall provide a storage box for concrete cylinders.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

E. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, each aggregate from one source, and each admixture from the same manufacturer.

F. Welding: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code--Reinforcing Steel."

G. ACI Publications: Comply with the following, unless more stringent provisions are indicated:

1. ACI 301, "Specification for Structural Concrete."
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials." CRSI

H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

1. Before submitting design mixes, review concrete mix design and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:

    a. Contractor's superintendent.
    b. Independent testing agency responsible for concrete design mixes.
    c. Ready-mix concrete producer.
    d. Concrete subcontractor.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle steel reinforcement to prevent bending and damage.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

1. Plywood, metal, or other approved panel materials.
2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:

    a. High-density overlay, Class 1, or better.

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

C. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

D. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that will leave no corrodible metal closer than 1 inch (25 mm) to the plane of the exposed concrete surface.
2. Furnish ties that, when removed, will leave holes not larger than 1 inch (25 mm) in diameter in concrete surface.
3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.2 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.

B. Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

2.3 REINFORCEMENT ACCESSORIES

A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete, and as follows:

1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected or CRSI Class 2 stainless-steel bar supports.

B. 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.

C. All hooks, unless otherwise noted, shall conform to "ACI Standard Hooks".

D. Tie-wire shall not be less than 16 gauge wire

2.4 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, Type I/II.

B. Normal-Weight Aggregate: ASTM C 33, uniformly graded, and as follows:
1. Nominal Maximum Aggregate Size: 3/4 inch.

C. Fly Ash : ASTM C618, Type F

D. Water: Potable and complying with ASTM C 94.

2.5 ADMIXTURES

A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material and to be compatible with other admixtures and cementitious materials. Do not use admixtures containing calcium chloride.

B. Air-Entraining Admixture: ASTM C 260.

C. Water-Reducing Admixture: ASTM C 494, Type A.

D. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.

E. Water-Reducing and Accelerating Admixture: ASTM C 494, Type E.

F. Water-Reducing and Retarding Admixture" ASTM C 494, Type D.

2.6 VAPOR BARRIER SYSTEM

A. Vapor Barrier System: ASTM E 1745, Class A, polyolefin sheet, not less than 10 mil.

B. Fine-Graded Granular Material: Clean mixture of crushed stone, crushed gravel, and manufactured or natural sand; ASTM D 448, Size 10, with 100 percent passing a No. 4 sieve and 10 to 30 percent passing a No. 100 sieve; meeting deleterious substance limits of ASTM C 33 for fine aggregates.

C. Granular Fill: Clean mixture of crushed stone or crushed or uncrushed gravel; ASTM D 448, Size 57, with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.

2.7 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Clear, Solvent-Borne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

F. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

G. Products: Subject to compliance with requirements, provide one of the following or equivalent:

1. Evaporation Retarder:

    a. Sure Film; Dayton Superior Corporation.
    b. Eucobar; Euclid Chemical Co.
    c. E-Con; L&M Construction Chemicals, Inc.
    d. Confilm; Master Builders, Inc.
    e. Waterhold; Metalcrete Industries.
    f. Rich Film; Richmond Screw Anchor Co.
    g. SikaFilm; Sika Corporation.
    h. Finishing Aid; Symons Corporation.

2. Clear, Solvent-Borne, Membrane-Forming Curing Compound:

    a. Nitocure S; Fosroc.
    b. Cure & Seal 309; Kaufman Products Inc.
    c. L&M Dress & Seal 18; L&M Construction Chemicals, Inc.

d. CS-309; W. R. Meadows, Inc.
e. Seal N Kure; Metalcrete Industries.
f. Rich Seal 14 percent UV; Richmond Screw Anchor Co.
g. Kure-N-Seal; Sonneborn, Div. of ChemRex, Inc.
h. Clear Seal 150; Tamms Industries Co., Div. of LaPorte Construction Chemicals of North America, Inc.

3. Clear, Waterborne, Membrane-Forming Curing Compound:

a. Safe Cure and Seal; Dayton Superior Corporation.
b. Aqua Cure VOX; Euclid Chemical Co.
c. Dress & Seal WB; L&M Construction Chemicals, Inc.
d. Vocomp-20; W. R. Meadows, Inc.
e. Metcure; Metalcrete Industries.
f. Cure & Seal 150E; Nox-Crete Products Group, Kinsman Corporation.
g. Cure & Seal 14 percent E; Symons Corporation.
h. Seal Cure WB 150; Tamms Industries Co., Div. of LaPorte Construction Chemicals of North America, Inc.

2.8 RELATED MATERIALS

A. Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

B. Epoxy Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Shore A hardness of 80 per ASTM D 2240.

C. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

D. Epoxy-Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class and grade to suit requirements, and as follows:

1. Type II, non-load bearing, for bonding freshly mixed concrete to hardened concrete.
2. Types I and II, non-load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
3. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

E. Reglets: Fabricate reglets of not less than 0.0217-inch- thick galvanized steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.

F. Dovetail Anchor Slots: Hot-dip galvanized steel sheet, not less than 0.0336 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.9 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109/C 109M.

B. Repair Topping: Traffic-bearing, cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5700 psi at 28 days when tested according to ASTM C 109/C 109M.

2.10 CONCRETE MIXES

A. Prepare design mixes for each type and strength of concrete determined by either laboratory trial mix or field test data bases, as follows:

1. Proportion normal-weight concrete according to ACI 211.1 and ACI 301.

B. Use a qualified independent testing agency for preparing and reporting proposed mix designs for the laboratory trial mix basis.

C. Footings and Foundation Walls: Proportion normal-weight concrete mix as follows:
1. Compressive Strength (28 Days): 4000 psi.
2. Maximum Slump: 3 inches.
3. Maximum Slump for Concrete Containing High-Range Water-Reducing Admixture: 8 inches after admixture is added to concrete with site-verified 2- to 3-inch slump.

D. Slab-on-Grade: Proportion normal-weight concrete mix as follows:
1. Compressive Strength (28 Days): 4000 psi.
2. Maximum Slump: 4 inches.

E. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash: 25 percent.

F. Maximum Water-Cementitious Materials Ratio: 0.40 for concrete required to have low water permeability. This includes elevator pits and basement walls.

G. Maximum Water-Cementitious Materials Ratio: 0.40 for concrete exposed to deicers or subject to freezing and thawing while moist. This includes exterior slabs and walls.

H. Maximum Water-Cementitious Materials Ratio: 0.40 for corrosion protection of steel reinforcement in concrete exposed to chlorides from deicing chemicals, salt, saltwater, brackish water, seawater, or spray from these sources.

I. Maximum Water-Cementitious Materials Ratio: 0.40 for all interior slabs.

J. Air Content: Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content as follows within a tolerance of plus 1 or minus 1.5 percent, unless otherwise indicated:

1. Air Content: 5.5 percent for 1-1/2-inch- nominal maximum aggregate size.
2. Air Content: 6 percent for 1-inch- nominal maximum aggregate size.
3. Air Content: 6 percent for 3/4-inch- nominal maximum aggregate size.

K. Do not air entrain concrete to trowel-finished interior floors and suspended slabs. Do not allow entrapped air content to exceed 3 percent.

L. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

M. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing admixture or high-range water-reducing admixture (superplasticizer) in concrete, as required, for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.
4. Use corrosion-inhibiting admixture in concrete mixes where indicated.

2.11 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.12 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94 and ASTM C 1116, and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

B. Project-Site Mixing: Only when specifically approved by the Architect. Measure, batch, and mix concrete materials and concrete according to ASTM C 94. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least one and one-half minutes, but not more than five minutes after ingredients are in mixer, before any part of batch is released.
2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd..
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mix type, mix time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until 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 for surfaces exposed to view.
2. Class C, 1/2 inch all other surfaces.

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical. Kerf wood inserts for forming keyways, reglets, recesses, and the like, for easy removal.

1. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to

prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete.

I. Do not chamfer corners or edges of concrete.

J. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

K. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

L. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

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

3.2 EMBEDDED ITEMS

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

1. Install anchor bolts, accurately located, to elevations required.
2. Install reglets to receive top edge of foundation sheet waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
3. Install dovetail anchor slots in concrete structures as indicated.

3.3 REMOVING AND REUSING FORMS

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

B. 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. At least 70 percent of 28-day design compressive strength.

C. 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.

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

3.4 SHORES AND RESHORES

A. Comply with ACI 318, ACI 301, and recommendations in ACI 347R for design, installation, and removal of shoring and reshoring.

B. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.

C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.5 VAPOR BARRIER SYSTEM

A. Vapor Barrier System: Place, protect, and repair vapor-barrier sheets according to ASTM E 1643 and manufacturer's written instructions. Lap joints 6 inches minimum and seal with manufacturer's tape.

3.6 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

1. Do not cut or puncture vapor barrier. Repair damage and reseal vapor barrier 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. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.7 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
2. Form from preformed galvanized steel, plastic keyway-section forms, or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.
3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
7. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-third of concrete thickness, as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete as soon as possible when cutting action will not dislodge aggregate or otherwise damage surface usually 1 to 2 hours depending on mix design, environmental conditions, etc. and before concrete develops random contraction cracks, typically 1 to 2 hours depending on mix design, environmental conditions, etc.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.
2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Division 7 Section "Joint Sealants," are indicated.
3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Dowel Joints: Install dowel sleeves and dowels or dowel bar and support assemblies at joints where indicated.

1. Use dowel sleeves or lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.8 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Do not add water to concrete during delivery, at Project site, or during placement, unless approved by Architect.

C. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation. Limit Free-Fall to a height of five (5) feet.

D. Deposit concrete in forms in horizontal layers no deeper than 24 inches and in a manner to avoid inclined construction joints. Place each layer while preceding layer is still plastic, to avoid cold joints.

1. Consolidate placed concrete with mechanical vibrating equipment. Use equipment and procedures for consolidating concrete recommended by ACI 309R.
2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the vibrator. Place vibrators to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix constituents to segregate.

E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.
4. Slope surfaces uniformly to drains where required.
5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, free of humps or hollows, before excess moisture or bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.

2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mix designs.

G. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows, when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.9 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defective areas repaired and patched. Remove fins and other projections exceeding ACI 347R limits for class of surface specified.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Remove fins and other projections exceeding 1/8 inch in height.

1. Apply to concrete surfaces exposed to public view or to be covered with a coating or covering material applied directly to concrete, such as waterproofing, dampproofing, veneer plaster, or painting.
2. Do not apply rubbed finish to smooth-formed finish.

C. Rubbed Finish: Apply the following to smooth-formed finished concrete:

1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix one part portland cement and one part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.10 FINISHING FLOORS AND SLABS

A. General: Comply with recommendations in ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes.

1. Apply scratch finish to surfaces indicated and to surfaces to receive concrete floor topping or mortar setting beds for ceramic or quarry tile, portland cement terrazzo, and other bonded cementitious floor finishes.

C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces indicated, to surfaces to receive trowel finish, and to floor and slab surfaces to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.

D. Trowel Finish: After applying float finish, apply first trowel finish and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces indicated and to floor and slab surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin film-finish coating system
2. Finish surfaces to the following tolerances, measured within 24 hours according to ASTM E 1155/E 1155M for a randomly trafficked floor surface:

a. For thin-set flooring or resilient floor covering: Specified overall values of flatness, F(F) 35; and levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and levelness, F(L) 17.

b. For carpet floors: Specified overall values of flatness, F(F) 25; and levelness, F(L) 20; with minimum local values of flatness, F(F) 17; and levelness, F(L) 15.

E. Trowel and Fine-Broom Finish: Apply a partial trowel finish, stopping after second troweling, to surfaces indicated and to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. Immediately after second troweling, and when concrete is still plastic, slightly scarify surface with a fine broom.

F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.11 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete Work.

B. Curbs: Provide monolithic finish to interior curbs where indicated by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

3.12 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with recommendations in ACI 305R for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing by one or a combination of the following methods:

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

   a. Water.
   b. Continuous water-fog spray.
   c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than

seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer recommends for use with floor coverings.

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.13 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.

1. Defer joint filling until concrete has aged at least six months. Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

C. Install semirigid epoxy joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.14 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension in solid concrete but not less than 1 inch in depth. Make edges

of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.

2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least 3/4 inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mix as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.15 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage and pay for a qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports during concrete placement. Sampling and testing for quality control may include those specified in this Article.

B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mix exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
2. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mix placed each day.

    a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mix, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

3. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
4. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
5. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
6. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
7. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of four standard cylinder specimens for each composite sample.

    a. Cast and field cure one set of four standard cylinder specimens for each composite sample.

8. Compressive-Strength Tests: ASTM C 39; test two laboratory-cured specimens at 7 days and two at 28 days.

    a. Test two field-cured specimens at 7 days and two at 28 days.
    b. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at age indicated.

C. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.

D. Strength of each concrete mix will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.

E. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-and 28-day tests.

F. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

G. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by Architect.

END OF SECTION 03300

SECTION 03540 - GYPSUM CEMENTITIOUS UNDERLAYMENT

PART 1 GENERAL

1.01 SUMMARY

A. This is the recommended specification for Dura-Cap Floor Underlayment over precast concrete slabs.

1.02 SECTION INCLUDES

A. Dura-Cap gypsum cement or equivalent

B. Maxxon Floor Primer or equivalent

C. Maxxon Overspray or equivalent

1.03 QUALITY ASSURANCE

A. Dura-Cap Installer's Qualifications: Installation of Dura-Cap shall be by an applicator authorized by the Maxxon Corporation using Maxxon approved mixing and pumping equipment.

1.04 DELIVERY, STORAGE AND HANDLING

A. General Requirements: Materials shall be delivered in their original, unopened packages, and protected from exposure to the elements. Damaged or deteriorated materials shall be removed from the premises.

1.05 SITE CONDITIONS

A. Environmental Requirements: Before, during and after installation of Dura-Cap, building interior shall be enclosed and maintained at a temperature above 50 degrees F (10 degrees C) and below 100 degrees F (37.7 degrees C) until structure and precast temperature are stabilized.

PART 2 PRODUCTS

2.01 MATERIALS

A. Dura-Cap gypsum cement: Floor underlayment compound shall be Dura-Cap gypsum cement underlayment as manufactured by Maxxon Corporation, Hamel, MN. All others must receive prior approval.

B. Sand Aggregate: Sand shall be 1/8 inch (3 mm) or less, washed masonry or plaster sand, meeting requirements of Maxxon Corporation Sand Specification 101.

C. Mix Water: Potable, free from impurities.

D. Precast Primer: Maxxon Floor Primer

E. Sealer: Maxxon Overspray

2.02 MIX DESIGNS

A. General Requirements: Dura-Cap mix proportions and methods shall be in strict accordance with product manufacturer recommendations.

B. Minimum Comprehensive Strength: 2,000 PSI

PART 3 EXECUTION

3.01 PREPARATION

A. Condition and Cleaning of Precast: Precast shall be structurally sound. General Contractor shall clean precast to remove mud, oil, grease, and other contaminating factors before the arrival of the Dura-Cap underlayment crew.

B. Leak Prevention: Fill cracks and voids with a quick setting patching or caulking material where leakage of Dura-Cap could occur.

C. Priming Precast: Prime precast using the Maxxon Floor Primer. Priming instructions may vary according to the porosity of the precast; multiple coats may be necessary.

D. Expansion Joints: Allow joints to continue through the Dura-Cap at the same width.

3.02 APPLICATION OF CEMENTITIOUS FLOORING

A. Scheduling: Application of Dura-Cap shall not begin until the building is enclosed, including roof, windows, doors, and other fenestration. Install after drywall installation unless tenant finish requirements identify partitioning after the pour.

B. Application: Place Dura-Cap from 3" (76 mm) to featheredge. Spread and float Dura-Cap to a smooth surface. Except at authorized joints, place Dura-Cap as

continuously as possible until application is complete so that no Dura-Cap slurry is placed against Dura-Cap product that has obtained its initial set.

C. Drying: General Contractor shall provide continuous ventilation and adequate heat to rapidly remove moisture from the area until the Dura-Cap is dry. General Contractor shall provide mechanical ventilation if necessary. Under the above conditions, for 3/4 inch (19 mm) thick Dura-Cap 5-7 days is usually adequate drying time. To test for dryness, tape a 24 inch by 24 inch (609 mm by 609 mm) section of plastic or high density rubber mat to the surface of the underlayment. After 48-72 hours, if no condensation occurs, the underlayment shall be considered dry. Perform dryness test 5-7 days after pour.

3.03 PREPARATION FOR INSTALLATION OF GLUE DOWN FLOOR GOODS

A. Sealing: Seal all areas that receive glue down floor goods according to the Maxxon Corporation's specifications. Any floor areas where the surface has been damaged shall be cleaned and sealed regardless of floor covering to be used. Use Maxxon Overspray to seal the Dura-Cap prior to installation of glue down floor goods. Where floor goods manufacturers require special adhesive or installation systems, their requirements supersede these recommendations.

B. Floor Goods Procedures: See the Maxxon Corporation's "Procedures for Attaching Finished Floor Goods to Maxxon Underlayments" brochure for guidelines for installing finished floor goods. This procedure is not a warranty and is to be used as a guideline only.

3.04 FIELD QUALITY CONTROL

A. Slump Test: Dura-Cap mix shall be tested for slump as it's being pumped using a 2 inch by 4 inch (50 mm by 101 mm) cylinder resulting in a patty size of 8 inches (203 mm) plus or minus 1 inch (25 mm) diameter.

B. Field Samples: At least one set of 3 molded cube samples shall be taken from each day's pour during the Dura-Cap application. Cubes shall be tested as recommended by the Maxxon Corporation in accordance with modified ASTM C 472. Test results shall be available to architect and/or contractor upon request from applicator.

3.05 PROTECTION

A. Protection From Heavy Loads: During construction, place temporary wood planking over Dura-Cap wherever it will be subject to heavy wheeled or concentrated loads.

END OF SECTION

SECTION 04810 - UNIT MASONRY ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes unit masonry assemblies consisting of the following when indicated:

1. Concrete masonry units.
2. Building (common) brick.
3. Mortar and grout.
4. Reinforcing steel.
5. Masonry joint reinforcement.
6. Ties and anchors.
7. Embedded flashing.
8. Miscellaneous masonry accessories.
9. Cavity-wall insulation.

B. 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."
2. Anchor sections of adjustable masonry anchors for connecting to structural frame, installed under Division 5 Section "Structural Steel."

C. Products installed, but not furnished, under this Section include the following:
1. Steel lintels and shelf angles for unit masonry, furnished under Division 5 Section "Metal Fabrications."
2. Manufactured reglets in masonry joints for metal flashing, furnished under Division 7 Section "Sheet Metal Flashing and Trim."
3. Hollow-metal frames in unit masonry openings, furnished under Division 8 Section "Steel Doors and Frames."

D. Related Requirements:
1. Section 07272 “Fluid-Applied Membrane Air Barriers” for flexible through wall flashings.

1.3 DEFINITIONS

A. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 SUBMITTALS

A. Product Data: For each different masonry unit, accessory, and other manufactured product specified.

B. Shop Drawings: Show fabrication and installation details for the following:

1. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement." Show elevations of reinforced walls.
2. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

C. Samples for Initial Selection: For the following:

1. Unit masonry Samples in full-scale form showing the full range of colors and textures.
2. Colored mortar Samples showing the full range of colors.

D. Samples for Verification: For the following:

1. Full-size units for each different exposed masonry unit required, showing the full range of exposed colors, textures, and dimensions to be expected in the completed construction.
2. Colored mortar Samples for each color required, showing the full range of colors expected in the finished construction. Make samples using the same sand and mortar ingredients to be used on Project. Label Samples to indicate types and amounts of pigments used.
3. Stone trim samples not less than 12 inches in length, showing the full range of colors and textures expected in the finished construction.
4. Weep holes/vents in color to match mortar color.
5. Accessories embedded in the masonry.

E. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.

1. Submittal is for information only. Neither receipt of list nor approval of mockup constitutes approval of deviations from the Contract Documents, unless such deviations are specifically brought to the attention of the Architect and approved in writing.

F. Qualification Data: For firms and persons specified in "Quality Assurance" Article.

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

1. Each type of masonry unit required.

    a. Include size-variation data for brick, verifying that actual range of sizes falls within specified tolerances.
    b. Include test results, measurements, and calculations establishing net-area compressive strength of masonry units.

2. Mortar complying with property requirements of ASTM C 270
3. Grout mixes complying with compressive strength requirements of ASTM C 476. Include description of type and proportions of grout ingredients.

H. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements:

1. Each type of masonry unit required.

    a. Include size-variation data for brick, verifying that actual range of sizes falls within specified tolerances.
    b. Include test data, measurements, and calculations establishing net-area compressive strength of masonry units.

2. Each cement product required for mortar and grout, including name of manufacturer, brand, type, and weight slips at time of delivery.
3. Each combination of masonry unit type and mortar type. Include statement of net-area compressive strength of masonry units, mortar type, and net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.
4. Each material and grade indicated for reinforcing bars.
5. Each type and size of joint reinforcement.
6. Each type and size of anchor, tie, and metal accessory.

I. Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with cold-weather requirements.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1093 to conduct the testing indicated, as documented according to ASTM E 548.

B. Contractor shall employ and pay a qualified professional engineer to provide a survey and inspection of foundations for compliance with dimensional tolerances.

C. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, through one source from a single manufacturer for each product required.

D. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source or producer for each aggregate.

E. Preconstruction Testing Service: The Contractor shall employ and pay for a qualified independent testing agency to perform the following preconstruction testing:

1. Concrete Masonry Unit Test: For each concrete masonry unit indicated, per ASTM C 140.
2. Prism Test: For each type of wall construction indicated, per ASTM C 1314].
3. Mortar Test: For mortar properties per ASTM C 270.
4. Grout Test: For compressive strength per ASTM C 1019.

F. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire-resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by another means, as acceptable to authorities having jurisdiction.

G. Mockups: Before installing unit masonry, build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution.

Build mockups to comply with the following requirements, using materials indicated for the completed Work:

1. Locate mockups in the locations indicated or, if not indicated, as directed by Architect.
2. Build mockups for the following types of masonry in sizes approximately 48 inches long by 48 inches high by full thickness, including face and backup wythes and accessories. Include a sealant-filled joint at least 16 inches long in each mockup.

    a. Typical exterior wall with lower corner of window opening framed with stone trim at upper corner of mockup. Make opening approximately 12 inches wide by 16 inches high.

3. Clean exposed faces of mockups with masonry cleaner as indicated.
4. Where masonry is to match existing, erect mockups adjacent and parallel to existing surface.
5. Notify Architect seven days in advance of dates and times when mockups will be constructed.
6. Protect accepted mockups from the elements with weather-resistant membrane.
7. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
8. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.

    a. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.
    b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups, unless such deviations are specifically approved by Architect in writing.

9. Demolish and remove mockups when directed.
10. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

H. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

1. Protect Type I concrete masonry units from moisture absorption so that, at the time of installation, the moisture content is not more than the maximum allowed at the time of delivery.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver pre-blended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store pre-blended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.7 PROJECT CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

1. Protect base of walls from rain-splashed mud and from mortar splatter by coverings spread on ground and over wall surface.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. This specification supersedes ACI 530.1/ASCE 6/TMS 602 in that masonry shall not be installed when the ambient temperature is 32 degF or below or the temperature of the masonry units is below 32degF, unless a heated temporary enclosure is provided for a minimum of 24 hours. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602 when the ambient temperature is above 32degF. masonry products shall always be protected from the elements.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.

E. Hot-Weather Requirements: Protect unit masonry work when temperature and humidity conditions produce excessive evaporation of water from mortar and grout. Provide artificial shade and wind breaks and use cooled materials as required.

1. When ambient temperature exceeds 100 deg F, or 90 deg F with a wind velocity greater than 8 mph, do not spread mortar beds more than 48 inches ahead of masonry. Set masonry units within one minute of spreading mortar.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate

2.2 PERFORMANCE REQUIREMENTS

A. Provide structural unit masonry that develops indicated net-area compressive strengths at 28 days.

1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to TMS 602/ACI 530.1/ASCE 6.

2.3 UNIT MASONRY, GENERAL

A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE6, except as modified by requirements in the Contract Documents.

B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work and will be within 20 feet vertically and horizontally of a walking surface.

C. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs indicated.

1. Where fire-resistance-rated construction is indicated, units shall be listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction.

2.4 CONCRETE MASONRY UNITS

A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.

1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.

2. Provide bullnose units for outside corners unless otherwise indicated.

B. Integral Water Repellent: Provide units made with integral water repellent for exposed units.

1. Integral Water Repellent: Liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested according to ASTM E 514/E 514M as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive, with test period extended to 24 hours, shall show no visible water or leaks on the back of test specimen.

C. CMU: ASTM C90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2150 psi minimum and as noted in drawings.
2. Density Classification: Medium weight unless otherwise indicated.
3. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.
4. Exposed Faces: provide color and texture matching the range represented by Architect's sample.
5. Faces to Receive Plaster: Where units are indicated to receive a direct application of plaster, provide textured-face units made with gap-graded aggregates.

D. Concrete Building Brick: ASTM C 55.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2800 psi minimum and as noted in the drawings.
2. Density Classification: Medium weight.
3. Size (Actual Dimensions): 3-5/8 inches wide by 3-5/8 inches high by 7-5/8 inches long.

2.5 CONCRETE AND MASONRY LINTELS

A. General: Provide as shown in drawings.

B. Concrete Lintels: ASTM C 1623, matching CMUs in color, texture, and density classification; and with reinforcing bars indicated.

C. Concrete Lintels: Precast or formed-in-place concrete lintels complying with requirements in Section "Cast-in-Place Concrete", and with reinforcing bars indicated.

D. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs matching adjacent CUMs in color, texture, and density classification, with reinforced bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

2.6 BRICK

A. General: Provide utility brick.

1. Provide Belden Brick Products (Basis of Design) or equal by Glen Gery Brick Endicott Brick.

B. Provide shapes indicated and as follows for each form of brick required:

1. Provide units without cores or frogs and with exposed surfaces finished for ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces.

C. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.

1. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
2. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.

D. Building Brick: ASTM C 216, Grade SW, Type FBX and as follows:

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 5,500 psi.
2. Size: Manufactured to the following actual dimensions:

a. Utility: 3-5/8 inches wide by 3-5/8 inches high by 11 5/8 inches long (Type FBX).

3. Application: Use where brick is indicated for concealed locations. Note that hollow brick is not simply face brick with the usual cores (holes); it is brick that has voids (cores and cells) exceeding 25 percent of the gross cross-sectional area. See Evaluations.

4. Color and texture: Selected by Owner/Architect

E. Paving Brick: ASTM C902, Class SX, Type 1 Application FX

1. Manufacturer: Glen Gery Brick or equivalent
2. Color and texture: Selected by Owner/Architect
3. Type: Repressed Chamfered
4. Size: 2-1/4" x 4" x 8"
5. Engraved pavers up to 15 characters included in allowance. Characters/list by Owner.

2.7 MORTAR AND GROUT MATERIALS

A. Regional Materials: Aggregate for mortar and grout, cement, and lime shall be extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

B. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

C. Hydrated Lime: ASTM C 207, Type S.

D. 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.

E. Mortar Cement: ASTM C 1329.

F. Masonry Cement: ASTM C 91.

1. For pigmented mortar, use a colored cement formulation as required to produce the color indicated or, if not indicated, as selected from manufacturer's standard formulations.

    a. Pigments shall not exceed 10 percent of portland cement by weight for mineral oxides nor 2 percent for carbon black.
    b. Pigments shall not exceed 5 percent of mortar cement by weight for mineral oxides nor 1 percent for carbon black.

2. For colored-aggregate mortar, use natural color or white cement as necessary to produce required mortar color.

G. Aggregate for Mortar: ASTM C 144; except for joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.

1. White-Mortar Aggregates: Natural white sand or ground white stone.
2. Colored-Mortar Aggregates: Natural-colored sand or ground marble, granite, or other sound stone; of color necessary to produce required mortar color.

H. Aggregate for Grout: ASTM C 404.

I. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortar.

J. Epoxy Pointing Mortar: ASTM C 395, epoxy-resin-based material formulated for use as pointing mortar for structural-clay tile facing units (and approved for such use by manufacturer of the units); in color indicated or, if not otherwise indicated, as selected by Architect from manufacturer's colors.

K. Cold-Weather Admixture: Permitted in accordance with ASTM C 494 Type E. No masonry work below 32 deg F.

L. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with concrete masonry units, containing integral water repellent by same manufacturer.

M. Water: Potable.

N. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

O. Products: Subject to compliance with requirements, provide one of the following or equivalent:

1. Colored Portland Cement-Lime Mix:

    a. Eaglebond; Blue Circle Cement.
    b. Color Mortar Blend; Glen-Gery Corporation.
    c. Rainbow Mortamix Custom Color Cement/Lime; Holnam, Inc.
    d. Centurion Colorbond PL; Lafarge Corporation.
    e. Lehigh Custom Color Portland/Lime; Lehigh Portland Cement Co.
    f. Riverton Portland Cement Lime Custom Color; Riverton Corporation (The).

2. Mortar Cement:

   a. Magnolia Superbond Mortar Cement; Blue Circle Cement.
   b. Lafarge Mortar Cement; Lafarge Corporation.
   c. Essroc Cement Corporation.

3. Colored Mortar Cement:

   a. Magnolia Superbond Mortar Cement; Blue Circle Cement.
   b. Spec Mix, Inc.
   c. Montfort Bros.

4. Colored Masonry Cement:

   a. Magnolia Masonry Cement; Blue Circle Cement.
   b. Brixment-in-Color; Essroc Materials, Inc.
   c. Rainbow Mortamix Custom Color Masonry Cement; Holnam, Inc.
   d. Centurion Colorbond; Lafarge Corporation.
   e. Lehigh Custom Color Masonry Cement; Lehigh Portland Cement Co.
   f. Coosa Masonry Cement; National Cement Company, Inc.
   g. Flamingo Color Masonry Cement; Riverton Corporation (The).
   h. Richcolor Masonry Cement; Southdown, Inc.

5. Mortar Pigments:

   a. True Tone Mortar Colors; Davis Colors.
   b. Centurion Pigments; Lafarge Corporation.
   c. SGS Mortar Colors; Solomon Grind-Chem Services, Inc.

6. Water-Repellent Admixture: See Section 07200

2.8 REINFORCEMENT

A. Uncoated-Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60 (Grade 420).

B. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and to hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.

C. Masonry-Joint Reinforcement, General: ASTM A 951/A 951M.

1. Interior Walls: Mill-galvanized carbon steel.
2. Exterior Walls: **STAINLESS STEEL**.
3. Wire Size for Side Rods: 0.148-inch diameter.
4. Wire Size for Cross Rods: 0.148-inch diameter.
5. Wire Size for Veneer Ties: 0.187-inch diameter.
6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
7. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.

D. Masonry-Joint Reinforcement for Multiwythe Masonry:

1. Adjustable (two-piece) type, **STAINLESS STEEL** ladder design, with one side rod at each face shell of backing wythe and with separate adjustable ties with pintle-and-winged loops connections having a maximum horizontal play of 1/16 inch and maximum vertical adjustment of 1-1/4 inches. Size ties to extend at least halfway through facing wythe but with at least 5/8-inch cover on outside face.
2. Basis of Design: Hohman & Barnard #265 adjustable ladder joint reinforcement with 2X-Hook, standard weight, with hook spacing of 16 inches on center. Provide pre-fabricated tees and corners. Equivalent substitutions will be considered in accordance with Specification Section 01300-Submittals.
3. Provide H&B stainless steel adjustable wall ties, 3/16-inch diameter pintles and 3/16-inch diameter eyes with 2X-Hooks, Locate where additional ties are required at masonry openings and veneer movement joints.

E. BRICK MASONRY JOINT REINFORCEMENT

1. Stainless steel, truss type, with two side rods, one at each face of brick, with at least 5/8" cover on outside face.

2.9 TIES AND ANCHORS

A. General: ties and anchors shall extend at least 1-1/2 inches into veneer but with at least a 5/8-inch cover on outside face.

B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:

1. Mill-Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M, with ASTM A 641/A 641M, Class 1 coating.
2. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M, with ASTM A 153/A 153M, Class B-2 coating.
3. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304.
4. Galvanized-Steel Sheet: ASTM A 653/A 653M, Commercial Steel, G60 (Z180) zinc coating.
5. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel with ASTM A 153/A 153M, Class B coating.
6. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304.
7. Steel Plates, Shapes and Bars: ASTM A 36/A 36M.
8. Stainless-Steel Bars: ASTM A276 or ASTM A 666, Type 304.

C. Welded adjustable anchors for Connecting to Structural Steel Framing: Where indicated, or required, provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch diameter, hot-dip galvanized steel wire.
2. Tie Section: Triangular-shaped wire tie made from 0.25-inch diameter, hot-dip galvanized steel wire.
3. Basis of design: Hohman & Barnard #359-C weld-on ties, with 8 inch offsets, 1/4 inch wire, Vee-Byna tie, wire diameter to match net tie space between structural steel and inside of weld-on ties plus or minus 1/16 inch clearance max, hot dip galvanized, shop welded to steel.

4. Touch up welds with zinc-rich coating per approved shop paint SSPC-Paint 20 manufacturer's recommendations.

D. Rigid anchors can be used to connect T-intersections of CMU shear walls in lieu of masonry bonding or bond beams. They are also often used at T-intersections of other CMU walls, although masonry bonding and T-shaped masonry-joint reinforcement may be used.

E. Rigid Anchors: Fabricate from steel bars 1-1/2 inches wide by 1/4 inch thick by 24 inches long, with ends turned up 2 or with cross pins unless otherwise indicated.

1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A 153/A 153M.

F. Adjustable Masonry-Veneer Anchors:

1. General: Provide Stainless Steel anchors that allow vertical adjustment but resist a minimum of 100-lbf load in both tension and compression perpendicular to plane of wall without deforming or developing play in excess of 1/16 inch.
2. Fabricate sheet metal anchor sections and other sheet metal parts from 0.078-inch thick, stainless-steel sheet.
3. Fabricate wire ties from 0.187 inch diameter, **STAINLESS STEEL** wire.
4. Screw or and post installed anchor attached, Masonry-Veneer Anchors: Wire tie and a rib-stiffened, sheet metal anchor section with screw holes top and bottom, with a projecting vertical tab having a slotted hole for inserting wire tie.

a. Attached to existing CMU

1) Basis of Design: Hohmann & Barnard HB-5213 adjustable veneer anchor with 2X-Hook and insulation retaining washer.
2) Fasten to existing CMU with 3/8-inch diameter stainless-steel sleeve anchor (Basis of Design: Powers Fasteners, Powerbolt) hex head sleeve anchor with 1 1/4 inch embedment in CMU faceshell and located within cell of CMU per manufacturer's requirements.
3) Acceptable products:

a) CTP-516 with CTP 2" post installed stainless steel and 2" bronze expansion anchor and insulation retaining washer. www.ctpanchors.com.
b) Or equivalent

b. Attached to steel studs

1) Basis of Design: Hohmann & Barnard H&B-213 adjustable stainless steel veneer anchor, 2X-Hook and insulation retaining washer.
2) Fasten to steel stud with two (2) #10-16 hex head self-drilling screws with bonded neoprene washer and corrosion protective coating (Basis of Design: Hilti, Self-Drilling Screws and Kwik-Cote coating).
3) Other acceptable products:

a) CTP-16 with fasteners noted above and insulation retaining washer.
b) Or equivalent.

c. Attached to structural steel where indicated.

1) Unless noted otherwise, Basis of Design: Hohmann & Barnard HB-213 stainless steel adjustable veneer anchor, 2X hooks and insulation retaining washer.
2) Where indicated: Hohmann & Barnard 359-FH Stainless Steel with Vee Byna-Tie, 3 /16" wire tie diameter.
3) Fasten to structural steel with two (2) 1/4 x 20 (Basis of Design: HILTI BI-METAL KWIK FLEX with HEX) washer head self-drilling fasteners.
4) Other acceptable products:
   a) CTP-16 with fasteners noted above and insulation retaining washer. www.ctpanchors.com
   b) Or equivalent.

2.10 FLEXIBLE FLASHING TYPE 304 STAINLESS STEEL

A. LAMINATED STAINLESS STEEL FABRIC FLASHING, NON-ASPHALTIC.

B. Definitions:

1. Cavity wall flashing: Same as flexible flashing.
2. Foundation sill flashing: Same as flexible flashing.
3. Flexible flashing: Water-proof material typically used in cavity wall construction to contain and assist in the proper water drainage that may penetrate wall system veneer. Other materials may be required to constitute the system.
4. Head and sill flashing: Same as flexible flashing.
5. Through-wall flashing:

   a. Generally considered the same as flexible flashing.
   b. Rare definition referred to full width cap flashing under copings or wall caps.

C. Submittals: Provide these documents in one complete shop drawings.

1. Product data: Indicate material type, composition, thickness, and installation procedures.
2. Samples: 3" by 5" flashing material.
3. Product quality and environmental submittals

   a. Certificates:

      1) Indicate materials supplied or installed are asbestos free.
      2) Indicate recycled content: 60% total recycled material; based on 60% Post Industrial Recycled Content.

   b. Minimum Performance Requirements:

      1) Tensile strength, 100,000 psi minimum average
      2) Puncture Resistance, 2,500 pounds average
      3) When tested as manufactured, product resists growth of mold pursuant to test method ASTM D3273.
      4) Fire Rating: flame spread and smoke generation
         1. Rated Class A, ASTM E84
      5) Certify the use of domestic manufactured stainless steel for flashing.
      6) Certify products contain no silica or asbestos.

4. Required Compatibility letter:

    a. Provide compatibility letter from the Air Barrier System and Flashing System manufacturer.

D. QUALITY ASSURANCE

1. Qualifications:

    a. Manufacturer: Provide flashing materials by single manufacturer with not less than twenty-five years of experience in manufacturing flexible flashing products.
    b. Flashing materials must be able to withstand 300° F temperature without changing the long-term performance of the flashing.

E. Required Compatibility Letter: Provide compatibility letter from the Air Barrier System and Flashing System manufacturer.

F. Warranty

1. Special warranty:

    a. Manufacturer: Warrant flexible flashing material for life of the wall
    b. Begin warranty at the Date of Substantial Completion.

G. MANUFACTURED UNITS

1. Product standard of quality:

    a. York Manufacturing, Inc.; Multi-Flash SS- Basis of Design.
    b. Illinois Products, Inc.; IPCO Stainless Steel Fabric Flashing
    c. Prosoco, Inc.; R-Guard SS ThruWall
    d. STS Coatings, Inc.; Wall Guardian Stainless Steel TWF
    e. TK Products, Inc.; TK TWF
    f. Equivalent products that meet the criteria in section 1.04 to 1.06.

2. Characteristics:

    a. Type: **Stainless Steel** core with polymer fabric laminated to the bottom stainless steel face with non-asphalt adhesive. The top face (exposed side) must not be covered with a polymer fabric.
    b. **Stainless Steel:** type 304, ASTM A240. Domestically sourced per DFARS 252.225-7008 and/or DFARS 252.225-7009.
    c. Fabric: polymer fabric; laminated back face (non-exposed side) of stainless steel core.
    d. Size: Manufacturer's standard width rolls.

H. ACCESSORIES:

1. Mastic/sealant: The Basis of Design is York Manufacturing, Inc.; UniverSeal US100 or equivalent.

    a. Characteristics:

1) Type: One part 100% solids, solvent-free formulated silyl-terminated polyether (STPE), ASTM C920-11, Type S, Grade NS, Class 50.

2. End dam: Provide preformed pieces by the flashing manufacturer using:

a. Stainless steel: 26 gauge stainless steel

3. Splice material: Product standard of quality is York304 SS by York or equivalent. Manufacturer's standard self-adhered metal material; material matching system material or use Multi-Flash Stainless Steel 6" lap piece and polyether sealant as a splice.

4. Termination bar: Product standard of quality is York T-96 termination bar or equivalent. Manufacturer's standard 1" composite material bar or a 1" 26 gauge stainless steel termination bar with sealant lip.

5. Weep vent protection: Product standard of quality is York's Weep Armor or equivalent. Geotextile drainage fabric at least 12" in height.

6. Repair and other materials/accessories: Manufacturer's standard.

7. Fasteners: 304 Stainless Steel Domestic manufactured fastener types and sizes recommended by flashing manufacturer for intended use.

I. INSTALLATION

1. General

a. Install where indicated, specified, or required in accord with flashing manufacturer's written instructions and as follows.
b. Extend flashing 8" minimum beyond opening. Provide pre-manufactured end dam units made of 26 gauge stainless steel.
c. Flashing width: Width required starting flush with outside face of exterior wythe, extending through cavity, rising height required to extend above lintel steel at least 2". **Flashing shall be installed a minimum of 1" past the face of veneer and cut off flush after inspection by C. M. or Architect**.
d. Splice end joints by overlapping them 6" and seal with a compatible sealant or metal splice tape.
e. Masonry back up:

1) Coordinate with fluid applied membrane air barrier installation, in accordance with manufacturer's installation instructions.
2) Embed flashing between CMU masonry installation and seal the top edge with compatible sealant.

f. Concrete back up:

1) Surface apply after fluid applied membrane air barrier installation in accordance with manufacturer's installation instructions.
2) Fasten to concrete surface at top by embedding in layer of sealant or use a non-corrosive termination bar and fasten it to the backer wall at the top edge of the flashing and seal the top edge with a compatible sealant.

g. Stud back up with sheathing:

1) Fasten to stud back-up. Install double faced butyl tape then install a non-corrosive termination bar and fasten it to the backer wall at the top edge of the flashing and seal the top edge with a compatible sealant.

h. Leave ready for certified compatible air barrier installation lapping flashing top installed in another Section.
i. Lay flashing in continuous bead of sealant on masonry supporting steel.
j. Provide purchased manufacturers preformed end dams.
k. Inside and outside corners: Provide purchase manufactured corners from manufacturer.
l. Cover flashing within a few days of installation to protect it from damage from the different trades, the environment and falling debris. If flashing is left unprotected and it is punctured, torn, or has loose scrim you should contact the manufacturer for repair instructions.

J. SCHEDULES

1. Locations:

a. Exterior door heads.
b. Window heads and sills.
c. Storefront heads.
d. Horizontal control joints.
e. Changes in veneer materials, vertically.
f. Other wall openings.
g. Other locations indicated.

2.11 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Pre-molded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene, urethane or PVC.

B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 or PVC, complying with ASTM D 2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

C. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D226/D 226M, Type 1 (No. 15 asphalt felt).

D. Weep/Cavity Vent Products:

1. Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 1/8 inch less than depth of outer wythe, in color selected form manufacturer's standard.

2. Products

a. Basis of Design: Hohmann & Barnard QV Quadro Vent full mortar joint height Color to match mortar
b. Or equivalent.

E. Cavity Drainage Material: Free-draining mesh, made form polymer strands that will not degrade within the wall cavity.

1. Configuration: Provide one of the following:

a. Strips, full depth of cavity and 10 inches high with dovetail-shaped notches 7 inches deep that prevent clogging with mortar droppings.
b. Strips, not less than 3/4 inch thick and 10 inches high, with dimpled surface designed to catch mortar droppings and prevent weep holes from clogging with mortar.
c. Sheets or strips, full depth of cavity and installed to full height of cavity.

F. Exterior Wall Expansion Joint Covers: Provide pre-manufactured silicone-coated, precompressed primary seal assembly at all exterior expansion joints.

G. Products: Subject to compliance with requirements, provide one of the following or equivalent:

1. Plastic Weep Hole/Vent:

a. Cell Vent; Dur-O-Wal, Inc.
b. Or Equivalent

2. Cavity Drainage Material:

a. Mortar Break; Advanced Building Products, Inc.
b. CavClear Masonry Mat; CavClear.
c. Mortar Net; Mortar Net USA, Ltd.
d. Mortar Stop; Polytite Manufacturing Corp.
e. Or Equivalent

3. Reinforcing Bar Positioners:

a. #RB Rebar Positioner; Hohmann & Barnard, Inc.
b. #RB-Twin Rebar Positioner; Hohmann & Barnard, Inc.
c. Or Equivalent

4. Exterior Wall Expansion Joint Cover:

a. Seismic Colorseal; EMSEAL LLC.
b. Or Equivalent

2.12 CAVITY-WALL INSULATION

A. Continuous Insulation Xci foil wall panels: Comply with NFPA 285 exterior wall assembly and ASTM C1289. Panels are a high thermal resistive rigid insulation panel composed of a closed cell Polyisocyanurate foam core bonded to an impermeable foil facer. Provide type: ASTM C1289, type 1 Grade (3) = 25 PSI thickness 1.5 inches (38 mm)/R-value 10.0. Provide

panel fasteners that are corrosive resistant with length and embedment as recommended by panel manufacturer.

B. Basis of Design Product: Hunter Panels Xci Foil. Equivalent substitutions will be considered in accordance with Specification Section 01300-Submittals.

2.13 MASONRY CLEANERS

A. Job-Mixed Detergent Solution: Solution of 1/2-cup dry measure tetrasodium polyphosphate and 1/2-cup dry measure laundry detergent dissolved in 1 gal. of water.

B. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

1. Available Products: Subject to compliance with requirements, products that may be used to clean unit masonry surfaces include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following or equivalent:

    a. Cleaners for Red and Light-Colored Brick Not Subject to Metallic Staining with Mortar Not Subject to Bleaching:

        1) 202 New Masonry Detergent; Diedrich Technologies, Inc.
        2) Sure Klean No. 600 Detergent; ProSoCo, Inc.
        3) Florok 700 Masonry Detergent; Chargar Corporation.

    b. Cleaners for Red and Dark-Colored Brick Not Subject to Metallic Staining:

        1) 200 Lime Solv; Diedrich Technologies, Inc.
        2) Sure Klean No. 101 Lime Solvent; ProSoCo., Inc.
        3) Chargar Corporation.

    c. Cleaners for Brick Subject to Metallic Staining:

        1) 202V Vana-Stop; Diedrich Technologies, Inc.
        2) Sure Klean Vana Trol; ProSoCo, Inc.
        3) Chargar Corporation.

2.14 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.
2. Add cold-weather admixture (if used) at the same rate for all mortar, regardless of weather conditions, to ensure that mortar color is consistent.

B. Pre-blended, Dry Mortar Mix: Furnish dry mortar ingredients in the form of a pre-blended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C 270, Property Specification.

1. Extended-Life Mortar for Unit Masonry: Mortar complying with ASTM C 1142 may be used instead of mortar specified above, at Contractor's option.
2. Limit cementitious materials in mortar for exterior and reinforced] masonry to portland cement, mortar cement, and lime.
3. For masonry below grade, in contact with earth, and where indicated, use Type S.
4. For reinforced masonry and where indicated, use Type S.
5. For exterior ,veneer brick use Type N.

D. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.

1. Pigments shall not exceed 10 percent of Portland cement by weight
2. Mix to match Architect's sample.
3. Application: Use pigmented mortar for exposed mortar joints with the following units:

a. Clay face brick.

E. Grout for Unit Masonry: Comply with ASTM C 476.

1. Use grout of type indicated or, if not otherwise indicated, of type fine that will comply with TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
2. Self-consolidated grout where indicated (SCG): ASTM C476 fine grout, pre-batched, pre-bagged, dry ingredients ready for hydration at the project site. Site proportioned grout will be rejected.

a. Specified minimum 28-day compressive strength is 3000 psi (ASTM C1019);
b. Slump flow (ASTM C1611) 24 inches to 28 inches;
c. T50 = 2 to 5 seconds
d. Visual Stability Index (VSI) = 0;
e. Basis of Design: SPEC MIX SCG, or equivalent.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance.
2. Verify that foundations are within tolerances specified.
3. Verify that reinforcing dowels are properly placed.
4. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Before installation, examine rough-in and built-in construction to verify actual locations of piping connections.

3.2 INSTALLATION, GENERAL

A. Thickness: Build cavity and composite walls and other masonry construction to the full thickness shown. Build single-wythe walls to the actual widths of masonry units, using units of widths indicated.

B. Build chases and recesses to accommodate items specified in this Section and in other Sections of the Specifications.

C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to the opening.

D. Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide a continuous pattern and to fit adjoining construction. Where possible, use full-size units without cutting. Allow units cut with water-cooled saws to dry before placing, unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.

1. Mix units from several pallets or cubes as they are placed.

F. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.

G. Wetting of Brick: Wet brick before laying if the initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at the time of laying.

3.3 TOLERANCES

A. Dimensions and Locations of Elements: or minus 1/4 inch (6 mm).

1. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch.
2. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch (6 mm) in a story height or 1/2 inch total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls, do not vary from level by more that 1/4 inch in 10 feet, or 1/2 inch maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet or 1/2 inch maximum.
3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet or 1/2 inch maximum.

4. For conspicuous vertical lines, such as external corners, door jambs, reveals and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet or 1/2 inch maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet in, 3/8 inch in 20 feet or 1/2 inch maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet or 1/2 inch maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3mm), with a maximum thickness limited to 1/2 inch.
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch (9 mm) or minus 1/4 inch.
4. For exposed head joints, do not vary form thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joints and head-joint thicknesses by more than 1/8 inch.
5. For exposed bed joints and head joints of stacked bond, do not vary from straight line by more than 1/16 inch from one masonry unit to the next.

3.4 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Lay exposed masonry in the following bond pattern; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

1. One-half running bond with vertical joint in each course centered on units in courses above and below.
2. Stack bond.
3. One-third running bond.
4. As indicated on Drawings.

C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2 inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

D. Stopping and Resuming Work: In each course, rack back one-half-unit length for one-half running bond or one-third-unit length for one-third running bond; do not tooth. Clean exposed surfaces of set masonry, wet clay masonry units lightly if required, and remove loose masonry units and mortar before laying fresh masonry.

E. Built-in Work: As construction progresses, build in items specified under this and other Sections of the Specifications. Fill in solidly with masonry around built-in items.

F. Fill space between hollow-metal frames and masonry solidly with mortar, unless otherwise indicated.

G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath in the joint below and rod mortar or grout into core.

H. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

I. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above, unless otherwise indicated.

1. Install compressible filler in joint between top of partition and underside of structure above.
2. Wedge non-load-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.
3. At fire-rated partitions, install firestopping in joint between top of partition and underside of structure above to comply with Division 7 Section "Firestopping."

3.5 MORTAR BEDDING AND JOINTING

A. Lay CMU as follows:

1. Bed face shells in mortar and make head joints of depth equal to bed joints.
2. Bed webs in mortar in all courses of piers, columns, and pilasters.
3. Bed webs in mortar in grouted masonry, including starting course on footings.
4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.
5. Fully bed units and fill cells with grout at anchors and ties as needed to fully embed anchors and ties in mortar.

B. Lay solid masonry units and hollow brick with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

C. Set cast-stone trim units in full bed of mortar with full vertical joints. Fill dowel, anchor and similar holes.

1. Clean soiled surfaces with fiber brush and soap powder and rinse thoroughly with clear water.
2. Allow cleaned surfaces to dry before setting.
3. Wet joint surfaces thoroughly before applying mortar.
4. Rake out mortar joints for pointing with sealant.

D. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

E. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

F. Cut joints flush where indicated to receive waterproofing, cavity wall insulation and air barriers unless otherwise indicated.

3.6 BONDING OF MULTIWYTHE MASONRY

A. Use bonding system indicated on Drawings.

B. Corners: Provide interlocking masonry unit bond in each wythe and course at corners, unless otherwise indicated.

1. Provide continuity with masonry joint reinforcement at corners by using prefabricated "L" units as well as masonry bonding.

C. Intersecting and Abutting Walls: Unless vertical expansion or control joints are shown at juncture, bond walls together as follows:

1. Provide continuity with masonry joint reinforcement by using prefabricated "T" units.

3.7 CAVITY WALLS

A. Bond wythes of cavity walls together as follows:

1. Individual Metal Ties as indicated on drawings: Provide ties as shown installed in horizontal joints, but not less than one metal tie for 1.77 sq. ft. of wall area spaced not to exceed 24 inches o.c. horizontally and 16 inches o.c. vertically. Stagger ties in alternate courses. Provide additional ties around openings and space as indicated around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 24 inches o.c. vertically.

a. Where bed joints of wythes do not align, use adjustable-type (two-piece-type) ties.
b. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable-type (two-piece-type) ties to allow for differential movement regardless of whether bed joints align.

2. Masonry-Joint Reinforcement: Installed in horizontal mortar joints.

a. Where bed joints of wythes do not align, use adjustable-type (two-piece-type) reinforcement.
b. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable-type (two-piece-type) reinforcement to allow for differential movement regardless of whether bed joints align.

3. Masonry-Veneer Anchors: Comply with requirements for anchoring masonry veneers.

B. Bond wythes of cavity walls together using bonding system indicated on drawings.

C. Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity. Do not attempt to trowel or

remove mortar fins protruding into cavity. Provide clean out units (CMU or clay facing) every other unit for the length of the work. Remove accumulated mortar at completion of each lift of work. Install cleanout unit after top of masonry is completed.

D. Parge all cavity face of backup wythe in a single coat to match existing (approximately 1/2 inch (10 mm)) thick. Trowel face of parge coat smooth to match existing and as required by the air barrier manufacturer.

3.8 ANCHORED MASONRY VENEERS

A. Anchor masonry veneers to wall framing and structural steel and masonry backup with masonry-veneer anchors to comply with the following requirements:

1. Fasten fastener-attached anchors through sheathing to wall framing and to masonry backup with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.
2. Embed tie sections in masonry joints.
3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
4. Space anchors as indicated, but not more than 16 inches o.c. vertically and 16 inches o.c. horizontally, with not less than one anchor for each 1.77 sq. ft. of wall area. Install additional anchors around openings and at intervals, not exceeding 8 inches, around perimeter and as indicated.

B. Provide not less than 1 inch of airspace between back of masonry veneer and face of insulation.

1. Keep airspace clean of mortar droppings and other materials during construction. Bevel beds away from airspace, to minimize mortar protrusions into airspace. Do not attempt to trowel or remove mortar fins protruding into airspace. Provide clean out units (CMU or clay facing) every other unit for the length of the work. Remove accumulated mortar at completion of each lift of work. Install cleanout unit after top of masonry is completed.

3.9 MASONRY-JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement at minimum of 6 inches.

1. Space reinforcement not more than 16 inches o.c.
2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings in addition to continuous reinforcement.

B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.

C. Provide continuity at wall intersections by using prefabricated T-shaped units.

D. Provide continuity at corners by using prefabricated L-shaped units.

E. Install brick masonry joint reinforcement at heads and sills of openings in brick veneer as indicated. Coordinate bed joint locations with adjustable anchor/ties. Do not install joint reinforcement in the same bed joint as the anchor/ties.

3.10 ANCHORING MASONRY TO STRUCTURAL STEEL

A. Anchor masonry to structural steel, where masonry abuts or faces structural steel or concrete, to comply with the following:

1. Provide an open space not less than 1 inch wide between masonry and structural steel unless otherwise indicated. Keep open space free of mortar and other rigid materials.
2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
3. Space anchors as indicated.

3.11 CONTROL AND EXPANSION JOINTS

A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.

B. Form control joints in concrete masonry using one of the following methods:

1. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout, and rake out joints in exposed faces for application of sealant.
2. Install preformed control-joint gaskets designed to fit standard sash block.
3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar, or rake out joint for application of sealant.
4. Install temporary foam-plastic filler in head joints, and remove filler when unit masonry is complete for application of sealant.

C. Form expansion joints in brick as follows:

1. Build flanges of metal expansion strips into masonry. Lap each joint 4 inches in direction of water flow. Seal joints below grade at junctures with horizontal expansion joints if any.
2. Build flanges of factory-fabricated, expansion-joint units into masonry.
3. Build in compressible joint fillers where indicated.
4. Form open joint full depth of brick wythe and of width indicated, but not less than 1/2 inch for installation of sealant and backer rod.

D. Provide horizontal, pressure-relieving joints by either leaving an airspace or inserting a compressible filler of width required for installing sealant and backer rod but not less than 1/2 inch.

1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

3.12 LINTELS

A. Install galvanized steel lintels where indicated.

B. Provide concrete or masonry lintels where shown and where openings of more than 12 inches (305 mm) for brick-size units and 24 inches for block-size units shown without structural steel or other supporting lintels.

C. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

3.13 FLASHING, WEEP HOLES, WATERPROOFING AND CAVITY VENTS

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.

B. Install flashing as follows unless otherwise indicated:

1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, and tape as recommended by flashing manufacturer.
2. At masonry-veneer walls, extend flashing through veneer, across airspace behind veneer, and up fact of sheathing or masonry backup in accordance with barrier system manufacturer requirements at least 8 inches; with upper edge tied into water-resistive barrier, lapping at least 6 inches. Fasten upper edge of flexible flashing to sheathing through termination bar. Provide cut off sealant above termination bar to CMU.
3. At lintels and shelf angles, extend flashing at minimum of 6 inches into masonry at each end. At heads and sills, extend flashing a minimum of 6 inches at ends and turn up not less than 2 inches to form end dams at nearest head joint.
4. Install metal drip plates beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall, and adhere flexible flashing to tope of metal drip plate.
5. Install metal flashing termination beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall, and adhere flexible flashing to tope of metal flashing termination.
6. Provide minimum of 3 inches lap into drip plate. Set drip plate in continuous bed of butyl sealant. Set butyl on grouted solid brick course.
7. Install continuous self-adhering base of wall waterproofing flush to exterior surface of trench foundation wall, extend horizontally inward to intersecting masonry wall and rise to the underside of through wall flashing location, terminate with termination bar to CMU wall, prime surfaces as required by approved manufacturer to provide complete adhesion.

C. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.

D. Install weep holes in exterior wythes and veneers in head joints of first course of masonry immediately above embedded flashing.

1. Use specified weep/cavity vent products to form weep holes.

3.14 REINFORCED UNIT MASONRY INSTALLATION

A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.

1. Construct formwork to provide shape, line and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace,

tie and support forms to maintain position and shape during construction and curing of reinforced masonry.

2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and that of other loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in TMS 602/ACI 530.1/ASCE 6.

C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.

1. Comply with requirements in TMS 602/ACI 530.1/ASCE 6 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
2. Limit height of vertical grout pours to not more than 60 inches.

3.15 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform test and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

B. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.

C. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.

3.16 REPAIRING, POINTING AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes and completely fill with mortar. Point up joints, including corners, openings and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar in thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.

4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
5. Clean brick by bucket-and-brush hand-cleaning method.
6. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.
7. Clean masonry with a proprietary acidic cleaner applied according to the manufacturer's written instructions.
8. Clean stone trim to comply with stone supplier's written instructions.
9. Clean limestone units to comply with recommendations in ILI's "Indiana Limestone Handbook".

3.17 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excel masonry materials are Contractor's property. At completion of unit masonry work, remove from project site.

B. Masonry Waste Recycling: Return broken CMUs not used as fill to manufacturer for recycling.

C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used, as described above or recycled, and other masonry waste and legally dispose of off Owner's property.

END OF SECTION 04810

SECTION 05120 - STRUCTURAL STEEL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes structural steel.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Engineer structural steel connections required by the Contract Documents to be selected or completed by the fabricator to withstand design loadings indicated.

B. Engineering Responsibility: Engage a fabricator who utilizes a qualified professional engineer to prepare calculations, Shop Drawings, and other structural data for structural steel connections.

1.4 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data for each type of product specified.

C. Shop Drawings detailing fabrication of structural steel components.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
3. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify high-strength bolted slip-critical, direct-tension, or tensioned shear/bearing connections.
4. Include Shop Drawings signed and sealed by a qualified professional engineer responsible for their preparation.

D. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

E. Mill test reports signed by manufacturers certifying that their products, including the following, comply with requirements.

1. Structural steel, including chemical and physical properties.
2. Bolts, nuts, and washers, including mechanical properties and chemical analysis.
3. Direct-tension indicators.
4. Shop primers.
5. Nonshrink grout.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who has completed structural steel work similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Fabricator Qualifications: Engage a firm experienced in fabricating structural steel similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to fabricate structural steel without delaying the Work.

C. Comply with applicable provisions of the following specifications and documents:

1. AISC's "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design."
2. AISC's "Specification for Allowable Stress Design of Single-Angle Members."
3. AISC's "Seismic Provisions for Structural Steel Buildings."
4. ASTM A 6 (ASTM A 6M) "Specification for General Requirements for Rolled Steel Plates, Shapes, Sheet Piling, and Bars for Structural Use."
5. Research Council on Structural Connections' (RCSC) "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

D. Professional Engineer Qualifications: A professional engineer who is legally authorized to practice in the jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for projects with structural steel framing that are similar to that indicated for this Project in material, design, and extent.

E. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code--Steel."

1. Present evidence that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

F. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver structural steel to Project site in such quantities and at such times to ensure continuity of installation.

B. Store materials to permit easy access for inspection and identification. Keep steel members off ground by using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration.

1. Store fasteners in a protected place. Clean and relubricate bolts and nuts that become dry or rusty before use.
2. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

1.7 SEQUENCING

A. Supply anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, templates, instructions, and directions, as required, for installation.

PART 2 - PRODUCTS

2.1 MATERIALS AS INDICATED.

A. Structural Steel Shapes, Plates, and Bars: As follows:

1. Carbon Steel: ASTM A 36.
2. High-Strength, Low-Alloy Columbium-Vanadium Steel: ASTM A 992, Grade 50.
3. High-Strength, Low-Alloy Structural Steel: ASTM A 588, Grade 50, corrosion resistant.

B. Cold-Formed Structural Steel Tubing: ASTM A 500, Grade B.

C. Hot-Formed Structural Steel Tubing: ASTM A 501.

D. Steel Pipe: ASTM A 53, Type E or S, Grade B.

1. Weight Class: Standard unless indicated otherwise.
2. Finish: Black, except where indicated to be galvanized.

E. Carbon-Steel Castings: ASTM A 27, Grade 65-35, medium-strength carbon steel.

F. High-Strength Steel Castings: ASTM A 148, Grade 80-50.

G. Shear Connectors: ASTM A 108, Grade 1015 through 1020, headed-stud type, cold-finished carbon steel, AWS D1.1, Type B.

H. Anchor Rods, Bolts, Nuts, and Washers: As follows:

1. Unheaded Rods: ASTM A 36.
2. Headed Bolts: ASTM A 307, Grade A; carbon-steel, hex-head bolts; and carbon-steel nuts.

3. Headed Bolts: ASTM A 325, Type 1, heavy hex steel structural bolts and heavy hex carbon-steel nuts. Use where high strength bolts are indicated.
4. Washers: ASTM A 36.

I. Nonhigh-Strength Bolts, Nuts, and Washers: ASTM A 307, Grade A; carbon-steel, hex-head bolts; carbon-steel nuts; and flat, unhardened steel washers.
1. Finish: Hot-dip zinc-coating, ASTM A 153, Class C.

J. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy hex steel structural bolts, heavy hex carbon-steel nuts, and hardened carbon-steel washers.
1. Finish: Hot-dip zinc-coating, ASTM A 153, Class C.

K. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, heavy-hex head assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.
1. Finish: Mechanically deposited zinc coating.

L. Welding Electrodes: Comply with AWS requirements.

2.2 PRIMER

A. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer.

B. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds and repair painting galvanized steel, with dry film containing not less than 93 percent zinc dust by weight, and complying with DOD-P-21035A or SSPC-Paint 20.

2.3 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage compensating agents, plasticizing and water-reducing agents, complying with ASTM C 1107, of consistency suitable for application, and a 30-minute working time.

2.4 FABRICATION

A. Fabricate and assemble structural steel in shop to greatest extent possible. Fabricate structural steel according to AISC specifications referenced in this Section and in Shop Drawings.

1. Camber structural steel members where indicated.
2. Identify high-strength structural steel according to ASTM A 6 and maintain markings until steel has been erected.
3. Mark and match-mark materials for field assembly.
4. Fabricate for delivery a sequence that will expedite erection and minimize field handling of structural steel.
5. Complete structural steel assemblies, including welding of units, before starting shop-priming operations.

6. Comply with fabrication tolerance limits of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for structural steel.

B. Fabricate architecturally exposed structural steel with exposed surfaces smooth, square, and free of surface blemishes, including pitting, rust, scale, seam marks, roller marks, rolled trade names and roughness.

1. Remove blemishes by filling or grinding, or by welding and grinding, prior to cleaning, treating, and shop priming.
2. Comply with fabrication requirements, including tolerance limits, of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for architecturally exposed structural steel.

C. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

1. Plane thermally cut edges to be welded.

D. Finishing: Accurately mill ends of columns and other members transmitting loads in bearing.

E. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's printed instructions.

F. Holes: Provide holes required for securing other work to structural steel framing and for passage of other work through steel framing members, as shown on Shop Drawings.

1. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame-cut holes or enlarge holes by burning. Drill holes in bearing plates.

2.5 SHOP CONNECTIONS

A. Shop install and tighten high-strength bolts according to RCSC's Allowable Stress Design Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

1. Bolts: ASTM A 325 high-strength bolts, unless otherwise indicated.
2. Connection Type: Snug tightened, unless indicated as slip-critical, direct-tension, or tensioned shear/bearing connections.

B. Weld Connections: Comply with AWS D1.1 for procedures, appearance and quality of welds, and methods used in correcting welding work.

1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without warp.
2. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent surface bleeding of back-side welding on exposed steel surfaces. Grind smooth exposed fillet welds 1/2 inch and larger. Grind flush butt welds. Dress exposed welds.

2.6 SHOP PRIMING

A. Shop prime steel surfaces, except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
2. Surfaces to be field welded.
3. Surfaces to be high-strength bolted with slip-critical connections.
4. Surfaces to receive sprayed-on fireproofing.
5. Galvanized surfaces.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust, loose mill scale, and spatter, slag, or flux deposits. Prepare surfaces according to SSPC specifications as follows:

1. SPC-SP 3 "Power Tool Cleaning."

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's instructions and at rate recommended by SSPC to provide a dry film thickness of not less than 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
2. Apply 2 coats of shop paint to inaccessible surfaces after assembly or erection. Change color of second coat to distinguish it from first.

D. Painting: Apply a 1-coat, nonasphaltic primer complying with SSPC's "Painting System Guide No. 7.00" to provide a dry film thickness of not less than 1.5 mils.

2.7 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel indicated for galvanizing according to ASTM A 123.

2.8 SOURCE QUALITY CONTROL

A. The Contractor will employ and pay for an independent testing and inspecting agency to perform shop inspections and tests and to prepare test reports.

1. Testing agency will conduct and interpret tests and state in each report whether test specimens comply with or deviate from requirements.
2. Provide testing agency with access to places where structural steel Work is being fabricated or produced so required inspection and testing can be accomplished.

B. Correct deficiencies in or remove and replace structural steel that inspections and test reports indicate do not comply with specified requirements.

C. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.

D. Shop-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

1. Direct-tension indicator gaps will be verified to comply with ASTM F 959, Table 2.

E. In addition to visual inspection, shop-welded connections will be inspected and tested according to AWS D1.1 and the inspection procedures listed below, at testing agency's option.

1. Liquid Penetrant Inspection: ASTM E 165.
2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Before erection proceeds, and with the steel erector present, verify elevations of concrete and masonry bearing surfaces and locations of anchorages for compliance with requirements.

B. Do not proceed with erection until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place, unless otherwise indicated.

1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

3.3 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC specifications referenced in this Section.

B. Base and Bearing Plates: Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen surfaces prior to setting base and bearing plates. Clean bottom surface of base and bearing plates.

1. Set base and bearing plates for structural members on wedges, shims, or setting nuts as required.
2. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.
3. Pack grout solidly between bearing surfaces and plates so no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure.

a. Comply with manufacturer's instructions for proprietary grout materials.

C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

1. Maintain erection tolerances of architecturally exposed structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

D. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure.
2. Establish required leveling and plumbing measurements on mean operating temperature of structure. Make allowances for difference between temperature at time of erection and mean temperature at which structure will be when completed and in service.

E. Remove erection bolts on welded, architecturally exposed structural steel; fill holes with plug welds; and grind smooth at exposed surfaces.

F. Do not use thermal cutting during erection.

G. Finish sections thermally cut during erection equal to a sheared appearance.

H. Do not enlarge unfair holes in members by burning or by using drift pins. Ream holes that must be enlarged to admit bolts.

3.4 FIELD CONNECTIONS

A. Install and tighten nonhigh-strength bolts, except where high-strength bolts are indicated.

B. Install and tighten high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

1. Bolts: ASTM A 325 high-strength bolts, unless otherwise indicated.
2. Connection Type: Snug tightened, unless indicated as slip-critical, direct-tension, or tensioned shear/bearing connections.

C. Weld Connections: Comply with AWS D1.1 for procedures, appearance and quality of welds, and methods used in correcting welding work.

1. Comply with AISC specifications referenced in this Section for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
2. Assemble and weld built-up sections by methods that will maintain true alignment of axes without warp.
3. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent surface

bleeding of back-side welding on exposed steel surfaces. Grind smooth exposed fillet welds 1/2 inch and larger. Grind flush butt welds. Dress exposed welds.

3.5 FIELD QUALITY CONTROL

A. Owner will employ and pay for an independent testing and inspecting agency to perform field inspections and tests and to prepare test reports.

1. Testing agency will conduct and interpret tests and state in each report whether tested Work complies with or deviates from requirements.

B. Correct deficiencies in or remove and replace structural steel that inspections and test reports indicate do not comply with specified requirements.

C. Additional testing will be performed to determine compliance of corrected Work with specified requirements. Contractor will reimburse Owner for the costs of these additional tests.

D. Field-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

1. Direct-tension indicator gaps will be verified to comply with ASTM F 959, Table 2.

E. In addition to visual inspection, field-welded connections will be inspected and tested according to AWS D1.1 and the inspection procedures listed below, at testing agency's option.

1. Liquid Penetrant Inspection: ASTM E 165.
2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.

3.6 CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint. Apply paint to exposed areas using same material as used for shop painting.

1. Apply by brush or spray to provide a minimum dry film thickness of 1.5 mils.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and apply galvanizing repair paint according to ASTM A 780.

END OF SECTION 05120

SECTION 05210 - STEEL JOISTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Open-web K-series steel joists where indicated
2. Joist accessories.

1.3 DEFINITIONS

A. Special Joists: Joists requiring modification by the manufacturer to support nonuniform, unequal, or special loading conditions that invalidate SJI's "Standard Specifications Load Tables and Weight Tables for Steel Joists and Joist Girders."

1.4 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide special joists and connections capable of withstanding the following design loads within limits and under conditions indicated:

1. Design Loads: As indicated on the Structural Drawings

B. Design joists to withstand design loads with total load deflections no greater than the following:
1. Roof Joists: Vertical live load deflection of 1/360 of the span.

1.5 SUBMITTALS

A. Product Data: For each type of joist, accessory, and product indicated.

B. Shop Drawings: Show layout, mark, number, type, location, and spacings of joists. Include joining and anchorage details, bracing, bridging, accessories; splice and connection locations and details; and attachments to other construction.

1. Indicate locations and details of anchorage devices and bearing plates to be embedded in other construction.
2. Comprehensive engineering analysis signed and sealed by the qualified professional engineer responsible for its preparation when required.

C. Welding Certificates: Copies of certificates for welding procedures and personnel.

D. Mill certificates signed by manufacturers of bolts certifying that their products comply with specified requirements.

E. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

F. Research/Evaluation Reports: Evidence of steel joists' compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in manufacturing joists similar to those indicated for this Project and with a record of successful in-service performance.

1. Manufacturer must be certified by SJI to manufacture joists complying with SJI standard specifications and load tables.
2. Assumes responsibility for engineering special joists to comply with performance requirements. This responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.
3. Professional Engineer Qualifications: A professional engineer who is legally authorized to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of joists that are similar to those indicated for this Project in material, design, and extent.

B. SJI Specifications: Comply with SJI's "Standard Specifications Load Tables and Weight Tables for Steel Joists and Joist Girders" (hereafter, "Specifications"), applicable to types of joists indicated.

C. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel"; and AWS D1.3 "Structural Welding Code--Sheet Steel."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle joists as recommended in SJI's "Specifications."

B. Protect joists from corrosion, deformation, and other damage during delivery, storage, and handling.

1.8 SEQUENCING

A. Deliver steel bearing plates and other devices to be built into concrete and masonry construction.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Steel: Comply with SJI's "Specifications" for chord and web members.

B. Steel Bearing Plates: ASTM A 36/A 36M.

C. Carbon-Steel Bolts and Threaded Fasteners: ASTM A 307, Grade A, carbon-steel, hex-head bolts and threaded fasteners; carbon-steel nuts; and flat, unhardened steel washers.

1. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.

D. Welding Electrodes: Comply with AWS standards.

E. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035.

2.2 PRIMERS

A. Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer with good resistance to normal atmospheric corrosion, complying with performance requirements in FS TT-P-664.

2.3 OPEN-WEB K-SERIES STEEL JOISTS

A. Manufacture steel joists according to "Standard Specifications for Open Web Steel Joists, K-Series," in SJI's "Specifications," with steel-angle top- and bottom-chord members, underslung ends, and parallel top chord; of joist type indicated.

1. Joist Type: K and KCS-series steel joists.

B. Comply with AWS requirements and procedures for shop welding, appearance, quality of welds, and methods used in correcting welding work.

C. Provide holes in chord members for connecting and securing other construction to joists.

D. Top-Chord Extensions: Extend top chords of joists with SJI's Type S top-chord extensions where indicated, complying with SJI's "Specifications."

E. Extended Ends: Extend bearing ends of joists with SJI's Type R extended ends where indicated, complying with SJI's "Specifications."

F. Camber joists according to SJI's "Specifications", as required.

G. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches.

2.5 JOIST ACCESSORIES

H. Bridging: Provide bridging anchors and number of rows of horizontal or diagonal bridging of material, size, and type required by SJI's "Specifications" for type of joist, chord size, spacing, and span.

I. Bridging: Schematically indicated. Detail and fabricate according to SJI's "Specifications."

J. Bridging: Fabricate as indicated and according to SJI's "Specifications."

1. Furnish additional erection bridging if required.

K. Fabricate steel bearing plates with integral anchorages of sizes and thicknesses indicated. Hot-dip zinc coat according to ASTM A 123/A 123M.

L. Steel bearing plates with integral anchorages are specified in Division 5 Section "Metal Fabrications."

M. Supply ceiling extensions, either extended bottom-chord elements or a separate extension unit of enough strength to support ceiling construction. Extend ends to within 1/2 inch of finished wall surface, unless otherwise indicated.

N. Supply miscellaneous accessories, including splice plates and bolts required by joist manufacturer to complete joist installation.

2.6 CLEANING AND SHOP PAINTING

O. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories to be primed by hand-tool cleaning, SSPC-SP 2 or power-tool cleaning, SSPC-SP 3.

P. Do not prime paint joists and accessories to receive sprayed fire-resistive materials].

Q. Apply one shop coat of primer to joists and joist accessories to be primed to provide a continuous, dry paint film not less than 1 mil thick.

R. Painting of joists and joist accessories is specified in Division 9 Section "Painting."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates, embedded bearing plates, and abutting structural framing, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Do not install joists until supporting construction is in place and secured.

B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Specifications," joist manufacturer's written recommendations, and requirements in this Section.

1. Before installation, splice joists delivered to Project site in more than one piece.
2. Space, adjust, and align joists accurately in location before permanently fastening.
3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.
4. Delay rigidly connecting bottom-chord extensions to columns or supports until dead loads have been applied.

C. Field weld joists to supporting steel bearing plates. Coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

D. Bolt joists to supporting steel framework using carbon-steel bolts, unless otherwise indicated.

E. Bolt joists to supporting steel framework using high-strength structural bolts, unless otherwise indicated. Comply with RCSC's "Allowable Stress Design Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts" for high-strength structural bolt installation and tightening requirements.

F. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Owner shall employ and pay for a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.

B. Field welds will be visually inspected according to AWS D1.1.

C. In addition to visual inspection, field welds will be tested according to AWS D1.1 and the following procedures, as applicable:

1. Magnetic Particle Inspection: ASTM E 709.
2. Liquid Penetrant Inspection: ASTM E 165.

D. Bolted connections will be visually inspected.

1. High-strength, field-bolted connections will be tested and verified according to procedures in RCSC's "Allowable Stress Design Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts."

E. Correct deficiencies in Work that inspections and test reports have indicated are not in compliance with specified requirements.

F. Additional testing will be performed to determine compliance of corrected Work with specified requirements.

3.4 REPAIRS AND PROTECTION

A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists and accessories, bearing plates and abutting structural steel.

1. Clean and prepare surfaces by hand-tool cleaning, SSPC-SP 2, or power-tool cleaning, SSPC-SP 3.
2. Apply a compatible primer of the same type as the shop primer used on adjacent surfaces.

C. Touchup Painting: Cleaning and touchup painting are specified in Division 9 Section "Painting."

D. Provide final protection and maintain conditions, in a manner acceptable to manufacturer, Installer and Engineer that ensure joists and accessories are without damage or deterioration at time of Substantial Completion.

END OF SECTION 05210

SECTION 05310 - STEEL DECK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Roof deck when indicated.
2. Composite floor deck when indicated.
3. Noncomposite form deck when indicated.

1.3 SUBMITTALS

A. Product Data: For each type of deck, accessory, and product indicated.

B. Shop Drawings: Show layout and types of deck panels, anchorage details, reinforcing channels, pans, deck openings, special jointing, accessories, and attachments to other construction.

C. Product Certificates: Signed by steel deck manufacturers certifying that products furnished comply with requirements.

D. Welding Certificates: Copies of certificates for welding procedures and personnel.

E. Product Test Reports: From a qualified testing agency indicating that each of the following complies with requirements, based on comprehensive testing of current products:

1. Mechanical fasteners.
2. Acoustical roof deck.

F. Research/Evaluation Reports: Evidence of steel deck's compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed steel deck 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. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.

C. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."

D. Fire-Test-Response Characteristics: Where indicated, provide steel deck units identical to those steel deck units tested for fire resistance per ASTM E 119 by a testing and inspection agency acceptable to authorities having jurisdiction.

1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.
2. Steel deck units shall be identified with appropriate markings of applicable testing and inspecting agency.

E. AISI Specifications: Calculate structural characteristics of steel deck according to AISI's "Specification for the Design of Cold-Formed Steel Structural Members."

F. FM Listing: Provide steel roof deck evaluated by FM and listed in FM's "Approval Guide, Building Materials" for Class 1 fire rating and Class 1-90 windstorm ratings.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

1.6 COORDINATION

A. Coordinate installation of sound-absorbing insulation strips in topside ribs of acoustical deck with roofing installation specified in Division 7 to ensure protection of insulation strips against damage from effects of weather and other causes.

B. Coordinate layout and installation of trench headers, preset inserts, duct fittings, and other components specified in Division 16 Section "Underfloor Raceway" with installation of cellular metal floor deck.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following or equivalent:

1. Steel Deck:

a. BHP Steel Building Products USA Inc.
b. Consolidated Systems, Inc.
c. Epic Metals Corp.
d. Marlyn Steel Products, Inc.
e. Nucor Corp.; Vulcraft Div.
f. Roof Deck, Inc.
g. United Steel Deck, Inc.
h. Verco Manufacturing Co.
i. Wheeling Corrugating Co.; Div. of Wheeling-Pittsburgh Steel Corp.

2.2 ROOF DECK

A. Steel Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 29, and the following:
1. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G60 zinc coating.
2. Deck Profile: As Indicated.
3. Profile Depth: As indicated
4. Design Uncoated-Steel Thickness: As indicated
5. Design Uncoated-Steel Thicknesses; Deck Unit/Bottom Plate: As indicated
6. Span Condition: As indicated.
7. Side Laps: As indicated

2.3 COMPOSITE FLOOR DECK

A. Composite Steel Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 29, the minimum section properties indicated, and the following:
1. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33 minimum or as indicated, G60 zinc coating.
2. Profile Depth: As Indicated.
3. Design Uncoated-Steel Thickness: As indicated
4. Span Condition: As indicated

2.4 NONCOMPOSITE FORM DECK

A. Noncomposite Steel Form Deck: Fabricate ribbed-steel sheet noncomposite form deck panels to comply with "SDI Specifications and Commentary for Noncomposite Steel Form Deck," in SDI Publication No. 29, the minimum section properties indicated, and the following:

1. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33 minimum or as indicated, G60 zinc coating.
2. Profile Depth: As Indicated.
3. Design Uncoated-Steel Thickness: As indicated
4. Span Condition: As indicated

2.5 ACCESSORIES

A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.

C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.

D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

F. Steel Sheet Accessories: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.

G. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi, of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 29 for overhang and slab depth.

H. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.

I. Piercing Hanger Tabs: Piercing steel sheet hanger attachment devices for use with floor deck.

J. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, .0598 inch thick, with factory-punched hole of 3/8-inch minimum diameter.

K. Recessed Sump Pans: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck, with 3-inch- wide flanges and recessed pans of 1-1/2- inch minimum depth. For drains, cut holes in the field.

L. Flat Sump Plate: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck. For drains, cut holes in the field.

M. Shear Connectors: ASTM A 108, Grades 1010 through 1020 headed stud type, cold-finished carbon steel, AWS D1.1, Type B, with arc shields.

N. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035, with dry film containing a minimum of 94 percent zinc dust by weight.

O. Repair Paint: Lead- and chromate-free rust-inhibitive primer complying with performance requirements of FS TT-P-664.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

3.2 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 29, manufacturer's written instructions, and requirements in this Section.

B. Install temporary shoring before placing deck panels, if required to meet deflection limitations.

C. Locate decking bundles to prevent overloading of supporting members.

D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.

1. Align cellular deck panels for entire length of cell runs and align cells at ends of abutting panels.

E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to decking.

G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of decking, and support of other work.

H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

I. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

3.3 ROOF DECK INSTALLATION

A. Fasten roof deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter, but not less than 1-1/2 inches long, and as follows:

1. Weld Diameter: 5/8 inch nominal.
2. Weld Spacing: Weld edge and interior ribs of deck units with a minimum of two welds per deck unit at each support. Space welds as indicated.
3. Weld Washers: Install weld washers at each weld location.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports as indicated, and as follows

1. Mechanically fasten with self-drilling No. 10 diameter or larger carbon-steel screws.
2. Mechanically clinch or button punch.
3. Fasten with a minimum of 1-1/2-inch- long welds.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:

1. End Joints: Lapped 2 inches minimum

D. Roof Sump Pans and Sump Plates: Install over openings provided in roof decking and weld flanges to top of deck. Space welds not more than 12 inches apart with at least 1 weld at each corner.

E. Miscellaneous Roof Deck Accessories: Install ridge and valley plates, finish strips, cover plates, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld to substrate to provide a complete deck installation.

F. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.

G. Sound-Absorbing Insulation: Installation into topside ribs of deck as specified in Division 7 .

3.4 FLOOR DECK INSTALLATION

A. Fasten floor deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:

1. Weld Diameter: 5/8 inch, nominal.
2. Weld Spacing: Weld edge ribs of panels at each support. Space additional welds an average of 12 inches apart, but not more than 18 inches apart.
3. Weld Spacing: Space and locate welds as indicated.
4. Weld Washers: Install weld washers at each weld location.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of 1/2 of the span or 36 inches, and as follows:

1. Mechanically fasten with self-drilling No. 10 diameter or larger carbon-steel screws.
2. Mechanically clinch or button punch.
3. Fasten with a minimum of 1-1/2-inch- long welds.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:

1. End Joints: Lapped

D. Shear Connectors: Weld shear connectors through deck to supporting frame according to AWS D1.1 and manufacturer's written instructions. Butt end joints of deck panels; do not overlap. Remove and discard arc shields after welding shear connectors.

E. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations, unless otherwise indicated.

F. Floor Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of decking. Weld cover plates at changes in direction of floor deck panels, unless otherwise indicated.

G. Install piercing hanger tabs not more than 14 inches apart in both directions, within 9 inches of walls at ends, and not more than 12 inches from walls at sides, unless otherwise indicated.

3.5 FIELD QUALITY CONTROL

A. Testing: Owner shall employ and pay for a qualified independent testing agency to perform field quality-control testing.

B. Field welds will be subject to inspection.

C. Shear connector stud welds will be inspected and tested according to AWS D1.1 for stud welding and as follows:

1. Shear connector stud welds will be visually inspected.
2. Bend tests will be performed if visual inspections reveal less than a full 360-degree flash or welding repairs to any shear connector stud.
3. Tests will be conducted on additional shear connector studs if weld fracture occurs on shear connector studs already tested according to AWS D1.1.

D. Testing agency will report test results promptly and in writing to Contractor and Architect.

E. Remove and replace work that does not comply with specified requirements.

F. Additional testing and inspecting will be performed to determine compliance of corrected work with specified requirements. Contractor will reimburse Owner for the costs of these additional tests.

3.6 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05310

SECTION 05400 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Interior non-load-bearing wall framing.
2. Exterior non-load-bearing wall framing.

1.3 DEFINITIONS

A. Minimum Base Steel Thickness: Minimum base thickness of cold-formed framing delivered to the Project site shall be not less than 95 percent of the thickness used in the cold- formed framing design. Lesser thicknesses shall be permitted at bends due to cold forming.

B. Producer: Entity that produces steel sheet coil fabricated into cold-formed members.

1.4 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.

1. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
   a. Interior Non-Load-Bearing Wall Framing: Horizontal deflection of 1/360 of the wall height under a horizontal load of 5 lbf/sq. ft.
   b. Exterior Non-Load-Bearing Framing: Horizontal deflection of 1/600 of the wall height for backing brick veneer and 1/360 of the wall height for backing others.
   c. Ceiling Joist Framing: Vertical deflection of 1/360 of the span.

2. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg. F.
3. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:

a. Upward and downward movement of 1/2 inch.

B. Cold-Formed Steel Framing, General: Design according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions." and AISI S200 and ASTM C955, Section 8.

1. Headers: Design according to AISI's "Standard for Cold-Formed Steel Framing - Header Design."
2. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

1.5 SUBMITTALS

A. Product Data: For each type of cold-formed metal framing product and accessory indicated.

B. Shop Drawings: Provide Shop Drawings prepared by cold-formed metal framing manufacturer. Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

1. For cold-formed metal framing indicated to comply with design loads, include structural Analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Mill certificates by steel sheet producer or test reports from a qualified independent testing agency indicating steel sheet complies with requirements.

D. Welding Certificates: Copies of certificates for welding procedures and personnel.

E. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

F. Product Test Reports: From a qualified testing agency indicating that each of the following complies with requirements, based on comprehensive testing of current products:

1. Expansion anchors.
2. Steel Sheet.
3. Power-actuated anchors.
4. Mechanical fasteners.
5. Vertical deflection clips.
6. Miscellaneous structural clips and accessories.

G. Research/Evaluation Reports: Evidence of cold-formed metal framing's compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Member in good standing of the Steel Framing Industry Association (SFIA) or be a part of a similar organization that provides verifiable code compliance program.

1. Products to be certified under an independent third-party inspection program administered by an agency accredited by IAS to ICC-ES AC98 IAS Accreditation Criteria for Inspection Agencies.

B. Installer Qualifications: An experienced installer who has completed cold-formed metal framing 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.

C. Engineering Responsibility: Engage a qualified professional engineer to prepare design calculations, Shop Drawings, and other structural data.

D. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.

E. Mill certificates signed by steel sheet producer or test reports from a qualified independent testing agency indicating steel sheet complies with requirements, including uncoated steel thickness, yield strength, tensile strength, total elongation, chemical requirements, ductility, and galvanized-coating thickness.

F. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated.

G. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified in accordance with the product-certification program of the Steel Framing Industry Association (SFIA) or be a part of a similar organization that provides verifiable code compliance program.

H. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."

I. Fire-Test-Response Characteristics: Where metal framing is part of a fire-resistance-rated assembly, provide framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

J. Fire-Resistance Ratings: Indicated by GA File Numbers in GA-600, "Fire Resistance Design Manual," or by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.

K. Comply with AISI's S100 "Specification for the Design of Cold-Formed Steel Structural Members" for calculating structural characteristics of cold-formed metal framing, AISI S200 and ASTM C955, Section 8.

L. Comply with HUD's "Prescriptive Method for Residential Cold-Formed Steel Framing."

M. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering cold-formed metal framing that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide cold-formed metal framing by one of the following or equivalent:

1. The Steel Network, Inc.
2. ClarkDietrich.
3. AllSteel Products, Inc.
4. MarinoWare; Div. of Ware Industries, Inc.
5. United Metal Products, Inc.
6. Steel Construction Systems.
7. Or Equivalent.

2.2 MATERIALS

A. Framing Members, General: Comply with AISI S200 and ASTM C955, Section 8 for conditions indicated.

B. Steel Sheet: ASTM A1003/A1003M; A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:

1. Grade: 33 minimum or as required by structural performance.
2. Coating: G60

C. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, complying with AISI S200 and ASTM C 955, and as follows:

1. Minimum Uncoated-Steel Thickness: Matching steel studs.

D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal and lateral loads, and as follows:.

1. Minimum Base-Steel Thickness: Matching steel studs.
2. Flange Width: Manufacturer's standard deep flange width

E. Vertical Deflection Clips: Manufacturer's standard clips, capable of accommodating upward and downward vertical displacement of primary structure.

2.3 EXTERIOR AND INTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
1. Minimum Base Steel Thickness: 0.0428 inch
2. Flange Width: 1-5/8 inches

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
1. Minimum Base Steel Thickness 0.0428 inch
2. Flange Width: 1-1/4 inches

C. Vertical Deflection Clips: Manufacturer's standard head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following or equivalent:
   a. ClarkDietrich.
   b. MarinoWare, a division of Ware Industries.
   c. SCAFCO Corporation
   d. The Steel Network, Inc.
   e. Or equivalent

D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal and lateral loads and transfer them to the primary structure, and as follows:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following or equivalent:
   a. ClarkDietrich.
   b. MarinoWare, a division of Ware Industries.
   c. SCAFCO Corporation
   d. The Steel Network, Inc.

e. Or equivalent
2. Minimum Base Steel Thickness: 0.0428
3. Flange Width: 1 inch plus the design gap for 1-story structures

E. Slotted Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; punched with vertical slots in both legs. Studs should be positively attached to deep-leg track using vertical slots while allowing free vertical movement. Legs designed to support horizontal and lateral loads and transfer them to the primary structure, as follows:
1. ClarkDietrich; BlazeFrame DSL Slotted Deflection Track or comparable product.
2. Leg Dimension: 2-1/2 inches with 1-1/2-inch slot
3. Minimum Thickness:[0.0428 inch

F. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.
1. Outer Track: Of web depth to allow free vertical movement of inner track, with flanges designed to support horizontal and lateral loads and transfer them to the primary structure, and as follows:
a. Minimum Base Steel Thickness: 0.0428 inch
b. Flange Width: 1 inch plus the design gap for 1-story structures
2. Inner Track: Of web depth indicated, and as follows:
a. Minimum Base Steel Thickness: 0.0428 inch
b. Flange Width: Equal to sum of outer deflection track flange width plus 1 inch

G. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and structure.
1. ClarkDietrich; Drift FastClip Slide Clip (D-FCSC) or comparable product.
2. Minimum Base-Steel Thickness: 0.0677 inch

2.4 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
1. Supplementary framing.
2. Bracing, bridging, and solid blocking.
a. ClarkDietrich; Spazzer 5400 Bridging Bar (SPZS) or comparable product.
3. Web stiffeners.
a. ClarkDietrich; Quick Twist Web Stiffener (QTWS) or comparable product.
4. Anchor clips.
a. ClarkDietrich; Moment Clip (MC Series) or comparable product.
5. End clips.
6. Foundation clips.
a. ClarkDietrich; Pony Wall **PW48** or comparable product.
7. Gusset plates.
8. Stud kickers, knee braces, and girts.

9. Joist hangers and end closures.
   a. ClarkDietrich; Universal Joist Hanger (UJH) or comparable product.
10. Hole reinforcing plates.
11. Backer plates.

2.5 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTMA 123.

B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel hex-headed bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.

C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.

E. Mechanical Fasteners: Corrosion-resistant-coated, self-drilling, self-threading steel drill screws.
   1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

F. Welding Electrodes: Comply with AWS standards.

2.6 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035B,

B. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

C. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107, with fluid consistency and 30-minute working time.

D. Shims: Load bearing, high-density multimonomer plastic, nonleaching.

E. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.7 FABRICATION

A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to manufacturer's written recommendations and requirements in this Section.
   1. Fabricate framing assemblies using jigs or templates.
   2. Cut framing members by sawing or shearing; do not torch cut.
   3. Fasten cold-formed metal framing members by welding. Wire tying of framing members is not permitted. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
   4. Fasten cold-formed metal framing members by welding or screw fastening, as standard with fabricator. Wire tying of framing members is not permitted.
      a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
      b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.
   5. Fasten other materials to cold-formed metal framing by welding, bolting, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
   1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
   2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.

B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that are required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

C. Grout bearing surfaces uniform and level to ensure full contact of bearing flanges or track webs on supporting concrete or masonry construction.

D. Install sealer gaskets to isolate the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL

A. A Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed metal framing according to ASTM C 1007, AISI S200, and manufacturer's written instructions unless more stringent requirements are indicated.

C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
   1. Bolt or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.

D. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to manufacturer's written recommendations and requirements in this Section.
   1. Cut framing members by sawing or shearing; do not torch cut.
   2. Fasten cold-formed metal framing members by welding or screw fastening, as standard with fabricator. Wire tying of framing members is not permitted.
      a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
      b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.

E. Install framing members in one-piece lengths, unless splice connections are indicated for track or tension members.

F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

G. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.

H. Install insulation in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.

J. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
   1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 EXTERIOR AND INTERIOR NON-LOAD-BEARING WALL INSTALLATION

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.

B. Fasten both flanges of studs to top and bottom track, unless otherwise indicated. Space studs as follows:
   1. Stud Spacing: 16 inches (Unless noted otherwise)

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
   1. Install single-leg deflection tracks and anchor to building structure.
   2. Install double deep-leg deflection tracks and anchor outer track to building structure.
   3. Connect vertical deflection clips to bypassing studs and anchor to building structure.
   4. Connect drift clips to cold formed metal framing and anchor to building structure.

E. Install horizontal bridging in curtain-wall studs, spaced in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.
   1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches of single deflection track. Install a combination of flat, taut, steel sheet straps of width and thickness indicated and stud or stud-track solid blocking of width and thickness matching studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
      a. Install solid blocking at 96-inch centers or as indicated on Shop Drawings.
   2. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
   3. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
   4. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable curtain-wall-framing system.

3.5 GYPSUM SHEATHING INSTALLATION

A. General: Install gypsum sheathing to comply with GA-253 and manufacturer's written instructions.

B. Cut boards at penetrations, edges, and other obstructions of the work; fit tightly against abutting construction, except provide a 3/8-inch setback where non-load-bearing construction abuts structural elements.

C. Coordinate sheathing installation with flashing and joint sealant installation so these materials are installed in the sequence and manner that prevent exterior moisture from passing through completed exterior wall assembly.

D. Apply fasteners so screw heads bear tightly against face of sheathing boards but do not cut into facing.

E. Do not bridge building expansion joints with sheathing; cut and space edges to match spacing of structural support elements.

F. Horizontal Installation: Install 24-inch- wide gypsum sheathing boards horizontally with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent boards without forcing. Abut ends of boards over centers of stud flanges and stagger end joints of adjacent boards not less than one stud spacing. Screw-attach boards at perimeter and within field of board to each steel stud at approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of boards.

G. Vertical Installation: Install 48-inch wide gypsum sheathing boards vertically with vertical edges centered over flanges of steel studs. Abut ends and edges of each board with those of adjacent boards. Screw-attach boards at perimeter and within field of board to each steel stud at approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of boards.

H. Air-Infiltration Barrier Application: Cover sheathing with air-infiltration barrier as follows:
   1. Cut back air-infiltration barrier 1/2 inch on each side of break in supporting members at expansion- or control-joint locations.
   2. Apply asphalt-saturated organic felt horizontally with 2-inch overlap and 6-inch end lap; fasten to sheathing with corrosion-resistant staples.
   3. Apply proprietary building wrap to comply with manufacturer's written installation instructions.
   4. Apply air-infiltration barrier to cover vertical flashing with 4-inch overlap.

I. Sealing Sheathing Joints: Seal joints according to sheathing manufacturer's written recommendations and as follows:
   1. Apply elastomeric sealant on joints and fasteners and trowel flat. Apply sufficient quantity of sealant to completely cover joints and fasteners after troweling. Seal other penetrations and openings.
   2. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing board joints, and apply and trowel silicone emulsion sealant to embed sealant in entire face of tape. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

3.6 FIELD QUALITY CONTROL

A. Testing: Owner will employ and pay for a qualified independent testing agency to perform field quality-control testing.

B. Field and shop welds will be subject to inspection and testing.

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Remove and replace Work that does not comply with specified requirements.

E. Additional testing and inspecting will be performed to determine compliance of corrected Work with specified requirements. Contractor will reimburse Owner for the costs of these additional tests.

3.7 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Touchup Painting: Wire brush, clean, and paint scarred areas, welds, and rust spots on fabricated and installed prime-painted, cold-formed metal framing. Paint framing surfaces with same type of shop paint used on adjacent surfaces.

C. Protect paper-surfaced gypsum sheathing that will be exposed to weather for more than 30 days by covering exposed exterior surface of sheathing with a securely fastened air-infiltration barrier. Apply covering immediately after sheathing is installed.

D. Protect cutouts, corners, and joints in sheathing by filling with a flexible sealant or by applying tape recommended by sheathing manufacturer at time sheathing is applied.

END OF SECTION 05400

SECTION 05500 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Loose steel lintels.
   2. Steel framing and supports for mechanical equipment.

1.3 SUBMITTALS

A. Product Data: For the following:
   1. Paint products.
   2. Grout.
   3. Hardware

B. Shop Drawings: Detail fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

1.4 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm experienced in producing metal fabrications similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

B. Welding: Qualify procedures and personnel according to the following:

   1. AWS D1.1, "Structural Welding Code--Steel."
   2. AWS D1.3, "Structural Welding Code--Sheet Steel."

1.5 PROJECT CONDITIONS

A. Field Measurements: Where metal fabrications are indicated to fit walls and other construction, verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions. Allow for trimming and fitting.

1.6 COORDINATION

A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

A. Metal Surfaces, General: For metal fabrications exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

2.2 FERROUS METALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304.

C. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304.

D. Steel Tubing: Cold-formed steel tubing complying with ASTM A 500.

E. Steel Pipe: ASTM A 53, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.

F. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

2.3 PAINT

A. Shop Primers: Provide primers that comply with Division 9 Section "Painting."

B. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements in FS TT-P-664; selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.

C. Shop Primer for Ferrous Metal: Organic zinc-rich primer, complying with SSPC-Paint 20 and compatible with topcoat.

D. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

2.4 FASTENERS

A. General: Provide Type 304 or 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, where built into exterior walls. Select fasteners for type, grade, and class required.

B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.

C. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

1. Material: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.
2. Material: Alloy Group 1 or 2 stainless-steel bolts complying with ASTM F 593 and nuts complying with ASTM F 594.

2.5 GROUT

A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.6 CONCRETE FILL

A. Concrete Materials and Properties: Normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi, unless otherwise indicated.

2.7 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Shear and punch metals cleanly and accurately. Remove burrs.

C. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

E. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

F. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

G. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

H. Allow for thermal movement resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening up of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

I. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.

J. Remove sharp or rough areas on exposed traffic surfaces.

K. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.

2.8 LOOSE STEEL LINTELS

A. Fabricate loose structural-steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.

B. Weld adjoining members together to form a single unit where indicated.

C. Size loose lintels to provide bearing length at each side of openings equal to one-twelfth of clear span, but not less than 8 inches, unless otherwise indicated.

D. Galvanize loose steel lintels located in exterior walls.

2.9 SHELF ANGLES AND WELDED STEEL BOX CHASES

A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch bolts, spaced not more than 6 inches from ends and 24 inches o.c., unless otherwise indicated.

B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete. Align expansion joints in angles with indicated control and expansion joints in cavity-wall exterior wythe.

C. Galvanize shelf angles to be installed in exterior walls.

D. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

2.10 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports that are not a part of structural-steel framework as necessary to complete the Work.

B. General: Provide steel framing and supports indicated and as necessary to complete the Work.

C. Fabricate units from structural-steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.

D. Galvanize miscellaneous framing and supports where indicated.

2.11 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal fabrications after assembly.

2.12 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:

1. ASTM A 123, for galvanizing steel and iron products.
2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.

B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface-preparation specifications and environmental exposure conditions of installed metal fabrications:

1. Exteriors (SSPC Zone 1B): SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."

C. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for shop painting.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal fabrications to in-place construction. Include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

E. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings, if any.

1. Support steel beams on solid grouted masonry, concrete, or on existing structural steel.

3.3 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 9 Section "Painting."

C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 05500

SECTION 06100 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Framing with dimension lumber.
2. Framing with engineered wood products.
3. Wood furring, grounds, nailers, and blocking.
4. Sheathing.
5. Subflooring.

1.3 DEFINITIONS

A. Rough Carpentry: Carpentry work not specified in other Sections and not exposed, unless otherwise specified.

B. Exposed Framing: Dimension lumber not concealed by other construction and indicated to receive a stained or natural finish.

1.4 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data for the following products:

1. Engineered wood products.
2. Underlayment.
3. Insulating sheathing.
4. Air-infiltration barriers.

C. Material certificates for dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the American Lumber Standards Committee's (ALSC) Board of Review.

D. Wood treatment data as follows, including chemical treatment manufacturer's instructions for handling, storing, installing, and finishing treated materials:

1. For each type of preservative-treated wood product, include certification by treating plant stating type of preservative solution and pressure process used, net amount of preservative retained, and compliance with applicable standards.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: To qualify for approval, an independent testing agency must demonstrate to Architect's satisfaction, based on evaluation of agency-submitted criteria conforming to ASTM E 699, that it has the experience and capability to satisfactorily conduct the testing indicated without delaying the Work.

B. Single-Source Responsibility for Engineered Wood Products: Obtain each type of engineered wood product from one source and by a single manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Keep materials under cover and dry. Protect from weather and contact with damp or wet surfaces. Stack lumber, plywood, and other panels. Provide for air circulation within and around stacks and under temporary coverings.

1. For lumber and plywood pressure treated with waterborne chemicals, place spacers between each bundle to provide air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following or equivalent:

1. Wood-Preservative-Treated Materials:
   a. Baxter: J. H. Baxter Co.
   b. Chemical Specialties, Inc.
   c. Continental Wood Preservers, Inc.
   d. Osmose Wood Preserving, Inc.
   e. or equivalent

2. Laminated-Veneer Lumber:
   a. Alpine Structures.
   b. Georgia-Pacific Corp.
   c. Trus Joist MacMillan.
   d. or equivalent

3. Prefabricated Wood I-Joists:
   a. Trus Joist MacMillan.
   b. Alpine Structures.

c. Georgia-Pacific Corp.
d. or equivalent

4. Gypsum Sheathing Board:
   a. Georgia-Pacific Corp.
   b. National Gypsum Co.; Gold Bond Building Products Division.
   c. United States Gypsum Co.
   d. or equivalent

5. Air-Infiltration Barriers:
   a. Celotex Corporation (The); Building Products Division.
   b. DuPont Company; Fibers Department.
   c. or equivalent

2.2 LUMBER, GENERAL

A. Lumber Standards: Comply with DOC PS 20, "American Softwood Lumber Standard," and with applicable grading rules of inspection agencies certified by ALSC's Board of Review.

B. Inspection Agencies: Inspection agencies, and the abbreviations used to reference them, include the following:

1. NELMA - Northeastern Lumber Manufacturers Association.
2. NLGA - National Lumber Grades Authority (Canadian).
3. RIS - Redwood Inspection Service.
4. SPIB - Southern Pine Inspection Bureau.
5. WCLIB - West Coast Lumber Inspection Bureau.
6. WWPA - Western Wood Products Association.

C. Grade Stamps: Provide lumber with each piece factory marked with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.

D. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.

1. Provide dressed lumber, S4S, unless otherwise indicated.
2. Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominal (38-mm actual) thickness or less, unless otherwise indicated.

2.3 WOOD-PRESERVATIVE-TREATED MATERIALS

A. General: Where lumber or plywood is indicated as preservative treated or is specified to be treated, comply with applicable requirements of AWPA C2 (lumber) and AWPA C9 (plywood). Mark each treated item with the Quality Mark Requirements of an inspection agency approved by ALSC's Board of Review.

B. Pressure treat wood members in contact with ground or freshwater with waterborne preservatives to a minimum retention of 0.40 lb/cu. ft. (6.4 kg/cu. m).

C. All preservative treated materials should all be secured by stainless steel screws or fasteners with isolated material to all metal members.

2.4 DIMENSION LUMBER

A. General: Provide dimension lumber of grades indicated according to the ALSC National Grading Rule (NGR) provisions of the inspection agency indicated.

B. Non-Load-Bearing Interior Partitions: Provide framing of the following grade and species:

1. Grade: No. 2.
2. Species: Eastern softwoods; NELMA.
3. Species: Northern species; NLGA.
4. Species: Mixed southern pine; SPIB.
5. Species: Western woods; WCLIB or WWPA.
6. Species: Any species above.

C. Exterior and Load-Bearing Walls: Provide framing of the following grade and species:

D. Framing Other than Non-Load-Bearing Partitions: Provide framing of the following grade and species:

1. Grade: No. 2.
2. Species: Spruce-pine-fir south; NELMA.
3. Species: Hem-fir north; NLGA.
4. Species: Spruce-pine-fir north; NLGA.
5. Species: Mixed southern pine; SPIB.
6. Species: Hem-fir; WCLIB or WWPA.
7. Species: Any species above.

2.5 BOARDS

A. Exposed Boards: Where boards will be exposed in the finished work, provide the following:

1. Moisture Content: 19 percent maximum.
2. Species and Grade: Spruce-pine-fir, C & Btr per WCLIB rules or C Select per NLGA or WWPA rules.
3. As noted on plans by Architect.

B. Concealed Boards: Where boards will be concealed by other work, provide lumber with 19 percent maximum moisture content and of following species and grade:

1. Species and Grade: Eastern softwoods, No. 3 Common per NELMA rules.
2. Species and Grade: Mixed southern pine, No. 2 per SPIB rules.

3. Species and Grade: Spruce-pine-fir, Standard per WCLIB rules or No. 3 Common per WWPA rules.
4. Species and Grade: Western woods, Standard per WCLIB rules or No. 3 Common per WWPA rules.
5. Species and Grade: Any species above.

2.6 MISCELLANEOUS LUMBER

A. General: Provide lumber for support or attachment of other construction, including rooftop equipment curbs and support bases, cant strips, bucks, nailers, blocking, furring, grounds, stripping, and similar members.

B. Fabricate miscellaneous lumber from dimension lumber of sizes indicated and into shapes shown.

C. Moisture Content: 19 percent maximum for lumber items not specified to receive wood preservative treatment.

D. Grade: For dimension lumber sizes, provide No. 3 or Standard grade lumber per ALSC's NGRs of any species. For board-size lumber, provide No. 3 Common grade per NELMA, NLGA, or WWPA; No. 2 grade per SPIB; or Standard grade per NLGA, WCLIB or WWPA of any species.

2.7 ENGINEERED WOOD PRODUCTS

A. General: Provide engineered wood products acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that evidence compliance with building code in effect for Project.

1. Allowable Design Stresses: Provide engineered wood products with allowable design stresses, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis, and demonstrated by comprehensive testing performed by a qualified independent testing agency.

B. Laminated-Veneer Lumber: Lumber manufactured by laminating wood veneers in a continuous press using an exterior-type adhesive complying with ASTM D 2559 to produce members with grain of veneers parallel to their lengths and complying with the following requirements:

1. Extreme Fiber Stress in Bending: 2500 psi (17 MPa) for 12-inch nominal- (286-mm actual-) depth members.
2. Modulus of Elasticity: 2,000,000 psi (13 800 MPa).
3. Tension Parallel to Grain: 1850 psi (13 MPa).
4. Compression Parallel to Grain: 2800 psi (19 MPa).
5. Compression Perpendicular to Grain: 400 psi (3 MPa) perpendicular to and 500 psi (3.5 MPa) and parallel to glue line.

6. Horizontal Shear: 285 psi (2 MPa) perpendicular to and 190 psi (1.3 MPa) parallel to glue line.

C. Prefabricated Wood I-Joists: Units manufactured by bonding stress-graded lumber flanges to wood-based structural-use panel webs with exterior-type adhesives complying with ASTM D 2559, to produce I-shaped joists complying with the following requirements:

1. Flange Material: Laminated-veneer lumber.
2. Web Material: Oriented-strand board (OSB) complying with DOC PS 2.
3. Web Material: Plywood complying with DOC PS 2.
4. Web Material: Either material indicated above, as standard with joist manufacturer.
5. Structural Capacities: Establish and monitor structural capacities according to ASTM D 5055.
6. Sizes: Depths and widths as indicated, with flanges not less than 1-1/2 inches (38 mm) in actual width.
7. I-Joists shall be installed with all required anchors, stiffeners and bracing in accordance with manufacturer requirements.

2.8 CONCEALED, PERFORMANCE-RATED STRUCTURAL-USE PANELS

A. General: Where structural-use panels are indicated for the following concealed types of applications, provide APA-performance-rated panels complying with requirements designated under each application for grade, span rating, exposure durability classification, and edge detail (where applicable).

1. Thickness: Provide panels meeting requirements specified but not less than thickness indicated.
2. Span Ratings: Provide panels with span ratings required to meet "Code Plus" provisions of APA Form No. E30V, "APA Design/Construction Guide: Residential & Commercial."

B. Subflooring: APA-rated sheathing.

1. Exposure Durability Classification: Exposure 1.
2. Span Rating: 48/24.
3. Minimum thickness: 5/8 inch.
4. Floor sheathing shall be tongue and groove and installed with both construction adhesive and required nailing.

C. Wall Sheathing: APA-rated sheathing.

1. Exposure Durability Classification: Exposure 1.
2. Span Rating: As required to suit stud spacing indicated.
3. Minimum thickness indicated on plan.

D. Roof Sheathing: APA-rated sheathing.

1. Exposure Durability Classification: Exterior, Structural I, Exposure 1.

2. Minimum Span Rating: 32/16.
3. Minimum thickness: 3/4 inch.
4. Roof sheathing shall be installed with panel clips.

2.9 STRUCTURAL-USE PANELS FOR BACKING

A. Plywood Backing Panels: For mounting electrical or telephone equipment, provide fire-retardant-treated plywood panels with grade, C-D Plugged Exposure 1, in thickness indicated or, if not otherwise indicated, not less than 15/32 inch (11.9 mm) thick.

2.10 AIR-INFILTRATION BARRIER

A. Air retarder complying with ASTM E 1677; made from polyolefins; either cross-laminated films, woven strands, or spunbonded fibers; coated or uncoated; with or without perforations to transmit water vapor but not liquid water; and as follows:

1. Minimum Thickness: 3 mils (0.08 mm).
2. Minimum Water-Vapor Transmission: 10 perms (575 ng/Pa x s x sq. m) when tested according to ASTM E 96, Procedure A.
3. Maximum Flame Spread: 25 per ASTM E 84.
4. Minimum Allowable Exposure Time: 3 months.

2.11 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

1. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with a hot-dip zinc coating per ASTM A 153 or of Type 304 stainless steel.

B. Nails, Wire, Brads, and Staples: FS FF-N-105.

C. Power-Driven Fasteners: CABO NER-272.

D. Wood Screws: ASME B18.6.1.

E. Lag Bolts: ASME B18.2.1. (ASME B18.2.3.8M)

F. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

G. All fasteners to secure pressure treated lumber/plywood shall be Type 304 Stainless Steel.

2.12 METAL FRAMING ANCHORS

A. General: Provide galvanized steel framing anchors of structural capacity, type, and size indicated and as follows:

1. Research or Evaluation Reports: Provide products for which model code research or evaluation reports exist that are acceptable to authorities having jurisdiction and that evidence compliance of metal framing anchors for application indicated with building code in effect for Project.
2. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis, and demonstrated by comprehensive testing performed by a qualified independent testing agency.

B. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653, G60 (ASTM A 653M, Z180) coating designation; structural, commercial, or lock-forming quality, as standard with manufacturer for type of anchor indicated.

C. Joist Hangers: U-shaped joist hangers with 2-inch- (50-mm-) long seat and 1-1/4-inch- (32-mm-) wide nailing flanges at least 85 percent of joist depth.

1. Thickness: 0.064 inch (1.6 mm).

D. Top Flange Hangers: U-shaped joist hangers, full depth of joist, formed from metal strap with tabs bent to extend over and be fastened to supporting member.

1. Strap Width: 2 inches (50 mm).
2. Thickness: 0.064 inch (1.6 mm).

E. Bridging: Rigid, V-section, nailless type, 0.064 inch (1.6 mm) thick, length to suit joist size and spacing.

F. Rafter Tie-Downs (Hurricane Ties): Bent strap tie for fastening rafters or roof trusses to wall studs below, 1-5/8 inches (41 mm) wide by 0.052 inch (1.3 mm) thick minimum. Tie-Downs must be selected to meet uplift forces as calculated in the wood truss design.

2.13 THERMO-PLY SHEATHING

A. Standard Grade – Green, 0.78" for use in attic to secure under truss rafter for supporting glass fiber insulation board.

B. Pre-cut to 24" wide strip for easy field installation.

C. Perm Rating: Minimum 0.63.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Discard units of material with defects that impair quality of rough carpentry and that are too small to use with minimum number of joints or optimum joint arrangement.

B. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted.

C. Fit rough carpentry to other construction; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds, and similar supports to allow attachment of other construction.

D. Apply field treatment complying with AWPA M4 to cut surfaces of preservative-treated lumber and plywood.

E. Comply with applicable recommendations contained in APA Form No. E30V, "APA Design/Construction Guide: Residential & Commercial," for types of structural-use panels and applications indicated.

1. Comply with "Code Plus" provisions in above-referenced guide.
2. Roof sheathing shall be installed with 1/8" spacing at all edge and end joints for expansion per APA recommendations in above-referenced guide.

F. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. CABO NER-272 for power-driven staples, P-nails, and allied fasteners.
2. Published requirements of metal framing anchor manufacturer.
3. "Recommended Nailing Schedule" of referenced framing standard and with AFPA's "National Design Specifications for Wood Construction."
4. "Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.

G. Use common wire nails, unless otherwise indicated. Use finishing nails for finish work. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; predrill as required.

H. Use double hot-dip galvanized or stainless-steel nails where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity.

I. Countersink nail heads on exposed carpentry work and fill holes with wood filler.

3.2 WOOD FRAMING, GENERAL

A. Framing Standard: Comply with AFPA's "Manual for Wood Frame Construction," unless otherwise indicated.

B. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.

C. Install framing members of size and at spacing indicated.

D. Do not splice structural members between supports.

E. Firestop concealed spaces of wood-framed walls and partitions at each floor level and at ceiling line of top story. Where firestopping is not inherent in framing system used, provide closely fitted wood blocks of 2-inch nominal- (38-mm actual-) thickness lumber of same width as framing members.

3.3 THERMO-PLY SHEATHING:

A. Provide conceal envelope in attic to support board insulation and to act as a vapor barrier.

B. Pre-cut 24" wide strip to secure under wood truss rafter. Cut edge to clear truss web member.

C. Tape joint between rafter without wood backing.

3.4 AIR-INFILTRATION BARRIER

A. Cover sheathing with air-infiltration barrier as follows:
1. Apply air retarder to comply with manufacturer's written instructions.
2. Apply air-infiltration barrier to cover upstanding flashing with 4-inch (100-mm) overlap.

END OF SECTION 06100

SECTION 06160 - CEMENT BOARD SHEATHING

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the following:

1. Weather-Resistant Sheathing Barriers.

1.02 REFERENCES

A. American National Standards Institute:

1. ANSI A118.9: Specification for Cementitious Backer Units.

B. American Society for Testing and Materials:

1. ASTM C 954: Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 inch to 0.110 inch in Thickness.
2. ASTM C 1002: Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
3. ASTM C 1280: Standard Specification for Application of Gypsum Sheathing.
4. ASTM C 1325: Standard Specification for Non-Asbestos Fiber-Mat Reinforced Cement Interior Substrate Sheets.
5. ASTM D 226: Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.
6. ASTM E 84: Standard Test Method for Surface Burning Characteristics of Building Materials.
7. ASTM E119: Test Method for Fire Tests of Building Construction and Materials.
8. ASTM E 1677: Standard Specification for an Air Retarder (AR) Material or System for Low-Rise Framed Building Walls.

C. Gypsum Association:

1. GA 253: Recommended Specification for the Application of Gypsum Sheathing.

1.03 SUBMITTALS

A. General: Submit in accordance with Section 01300

B. Product Data: Submit manufacturer's current technical literature for product specified.

1.04 QUALITY ASSURANCE

A. Fire Resistance Rated Assembly Characteristics: Provide materials and construction identical to those tested in accordance to ASTM E 119 by an independent testing and inspection agency acceptable to authorities having jurisdiction.

1. Fire Resistance Ratings: Indicated by design designations from UL Fire Resistance Directory.

1.05 DELIVERY, STORAGE, AND HANDLING

A. All materials shall be delivered in their original unopened packages and stored in an enclosed shelter providing protection from damage and exposure to the elements. WARNING: Store all DUROCK Brand Cement Board flat. Panels are heavy and can fall over, causing serious injury or death. Do not move unless authorized.

PART 2 - PRODUCTS

2.01 WALL SHEATHING

A. Cementitious Fiber-Mat Reinforced Sheathing: ASTM C 1325, ANSI A118.9, cementitious backer.

1. Product: Subject to compliance with requirements, provide DUROCK Brand Cement Board by United States Gypsum Company or equivalent
2. Type and Thickness: 5/8 inch thick.
3. Size: 48 by 96 inches.

2.02 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and application.

B. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: DUROCK Brand Steel or USG Sheathing SF steel drill screws 1-5/8 inch with corrosion-resistant coating.

1. For steel framing less than 0.0329 inch thick, attach sheathing to comply with ASTM C 1002.
2. For steel framing from 0.033 to 0.112 inch thick, attach sheathing to comply with ASTM C 954.

2.03 WEATHER-RESISTANT SHEATHING BARRIERS

A. Building Paper: ASTM D 226, Type 1 (No. 15 asphalt-saturated organic felt), unperforated.

B. Building Wrap: ASTM E 1677, Type I air retarder, with flame-spread and smoke-developed indexes of less that 25 and 450, respectively, when tested according to ASTM E 84, UV stabilized and acceptable to authorities having jurisdiction.

1. Products: Subject to compliance with requirements, provide Tyvek StuccoWrap by DuPont (E. I. du Pont de Nemours and Company) or equivalent.

C. Building-Wrap Tape: Pressure-sensitive plastic tape recommended by building-wrap manufacturer for sealing joints and penetrations in building wrap.

2.04 MISCELLANEOUS MATERIALS

A. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film.

B. Primer for Flexible Flashing: Product recommended by manufacturer of flexible flashing for substrate.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction, unless otherwise indicated.

C. Coordinate wall sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

D. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

3.03 GYPSUM SHEATHING INSTALLATION

A. Comply with ASTM C 1280, GA-253 and manufacturer's written instructions.

1. Fasten sheathing to cold-formed metal framing with screws.
2. Install boards with a 1/4-inch gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.

B. Apply fasteners so heads bear tightly against face of sheathing boards but do not cut into facing.

C. Horizontal Installation: Abut ends of boards over centers of studs, and stagger end joints of adjacent boards not less than one stud spacing. Attach boards at perimeter and within field of board to each stud.

1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of boards.
2. For sheathing under stucco cladding, boards may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.

D. Vertical Installation: Install board vertical edges centered over studs. Abut ends and edges of each board with those of adjacent boards. Attach boards at perimeter and within field of board to each stud.

1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of boards.
2. For sheathing under stucco cladding, boards may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.

3.04 WEATHER-RESISTANT SHEATHING BARRIER INSTALLATION

A. General: Cover framing with weather-resistant sheathing paper as follows:

1. Cut back barrier 1/2 inch on each side of the break in supporting members at expansion- or control-joint locations.
2. Apply barrier to cover vertical flashing with a minimum 4-inch overlap, unless otherwise indicated.

B. Building Paper: Apply horizontally with a 2-inch overlap and a 6-inch end lap; fasten to framing with galvanized staples or roofing nails.

C. Building Wrap: Comply with manufacturer's written instructions.

1. Seal seams, edges, fasteners, and penetrations with tape.
2. Extend into jambs of openings and seal corners with tape.

3.05 FLEXIBLE FLASHING INSTALLATION

A. Apply flexible flashing where indicated to comply with manufacturers written instructions.

1. Prime substrates as recommended by flashing manufacturer.
2. Lap seams and junctures with other materials at least 4 inches, except that at flashing flanges of other construction, laps need not exceed flange width.
3. Lap flashing over weather-resistant building paper at bottom and sides of openings.
4. Lap weather-resistant building paper over flashing at heads of openings.
5. After flashing has been applied, roll surfaces with a hard rubber or metal roller to ensure that flashing is completely adhered to substrates.

3.06 PROTECTION

A. Cementitious Fiber-Mat Reinforced Sheathing: A continuous water barrier must be installed over the studs and lap over the flashing. Weeps must be provided to allow water drainage out of the system at all horizontal terminations

END OF SECTION 06160

SECTION 06402 - INTERIOR ARCHITECTURAL WOODWORK

1.1 GENERAL

A. Interior architectural woodwork includes all interior wood work, cabinets, casework, shelves, counters wood furring, blocking, shims, and hanging strips unless concealed within other construction prior to woodwork installation.

B. Submittals: In addition to product data, submit the following:

1. Shop drawings showing location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
2. Samples of lumber and panel products for each species and cut indicated for transparent finish, and each material indicated for opaque finish, with one-half of exposed surfaces finished.
3. Samples of laminate-clad panel products, for each type, color, pattern, and surface finish.
4. Samples of thermoset decorative-overlay surfaced panel products, for each type, color, pattern, and surface finish.
5. Samples of solid surfacing materials.

C. AWI Quality Standard: Comply with "Architectural Woodwork Quality Standards" of the Architectural Woodwork Institute.

D. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet-work is completed, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

1.2 PRODUCTS

A. Woodwork Fabricators: Subject to compliance with requirements, provide interior architectural woodwork by one of the following:

B. Panel Products: As follows:

1. Hardboard: AHA A135.4.
2. Particleboard: ANSI A208.1, Grade M-2.
3. Softwood Plywood: PS 1.
4. Hardwood Plywood and Face Veneers: HPVA HP-1.

C. High-Pressure Decorative Laminate: NEMA LD 3.

D. Thermoset Decorative Overlay: Decorative surface of thermally fused polyester or melamine-impregnated web, bonded to specified substrate and complying with ALA 1992.

E. Fire-Retardant-Treated Materials: Where indicated, use materials pressure impregnated with Exterior or Interior Type A fire-retardant chemical to comply with AWPA C20. Kiln-dry material after treatment. Discard material that does not comply with referenced woodworking standard.

F. Fire-Retardant Particleboard: Panels made from softwood particles and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame spread of 25 or less and smoke developed of 25 or less per ASTM E 84.

G. Cabinet Hardware: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items specified in Division 8 Section "Door Hardware."

1. Cabinet Hardware Schedule: Match hardware used in manufacturer made units. See Specification Section 08710.
2. Hardware Standard: Comply with BHMA A156.9 for items indicated by reference to BHMA numbers or referenced to this standard.
3. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA code number indicated.

    a. Chromium Wire Brushed: BHMA 626 for brass or bronze base; BHMA 652 for steel base.

4. For concealed hardware provide manufacturer's standard finish that complies with product class requirements of BHMA A156.9.

H. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated softwood lumber, kiln dried to less than 15 percent moisture content.

I. Fabrication, General: Complete fabrication, including assembly and finishing, before shipment to Project site to maximum extent possible. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

1. Backout or groove backs of flat trim members, kerf backs of other wide, flat members, except for members with ends exposed in finished work.
2. Assemble casings in plant except where limitations of access to place of installation require field assembly.
3. Shop-cut openings, to maximum extent possible. Smooth edges of cutouts and, where located in countertops and similar exposures, seal edges with a water-resistant coating.

J. Laminate-Clad Cabinets (Plastic-Covered Casework): As follows:

1. AWI Type of Cabinet Construction: Flush overlay.
2. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate complying with the following requirements:

    a. Horizontal Surfaces Other than Tops: GP-50, 0.050-inch (1.270-mm) nominal thickness.
    b. Vertical Surfaces: GP-50, 0.050-inch (1.270-mm) nominal thickness.
    c. Edges: Same thickness matching laminate in color, pattern, and finish to vertical and horizontal surfaces.

3. Materials for Semi-exposed Surfaces: Provide surface materials indicated below:

    a. Surface Material: High-pressure decorative laminate, Grade GP-28.

4. Colors, Patterns, and Finishes: Provide colors and textures of laminate surfaces complying with the following:

   a. Match manufacturer's made furniture unit in the same room.
   b. Match color, pattern, and finish indicated by reference to laminate manufacturer's standard designations.
   c. Provide Architect's selections from laminate manufacturer's full range of colors and finishes.

5. Provide dust panels of ¼-inch (6.4-mm) plywood or tempered hardboard above compartments and drawers except where located directly under tops.

K. Countertops: As follows:

1. Type of Top: High pressure decorative laminate as follows:

   a. Grade: GP-50, 0.050-inch (1.270-mm) nominal thickness
   b. Colors, Patterns, and Finishes: Provide colors and textures of laminate surfaces complying with the following

      1) Match manufacturer's made furniture unit in the same room from the laminate manufacturer's standard

   c. Edge treatment: Solid hardwood matching the wood furniture in the same room or PVC mold edge as noted on the drawings for construction and details.

1.3 EXECUTION

A. Preparation: Condition woodwork to average prevailing humidity conditions in installation areas, and examine and complete work as required, including back priming and removal of packing, before installing.

B. Install woodwork to comply with AWI Section 1700 for the same grade specified above for type of woodwork involved.

1. Install woodwork plumb, level, true, and straight with no distortions. Shim as required with concealed shims. Install to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm).
2. Scribe and cut woodwork to fit adjoining work and refinish cut surfaces or repair damaged finish at cuts.

C. Standing and Running Trim: Install with minimum number of joints, using full-length pieces to the greatest extent possible. Stagger joints in adjacent and related members. Fill gaps, if any, between top of base and wall with plastic wood filler and sand smooth.

D. Tops: Anchor securely to base units. Seal space between backsplash and wall.

END OF SECTION 06402

SECTION 07210-BUILDING INSULATION

1.1 GENERAL

A. Submittals: Product Data for each type of insulation product specified.

B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated as determined by testing identical products per NFPA 285, ASTM E 84, ASTM E 119, or ASTM E 136 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

1.2 PRODUCTS

A. General: Provide insulating materials that comply with requirements and with referenced standards.

1. Preformed Units: Sizes to fit applications indicated; selected from manufacturer's standard thickness, widths and lengths.

B. For below slab insulation: Extruded-Polystyrene Board Insulation: ASTM C 578 for type indicated below:

1. Under Slab Type IV, 1.60-lb/cu. ft. (26-kg/cu. m) minimum density.

C. For masonry cavity insulation: Board Insulation: Polyisocyanurate Foam – Board Insulation: ASTM C 1289, foil faced, Type I, Class 1 or 2. Do not tape the Board joints. Leave joints open for vapor permeability.

1. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

D. For all interior walls: Unfaced Mineral-Fiber Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing) of type described below:

1. Mineral-Fiber Type: Fibers manufactured from glass. (3 5/8" R=13, 6" R=19).
2. Surface-Burning Characteristics: Maximum flame-spread and smoke-developed indices of 25 and 50, respectively.

E. For all Exterior Stud Walls or Attic Spaces: Unfaced Mineral-Fiber Blanket Insulation: ASTM C 665, Type III, Class A.

1. Mineral-Fiber Type: Fibers manufactured from glass. (6" R=19)

F. For use as fire stop at openings between edge of slab and exterior wall panels: Provide a fire tested assembly where required. Slag-Wool-Fiber Board Safing Insulation: Semirigid boards designed and produced by combining slag-wool fibers with thermosetting resin binders to comply with ASTM C 612, Type IA and IB; nominal density of 4 lb/cu. ft. (64kg/cu. m); passing ASTM E 136 for combustion characteristics; thermal resistivity of 4 deg. F x h x sq. ft./Btu x in. at 75 deg F (27.7 K x m/W at 24 deg C).

1. Calking Compound: Material approved by manufacturer of safing insulation for sealing joint between foil backing of safing insulation and edge of concrete floor slab against penetration of smoke.
2. Safing Clips: Galvanized steel safing clips approved by manufacturer of safing insulation for holding safing insulation in place.

G. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of hooding insulation, of thickness indicated, securely in position indicated with self-locking washer in place; and complying with the following requirements:

1. Plate: Perforated galvanized carbon-steel sheet, 0.030 inch (0.762 mm) thick by 2 inches (50 mm) square.
2. Spindle: Copper-coated low carbon steel, fully annealed, 0.105 inches (2.67 mm) in diameter, length to suit depth of insulation indicated.

1.3 EXECUTION

A. Installation, General: Comply with insulation manufacturer's written instructions applicable to products and application indicated.

1. Install insulation that is undamaged, dry, unsoiled, and has not been exposed at any time to ice and snow.
2. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
3. Apply single layer of insulation to produce thickness indicated.
4. Apply single layer of insulation to produce thickness indicated, unless multiple layers are otherwise shown or required to make up total thickness.
5. Seal joints between closed-cell (nonbreathing) insulation units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant.
6. Install mineral-fiber blankets in cavities formed by framing members according to the following requirements:

    a. Use blanket widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.
    b. Place blankets in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.

7. Install insulation in curtain-wall construction where indicated on Drawings according to curtain-wall manufacturer's written instructions.
8. Retain insulation in place by metal clips and straps or integral pockets within window frames, spaced at intervals recommended in writing by insulation manufacturer to hold insulation securely in place without touching spandrel glass. Maintain cavity width of dimension indicated between insulation and glass.
9. Install insulation where it contacts perimeter fire-containment system to prevent insulation from bowing under pressure from perimeter fire-containment system.

10. Stuff glass-fiber, loose-fill insulation into miscellaneous voids and cavity spaces where shown. Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft. (40 kg/cu. m).
11. Attic insulation board should be a tight fit at the bottom of the rafters. Apply thermo-ply sheathing under insulation board to act as vapor barrier and insulation board support.
12. In between bathroom walls and cavity walls where there is no gypsum wall board sheathing on the inside face, provide horizontal metal straps between studs at 48" on center to hold insulation in place.

B. Protect below-grade insulation on vertical surfaces from damage during backfilling by applying protection board. Set in adhesive according to written instructions of insulation manufacturer.

C. Install board insulation on concrete substrates by adhesively attached, spindle-type insulation anchors.

D. Place loose-fill insulation into spaces and onto surfaces as shown, either by pouring or by machine blowing to comply with ASTM C 1015.

E. Protect installed insulation and vapor retarders from damage due to harmful weather exposures, physical abuse, and other causes.

1.4 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84 for surface-burning characteristics, by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

END OF SECTION

SECTION 07270 - FIRESTOPPING

1.1 GENERAL

A. System Performance Requirements: Provide firestopping systems that are produced and installed to resist the spread of fire, according to the Room Finish Schedule Fire Rating indicated. The system shall resist the passage of smoke and other gases.

1. Provide through-penetration firestop systems with F ratings indicated, as determined per ASTM E 814, but not less than the fire-resistance rating of the constructions penetrated.
2. Provide through-penetration firestop systems with T ratings as well as F ratings, as determined per ASTM E 814.
3. Provide joint sealants with fire-resistance ratings indicated, as determined per ASTM E 119, but not less than that equaling or exceeding the fire-resistance rating of the construction in which the joint occurs.
4. For firestopping exposed to view, traffic, moisture, and physical damage, provide products that do not deteriorate when exposed to these conditions.
5. For firestopping exposed to view, provide products with flame-spread values of less than 25 and smoke-developed values of less than 450, as determined per ASTM E 84.
6. Provide penetration firestopping with mold and mildew resistance rating of one (1) or less as tested per ASTM G21

B. Submittals: Provide a complete tested assembly of products with a specific tested assembly system. In addition, provide product data for each type of product in the assembly. Submit the following:

1. Certification by firestopping manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs) and are nontoxic to building occupants.
2. Shop drawings detailing materials, installation methods, and relationships to adjoining construction for each through-penetration firestop system, and each kind of construction condition penetrated and kind of penetrating item along with design designation of qualified testing and inspecting agency.
3. Product certificates signed by manufacturers of firestopping products certifying compliance of their products with specified requirements.
4. Product test reports from a qualified testing and inspecting agency evidencing compliance of firestopping with requirements based on comprehensive testing of current products. Test reports must indicate T and F ratings and all system performance requirements.

C. Fire-Test-Response Characteristics: Provide firestopping that complies with the following requirements and those specified under the "System Performance Requirements" paragraph:

1. Firestopping tests are performed by a qualified testing and inspecting agency, including UL, Warnock Hersey, or an equivalent agency performing testing and follow-up inspection services, that is acceptable to authorities having jurisdiction.
2. Through-penetration firestop systems are identical to those tested per ASTM E 814 under conditions where positive furnace pressure differential of at least 0.01

inch of water is maintained at a distance of 0.78 inch below the fill materials surrounding the penetrating items in the test assembly.

3. Fire-resistive joint sealant systems are identical to those tested for fire-response characteristics per ASTM E 119 under conditions where the positive furnace pressure differential is at least 0.01 inch of water, as measured 0.78 inch from the face exposed to furnace fire.
4. Ratings of Firestopping: As indicated by reference to designations of UL in their "Fire Resistance Directory" or by another qualified testing and inspecting agency.

1.2 PRODUCTS

A. Through-Penetration Firestop Systems: Comply with the following requirements in providing system components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating firestops under conditions of service and application, based on testing and field experience. Subject to compliance with requirements provide products manufactured by Hilti, 3M Fire Protection Products, STI – Specified Technologies, Inc., or equivalent.

1. Accessories: Provide the following components for each firestopping system as needed to install fill materials and to comply with "System Performance Requirements" paragraph:

a. Permanent forming/damming/backing materials including the following:

1) Sealants used in combination with other forming/damming materials to prevent leakage of fill materials in liquid state.
2) Joint fillers for joint sealants.

b. Temporary forming materials.
c. Substrate primers.
d. Collars.
e. Steel sleeves.

2. Fill Materials: Provide through-penetration firestop systems composed of the fill materials indicated below:

a. Endothermic, Latex Compound Sealant: Single-component, endothermic, latex formulation.
b. Intumescent, Latex Sealant: Single-component, intumescent, latex formulation.
c. Intumescent Putty: Nonhardening, dielectric, water-resistant putty containing no solvents, inorganic fibers, or silicone compounds.
d. Intumescent Wrap Strips: Single-component, elastomeric sheet with aluminum foil on one side.
e. Job-Mixed Vinyl Compound: Prepackaged vinyl-based powder product for mixing with water at Project site to produce a paintable compound, passing ASTM E 136, with flame-spread and smoke-developed ratings of zero per ASTM E 84.
f. Mortar: Prepackaged dry mix composed of a blend of inorganic binders, fillers, and lightweight aggregate formulated for mixing with water at

Project site to form a nonshrinking, homogenous mortar.

g. Pillows/Bags: Re-usable, heat-expanding pillows/bags composed of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents and fire-retardant additives.

h. Silicone Foam: Two-component, silicone-based liquid elastomer that, when mixed, expands and cures in place to produce a flexible, nonshrinking foam.

i. Silicone Sealant (ASTM E814 UL 14779) Standard Test Method for Fire Tests of Penetration Firestop Systems: Neutral-curing, single-component, silicone-based, intumescent, neutral-curing sealant.

j. Solvent-Release-Curing Intumescent Sealant: Solvent-release-curing, single-component, synthetic-polymer-based sealant.

k. Mineral Wool Insulation (ASTM C 518): 4 pcf actual density; .23 BTU in/hr SF 24°F; 4.3 R value; 0 Flame; 0 Smoke Developed.

l. Drop-In Firestop Devices: Factory-assembled devices for use with combustible or noncombustible penetrants in cored holes within concrete floors. Device shall consist of galvanized steel sleeve lined with an intumescent strip, an extended rectangular flange attached to one end of the sleeve for fastening to concrete floor, and neoprene gasket.

B. Fire-Resistive Elastomeric Joint Sealants: Chemically curing, elastomeric sealants of base polymer indicated complying with ASTM C 920 requirements and requirements specified in this Section applicable to fire-resistive joint sealants.

1. Sealant Colors: Provide selections made by Architect from manufacturer's full range of standard colors for products of type indicated.

2. Single-Component, Neutral-Curing Silicone Sealant: Type S; Grade NS; Class 25; exposure-related Use NT, and joint-substrate-related Uses M, G, A, and (as applicable to joint substrates indicated) O.

   a. Additional capability, when tested per ASTM C 719, to withstand the following percentage changes in joint width as measured at time of installation and still comply with other requirements of ASTM C 920:

      1) 100 percent movement in extension and 50 percent movement in compression for a total of 150 percent movement.

3. Multicomponent, Nonsag, Urethane Sealant: Type M; Grade NS; Class 25; exposure-related Use NT, and joint-substrate-related Uses M, A, and (as applicable to joint substrates indicated) O.

   a. Additional capability, when tested per ASTM C 719, to withstand the following percentage changes in joint width as measured at time of installation and still comply with other requirements of ASTM C 920:

      1) 50 percent movement in both extension and compression for a total of 100 percent movement.

4. Single-Component, Nonsag, Urethane Sealant: Type S; Grade NS; Class 25; and

Uses NT, M, A, and (as applicable to joint substrates indicated) O.

1.3 EXECUTION

A. Install through-penetration firestops to comply with the "System Performance Requirements" paragraph and the through-penetration firestop manufacturer's installation instructions and drawings pertaining to products and applications indicated.

B. Install fire-resistive joint sealant to comply with the "System Performance Requirements" paragraph, with ASTM C 1193, and with the sealant manufacturer's installation instructions and drawings pertaining to products and applications indicated.

END OF SECTION 07270

SECTION 07272 – FLUID-APPLIED MEMBRANE AIR BARRIERS

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. The General Conditions, Supplementary Conditions, Instructions to Bidders, and Division 01- General Requirements shall be read in conjunction with and govern this section.

B. The Specification shall be read in its entirety by all parties concerned. Each Section may contain more or less than the complete Work of any trade. The Contractor is solely responsible to make clear to the Subcontractor the extent of their Work.

C. Throughout this Section there is basis of design products listed. Equivalent substitutions will be considered in accordance with Specification Section 01300-Submittals.

1.2 SUMMARY

A. This Section includes requirements for supplying labor, materials, tools, and equipment to complete the Work as shown on the Drawings as specified herein including, but not limited to, the following:

1. Adhesives/Primers
2. Fluid Applied, Vapor Permeable Air & Water Barrier Membrane
3. Transition Membranes
4. Sealant
5. Thru-wall flashing

1.3 DEFINITIONS

A. Air-Barrier Material: A primary element that provides a continuous barrier to the movement of air.

B. Air-Barrier Accessory: A transitional component of the air barrier that provides continuity.

C. Air-Barrier Assembly: The collection of air-barrier materials and accessory materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

D. Transition Membranes has the same meaning as Transition Strips.

1.4 REFERENCES

A. American Architectural Manufacturers Association (AAMA):

1. AMMA 2400-02, Standard Practice for Installation of Windows with a Mounting Flange in Stud Frame Construction

B. American Society for Testing and Materials (ASTM):

1. ASTM D412, Standard Test Method for Vulcanized Rubber and Thermoplastic Elastomers - Tension
2. ASTM D471, Standard Test Method for Rubber Property - Effect of Liquids
3. ASTM D1970, Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection
4. ASTM D2243, Standard Test Method for Freeze-Thaw Resistance of Water-Borne Coatings
5. ASTM D5590, Standard Test Method for Determining the Resistance of Paint Films and Related Coatings to Fungal Defacement by Accelerated Four-Week Agar Plate Assay
6. ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials
7. ASTM E96, Standard Test Methods for Water Vapor Transmission of Materials
8. ASTM E283, Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
9. ASTM E330, Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference
10. ASTM E331, Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
11. ASTM E1354, Standard Test Method for Heat and Visible Smoke Release Rates for Materials and Products Using an Oxygen Consumption Calorimeter
12. ASTM E1677, Standard Specification for Air Barrier (AB) Material or System for Low- Rise Framed Building Walls
13. ASTM E2112, Standard Practice for Installation of Exterior Windows, Doors and Skylights
14. ASTM E2178, Standard Test Method for Air Permeance of Building Materials
15. ASTM E2357, Standard Test Method for Determining Air Leakage of Air Barrier Assemblies

C. National Fire and Protection Agency (NFPA):

1. NFPA 285, Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components

D. US Green Building Council (USGBC), Leadership in Energy and Environmental Design (LEED):

1. LEED Reference Guide, Version 4.0, and USGBC Project Calculation Spreadsheet. Web Site http://www.usgbc.org.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the Work of this Section with the installation of exterior substrate. Sequence Work so that installation of fluid-applied air barrier coincides with installation of substrate preparation without causing delay to the Work.

B. Pre-installation meetings:

1. Pre-installation Conference: Conduct conference at Project site.
2. Review air-barrier requirements and installation, special details, mockups, air-leakage and bond testing, air-barrier protection, and work scheduling that covers air barriers.
3. Air Barrier Manufacturer representative will meet with the necessary parties at the jobsite to review and discuss project conditions as it relates to the integrity of the assembly.

1.6 SUBMITTALS

A. ACTION SUBMITTALS:

1. Product Data: For each type of product.

a. Include manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties of products.
b. Air Barrier Manufacturer's guide specification.
c. Air Barrier Manufacturer's complete set of technical data sheets for assembly.
d. Air Barrier Manufacturer's complete set of standard detail drawings.

2. Shop Drawings: For air-barrier assemblies.

a. Show locations and extent of air barrier. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
b. Include details of interfaces with other materials that form part of air barrier.

B. INFORMATIONAL SUBMITTALS

1. Qualification Data: For Installer. Include list of ABAA-certified installers and supervisors employed by the Installer, who work on Project.
2. Product Certificates: From air-barrier manufacturer, certifying compatibility of air barriers and accessory materials with Project materials that connect to or that come in contact with the barrier.
3. Product Test Reports: For each product, for tests performed by a qualified testing agency.

a. NFPA 285 wall assembly compliance: Air Barrier Manufacturer statement that anticipated wall assembly passes NFPA 285.

4. Evaluation Reports: from ICC-ES
5. Product certification that the assembly components are supplied and warranted by single source Air Barrier Manufacturer.
6. Statement that installing contractor is authorized by Air Barrier Manufacturer to complete Work as specified.
7. Statement that materials are adhesively and chemical compatible with adjacent materials proposed for use.
8. Reports indicating that field peel-adhesion test on all materials to which sealants are adhered have been performed and the changes made, if required, to other approved materials, in order to achieve successful adhesion.
9. Letter from primary materials manufacturer indicating compatibility of products not manufactured by primary manufacturer.
10. Submit Eco-Efficiency Analysis of each material.
11. Submit recommended values for field adhesion test on each substrate.
12. Submit accreditation number of manufacturer and certification number of installers.
13. Warranty: Sample warranty as specified.

1.7 QUALITY ASSURANCE

A. Single Source Responsibility:

1. Obtain fluid-applied membrane air barrier, transition membranes, air barrier sealants, primers, mastics, and adhesives from a single Air Barrier Manufacturer regularly engaged in the manufacturing and supply of the specified products.
2. Contactor to verify product compliance with federal, state, and local regulations controlling use of Volatile Organic Compounds (VOC).

B. Manufacturer Qualifications:

1. Air Barrier Manufacturer shall demonstrate qualifications to supply materials of this section by certifying the following:

a. Air Barrier Manufacturer must not issue warranties for terms longer than they have been manufacturing and supplying specified products for similar scope of Work.

C. Installer Qualifications:

1. Perform Work in accordance with Air Barrier Manufacturer published literature and as specified in this section.

a. Installer shall be licensed by ABAA according to ABAA's Quality Assurance Program and shall employ ABAA-certified installers and supervisors on Project.

2. Maintain one (1) copy of Air Barrier Manufacturer's instructions on site.
3. At all times during the execution of the Work allow access to site by the Air Barrier Manufacturer representative.
4. If meeting with Air Barrier Manufacturer during project construction, contact Air Barrier Manufacturer a minimum of two weeks prior to schedule meeting.

D. VOC Regulations: Provide products which comply with applicable regulations controlling the use of volatile organic compounds.

E. Preconstruction Meeting: Organize and convene a minimum of two weeks prior to commencing Work of this Section. Agenda shall include, at a minimum, construction and testing of mock- up, sequence of construction, coordination with substrate preparation, materials approved for use, compatibility of materials, coordination with installation of adjacent and covering materials, and details of construction. General Contractor is responsible for all site safety requirements. Attendance is required by representatives of related trades including covering materials, substrate materials and adjacent materials.

1.8 MOCK-UPS

A. Construct mock-ups to verify selections made under submittals and to set quality standards for materials and execution in accordance with requirements.

B. Mock-Ups: General Contractor is responsible for coordinating the construction of the mock-up. Mock-up shall be representative of primary exterior wall assemblies and glazing assemblies including backup wall, air-barrier assemblies and typical penetrations. Mock-up shall be approximately 8 feet long by 8 feet high and include all components in the exterior wall assembly and as indicated.

C. Mock-Up Tests for Adhesion: Test mock-up of materials for adhesion in accordance with manufacturer's recommendations. Perform test after curing period recommended by the manufacturer. Record mode of failure and the area(s) which failed the project requirements. When the air barrier material manufacturer has established a minimum adhesion level for the product on the particular substrate, the inspection report shall indicate whether this requirement has been met.

1.9 MANUFACTURERS QUALIFICATIONS / ALTERNATE MANUFACTURERS:

A. The materials outlined are the type of materials to be used on this project. Please refer to Specification Section 01300, "Submittals." "Or Equal" substitutions are permitted so long as they are equal to or superior to the basis of design and the Contractor takes full responsibility for all coordination and costs associated with collateral issues related to the substitution. No Substitutions will be reviewed during the bidding process. The Contractor takes full responsibility for all substitutions. Substitution submittals shall be made no later than 30 days after Notice to Proceed in order to provide time for comparison review. All submittals after 30 days shall be in strict accordance with the basis of design / specified products. No Substitutions will be considered after 30 days. The following manufacturer criteria must be submitted with the substitution request.

1.10 PERIODIC INSPECTION BY MANUFACTURER'S REPRESENTATIVE

A. When the project is in progress, the Air Barrier manufacturer shall inspect the work not less than 2 days per week. In addition, the manufacturer shall:

1. Keep the architect and Owner's on site representative informed as to the progress and quality of the work as observed.
2. Report to architect and Owner's on-site representative in writing any failure or refusal of the Contractor to correct unacceptable practices called to the Contractor's attention.
3. Confirm after completion that manufacturer has observed no applications procedures in conflict with the specifications other than those that may have been previously reported and corrected.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Delivery of Materials:

1. Materials shall be delivered to the jobsite in undamaged and clearly marked containers indicating the name of the Air Barrier Manufacturer and product.

B. Storage of Materials:

1. Store materials as recommended by Air Barrier Manufacturer and conforming to applicable safety regulatory agencies. Refer to all applicable data including but not limited to MSDS sheets, Product Data sheets, product labels, and specific instructions for personal protection.
2. Keep solvents away from open flame or excessive heat.
3. Products should be stored in closed containers.
4. Store rolled materials on end in original packaging.
5. Protect rolls from direct sunlight until ready for use.
6. Refer to Air Barrier Manufacturer published literature.

C. Handling:

1. Refer to Air Barrier Manufacturer published literature.

1.12 SITE CONDITIONS

A. Environmental Requirements:

1. No Work shall be performed during rain or inclement weather.
2. No Work shall be performed on frost or wet covered surfaces.

B. Protection:

1. Cap and protect exposed back-up walls against wet weather conditions during and after application of membrane.

C. Ensure all preparation Work is completed prior to installing fluid-applied membrane air barrier.

1.13 WARRANTY

A. Provide manufacturer's exposure warranty that offers twelve (12) months of coverage against in-place exposure damage (delamination, deterioration) beginning with the date of installation of the product.

B. Provide manufacturer's standard warranty for sheathing to be free of manufacturing defects that make it unsuitable for its intended use. Warranty period shall be Ten (10) years from the date of Purchase.

C. Installer's Warranty: Provide an Installer's Warranty for two (2) years from the date of Substantial Completion.

PART 2 - PRODUCTS

2.2 MATERIALS MANUFACTURER

A. Components and auxiliary materials must be obtained as a single-source from the assembly Air Barrier Manufacturer to ensure total system compatibility and integrity.

B. Basis of Design (Equivalent substitutions will be considered in accordance with Specification Section 01300-Submittals.)
1. Henry Company
999 N. Sepulveda Blvd. Suite 800 El Segundo, CA 90245
(800) 486-1278
2. Or Equivalent

2.2 MATERIALS

A. Source Limitations: Obtain primary air-barrier materials and air-barrier accessories from single source from single manufacturer.

B. Primary Fluid-Applied Membrane Air Barrier (Basis of Design):

1. One-component, water-based, elastomeric emulsion membrane, designed to provide a vapor permeable air and water barrier when applied above-grade wall assemblies, having the following properties:

a. Basis of Design Product: Air-Bloc 17MR
b. Color: Graphite
c. Solids Content:

1) By Weight: 63%
2) By Volume: 53%

d. Service Temperature:

1) Low Temperature: -40 degrees F (-40 degrees C)
2) High Temperature: +180 degrees F (+80 degrees C)

e. Application Temperature:

1) Low Temperature: +20 degrees F (-6 degrees C)
2) High Temperature: +122 degrees F (+50 degrees C)

f. Tensile Strength (ASTM D412): 104 psi (717 kPa)
g. Elongation (ASTM D412): 420%
h. Low Temperature Flexibility @ -22 degrees F (-30 degrees C) (ASTM D1970): Pass
i. Freeze-Thaw Resistance (ASTM D2243): Pass; 10 cycles
j. Nail Sealability (ASTM D1970): Pass
k. VOC Content: 100 grams/liter max.
l. Water Absorption (ASTM D471, modified): 5.6%
m. Water Vapor Permeance (ASTM E96 B) @ 40 mils nominal dry film: 14 perms
n. Air Permeability:

1) Assembly Air Leakage (ASTM E2357): Pass
2) Building Material (ASTM E2178): 0.0001 cfm/ft2 (0.0005 L/s.m2)

o. Chemical Resistance: Resists salt solutions, mild acids and alkalis. Non-resistant to oils, grease or solvents
p. Fire Testing (NFPA 285): Complies in various assemblies
q. Flame Spread/Smoke Development (ASTM E84): 10/15
r. Resistance to Mold, Mildew, and Fungal Growth (ASTM D5590): No growth

C. Auxiliary Materials

1. Transition Membranes:

a. Liquid applied flashings:

1) Moisture-curing one component elastomeric liquid applied flashing membrane using a highly advanced STPe (Silyl-Terminated Polyether) polymer, having the following properties:

a) Basis of Design Product: Air-Bloc LF
b) Color: Blue
c) Air Leakage (ASTM E2178): <0.004 L/s/m^2 @ 75Pa
d) Water Vapor Permeance (ASTM E96, Method B): 21.8 perms @25 mils

e) Air Leakage of Air Barrier Assemblies (ASTM E2357): Pass
f) Water Resistance (AC212/ASTM D2247): Pass
g) Nail Sealability (AMMA 711): Pass
h) Surface Burning Characteristics (ASTM E84):

2) Class A
3) Flame Spread/Smoke Development (ASTM E84): 20/5

a) Tensile Strength (ASTM D412): 132 psi
b) Elongation (ASTM D412): 264%

b. Self-Adhering flashings:

1) Non-vapor permeable, self-adhered water resistive air and vapor barrier membrane consisting of an SBS rubberized asphalt compound, which is integrally laminated to a blue engineered thermoplastic film, having the following properties:

a) Basis of Design Product: Blueskin SA
b) Color: Blue
c) Water Vapor Permeance (ASTM E96, Method A): .86 perms
d) Air Leakage of Air Barrier Assemblies (ASTM E2357): Pass
e) Air Leakage (ASTM E2178): <0.0005 L/s/m^2 @ 75Pa
f) Water Tightness (CAN/CGSB-37.58-M86): Pass.
g) Nail Sealability (ASTM D1970): Pass.
h) Tensile Strength:

2) Membrane (ASTM D412-modified): 500 psi minimum
3) Film (ASTM D828): 5000 psi minimum

a) Elongation (ASTM D412-modified): 200% minimum

2. Sheathing Joint Membranes:

a. Vapor permeable, self-adhered water resistive air barrier membrane consisting of an engineered film and patented, permeable adhesive technology with split-back poly-release film, having the following properties:

1) Basis of Design Product: Blueskin VP160
2) Color: Blue
3) Air Leakage (ASTM E2178): <0.02 L/s/m^2 @ 75Pa
4) Water Vapor Permeance (ASTM E96, Method A): 29 perms
5) Air Leakage of Air Barrier Assemblies (ASTM E2357): Pass
6) Resistance to Water Penetration (ICC-ES AC 38): Pass.
7) Nail Sealability (ASTM D1970): Pass
8) Surface Burning Characteristics (ASTM E84):

a) Class A
b) Flame Spread/Smoke Development (ASTM E84): 0/105

9) Tensile Strength (ASTM D828): 182N MD/129N CD
10) Cycling and Elongation (ICC-ES AC48): Pass

b. Contact Air Barrier Manufacturer for a complete list of authorized transition membranes.

3. Adhesives and Primers:

a. Spray adhesive, and having the following properties:

1) Basis of Design Product: Blueskin Spray Prep
2) Color: Clear amber
3) Solids Content (By Weight): 35%
4) Aerosol

b. Polymer emulsion based adhesive type, quick setting, low VOC content, having the following properties:

1) Basis of Design Product: Blueskin LVC Adhesive
2) Color: Blue.
3) Solids Content (By Weight): 40%.
4) Solvent based: 240 g/L.

c. Polymer emulsion based primer for self-adhered membranes, and having the following properties:

1) Basis of Design Product: Aquatac Primer
2) Color: Aqua.
3) Solids Content (By Weight): 58%.
4) Water based: Maximum VOC: 50 g/l

4. Sealants:

a. Building Envelope Sealant:

1) Moisture cure, medium modulus polymer modified sealing compound, having the following properties:

a) Basis of Design Product: HE925 BES Sealant
b) Complies with Fed. Spec. TT-S-00230C, Type II, Class A.
c) Complies with ASTM C920, Type S, Grade NS, Class 35.
d) Elongation: 450 – 550%.
e) Remains flexible with aging.

b. Sheathing Joint Sealants:

1) As recommended by Air Barrier Manufacturer

c. Contact Air Barrier Manufacturer for a complete list of authorized sealants.

5. Self-Adhesive Thru-Wall Flashing Membrane:

a. Non-vapor permeable, self-adhered water resistive air and vapor barrier membrane consisting of an SBS rubberized asphalt compound, which is integrally laminated to a blue engineered thermoplastic film, having the following properties:

1) Basis of Design Product: Blueskin TWF
2) Color: Yellow
3) High Temperature Stability - Flow Resistance (ASTM D5147): Pass
4) Air leakage (ASTM E283): 0.005 L/s.m² @ 75 Pa
5) Water vapor permeance (ASTM E96, Method B): 0.03 perms
6) Low temperature flexibility (CGSB 37-GP-56M): Pass

6. Termination bar: stainless steel with sealant receiver.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Substrate Conditions:

1. Verify substrates to receive work and surrounding adjacent surfaces are in accordance with Air Barrier Manufacturer published literature prior to installation of fluid applied membrane air barrier assembly.
2. Sheathing panels must be securely fastened and installed flush to ensure a continuous substrate in accordance with Air Barrier Manufacturer published literature.
3. Fastener penetrations must be set flush with sheathing and fastened into solid backing.
4. Mortar joints in concrete block and form tie holes/voids in poured concrete shall be filled, flush, smooth, and allowed to be cured for a minimum of twenty-four (24) hours.
5. New concrete should be cured for a minimum of sixteen (16) hours after forms are removed.
6. Cap and protect exposed back-up walls against wet weather conditions prior to application of fluid applied membrane air barrier assembly.
7. Exterior surfaces of existing CMU walls are parged with ± ½ inch of portland cement mortar with a high variability of surface irregularity.

a. CMU and Parging Repair is described in the Drawings

B. Notify contractor in writing of any conditions that are not acceptable.

C. The installing contractor shall examine and determine that surfaces and conditions are ready to accept the Work of this section in accordance with published literature. Commencement of Work or any parts thereof shall mean installer acceptance of the substrate.

3.2 PREPARATION

A. All surfaces must be sound, dry to touch, clean, and free of oil, grease, dirt, excess mortar, frost, laitance, loose and flaking particles, or other contaminants.

B. Protect adjacent surfaces not included in scope of Work to prevent spillage and overspray.

C. Hot weather or direct-sun applications over porous substrates, such as concrete, promote rapid surface drying and can form blisters in the fluid applied membrane air barrier during curing. To aid in blister prevention prepare substrate in accordance with one of the following optional procedures:

1. Prime coat:

   a. Apply a thin prime coat of fluid applied membrane air barrier to substrate.
   b. Allow fluid applied membrane air barrier to fully cure prior to subsequent application.
   c. Install primary fluid applied membrane air barrier to Air Barrier Manufacturer minimum recommended mil thickness.

2. Two coat:

   a. Apply fluid applied membrane air barrier to achieve one-half (1/2) of Air Barrier Manufacturer minimum recommended mil thickness.
   b. Allow fluid applied membrane air barrier to fully cure prior to subsequent application.
   c. Apply fluid applied membrane air barrier to achieve one-half (1/2) of Air Barrier Manufacturer minimum recommended mil thickness.
   d. Overall dry mil thickness shall be in accordance with Air Barrier Air Barrier Manufacturer published literature.

3.3 INSTALLATION

A. Ensure substrate is ready to receive fluid applied membrane air barrier in accordance with published literature.

B. If fluid applied membrane air barrier should freeze while in storage, move containers to a controlled environment above 32 degrees F (0 degrees C) until thawed and re-mix using a hand operated power mixer prior to use.

C. Fluid applied membrane air barrier shall not be applied when ambient (air) and substrate temperatures are below 20 degrees F (-6 degrees C).

D. Do not proceed with application of air barrier membrane when rain is expected within 16 hours.

E. Apply sealant at sharp corners, changes in substrate plane, penetrations, and edges to form a smooth transition from one plane to another.

F. Non-Moving Substrate Joint and Crack Treatment:

1. Gaps equal to or less than 3/8 inch (10 mm) wide:

a. Sheathing Joint Sealant:

1) Apply sealant at rate recommended by Air Barrier Manufacturer.
2) Spread sealant at joint extending a minimum one (1) inch beyond gap to ensure a continuous air and watertight assembly.

2. Gaps equal to or less than 1/2 inch (12 mm) wide:

a. Building Envelope Sealant:

1) Apply sealant at rate recommended by Air Barrier Manufacturer.
2) Spread sealant at joint extending a minimum one (1) inch on each side of substrate gap.

b. Liquid applied flashings:

1) Apply liquid applied flashing at rate recommended by Air Barrier Manufacturer.
2) Apply liquid applied flashing in accordance with Air Barrier Manufacturer published literature extending a minimum of two (2) inches on each side of substrate gap.

c. Self-adhering flashings:

1) Apply primer to substrate and allow curing in accordance with published literature prior to installation of self-adhered flashing.
2) Apply self-adhering flashing in accordance with Air Barrier Manufacturer published literature extending a minimum of three (3) inches on each side of substrate gap.
3) Roll membrane with countertop roller to eliminate air pockets between self- adhered flashing and substrate ensuring full adhesion of membrane onto substrate.
4) Seal exposed leading edges of self-adhered membrane with sealant.

3. Gaps greater than 1/2 inch wide:

a. Contact Air Barrier Manufacturer.

G. Refer to Drawings and Air Barrier Manufacturer requirements for installation procedures including, but not limited to, the following:

1. General:

   a. Coordinate all requirements and notify the architect and the Owner's on site representative of conflicting direction noted. Do not proceed with the Work until the conflict is resolved and written notice is given on how to proceed.

2. Inside corners
3. Outside corners
4. Crack treatment
5. Penetrations
6. Rough openings
7. Control joints
8. Expansion joints
9. Changes in substrate

H. Contact Air Barrier Manufacturer to coordinate transition of fluid applied membrane air barrier to adjacent areas including, but not limited to, the following:

1. Roof to air barrier
2. Air barrier to waterproofing
3. Fastener penetrations
4. Foundation and walls, including penetrations, ties and anchors.
5. Walls, windows, curtain walls, storefronts, louvers or doors.
6. Dissimilar wall assemblies and fixed openings within those assemblies.
7. Wall and roof connections.
8. Floors over unconditioned space.
9. Walls, floor and roof across construction, control and expansion joints.
10. Utility, pipe and duct penetrations.
11. Seismic and expansion and control joints.
12. Leakage pathways in the building envelope.

I. Thru-Wall Flashing:

1. Coordinate with Section 04200 Unit Masonry
2. Provide drip plate as indicated.

J. Primary Liquid Air Barrier Membrane

1. Install fluid applied membrane air barrier in accordance with Air Barrier Manufacturer published literature to ensure an air and watertight fluid applied membrane air barrier assembly.
2. Fluid applied membrane air barrier assembly must be installed in a monolithic application without sags, runs or voids, and transitioning with auxiliary components to create a uniform drainage plane and air barrier.

3. Install fluid applied membrane air barrier and transition membranes so that subsequent membrane installation laps one (1) inch (2.5 cm) onto existing membrane ensuring an air and watertight fluid applied membrane air barrier assembly.
4. Fluid applied membrane air barrier total dry thickness shall be in accordance with Air Barrier Manufacturer published literature. Refer to Air Barrier Manufacturer Technical Data Sheet.

3.4 FIELD QUALITY CONTROL

A. Final Observation and Verification:

1. Final inspection of fluid applied membrane air barrier assembly shall be carried out by the Owner's representative, the contractor, and Air Barrier Manufacturer representative.
2. Contact Air Barrier Manufacturer for warranty issuance requirements.

B. Fluid applied membrane air barrier assembly is not designed for permanent UV exposure. Refer to Air Barrier Manufacturer published literature for product limitations.

3.5 CLEANING

A. Promptly as the Work proceeds, and upon completion, clean up and remove from the premises all rubbish and surplus materials resulting from the foregoing Work.

B. Clean soiled surfaces, spatters, and damage caused by Work of this Section.

C. Check area to ensure cleanliness and remove debris, equipment, and excess material from the site.

END OF SECTION

SECTION 07530 – EPDM ROOF

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

B. "Or Equivalent" Roof System: The Contractor will use the system described under Part 2 product section ensure the physical characteristics of the submitted product meet the requirements of the specification.

1.2 SUMMARY

A. This Section includes the following:

1. JM EPDM NR FIT Fully adhered roof system or Firestone RubberGard Platinum™ Fully Adhered Roofing System or equivalent.
2. Roof expansion assemblies.
3. Roofing Insulation.
4. Cover Board
5. Roof flashings and counter flashings.
6. .090 non-reinforced EPDM roof membrane
7. Walkways.

1.3 PERFORMANCE REQUIREMENTS

A. General: Install a watertight, modified bituminous membrane roofing and base flashing system with compatible components that will not permit the passage of liquid water and will withstand wind loads, thermally induced movement, and exposure to weather without failure.

1. Roofing system shall comply with the following:

a. 100 mile per hour wind speed in 3 second gusts.
b. IBC 2018 building code compliance, NJ edition

1.4 SUBMITTALS

Provide one complete roof system shop drawing with an index, table of contents, and all related products.

A. Product Data: For each type of roofing product specified. Include data substantiating that materials comply with requirements.

B. Shop Drawings: Include plans, sections, details, and attachments to other work, for the following:

1. Base flashings and membrane terminations.
2. Flat and tapered insulation, including finished slopes at a minimum ¼" per foot.
3. Crickets, saddles, and tapered edge strips, including slopes.

C. Samples for Verification: Of the following products:

1. 12-by-12-inch (300-by-300-mm) square of non-reinforced EPDM
2. 12-by-12-inch (300-by-300-mm) square of roofing insulation.
3. 12-by-12-inch (300-by-300-mm) square of walkway pads.
4. 6 insulation fasteners of each type, length, and finish.
5. Flashing and counter flashing.

D. Installer Certificates: Signed by roofing system manufacturer certifying that Installer is approved, authorized, and licensed by manufacturer to install specified roofing system and is eligible to receive the no dollar limit roofing manufacturer's warranty.

E. Manufacturer Certificates: Signed by roofing system manufacturer certifying that the roofing system complies with requirements specified in the "Performance Requirements" Article. Upon request, submit evidence of complying with requirements.

F. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

G. Product Test Reports: Based on evaluation of tests performed by manufacturer and witnessed by a qualified independent testing agency, indicate compliance of components of roofing system with requirements based on comprehensive testing of current product compositions.

H. Research/Evaluation Reports: Evidence of roofing system's compliance with building code in effect for Project from a model code organization acceptable to authorities having jurisdiction.

I. Maintenance Data: For roofing system to include in the maintenance manuals specified in Division 1.

J. Warranty: Sample copy of no dollar limit roofing manufacturer's warranty stating obligations, remedies, limitations, and exclusions of warranty. Provide sample of the Installer's Warranty.

K. Inspection Report: Copy of roofing system manufacturer's inspection report and a qualified independent testing agency's report of completed roof installation.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer to perform Work of this Section who has specialized in installing roofing similar to that required for this Project; who is approved, authorized, and licensed by the roofing system manufacturer to install manufacturer's product; and who is eligible to receive the no dollar limit roofing manufacturer's warranty.

B. Roofing System Design: Provide a membrane roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist uplift pressure calculated according to ASCE 7.

1. Corner Uplift Pressure: 52.6 lbf/sq. ft. (kPa/sq. m).
2. Perimeter Uplift Pressure: 33.8 lbf/sq. ft. (kPa/sq. m).
3. Field-of-Roof Uplift Pressure: 18.8 lbf/sq. ft. (kPa/sq. m).

C. Pre-installation Conference: Before installing roofing system, conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings." Notify participants at least 5 working days before conference.

1. Meet with Owner; Construction Manger; Architect; Owner's insurer, if applicable; testing and inspecting agency representative; roofing installer; roofing system manufacturer's representative; deck installer; and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review methods of removing the existing roofing and cover board. Examine existing roof deck structure, slope and area of replacing roofing for daily output.
3. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and attachment to structural members.
5. Review loading limitations of deck during and after roofing.
6. Review flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing.
7. Review governing regulations and requirements for insurance, certifications, and inspection and testing, if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.
10. Document proceedings, including corrective measures or actions required, and furnish copy of record to each participant.
11. Review all roofing openings, sizes, location, curb or post supports.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store roofing materials in a dry, well-ventilated, weather tight location to ensure no significant moisture pickup and maintain at a temperature exceeding roofing system manufacturer's written instruction. Store membrane and other sheet materials on pallets or other raised surfaces under a waterproof cover.

1. Handle and store roofing materials and place equipment in a manner to avoid significant or permanent damage to deck or structural supporting members.

B. Do not leave unused membrane and other sheet materials on the roof overnight or when roofing work is not in progress unless protected from weather and moisture and unless maintained at a temperature exceeding 50 deg F (10 deg C).

C. Deliver and store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer.

D. Protect roofing insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

1. Insulation shipping wrap is not weather protection. Provide additional weather protection of insulation materials complying to manufacturer's written instruction and PIMA technical bulletin # 109.

1.7 INSTALLER QUALITY ASSURANCE

A. The Owner has determined that it would be in the best interest of this particular project, and reasonably related to the specific work to be performed, that all bidders be required to participate in an approved apprenticeship program pursuant to standards established under the Department of Wage and Industry Act of 1948 (N.J.S.A. 34:1A-34 et. seq. Please fill out and include the "Apprenticeship Form for Construction Projects" which is included in the Specifications with your Bid Documents.

B. The EPDM membrane roofing system must achieve a UL Class A.

C. Materials: All materials and adhesives must comply with New Jersey and local requirements limiting volatile organic compounds (VOC).

D. The manufacturer must have a minimum of 20 years experience in the manufacturing of vulcanized thermal set sheeting.

E. Unless otherwise noted in this specification, the roofing contractor must strictly comply with the manufacturer's current specifications and details.

F. The roofing system must be installed by an applicator authorized and trained by the manufacturer in compliance with shop drawings as approved by the manufacturer. The roofing applicator shall be thoroughly experienced and upon request be able to provide evidence of having at least five (5) years successful experience installing single-ply EPDM roofing systems and having installed at least one (1) roofing application or several similar systems of equal or greater size within one year.

G. Provide adequate number of experienced workmen regularly engaged in this type of work who are skilled in the application techniques of the materials specified. Provide at least one thoroughly trained and experienced superintendent on the job at all times roofing work is in progress.

H. There shall be no deviations made from this specification or the approved shop drawings without the prior written approval of the specifier. Any deviation from the manufacturer's installation procedures must be supported by a written certification on the manufacturer's letterhead and presented for the specifier's consideration.

I. Upon completion of the installation, the applicator shall arrange for an inspection to be made by a non-sales technical representative of the membrane manufacturer in order to determine whether or not corrective work will be required before the warranty will be issued. Notify the building owner seventy-two (72) hours prior to the manufacturer's final inspection.

J. The roofing system manufacturer will provide, when the project is in progress, the following:

1. Keeping the Owner informed as to the progress and quality of the work as observed.
2. Provide job site inspections a minimum of four days per week.
3. Reporting to the Owner in writing, any failure or refusal of the Contractor to correct unacceptable practices called to the Contractor's attention.
4. Confirming, after completion of the project and based on manufacturer's observations and tests, that manufacturer has observed no applications procedures in conflict with the specifications other than those that may have been previously reported.

1.8 JOB CONDITIONS, CAUTIONS AND WARNINGS

A. Refer to the manufacturer's requirements. JM EPDM Application Guide for a 30-year no dollar limit Peak Advantage Guarantee or Firestone's Application Guide for 30 Platinum warranty design requirements. Equivalent manufacturer's will be considered in accordance with Specification Section 01300 – Submittals.

B. Material Safety Data Sheets (MSDS) must be on location at all times during the transportation, storage and application of materials.

C. When positioning membrane sheets, exercise care to locate all field splices away from low spots and out of drain sumps. All field splices should be shingled to prevent bucking of water.

D. When loading materials onto the roof, the Manufacturer's Licensed Contractor must comply with the requirements of the building owner to prevent overloading and possible disturbance to the building structure.

E. Proceed with roofing work only when weather conditions are in compliance with the manufacturer's recommended limitations, and when conditions will permit the work to proceed in accordance with the manufacturer's requirements and recommendations.

F. Proceed with work so new roofing materials are not subject to construction traffic. When necessary, new roof sections shall be protected and inspected upon completion for possible damage.

G. Provide protection, such as 3/4 inch thick plywood, for all roof areas exposed to traffic during construction. Plywood must be smooth and free of fasteners and splinters. Blue EPS board may be used In lieu of plywood.

H. The surface on which the insulation or roofing membrane is to be applied shall be clean, smooth, dry, and free of projections or contaminants that would prevent proper application of or be incompatible with the new installation, such as fins, sharp edges, foreign materials, oil and grease.

I. New roofing shall be complete and weathertight at the end of the work day.

J. Contaminants such as grease, fats and oils shall not be allowed to come in direct contact with the roofing membrane.

1.9 WARRANTY

A. Roofing Manufacturer's Warranty: Provide a 30-year no dollar limit leak proof labor and material warranty by the roofing manufacturer from the date of substantial completion following approval by the roof manufacturer's agent. The single source warranty shall include all roofing system products, all edge/coping metal products and all wall panels. The maximum wind speed coverage shall be peak gusts of 100 mph measured at 10 meters above ground level. Certification is required with the shop drawing submittal indicating the manufacturer has reviewed and agreed to such wind coverage. Warranty shall also include Manufacturer's coverage for accidental puncture for the duration of the 30 year warranty.

B. Installer's Warranty: Submit installer's warranty letter, signed by the Installer, covering work of this section, including all roofing system components and all metal components for two (2) years from the date of Substantial Completion following approval by the roof manufacturer's agent.

C. Pro-rated System Warranties shall not be accepted.

PART 2 - PRODUCTS

2.1 GENERAL

A. All components of the specified roofing system shall be products of Johns Manville (JM) or Firestone Building Products, LLC (Firestone) or equivalent.

B. Unless otherwise approved by the specifier and accepted by the membrane manufacturer, all products (including insulation, fasteners, fastening plates and edgings) must be **manufactured and supplied** by the roofing system manufacturer and covered by the warranty.

2.2 MEMBRANE

A. Furnish JM EPDM NR 90 mil - FIT non-reinforced EPDM or Firestone RubberGard 90 mil RubberGard Platinum™ Non-Reinforced EPDM. (Ethylene, Propylene, Diene Terpolymer) in the largest sheet possible. The membrane shall conform to the minimum physical properties of ASTM D4637, type 1. When a 10 foot wide membrane is to be used, the membrane shall be manufactured in a single panel with no factory splices to reduce splice intersections. Equivalent

manufacturers will be considered in accordance with Specification Section 01300 – Submittals.

2.3 INSULATION MATERIALS

A. General: Provide preformed, roofing insulation boards that comply with requirements, selected from manufacturer's standard sizes and of thicknesses indicated.

B. Polyisocyanurate Board Insulation: Rigid, cellular Polyisocyanurate thermal insulation complying with ASTM C 1289, Class 1, Grade 2 (20 PSI) classified by facer type as follows:

1. Facer Type: Type II, felt or glass-fiber mat on both major surfaces.
Finished slope is to be 1/4":12"
Minimum thickness drains 3.5".

2. Minimum long term thermal resistance (LTTR): 5.7 per inch determined in accordance with CAN/ULC 770 @ 75 degrees F.

3. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated or required for sloping to drain. No standing water shall be permitted and the Contractor shall provide this insulation as necessary.

C. Cover Board: ASTM C 1289, Type II, Class 4, Grade 1. ½" High-Density Polyisocyanurate Foam Core, or manufacturer's approved cover board for the roof system.

1. Product: JM ProtectoR HD, ½" High-Density Polyiso Cover Board, Firestone ½" ISO Guard or equivalent.

2.4 ADHESIVES AND CLEANERS

All products shall be furnished by Johns Manville (JM) or Firestone Building Products, LLC (Firestone) or equivalent and specifically formulated for the intended purpose.

A. Bonding Adhesive: JM LVOC Membrane Adhesive or Firestone Single Ply LVOC Bonding Adhesive (or equivalent).

B. Splicing Cement: Splice Adhesive

C. Splice Tape and Primer: JM EPDM 4" Seam Tape Plus with Tape Primer (Low VOC) or Firestone QuickSeam 3" Tape and LVOC QuickPrime+ (or equivalent).

D. Cleaning Solvent: JM Weathered Membrane Cleaner or Firestone Clear Splice Adhesive (or equivalent).

E. External seam sealant: JM Single-ply LVOC caulk or Firestone Lap Sealant (or equivalent).

F. Sealer: Pourable Sealer

G. Reinforced Termination Strip: JM EPDM reinforced termination strip with tape (RTS) (or equivalent).

2.5 FASTENERS AND PLATES

To be used for mechanical attachment of insulation and to provide additional membrane securement:

A. Insulation Fastening Plates: a 3 inch diameter FM approved metal plate used for insulation attachment in conjunction with Heavy Duty Fastener must achieve a minimum pullout of 300 pounds for fully adhered roof systems. Comply with manufacturer's recommendations for minimum quantity of pull out tests.

B. Seam Fastening Plates: A 2 inch diameter FM approved metal plate meeting corrosion resistance provisions in FMG 4470, designed for fastening membrane to substrate and acceptable to the membrane roof system manufacturer.

C. QuickSeam RPF Strip: a 6 inch wide, 100 foot long strip of RubberGard reinforced EPDM membrane.

The 6 inch wide QuickSeam shall be utilized horizontally or vertically (in conjunction with Seam Fastening Plates) below the EPDM membrane for additional membrane securement.

2.6 METAL EDGING AND MEMBRANE TERMINATIONS

A. JM Presto-Tite Edge One Fascia or Firestone AnchorGard (or equivalent): a metal fascia system with an extruded aluminum anchor bar and 0.050 inch thick aluminum fascia. Metal fascia color shall be as designated by the Owner's Representative or to match existing.

B. JM Presto-Lock Coping or Firestone Coping (or equivalent): incorporates a 20 gauge galvanized steel anchor clips with 4 , a concealed joint cover and 10 foot continuous sections of coping cap. Metal coping cap color shall be as designated by the Owner's Representative.

C. Manufacturer's Termination Bar: a 1 inch wide and .106 inch thick extruded aluminum bar pre-punched 6 inches on center; incorporates a sealant ledge to support AP Sealant and provide increased stability for membrane terminations.

D. All metal coping / edge system to meet ANSI / SPRI ES-1 wind design standard.

2.7 WALKWAYS

A. Protective surfacing for roof traffic shall be provided by the manufacturer, factory formed, nonporous, heavy duty, slip resistant surface textured walkway pads sourced from the roofing system manufacturer. The pad shall be installed in accordance with the manufacturer's installation requirements to resist wind blow

off. Provide walk pads from the roof access point or hatch to each mechanical unit and around each mechanical unit in accordance with the equipment service requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions under which roofing will be applied, with Installer present, for compliance with requirements.

B. Verify that roof openings and penetrations are in place and set and braced and that roof drains are properly clamped into position.

C. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at roof penetrations and terminations and match the thicknesses of insulation required.

1. Verify that wood nailer strips are located perpendicular to roof slope and are spaced according to requirements of roofing system manufacturer.

D. Verify that deck is securely fastened with no projecting fasteners and with no adjacent units in excess of 1/16 inch (1.5 mm) out of plane.

E. Verify that all abandoned equipment, dunnage, vents, pipes, pitch pockets, etc. have been removed and the deck patched.

3.2 PREPARATION

A. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast. Verify that all roof drains are connected to roof drainage system.

B. Inspect the deck to verify integrity. Bring any areas of questionable integrity to the Architect's attention. Do not cover any areas of questionable welds or deck out of plane.

3.3 INSULATION AND COVER BOARD INSTALLATION

A. Comply with roofing system manufacturer's written instructions for installing roofing insulation. Do not install more cover board than can be covered with roofing material the same day.

B. Comply with membrane roofing system manufacture written instructions for installing insulation.

C. Install insulation with long joints of insulation in continuous straight lines with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch (6 mm) with insulation.

1. Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.

D. Install new tapered insulation crickets where designated but between all drains and scuppers.

E. Mechanically fasten common fastener through tapered insulation system and base layer insulation to roof deck using proper manufactures fasteners.

1. Fasten at the rate of 16 fasteners per 4'x 8' in the field of the roof, 24 fasteners per 4'x 8' in the perimeter of the roof and 32 fasteners per 4'x 8' in the corner of the roof.

F. Adhere Cover board: Install cover board and secure to tapered system insulation using twin pack adhesive.

1. Adhere the bead spacing at the rate of 12" apart in the field for a 4' x 4" board, 6" apart in the perimeter for a 4' x 4' board and 4" apart in the corner for a 4' x 4' board on the roof

3.4 ROOFING MEMBRANE INSTALLATION, GENERAL

A. Install roofing membrane in accordance with roofing system manufacturer's written instructions, applicable recommendations of the roofing manufacturer and requirements in this Section.

B. Where roof slope exceeds 1/2 inch per 12 inches (1:24), contact the membrane manufacturer for installation instructions regarding installation direction and backnailing.

C. Cooperate with testing and inspecting agencies engaged or required to perform services for installing roofing system.

D. Coordinate installing roofing system so insulation and other components of the roofing membrane system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is imminent.

1. Provide tie-offs at end of each day's work to cover exposed roofing membrane sheets and insulation with a course of coated felt set in roofing cement or hot roofing asphalt with joints and edges sealed.
2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system.
3. Remove and discard temporary seals before beginning work on adjoining roofing.

3.5 MEMBRANE PLACEMENT AND BONDING

A. Unroll and position membrane without stretching. Allow the membrane to relax for approximately 1/2 hour before bonding. Fold the sheet back onto itself so half the underside of the membrane is exposed.

B. Apply the Bonding Adhesive in accordance with the manufacturer's published instructions, to both the underside of the membrane and the substrate. Allow the

adhesive to dry until it is tacky but will not string or stick to a dry finger touch.

1. Roll the coated membrane into the coated substrate while avoiding wrinkles. Brush down the bonded half of the membrane sheet with a soft bristle push broom to achieve maximum contact.
2. Fold back the unbonded half of the membrane sheet and repeat the bonding procedure.

C. Install adjoining membrane sheets in the same manner, overlapping edges approximately 4 inches. Do not apply bonding adhesive to the splice area.

3.6 MEMBRANE SPLICING (Factory Applied Tape Splice)

A. Overlap adjacent sheets and mark a line out from the top sheet as recommended by roof manufacturer.

B. Fold the top sheet back and clean the dry splice area of membrane sheet with Sure-Seal Primer as required by the membrane manufacturer.

C. Position 4" JM Tape to bottom sheet with the edge of the release film along the marked line. Press tape onto the sheet using hand pressure. Overlap tape roll ends a minimum of 1 inch.

D. Install additional 6" EPDM Peel & Stick Sealing Strip over seam as outlined in the manufacturer's 30 year detail requirements.

E. Remove the release film and press the top sheet onto the tape using hand pressure.

F. Roll the seam toward the splice edge with a 2 inch wide steel roller.

3.7 FLASHING

A. Wall and curb flashing shall be cured EPDM membrane. Mechanically fasten 6" wide Strip at 12" on center in accordance with manufacturer's recommendations. Continue the deck membrane as wall flashing where practicable.

B. Follow manufacturer's Platinum flashing procedures for all wall, curb, and penetration flashing including metal edging/coping and roof drain applications.

3.8 WALKWAYS

A. Install walkways at all traffic concentration points such as roof hatches, access doors, rooftop ladders, etc. Provide walk pads from the roof access point or hatch to each mechanical unit and around each mechanical unit in accordance with the equipment service requirements.

B. Install walk pads to the EPDM membrane in accordance with the manufacturer's requirements to resist wind blow-off.

3.9 DAILY SEAL

A. On phased roofing, when the completion of flashings and terminations is not achieved by the end of the workday, a daily seal must be performed to temporarily close the membrane to prevent water infiltration.

B. Manufacturer's Pourable Sealer or other acceptable membrane seal in accordance with the manufacturer's requirements.

3.10 PROTECTION AND CLEANING

A. Perform daily clean-up to collect all wrappings, empty containers, paper, and other debris from the project site. Upon completion, all debris must be disposed of in a legally acceptable manner.

B. Prior to the manufacturer's inspection for warranty, the applicator must perform a pre-inspection to review all work and to verify all flashing has been completed as well as the application of all caulking.

C. Protect roofing system from damage and wear during remainder of construction period.

D. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

E. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

3.11 FIELD QUALITY CONTROL

A. The roofing contractor shall employ and pay for a qualified inspection agent for daily inspection work for this project, **3 days per week minimum or daily as required for the warranty to be provided**. A weekly report shall be emailed weekly to the CM, Architect and Owner for their records. See Specification Section 01400, Quality Control for details.

B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion and submit report to the CM, Architect and Owner.

1. Notify Construction Manager (if applicable), Architect and Owner 48 hours in advance of the date and time of inspection.

C. Repair or remove and replace components of roofing system where test results or inspections indicate that they do not comply with specified requirements.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.13 ROOFING INSTALLER'S WARRANTY

A. WHEREAS <NAME> of <ADDRESS>, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:

1. Owner:
2. Address:
3. Building Name/Type:
4. Address:
5. Area of Work: As per the Construction Documents.
6. Acceptance Date:
7. Warranty Period: Twenty (20) years
8. Expiration Date:

B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,

C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period he will, at his own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.

D. This Warranty is made subject to the following terms and conditions:

1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:

   a. lightning;
   b. peak gust wind speed exceeding 100 mph;
   c. fire;
   d. failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
   e. faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
   f. vapor condensation on bottom of roofing; and
   g. activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.

2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof has been paid by Owner or by another responsible party so designated.
3. The Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building

contents, resulting from leaks or faults or defects of work.

4. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void, unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.
5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.
6. The Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.
7. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

END OF SECTION 07530

SECTION 07920 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes joint sealants for the following applications, including those specified by reference to this Section:

1. Exterior joints in vertical surfaces and horizontal nontraffic surfaces.
2. Interior joints in vertical surfaces and horizontal nontraffic surfaces.

1.2 PERFORMANCE REQUIREMENTS

A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

1.3 SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples: For each type and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- (13-mm-) wide joints formed between two 6-inch- (150-mm-) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

C. Preconstruction field test reports.

D. Compatibility and adhesion test reports.

E. Product test reports.

1.4 QUALITY ASSURANCE

A. Preconstruction Compatibility and Adhesion Testing: Submit samples of materials that will contact or affect joint sealants to joint-sealant manufacturers for testing according to manufacturer's standard test method to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.

B. Preconstruction Field-Adhesion Testing: Before installing elastomeric sealants, field test their adhesion to Project joint substrates according to the method in ASTM C 1193 that is appropriate for the types of Project joints.

C. Mockups: Build mockups incorporating sealant joints, as follows, to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution:

1. Joints in mockups of assemblies specified in other Sections that are indicated to receive elastomeric joint sealants, which are specified by reference to this Section.

2. All test samples shall be approved and accepted by the Owner, Architect, Construction Manager and Manufacturer's field inspection personnel. Coordinate work and testing schedule with Manufacturer's field inspection personnel.

1.5 WARRANTY

A. Special Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Installers five (5) year workmanship warranty from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer's standard form in which elastomeric sealant manufacturer agrees to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Twenty (20) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 articles or equivalent.

2.2 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.

B. VOC Content of Interior Sealants: Provide interior sealants and sealant primers that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.

C. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.3 ELASTOMERIC JOINT SEALANTS

A. Elastomeric Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

B. Stain-Test-Response Characteristics: Where elastomeric sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

C. Suitability for Immersion in Liquids. Where elastomeric sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247 and qualify for the length of exposure indicated by reference to ASTM C 920 for Class 1 or 2. Liquid used for testing sealants is deionized water, unless otherwise indicated.

D. Suitability for Contact with Food: Where elastomeric sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

E. Single-Component **Neutral-Curing** Silicone Sealant for all exterior and interior joints application except as listed for other applications:

1. Products:
   a. Dow Corning Corporation; 790.
   b. GE Silicones; SilPruf LM SCS2700.
   c. Tremco; Spectrem 1 (Basic).
   d. Or equivalent.

2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 100/50.
4. Use Related to Exposure: NT (nontraffic).
5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
6. Stain-Test-Response Characteristics: Nonstaining to porous substrates per ASTM C 1248.
7. Paintable surface.

F. Single-Component Neutral-Curing Silicone Sealant for structural glazing and aluminum framing:

1. Products:
   a. Dow Corning Corporation; 795.
   b. GE Silicones; UltraGlaze SSG4000.
   c. Polymeric Systems Inc.; PSI-631.
   d. Schnee-Morehead, Inc.; SM5731 Poly-Glaze Plus.
   e. Tremco; Proglaze SG.
   f. Tremco; Tremsil 600.
   g. Or equivalent.

2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 25.
4. Use Related to Exposure: NT (nontraffic).
5. Uses Related to Joint Substrates: G, A, and, as applicable to joint substrates indicated, O.
6. Paintable surface.

G. Single-Component Mildew-Resistant Neutral-Curing Silicone Sealant for all interior wet areas including all ceramic tiles:

1. Products:
   a. Pecora Corporation; 898.
   b. Tremco; Tremsil 600 White.
   c. Or equivalent.

2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 25.
4. Use Related to Exposure: NT (nontraffic).
5. Uses Related to Joint Substrates: G, A, and, as applicable to joint substrates indicated, O.

2.4 ACOUSTICAL JOINT SEALANTS – For all interior paintable gypsum / wood joints.

A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 that effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

1. Products:
   a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
   b. United States Gypsum Co.; SHEETROCK Acoustical Sealant.
   c. or equivalent.

B. Acoustical Sealant for Concealed Joints: Manufacturer's standard, nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant recommended for sealing interior concealed joints to reduce airborne sound transmission for concealed gypsum / wood joints.

1. Products:
   a. Pecora Corporation; BA-98.
   b. Tremco; Tremco Acoustical Sealant.
   c. or equivalent.

2.5 JOINT-SEALANT BACKING

A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), O (open-cell material), B (bicellular material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:

C. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 26 deg F (minus 32 deg C). Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and to otherwise contribute to optimum sealant performance.

D. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.6 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants.

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant.

    a. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air.

2. Remove laitance and form-release agents from concrete.

a. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.

B. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.2 INSTALLATION

A. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

B. Acoustical Sealant Application Standard: Comply with recommendations in ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
4. Complete sealant all the way of the full joint length, everywhere.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.

G. Installation of Preformed Silicone-Sealant System: Comply with manufacturer's written instructions.

H. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

I. Conditions that should be avoided when working with Silicone Building Sealant:

1. **DO NOT** "wet tool" with solvents or soaps as this can inhibit the surface of this sealant, the rest of the sealant bulk may cure normally but the surface will remain tacky and gummy indefinitely.
2. **DO NOT** apply this sealant to a backer rod that is contaminated with solvent or primer.
3. **DO NOT** apply this sealant to a surface that has been cleaned with a solvent or primer.
4. **DO NOT** apply this sealant to EPOXY containing surfaces (unless they have been tested by The Americas Construction Test Lab) since they can inhibit the cure.

J. Do not use silicone sealant for:

1. Below-grade applications.
2. Surfaces to be immersed in water for prolonged time.
3. Brass and copper surfaces.
4. Materials bleeding oils, plasticizers, and solvents.
5. Structural glazing and adhesive.
6. Surfaces to be painted.
7. Surfaces in direct contact with food.
8. Medical and pharmaceutical applications.

K. Do not apply in totally confined spaces without ventilation for curing.

END OF SECTION 07920

SECTION 08100 – FRP FIBERGLASS DOORS

1.0 GENERAL DESCRIPTION

A. WORK INCLUDED: The fiberglass doors and aluminum sub-frames required for this work are indicated on the drawings and include, but is not necessarily limited to:

1. The installation of new opening systems that include aluminum sub-frames, fiberglass doors, fiberglass panels, door hardware and glass.

2. Only wide stile fiberglass doors are to be used.

1.1 QUALITY ASSURANCE

A. MANUFACTURER'S CERTIFICATION: Manufacturer is to have a minimum of 10 years experience in the production of pre-installed hardware and pre-assembled door systems, using the type of materials specified for this project.

B. DISSIMILAR METALS: Wherever aluminum is in contact with steel, concrete or other materials potentially creative of electrolytic action, provide all required permanent isolation of the aluminum by back painting with first-quality bituminous paint.

C. INSTALLER'S QUALIFICATIONS: For the installation of the entrance systems, use only mechanics who are thoroughly trained and experienced in the skills required and who are completely familiar with the manufacturer's recommended methods of installation plus the requirements of this work.

D. WARRANTY:

1. System manufacturer will guarantee THE ENTIRE SYSTEM FOR A PERIOD OF 10 YEARS.
2. The Fiberglass doors are guaranteed for 10 YEARS AGAINST CORE RELATED PRODUCT FAILURE.
3. Warranties are to be in writing and MUST be submitted before final invoices for payment will be reviewed.

1.2 TESTING AND PERFORMANCE REQUIREMENTS

A. Entrance systems to be supplied and installed that will comply with requirements for system performance characteristics as determined by the testing methods listed.

B. Copies of recent test reports must accompany the Product Data Submittal package, the reports required for this project are as follows:

1. Thermal Performance Test
2. Structural Performance Test
3. FRP Face Sheet Test

C. Thermal Performance for complete Door and Frame Entry System:

1. Thermal Transmission: U-value of not more than 0.28,BTU/HR-FT-F per AAMA 1503.1-1988.

2. Air Infiltration: Not more than 0.26 CFM/FT, per ASTM E283-91.

D. FRP FACE SHEETS AND CORE PERFORMANCE:

1. Materials to be tested in accordance with (per ASTM E84) Ratings will be as follows: (per ASTM E84-79a)

	FLAME SPREAD	SMOKE DEVELOPED
FRP EXTERIOR (Class C)	145	345
FRP INTERIOR (Class A)	10	320
POLYSTYRENE CORE	15	125

2. IMPACT STRENGTH OF FRP Face Sheets-per ASTM D256-Izod Impact Strength, Maintains 95% of physical Flexural Strength after 30 months of outdoor exposure. 13.5

3. Barcol Meter Hardness test on FRP Face Sheets-not more than 50, per ASTM D2583.

4. COLOR RETENTION of FRP Face Sheets-Color will not change more than 5.0 DE units after exposure to 500,000 Langleys.

1.3 MANUFACTURERS

A. ACCEPTABLE MANUFACTURERS: The products outlined in this specification are not the exclusive property of any one manufacturer. However, it should be noted that the manufacturers, listed in this specification, will have to make some modifications to their standard products, and, that new dies and designs may be required to adhere to the demands of this specification.

Products are to be from FRP Architectural Doors, Inc Series Heavy Wall FD55. Fire Rated FRP Doors Series FR45/60/90. Other acceptable manufactures provided they adhere to specification are Curries Assa/Abloy or equivalent. FRP doors must incorporate Kemlite RFP face sheet with extended U/V protection or equivalent.

1.4 SUBMITTALS

A. PRODUCT DATA:

1. Submit manufacturer's technical data for each type stile classification of door. Include all frame sections, elevations and details.

2. Include details of: Main frame corner joint construction on doors, stile and rail size, core material, vision lite moldings, louvers and factory finishing specifications.

3. Submit two samples of each door stile classification that shows rails, stiles, core, joint construction, edge trim and closer reinforcing.

4. Submit manufacturer of FRP face sheets.

B. TEST REPORTS: Two copies of current test reports are to be included with the submittals.

C. SHOP DRAWINGS: Submit signed and sealed shop drawings and calculations by a NJ registered professional engineer for the fabrication and installation of the Doors and Frames, and associated components of the work. Include wall elevations and detail sections of every typical composite member. Show frame anchoring, frame repairs to existing frames, glazing details, interior and exterior wall repairs and any other component or accessory required to complete each door opening.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

A. IDENTIFICATION: Each door and frame will be tagged with a mark or number which correlates with designation system used for shop drawings.

B. PROTECTION: All materials will be protected during transit and storage from soiling and deterioration.

2.0 DOORS, FRAMES AND PANELS

2.1 CLASSIFICATIONS OF DOOR SYSTEMS, FRAMES AND PANELS:

A. Door systems for this project are based on the following stile classification. Pre-approved manufacturers who have a standard product offering in that classification are listed.

B. Classifications are as follows:

FRP Architectural Doors, Inc Series Heavy Wall FD55. Fire Rated FRP Doors Series FR45/60/90. Other acceptable manufactures provided they adhere to specification are Vale V600, Curries Assa/Abloy or equivalent.

2.2 MATERIALS

A. ALUMINUM MEMBERS:

1. Doors, sub-frames, miscellaneous components and entrance systems accessories are to be **by the same manufacturer**.

2. Provide alloy and temper as recommended for resistance to corrosion and color control. Aluminum member references are ASTM B 221 for extrusions and ASTM B 209 for sheets.

2.3 ALUMINUM FRAMES & CLADDING:

A. Refer to Storefront Specification Section 08411 for door frame requirements including signed and sealed shop drawings and calculations.

1. VERTICAL MEMBERS-All sub-frames will be full height of opening.

B. ALUMINUM COLOR FINISH: As specified in Storefront Specification Section 08411.

2.4 FIBERGLASS (FRP) FACE SHEETS

A. THICKNESS AND COLOR:

1. FRP face sheets will be .120 minimum thickness with a pebble-like surface with aluminum or galvanized steel backing sheet to meet current IBC code requirements. Face sheets shall be manufactured by Kemlite with extended UV protection or equivalent.

2. COLOR shall be selected from the full range of available manufacturer's options.

2.5 FIBERGLASS (FRP) PANELS

A. ALUMINUM EDGED FIBERGLASS (FRP) PANELS:

1. CONSTRUCTION: Panels will be constructed of two sheets of .120 fiberglass sheets bonded to ¾" core material. Panel thickness will be 1-3/4". A 1-3/4" x 2" x 1/8" wall thickness aluminum frame surrounds the perimeter of the panel.

WOOD EDGED PANELS WILL NOT BE ACCEPTED.

2. CORE MATERIAL: Core Insulation will be high density expanded polystyrene. Core to have compressive strength ASTM D1621 - 25psi density with a nominal R-Value of 6.5. Core material must have a proven record for use in door fabrication without delaminating. Fill all openings, including frames.

POLYSTYRENE CORES ARE REQUIRED.

3. COLOR shall be selected from the full range of available manufacturer's options.

4. FIXED FRP PANEL: Panel will be two sheets of .120 fiberglass sheets bonded to 3/4" core material. Panel thickness shall be 1".

3.0 EXECUTION and INSTALLATION

A. SIZES AND PROFILES: the sizes for door and frame units and profile requirements as listed or shown in these Specifications are approximate. All bidders are responsible for visiting job site and measuring each tag for bidding purposes.

B. EXACT ORDER SIZES: ALL PROPER MEASURING AND ORDERING OF MATERIALS IS THE SOLE RESPONSIBILITY OF THE SUPPLIER/INSTALLER.

C. TOLERANCES between doors and frames are 1/8" around all sizes of single doors and 1/8" on hinge jambs and header with 3/16" in center of pairs, ¼" at threshold.

D. NOTIFY OWNER at least 48 hours before schedule date of installation for each opening and for each day of work.

E. PROVIDE barrier protection and warning signs around each opening before starting to work. This protection is for the people who may be using the building while the work is in progress.

F. COMPLY with all life safety code procedures that effect the use of the opening while work is being done. These procedures will be provided by an official of the building being worked on.

G. SET NEW THRESHOLDS in a bed of cement and press to a level line. However, never let threshold be raised more than an extra ½" on any one side.

H. PERIMETER CAULK new door frame on both sides of frame and with a matching color caulk to the finish of the frame.

I. INSTALLERS ARE TO CLEAN up every day leaving area in a safe and usable condition.

END OF SECTION 08100

SECTION 08105- STEEL FRAMES

1.1 GENERAL

A. Submit Product Data for each type of frame specified.

B. Quality Assurance: Comply with ANSI/SDI 100.

C. Fire-Rated Door Assemblies: NFPA 80, identical to assemblies tested per ASTM E 152, and labeled and listed by UL, Warnock Hersey, or another testing and inspecting agency acceptable to authorities having jurisdiction.

1.2 PRODUCTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or equivalent:

1. Amweld Building Products, Inc.
2. Benchmark Commercial Doors.
3. Ceco Door Products.
4. Copco Door Co.
5. Curries Co.
6. Deansteel Manufacturing Co.
7. Fenestra Corp.
8. Kewanee Corp.
9. Mesker Door, Inc.
10. Pioneer Industries.
11. Republic Builders Products.
12. Steelcraft.
13. Or equivalent.

B. Cold-Rolled Steel Sheets: ASTM A 366 (ASTM A 366M), commercial quality, or ASTM A 620 (ASTM A 620M), drawing quality.

C. Galvanized Steel Sheets: ASTM A 526 (ASTM A 526M), commercial quality, or ASTM A 642 (ASTM A 642M), drawing quality, with A 60 or G 60 (Z 180 or ZF 180) coating designation, mill phosphatized.

D. Frames: Provide frames for doors, sidelights, borrowed lights, and other openings that comply with ANSI/SDI 100; fabricate to be rigid, neat in appearance, and free from defects, warp, or buckle.

1. For interior frames provide units with mitered or coped and continuously welded corners, formed from 16 gage thick cold-rolled steel.
2. For exterior frames provide units with mitered or coped and continuously welded corners, formed from 16 gage thick galvanized steel sheet.
3. Door Silencers: 3 on strike jambs of single-door frames and 2 on heads of double-door frames.
4. Plaster Guards: Provide where mortar might obstruct hardware operation and to close off interior of openings.
5. For new frame install in existing opening. Knock down frame is allowed to secure to existing opening.

E. Tolerances: Comply with SDI 117.

F. Hardware Preparation: Prepare doors and frames to receive mortised and concealed hardware according to SDI 107 and the hardware specification.

G. Finishes, General: Comply with NAAMM's "Metal Finishes Manual" for recommendations relative to applying and designating finishes.

1. Apply primers to frames after fabrication.

H. Galvanized Steel Sheet Finishes: Comply with SDI 112 and the following:

1. Surface Preparation: Clean surfaces with nonpetroleum solvent so that surfaces are free of oil or other contaminants. After cleaning, apply a conversion coating of the type suited to the organic coating applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified to comply with ASTM A 780.
2. Galvanizing Repair Paint: SSPC-Paint 20, high-zinc-dust-content paint with dry film containing not less than 94 percent zinc dust by weight.
3. Factory Priming for Field-Painted Finish: Where field painting after installation is indicated, apply air-dried primer specified below immediately after cleaning and pretreatment.

a. Shop Primer: Zinc-dust, zinc-oxide primer paint complying with performance requirements of FS TT-P-641, Type II.

4. Field Painted Finish: Immediately after cleaning and pretreating, apply 2-coat finish consisting of prime coat and finish coat. See Section 09900, "Painting."

a. Color and Gloss: Match Architect's sample.

I. Steel Sheet Finishes: Comply with SSPC-PA 1, "Paint Application Specification No. 1."

1. Surface Preparation: Solvent-clean surfaces according to SSPC-SP 1. Remove mill scale and rust to comply with SSPC-SP 5 (White Metal Blast Cleaning) or SSPC-SP 8 (Pickling).
2. Pretreatment: Immediately after surface preparation, apply a conversion coating suited to organic coating applied over it.
3. Factory Priming for Field-Painted Finish: Apply shop primer that complies with ANSI A224.1 acceptance criteria, is compatible with finish paint systems indicated, and has capability to provide a sound foundation for field-applied topcoats. Apply primer immediately after surface preparation and pretreatment.

a. Color and Gloss: Match Architect's sample.

1.3 EXECUTION

A. General: Install steel doors, frames, and accessories according to Shop Drawings, manufacturer's data, and as specified.

B. Placing Frames: Comply with provisions of SDI 105, unless otherwise indicated. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set.

1. Except for frames located in existing concrete, masonry, or gypsum board assembly construction, place frames before constructing enclosing walls and ceilings.
2. Install at least 3 anchors per jamb adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb.
3. In-place gypsum board partitions, install knock-down, slip-on, drywall frames.
4. Install fire-rated frames according to NFPA 80.
5. Coordinate installation of all required wiring/conduit prior to frame installation.

C. Door Installation: Fit new wood doors accurately in new hollow-metal frames, within clearances specified in ANSI/SDI 100, including new door in existing frame.

1. Fire-Rated Doors: Install with clearances specified in NFPA 80.

D. Prime Coat Touchup: Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touchup of compatible air-drying primer.

E. Protection Removal: Immediately before final inspection, remove protective wrappings from doors and frames.

END OF SECTION 08110

SECTION 08211 - FLUSH WOOD DOORS

1.1 GENERAL

A. Submittals: In addition to product data, submit the following:

1. 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 veneer matching and factory finishing and other pertinent data. For factory-machined doors, indicate dimensions and locations of cutouts for locksets and other cutouts adjacent to light and louver openings.
2. Samples of actual materials in small sections for each face material and finish.

B. Quality Standard: Comply with the following standard:

1. NWWDA Quality Standard: I.S.1-A, "Architectural Wood Flush Doors," of the National Wood Window and Door Association.
2. AWI Quality Standard: "Architectural Woodwork Quality Standards" of the Architectural Woodwork Institute.

C. Fire-Rated Wood Doors: Provide wood doors labeled and listed by UL, Warnock Hersey, or another testing and inspection agency acceptable to authorities having jurisdiction. Provide certification for fire rating required acceptable to authorized agencies having jurisdiction for oversize fire rated doors over 4'-0" wide

D. Warranty

1. Provide manufacturer's warranty to the following term:

a. Interior Solid Core Doors: "Full Life of Original Installation" including rehang and refinish if door(s) do not comply with Warranty tolerance standards.

1.2 PRODUCTS

A. Manufacturers: Subject to compliance with requirements, provide doors by one of the following or equivalent:

1. Marshfield Door Systems, Inc., quality as defined in this section.
2. Algoma Wood Doors Inc., quality as defined in this section.
3. Eggers Wood Doors Inc., quality as defined in this section.
4. Mohawk Wood Doors Inc., quality as defined in this section.
5. V-T Industries Inc., quality as defined in this section.
6. Buell Door Company, quality as defined in this section.
7. Masonite (Marchfield division of Masonite)

B. Interior Solid Core Doors for Transparent Finish: As follows:
NOTE: ALL WOOD VENEER MUST APPEAR UNIFORM AND LIGHT IN APPEARANCE

1. Faces: Select White Birch, plain sliced.
2. Grade: "A" Select White ONLY

3. Construction: 5 plies.
4. Core: Structural composite lumber (engineered composite core)
5. Bonding: Stiles and rails bonded to core, then entire unit abrasive planed before veneering.

C. Interior Fire-Rated Solid Core Doors: As follows:

1. Faces and Grade: Provide faces and grade to match non-fire-rated doors in same area of building, unless otherwise indicated.
2. Edge Construction: Provide manufacturer's standard laminated-edge construction for improved screw-holding capability and split resistance.
3. Pairs: Furnish formed-steel edges and astragals for pairs of fire-rated doors, unless otherwise indicated.
4. Pairs: Provide fire-rated pairs with fire-retardant stiles that are labeled and listed for kinds of applications indicated without formed-steel edges and astragals.

D. Pairs and Sets: Provide pair matching and set matching.

E. Fabricate flush wood doors to comply with following requirements:

1. In sizes indicated for job-site fitting.
2. Factory fit doors to comply with clearance requirements of referenced quality standard. Comply with requirements of NFPA 80 for fire-resistance-rated doors.
3. Factory machine doors for hardware that is not surface applied.

    a. Metal Removable Mullions: Pre-machine locks and formed-steel edges for hardware for pairs of doors requiring removable mullions. See the Hardware Schedule.

4. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of door(s) required.

    a. Light Openings: Trim openings with moldings of material and profile indicated. * To be selected from manufacturer's standard profiles and colors unless noted otherwise. At existing buildings, metal trim shall be required to match adjacent existing to remain.
    b. Louvers: Factory install louvers in prepared openings.

5. Provide metal flashing at top of out swinging units.

F. Finish wood doors at factory as factory finished.

1. Transparent Finish: Comply with requirements indicated for grade, finish system, staining effect, and sheen.

    a. Grade: Custom.
    b. Finish: Manufacturer's standard finish with performance requirements comparable to either AWI System TR-2 catalyzed lacquer or AWI System TR-4 conversion varnish.
    c. Staining: Match Architect's sample or existing schools' wood doors.

d. Effect: Filled finish.
e. Sheen: Semigloss.

G. Provide soundproof seal as noted in the Hardware Schedule. Adjust Hardware and frame to align properly to have the best acoustical effect.

1.3 EXECUTION

A. Examination

1. Verify substrate-openings conditions.
2. Verify that opening sizes and tolerances are acceptable and ready to receive this work.
3. Do not install doors in frame openings that are not plumb or are out of tolerance for size or alignment.

B. Installation

1. Install fire-rated and non-rated doors in accordance with NFPA 80, manufacturers' instructions and fire rated labeling requirements.
2. Trim non-rated door width by cutting equally on both jamb edges.
3. Trim door height by cutting bottom edges to a maximum 3/4 inch (19mm).
4. Trim fire door height at bottom edge only, in accordance with fire rating requirements.
5. Pilot drill screw and bolt holes using templates provided by hardware manufacturer. (Use threaded through bolts for half surface hinges.)
6. Coordinate installation of doors with installation of frames and hardware.
7. Coordinate installation of glass and glazing.
8. Install door louvers and light kits plumb and level.
9. Reseal or refinish any doors that required site alteration.

C. Warranty Tolerances

1. Conform to WDMA standards and testing methods for warp, cup, bow and telegraphing.

D. Adjusting

1. Adjust work under provisions Division 1.
2. Adjust doors for smooth and balanced door movement.

E. Door and Frame Components Schedules

1. Refer to door and frame schedule.

END OF SECTION 08211

SECTION 08411 - ALUMINUM-FRAMED CURTAIN WALL, ENTRANCES, AND STOREFRONTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Special Conditions and other Division 0 and Division 1 Project Manual Sections, apply to this Section.

1.2 DESCRIPTION OF WORK

A. This Section Includes:

1. Exterior curtain wall framing.
2. Exterior and interior manual-swing entrance doors and door-frame units.
3. Exterior & interior storefronts.

1.3 DEFINITIONS

A. ADA/ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disability Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities."

1.4 PERFORMANCE REQUIREMENTS

A. General Performance: Aluminum-framed systems shall withstand the effects of the following performance requirements without exceeding performance criteria or failure due to defective manufacture, fabrication, installation, or other defects in construction:

1. Movements of supporting structure indicated on Drawings including, but not limited to, story drift and deflection from uniformly distributed and concentrated live loads.
2. Dimensional tolerances of building frame and other adjacent construction.
3. Failure includes the following:

    a. Deflection exceeding specified limits.
    b. Thermal stresses transferring to building structure.
    c. Framing members transferring stresses, including those caused by thermal and structural movements to glazing.
    d. Noise or vibration created by wind and by thermal and structural movements.
    e. Loosening or weakening of fasteners, attachments, and other components.
    f. Sealant failure.
    g. Failure of operating units.

B. Structural Loads:

1. Wind Loads: Provide entrance and storefront systems, including anchorage, capable of withstanding wind-load design pressures calculated according to requirements of authorities having jurisdiction or the American Society of Civil Engineers' ASCE 7 "Minimum Design Loads for Buildings and Other Structures," 6.4.2, "Analytical Procedure," whichever are more stringent.
2. Seismic Loads: IBC 2009, NJ Edition.
3. Design wind load velocity at the project site is 100 mph
4. The wind load design pressures for this project are 27.5 psf @ non-corner zones and 35 psf @ corner zones.

C. Deflection of Framing Members:

1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane shall not exceed L/240 + ¼" at openings greater than 13'6" and shall not exceed L/175 at openings lesser than 13'6" of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to 3/4 inch (19 mm), whichever is less.
2. Deflection Parallel to Glazing Plane: Limited to L/360 of clear span or 1/8 inch (3.2 mm), whichever is smaller.

D. Structural-Test Performance: Provide aluminum-framed systems tested according to ASTM E 330 as follows:

1. When tested at positive and negative wind-load design pressures, systems do not evidence deflection exceeding specified limits. The maximum wind load design pressure for this project is 35 psf.
2. When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity, but not fewer than 10 seconds.

E. Air Infiltration: Provide aluminum-framed systems with maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft. (0.03 L/s per sq. m) of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 6.24 lbf/sq. ft. (75 Pa).

F. Water Penetration under Static Pressure: Provide aluminum-framed systems that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. (300 Pa). The storefront systems shall have a maximum no leakage water performance of 12 psf and the curtain wall systems shall have a maximum no leakage water performance of 15 psf.

G. Thermal Movements: Provide aluminum-framed systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
2. Interior Ambient-Air Temperature: 75 deg F (24 deg C).

H. Condensation Resistance: Provide aluminum-framed systems with fixed glazing and framing areas having condensation-resistance factor (CRF) of not less than 57 for the framing when tested according to AAMA 1503-98.

I. Thermal Conductance: Provide aluminum-framed systems with fixed glazing and framing areas having an average U-factor of not more than 0.55 Btu/sq. ft. x h x deg F (3.92 W/sq. m x K) when tested according to AAMA 1503-98.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for aluminum-framed systems.

B. Shop Drawings: For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work.

1. Include details of provisions for system expansion and contraction and for drainage of moisture in the system to the exterior.

2. Submit to architect approved shop drawings for Structural Stamp & Calculations provided by Professional Engineer registered in the state of New Jersey for all local jurisdiction codes and wind velocities indicated. Calculations shall indicate the adequacy of the storefront and curtain wall systems perimeter anchors & attachments and the structural integrity of the fenestration system framing members. The final shop drawings must be readable for field personnel to use as an installation guideline regarding fastener type and locations.

C. Samples for Initial Selection: For units with factory-applied color finishes.

D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

E. Fabrication Sample: Of each vertical-to-horizontal intersection of aluminum-framed systems, made from 12-inch (300-mm) lengths of full-size components and showing details of the following:

1. Joinery, including concealed welds.
2. Anchorage.
3. Expansion provisions.
4. Glazing.
5. Flashing and drainage.

F. Other Action Submittals:

1. Entrance Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.

G. Qualification Data: For qualified Installer.

H. Welding certificates.

I. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for aluminum-framed systems, indicating compliance with performance requirements.

J. Source quality-control reports.

K. Maintenance Data: For aluminum-framed systems to include in maintenance manuals.

L. Warranties: Submit a copy of the Manufacturer's Special Ten (10) year Warranty.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative is to verify installation contractor's approval for ability to complete installation of units required for this Project.

B. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.

1. Do not revise intended aesthetic effects as judged solely by the architect, except with architect's approval. If revisions or substitutions are proposed, submit comprehensive explanatory data to architect within thirty (30) days of Notice to Proceed per Specification Section 01300, "Submittals". After thirty (30) days, no substitution products will be considered.

2. No stock length materials will be allowed for this project. All materials are to be factory fabricated by the manufacturer at their facility in order to be utilized for this project

C. Accessible Entrances: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

D. Single-Source Responsibility: Provide windows, storefront, entrance doors, curtain wall and related fenestration system sections, as well as all necessary accessories from one source and produced by a single manufacturer.

E. Welding Qualifications: Qualify procedures and personnel according to AWS D1.2, "Structural Welding Code - Aluminum."

F. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockup of typical wall area as shown on Drawings.
2. Field testing shall be performed on mockups according to requirements in "Field Quality Control" Article.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of structural supports for aluminum-framed systems by field measurements before fabrication and indicate measurements on Shop Drawings.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Failure to meet performance requirements.
   b. Structural failures including excessive deflection, water leakage, air infiltration, or condensation.
   c. Faulty operation of movable sash and hardware.
   d. Deterioration of metals, other materials, & metal finishes beyond normal weathering.
   e. Failure of insulating glass.
   f. Noise or vibration caused by thermal movement
   g. Water Leakage through fixed glazing and framing areas

2. Warranty Period: Ten (10) years from date of Substantial Completion.

B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes do not comply with requirements or that fail in materials or workmanship within specified warranty period. Warranty does not include normal weathering.

1. Warranty Period: 10 years from date of Substantial Completion.

1.9 MAINTENANCE SERVICE

A. Entrance Door Hardware:

1. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of entrance door hardware.
2. Initial Maintenance Service: Beginning at Substantial Completion, provide six months' full maintenance by skilled employees of entrance door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper entrance door hardware operation at rated speed and capacity. Provide parts and supplies the same as those used in the manufacture and installation of original equipment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following or equivalent:

1. Efco Corporation, a Pella Company.
2. Wausau Window & Wall Systems.
3. Oldcastle Building Envelope Systems.

B. Basis of Design Products: Subject to compliance with requirements, provide Efco products; series 401, 402, & 403 storefronts and entrance packages series D500 entrance doors.

2.2 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

1. Sheet and Plate: ASTM B 209 (ASTM B 209M).
2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
3. Extruded Structural Pipe and Tubes: ASTM B 429.
4. Structural Profiles: ASTM B 308/B 308M.
5. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.

2.3 FRAMING SYSTEMS

A. Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Construction: storefront systems are screw spline construction and curtain wall systems are shear block construction.
2. Glazing System: Retained mechanically with gaskets on four sides.
3. Glazing Plane: As indicated on architectural drawings.

B. Framing Members, General:

1. All storefront members shall have a minimum wall thickness of .080". The face dimension for the storefront system will be not less than 2" and the frame depth will not be less than 4 ½". All exposed work shall be carefully matched to produce continuity of line and design with all joints. System design will be such that raw edges will not be visible at joints.

2. Efco Model D500 Entrance Doors and 401, 402 & 403 Storefront, or equivalent. No stocklength materials will be allowed for this project. All materials are to be factory fabricated by the manufacturer at their facility in order to be utilized for this project.

3. Any manufacturer bidding this project with their storefront & curtain wall systems must provide their own internal steel reinforcement members as required to meet the project wind load design criteria and a minimum 35 psf wind load design pressure.

C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

D. Fasteners and Accessories: Provide nonmagnetic stainless steel or ceramic coated fasteners warranted by the fenestration system installer to be non-corrosive and accessories compatible with adjacent materials.

1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
2. Reinforce members as required to receive fastener threads.

E. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts, complying with ASTM A 123/A 123M or ASTM A 153/A 153M.

F. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials. Form exposed flashing from sheet aluminum finished to match framing and of sufficient thickness to maintain a flat appearance without visible deflection.

G. Framing System Gaskets and Sealants: Manufacturer's standard, recommended by manufacturer for joint type.

2.4 GLAZING SYSTEMS

A. Glazing: As specified in Division 08 Section "Glazing."

B. Glazing Gaskets: Manufacturer's standard compression types; replaceable, molded or extruded, of profile and hardness required to maintain watertight seal.

C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.

2.5 ENTRANCE DOOR SYSTEMS

A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation. Basis of design is Efco series D500 Wide Stile Doors.

1. Major portion of the door sections shall have a .125" (3 mm) wall thickness. Glazing stop sections shall have a .050" (1.2 mm) wall thickness.
2. Door stiles shall be no less than 5" (127 mm) wide (not including glass stops). Door sill shall have 12" high section.
3. Door stiles and rails shall have hairline joints at the corners. Heavy concealed reinforcement brackets shall be secured with screws and shall be installed in one stile of pairs of doors and in jamb stiles of center pivoted doors.
4. Doorstops shall include a bulb weather-strip that complies with ASTM E 2203 specification.
5. Glazing Stops and Gaskets: Manufacturer's standard compression types, replaceable, that maintain uniform pressure and watertight seal, snap-on, extruded-aluminum stops and preformed gaskets.

B. Entrance Door Hardware: As specified in Division 08 Section "Door Hardware."

2.6 ACCESSORY MATERIALS

A. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Division 07 Section "Joint Sealants."

B. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30-mil (0.762-mm) thickness per coat.

2.7 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.

2. Accurately fitted joints with ends coped or mitered.
3. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
4. Physical and thermal isolation of glazing from framing members.
5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
6. Provisions for field replacement of glazing from interior for vision glass and exterior for spandrel glazing or metal panels.
7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

E. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.

1. At exterior doors, provide compression weather stripping at fixed stops.
2. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.

F. Entrance Doors: Reinforce doors as required for installing entrance door hardware.

1. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
2. At exterior doors, provide weather sweeps applied to door bottoms.

G. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.

H. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.8 ALUMINUM FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designing finishes.

B. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

C. High Performance Organic Finish: AA-C12C42R1X (Chemical Finish: Cleaned & inhibitive chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer' written instructions.

1. Fluoropolymer two coat system: Manufacturer's standard two-coat, thermocured system consisting of specifically formulated inhibitive primer and fluoropolymer color topcoat

containing not less than 70% polyvinylidene fluoride resin by weight; complying with AAMA 2605. Architect is to select a custom color (non-metallic / non-exotic), which the fenestration system manufacturer can match 'in house". Architect will select the custom color during the shop drawing review process.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General:

1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure nonmovement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
6. Seal joints watertight unless otherwise indicated.

B. Metal Protection:

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or applying sealant or tape, or by installing nonconductive spacers as recommended by manufacturer for this purpose.
2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.

D. Set continuous sill members and flashing in full sealant bed as specified in Division 07 Section "Joint Sealants" to produce weathertight installation.

E. Install components plumb and true in alignment with established lines and grades, and without warp or rack.

F. Install glazing as specified in Division 08 Section "Glazing."

G. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.

1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

H. Install perimeter joint sealants as specified in Division 07 Section "Joint Sealants" to produce weathertight installation.

3.3 ERECTION TOLERANCES

A. Install aluminum-framed systems to comply with the following maximum erection tolerances:

1. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet (3 mm in 3.7 m); 1/4 inch (6 mm) over total length.
2. Alignment:

    a. Where surfaces abut in line, limit offset from true alignment to 1/16 inch (1.5 mm).
    b. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch (0.8 mm).

B. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch (3 mm).

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Owner may engage a qualified independent testing and inspecting agency to perform field tests and inspections.

B. Testing Services: Testing and inspecting of representative areas to determine compliance of installed systems with specified requirements shall take place as follows. Do not proceed with installation of the next area until test results for previously completed areas show compliance with requirements.

1. Water Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.

    a. Test Area: A minimum area of 75 feet (23 m) by 1 story of aluminum-framed systems. Field Test to be in accordance with Test Method "A" under AAMA 501.2.

C. Repair or remove work if test results and inspections indicate that it does not comply with specified requirements.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

E. Aluminum-framed assemblies will be considered defective if they do not pass tests and inspections.

F. Prepare test and inspection reports.

3.5 ADJUSTING

A. Adjust operating entrance door hardware to function smoothly as recommended by manufacturer.

1. For entrance doors accessible to people with disabilities, adjust closers to provide a 3-second closer sweep period for doors to move from a 70-degree open position to 3 inches (75 mm) from the latch, measured to the leading door edge.

3.6 CLEANING

A. Adjust doors and hardware to provide tight fit at contact points and weather stripping, smooth operation, and weather tight closure.

B. Remove excess sealant and glazing compounds, and dirt from surfaces.

3.7 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure entrance and storefront systems are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 08411

SECTION 08520 – ALUMINUM PROJECTION WINDOWS

PART 1 - GENERAL

PART 1.1 General Requirements

A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Special Conditions and other Division-0 and Division-1 Project Manual Sections, apply to this Section.

PART 1.2 Section Includes

A. Work of this Section includes all labor, materials, equipment and services necessary to complete the aluminum projection windows as shown on the Drawings and/or specified herein, including but not limited to, the following:
   1. Aluminum fixed and project out combination window systems.
   2. Anchors, hardware and accessories including extruded subframe and interior extruded trim pieces.

PART 1.3 Definitions

A. AW: Architectural Grade; thermal break and glazing.

B. Performance grade number, included as part of the ANSI/AAMA product designation code is actual design pressure in pounds force per square foot (pascals) used to determine structural test pressure and water test pressure.

C. Structural test pressure, for uniform load structural test, is equivalent to 150 percent of design pressure.

D. Minimum test size is smallest size permitted for performance class (gateway test size). Products must be tested at minimum test size or at a size larger than minimum test size to comply with requirements for performance class.

PART 1.4 Performance Requirements

A. General: Provide aluminum windows capable of complying with performance requirements indicated, based on testing manufacturer's windows that are representative of those specified and that are of test size indicated below:
   1. Minimum size required by ANSI/AAMA 101/1.5.2-97.

B. ANSI/AAMA 101-97 Performance Requirements: Provide aluminum windows of the performance class and grade indicated that comply with ANSI/AAMA 101-97.
   1. Performance Class: AW
   2. Performance Grade: Minimum for performance class indicated. (105)
   3. Testing performed according to ANSI/AAMA 101-97, Uniform Load Deflection Test ASTM E 330.

C. Structural Performance: Provide aluminum windows capable of withstanding the following, including wind loads based on passing ASTM E330, Uniform Load Structural Test, at basic wind speed indicated:

1. Design Criteria:
   a. Exposure: 'C'
   b. Importance factor: 1.15
   c. Wind load: 100 mph
   d. SHEG II A/v=0.10
   e. SPC C A/a=0.10

D. Air Infiltration: Maximum rate not more than indicated when tested according to ASTM E 283, Air Infiltration Test.
   1. Maximum Rate: 0.1 cfm/sq.ft. (2 cu. m/h x sq.m) of area at an inward test pressure of 6.24 lbf/sq.ft. (300 Pa).

E. Water Resistance: No water leakage as defined in AAMA/NWWDA referenced test methods at a water test pressure equaling that indicated, when tested according to ASTM E 331/ASTM E 547, Water Resistance Test.
   1. Test Pressure: 15 static air pressure difference of 12.0 psf.

F. Condensation-Resistance Factor: Provide aluminum windows tested for thermal performance according to AAMA 1503, showing a CRF of 71 for the frame.

G. Thermal Transmittance: Provide aluminum windows with a whole-window U-value maximum indicated at 15-mph (24-km/h) exterior wind velocity and winter condition temperatures when tested according to AAMA 1503.
   1. U-Value: 0.45 Btu/sq.ft. X h x deg F (W/sq.m x K).

H. Thermal Movements: Provide aluminum windows, including anchorage, that accommodate thermal movements of units resulting from the following maximum change (range) in ambient and surface temperatures without buckling, distortion, opening of joints, failure of joint sealants, damaging loads and stresses on glazing and connections, and other detrimental effects. Base engineering calculation on actual surface temperatures of materials due to solar heat gain and nighttime sky heat loss.
   1. Temperature Change (Range): 120 deg F (67 deg C), ambient.

I. Projected Windows: Comply with ANSI/AAMA 101-97 for the following tests:
   1. Torsion Test.
   2. Horizontal Concentrated Load Test on Latch Rail.
   3. Vertical Concentrated Load Test on Latch Rail.
   4. Torsion Load Test on Intermediate Frame Rails.
   5. Vertical Concentrated Load Test on Intermediate Frame Rails.
   6. Balance Arm Load Test.

PART 1.5 Submittals

A. Product Data: Include construction details, material descriptions, fabrication methods, dimensions of individual components and profiles, hardware, finishes, and operating instructions for each type of aluminum window indicated.

B. Shop Drawings: Include plans, elevations, sections, details, hardware, attachments to other work, operational clearances, and the following:

1. Mullion details, including reinforcement and stiffeners.
2. Joinery details.
3. Expansion provisions.
4. Flashing and drainage details.
5. Weather-stripping details.
6. Thermal-break details.
7. Glazing details.
8. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation and used to determine the following:
   a. Structural test pressures and design pressures from basic wind speeds indicated.
   b. Deflection limitations of glass framing systems.

C. Samples for Initial Selection: For units with factory-applied color finishes. Architect reserves the right to choose from full color offerings for organic painted finishes. Color is to match Architects' sample.

D. Samples for Verification: For aluminum window components required, prepared on Samples of size indicated below:
   1. Main Framing Member: 12-inch-(300-mm) long, full-size sections of extrusions with factory-applied color finish.
   2. Hardware: Full-size units with factory-applied finish.
   3. Weather Stripping: 12-inch-(300-mm) long sections.
   4. Architect reserves the right to require additional samples that show fabrication techniques, workmanship, and design of hardware and accessories.

E. Qualification Data: For installer and testing agency.

F. Product Test Reports: Based on evaluation of comprehensive tests performed within the last four years by a qualified testing agency, for each operation and configuration of aluminum window. Test results based on use of down-sized AAMA standard test size units will not be accepted.

G. Shop drawings shall be sealed by a state licensed structural engineer to assure all requirements in this specification and drawings are met. The final shop drawings must be readable for field personnel to use as an installation guideline regarding fastener type and fastener locations.

H. Submit a copy of the Manufacturer's Special 10-year warranty.

PART 1.6 Quality Assurance

A. Manufacturers Qualifications: Must have minimum 10 years of continuous fabrication of aluminum windows similar in design and scope to that which is required for this project. The window products supplied for this project must be produced and glazed by the same factory assembly line that the certified test window unit was produced. Any products fabricated by independent subcontractor organizations using "S.L." stock length parts at their own factory or shop facilities will not be accepted. Field glazing is not permitted.

B. Installer Qualifications: An installer acceptable to aluminum window manufacturer for installation of units required for this Project.

C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.

D. Single Source Responsibility: Provide aluminum window units, related fenestration system sections, and all necessary accessories from one source and produced by a single manufacturer.

E. For maximum performance, windows for this project must meet both the testing requirements stated herein and the minimum material requirements specified. Windows which carry the applicable AAMA rating but which do not meet the material thickness and depths are not acceptable for use on this project.

F. Product Options: Drawings indicate size, profiles, and dimensional requirements of aluminum windows and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements".
   1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.
   2. Provide AAMA certified aluminum windows.
   3. Do not revise intended aesthetic effects as judged solely by the architect, except with architect's approval. If revisions or substitutions are proposed, submit comprehensive explanatory data to architect within thirty (30) days of Notice to Proceed per Specification Section 01300, "Submittals". After thirty (30) days, no substitution products will be considered.

G. Glazing Publications: Comply with published recommendations of glass manufacturers and GANA's "Glazing Manual" unless more stringent requirements are indicated.

H. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination". Review methods and procedures related to aluminum windows including, but not limited to, the following:
   1. Inspect and discuss condition of substrate and other preparatory work performed by other trades.

   2. Review and finalize construction schedule and verify availability of materials. Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   3. Review required testing and inspecting procedures.

PART 1.7 Project Conditions

A. Field Measurements: Verify aluminum window openings by field measurements before fabrication and indicate measurements on Shop Drawings.

PART 1.8 Warranty

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace aluminum windows that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:
   1. Failure to meet performance requirements.
   2. Structural failures including excessive deflection.
   3. Water leakage, air infiltration, or condensation.
   4. Faulty operation of movable sash and hardware.
   5. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
   6. Insulating glass failure.

B. Warranty Period for Windows: ten (10) years from date of Substantial Completion.

C. Warranty Period for Metal Finishes: ten (10) years from date of Substantial Completion.

D. Warranty Period for Insulated Glass: ten (10) years from date of Substantial Completion.

PART 2 - PRODUCTS

PART 2.1 Manufacturers

A. Manufacturers: Subject to compliance with requirements, provide architectural grade, high performance thermal, fixed and project in combination windows with minimum of 3-1/4" frame, by one of the following or equivalent:

   1. Fixed Windows (all aluminum not less than 0.125 inches thick):
      a. EFCO Corporation: Series 325X
      b. Kawneer/Traco: NX-3400
      c. Wausau Window and Wall Systems: 3250i
      d. Equivalent.

   2. Projected Windows (all aluminum not less than 0.125 inches thick):
      a. EFCO Corporation: Series 325X
      b. Kawneer/Traco: NX-3400
      c. Wausau Window and Wall Systems: 3250i
      d. Equivalent

B. The following specifications are based on EFCO Corporation, Series 325X (High Performance Thermal Window). Equivalent manufacturers will be reviewed in accordance with the Specifications.

PART 2.2 Materials: General

A. Aluminum Extrusions: Alloy and temper recommended by aluminum window manufacturer for strength, corrosion resistance, and application of required finish, but not less than 22,000-psi (150-MPa) ultimate tensile strength, not less than

16,000-psi (110-MPa) minimum yield strength, and not less than 0.125-inch (1.6-mm) thickness at any location for the main frame and sash members.

B. Fasteners: Aluminum, nonmagnetic stainless steel, epoxy adhesive, or other materials warranted by manufacturer to be non-corrosive and compatible with aluminum window members, trim, hardware, anchors, and other components.

1. Reinforcement: Where fasteners screw-anchor into aluminum less than 0.125 inch (3.2-mm) thick, reinforce interior with aluminum or nonmagnetic stainless steel to receive screw threads, or provide standard, non-corrosive, pressed-in, splined grommet nuts.
2. Exposed Fasteners: Unless avoidable for applying hardware, do not use exposed fasteners. For application of hardware, use fasteners that match finish of member of hardware being fastened, as appropriate.\

C. Anchors, Clips, and Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.

D. Compression-Type Weather Stripping: Provide compressible weather stripping designed for permanently resilient sealing under bumper or wiper action, and completely concealed when aluminum window is closed.

1. Weather-Stripping Material: Manufacturer's standard system and materials complying with AAMA/NWWDA 101/I.S.2.

E. Replaceable Weather Seals: Comply with AAMA 701/702.

F. Sealant: For sealants required within fabricated windows, provide window manufacturer's standard, permanently elastic, non-shrinking, and non-migrating type recommended by sealant manufacturer for joint size and movement.

PART 2.3 Glazing

A. **Alternate #1 Bid Glass**: Manufacturer's standard "triple glazed" factory-glazing system that produces weathertight seal as indicated in Division 8 Section "Glazing". System shall incorporate "triple glazing" application with 1" I.G.U. @ exterior lite, 1" internal W.A.C.I blinds, and ¼" removable takeout panel with custodial screw head release mechanism. The head and sill rails of the blinds shall be extruded aluminum and all tilting of the internal blinds shall be performed without opening of the interior removable takeout panel.

B. Glazing System: Manufacturer's standard "insulated" factory-glazing system that produces weathertight seal as indicated in Division 8 Section "Glazing".

PART 2.4 Hardware

A. General: Provide manufacturer's standard hardware fabricated from, stainless steel, complying with AAMA 907, or other corrosion-resistant material compatible with aluminum; designed to smoothly operate, tightly close, and securely lock aluminum

windows and sized to accommodate sash or ventilator weight and dimensions. Cadmium-plated hardware is not permitted. Do not use aluminum in frictional contact with other metals. Where exposed, provide white bronze alloy and nonmagnetic stainless steel.

B. Locks and Latches: Designed to allow unobstructed movement of the sash across adjacent sash in direction indicated and operated from the inside only.

C. Projected Windows: Provide the following operating hardware:
   1. Hinge: 4 bar Anderberg Arm Hinge.
   2. Lock: Combination lever handle and cam-action lock with stainless steel operation arm.
   3. Limit Device: Concealed limit shim device; located on jamb of each ventilator. Architect will select final limited clear opening dimension.

PART 2.5 Insect Screens

A. General: Design windows and hardware to accommodate screens in a tight-fitting, removable arrangement, with a minimum of exposed fasteners and latches. Locate screens on inside of window and provide for each operable exterior sash or ventilator.
   1. Aluminum Tubular (extruded) Frame Screens: Comply with SMA 1004, "Specifications for Aluminum Tubular Frame Screens for Windows", Architectural C-24, or Monumental M-32 class.
   2. Comply with SMA 1004, "Specifications for Aluminum (extruded) Tubular Frame Screens for Windows", for minimum standards of appearance, fabrication, attachment of screen fabric, hardware, and accessories unless more stringent requirements are indicated.

B. Aluminum Insect Screen Frames: Manufacturer's standard aluminum alloy complying with SMA 1004. Fabricate frames with mitered or coped joints, concealed fasteners, adjustable rollers, and removable PVC spline/anchor concealing edge of frame.

   1. Extruded-Aluminum or Aluminum Tubular Framing Sections and Cross Braces: Not less than 0.040-inch (1-mm) wall thickness.
   2. Finish: Match aluminum window frame finish.

C. Aluminum Mesh Fabric: 20-by-30 (0.85-by-0.42-mm) mesh of PVC-coated, glass-fiber threads; woven and fused to form a fabric mesh resistant to corrosion, shrinkage, stretch, impact damage, and weather deterioration in the following color. Comply with ASTM D 3656.

   1. Mesh Color: **Gunmetal.**

D. Fixed: Provide full fixed screens @ project in operable sash, if required framed and trimmed for a tight fit and durability during handling.

PART 2.6 Fabrication

A. General: Fabricate aluminum windows, in sizes indicated, that comply with ANSI/AAMA 101-97 for performance class and performance grade indicated. Include a complete system for assembling components and anchoring windows.

B. General: Fabricate aluminum windows, in sizes indicated, that comply with requirements and that meet or exceed ANSI/AAMA 101-97 performance requirements for the following window type and performance class. Include a complete system for assembling components and anchoring windows.
   1. Projected Windows: AW105.

C. Fabricate aluminum windows that are reglazable without dismantling sash or ventilator framing.

D. Thermally Barrier Construction: All exterior aluminum shall be separated from interior aluminum by a rigid, structural thermal barrier. For purposes of this specification, a structural thermal barrier is defined as a system that shall transfer shear during bending and, therefore, promote composite action between the exterior and interior extrusions.
   1. The thermal barrier shall be thermal struts, consisting of glass reinforced polyamide nylon, mechanically crimped in raceways extruded in the exterior and interior extrusions. Poured and debridged urethane thermal barriers shall not be permitted.

E. Weather Stripping: Provide full-perimeter weather stripping for each operable sash and ventilator.

F. Weep Holes: Provide weep holes and internal passages to conduct infiltrating water to exterior.

G. Provide water-shed members above side-hinged ventilators and similar lines of natural water penetration.

H. Mullions: Provide mullions and cover plates as shown, matching window units, complete with anchors for support to structure and installation of window units to meet project wind loads. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections, as indicated. Vertical side stacking between window units is permitted provided window system provides necessary structural values to meet project specific wind loads.

I. Subframe: Provide subframes with anchors for window units as shown, of profile and dimensions indicated but not less than 0.062-inch (1.6-mm) thick extruded aluminum. Miter or cope corners, and weld and dress smooth with concealed mechanical joint fasteners. Finish to match window units. Provide subframes capable of withstanding design loads of window units.

J. Interior Trim: Provide interior trim as indicated on architectural drawings as shown, of profile and dimensions indicated but not less than 0.050-inch thick extruded aluminum. Finish to match window units.

K. Factory-Glazed Fabrication: Glaze aluminum windows in the factory where practical and possible for applications indicated. Comply with requirements in Division 8 Section "Glazing" and with ANSI/AAMS 101-88. Field glazing is not permitted.

PART 2.7 Finishes

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

C. Finish: Fluorocarbon 2 coat thermocured system, composed of specifically formulated inhibitive primer and fluorocarbon color topcoat containing not less than 70% PVFD resin by weight; comply with AAMA 2605. The color selected by Owner/Architect to be a custom color (non-metallic / non-exotic), which the window manufacturer can match. The architect will select the custom color during the shop drawing review process.

PART 3 - EXECUTION

PART 3.1 Examination

A. Examine openings, substrates, structural support, anchorage, and conditions with Installer present, for compliance with requirements for installation tolerances; rough opening dimensions; levelness of sill plate; coordination with wall flashings, vapor retarders, and other built-in components; operational clearances; and other conditions affecting performance of work.

1. Masonry Surfaces: Visibly dry and free of excess mortar, sand and other construction debris.
2. Wood Frame Walls: Dry, clean, sound, well nailed, free of voids, and without offsets at joints. Ensure that nail heads are driven flush with surfaces in opening and within 3 inches (76-mm) of opening.
3. Metal Surfaces: Dry; clean; free of grease, oil, dirt, rust, corrosion, and welding slag; without sharp edges or offset at joints.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

PART 3.2 Installation

A. General: Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components; Drawings; and Shop Drawings.

B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction.

C. Set sill members in bed of sealant or with gaskets, as indicated, for weathertight construction.

D. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.

E. Metal Protection: Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials by complying with requirements specified in "Dissimilar Materials" Paragraph in Appendix B in AAMA/NWWDA 101-I.S.2.

PART 3.3 Field Quality Control

A. Testing Services; Testing and inspecting of installed windows shall take place as follows:
   1. Testing Methodology: Testing of windows for air infiltration and water resistance shall be performed according to AAMA 502, Test Method "A" by applying same test pressures required to determine compliance with AAMA/NWWDA 101/I.S.2 in Part 1 "Performance Requirements" Article.
   2. Testing Extent: Three (3) windows as selected by Architect and a qualified independent testing and inspecting agency. Windows shall be tested immediately after installation.
   3. Test Reports; Shall be prepared according to AAMA 502.

B. Remove and replace windows where test results indicate that they do not comply with specified requirements.

C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

PART 3.4 Adjusting

A. Adjust operating sashes and ventilators, screens, hardware, operators, and accessories for a tight fit at contact points and weather stripping for smooth operation and weathertight closure. Lubricate hardware and moving parts.

PART 3.5 Protection and Cleaning

A. Protect window surfaces from contact with contaminating substances resulting from construction operations. In addition, monitor window surfaces adjacent to and below exterior concrete and masonry surfaces during construction for presence of dirt, scum, alkaline deposits, stains or other contaminants immediately according to manufacturer's written recommendations.

B. Clean aluminum surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt and other substances.

C. Clean factory-glazed glass immediately after installing windows. Comply with manufacturer's written recommendations for final cleaning and maintenance. Remove non-permanent labels and clean surfaces.

D. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

PART 3.6 Demonstration

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain window operating system. Refer to Division 1 Section "Closeout Procedures".

END OF SECTION 08520

SECTION 08710 – FINISH HARDWARE

Part 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Door Hardware, including electric hardware.
2. Storefront and entrance door hardware.
3. Overhead roll-up doors and Power operated overhead doors.
4. Hold-open closers with fire-alarm interface.
5. Wall or floor-mounted electromagnetic hold-open devices.
6. Power supplies for electric hardware.
7. Low energy door operators plus sensors and actuators.
8. Remote button release hardware.
9. Cabinet locks.
10. Cylinders for doors fabricated with locking hardware.
11. Wiring and riser diagrams for electric hardware.
12. Key cabinets, key management software.

B. Specific Omissions: Hardware for the following is specified or indicated elsewhere.

1. Windows.
2. Cabinets, including open wall shelving and locks.
3. Signs, except where scheduled.
4. Toilet accessories, including grab bars.
5. Installation.
6. Rough hardware.
7. Folding partitions, except cylinders where detailed.
8. Sliding aluminum doors, except cylinders where detailed.
9. Access doors and panels, except cylinders where detailed.
10. Corner Guards.
11. Wrought Iron railing, gates and supports.
12. Brass rail and drink rail supports.

1.2 REFERENCES:

A. Use date of standard in effect as of Bid date.
B. American National Standards Institute – ANSI 156.18 – Materials and Finishes.
C. ANSI A117.1 – Specifications for making buildings and facilities usable by physically handicapped people.
D. ADA – Americans with Disabilities Act of 1990
E. BHMA – Builders Hardware Manufacturers Association
F. DHI – Door and Hardware Institute
G. NFPA – National Fire Protection Association

1. NFPA 80 – Fire Doors and Windows
2. NFPA 101 – Life Safety Code
3. NFPA 105 – Smoke and Draft Control Door Assemblies
4. NFPA 252 – Fire Tests of Door Assemblies

H. UL – Underwriters Laboratories

1. UL10C – Fire Tests of Door Assemblies (Positive Pressure)
2. UL 305 – Panic Hardware

I. WHI – Warnock Hersey Incorporated
J. SDI – Steel Door Institute
K. WDI – Wood Door Institute
L. AWI – Architectural Woodwork Institute
M. NAAM – National Association of Architectural Metal Manufacturers

1.3 SUBMITTALS & SUBSTITUTIONS

A. SUBMITTALS: Submit six copies of schedule per Division 1. Organize vertically formatted schedule into "Hardware Sets" with index of doors and headings, indicating complete designations of every item required for each door or opening. Include following information:

1. Type, style, function, size, quantity and finish of hardware items. Use BHMA Finish codes per ANSI A156.18.
2. Name, part number and manufacturer of each item.
3. Fastenings and other pertinent information.
4. Location of hardware set coordinated with floor plans and door schedule.
5. Explanation of abbreviations, symbols, and codes contained in schedule.
6. Mounting locations for hardware.
7. Door and frame sizes, materials and degrees of swing.
8. List of manufacturers used and their nearest representative with address and phone number.
9. Catalog cuts.
10. Manufacturer's technical data and installation instructions for electronic hardware.
11. Date of jobsite visit.

B. Bid and submit manufacturer's updated/improved item if scheduled item is discontinued.

C. Make substitution requests in accordance with Division 1. Include product data and indicate benefit to the Project. Furnish operating samples on request.

1. Items listed with no substitute manufacturers have been requested by Owner to meet existing standard.

D. Furnish as-built/as-installed schedule with closeout documents, including keying schedule, wiring/riser diagrams, manufacturers' installation, adjustment and maintenance information, and supplier's final inspection report.

1.4 QUALITY ASSURANCE:

A. Qualifications:

1. Hardware supplier: direct factory contract supplier who employs a certified architectural hardware consultant (AHC), available at reasonable times during course Work for project hardware consultation to Owner, Architect and Contractor.
   (1) Responsible for detailing, scheduling and ordering of finish hardware.

B. Hardware: New, free of defects, blemishes and excessive play. Obtain each kind of hardware (latch and locksets, exit devices, hinges and closers) from one manufacturer.

C. Exit Doors: Operable from inside with single motion without the use of a key or special knowledge or effort.

D. Fire-Rated Openings: In compliance with NFPA 80. Hardware UL10C/UBC-7-2 (positive pressure) compliant for given type/size opening and degree of label. Provide proper latching hardware, non-flaming door closers, approved-bearing hinges, plus resilient and required intumescent seals. Furnish openings complete.

1. Note: scheduled seals may exceed selected door manufacturer's requirements. See 2.6.E for clarification.

E. Pre-Installation Meetings: Initiate and conduct with supplier, installer and related trades, coordinate materials and techniques, and sequence complex hardware items and systems installation. Convene at least one week prior to commencement of related work.

1.5 DELIVERY, STORAGE AND HANDLING:

A. Delivery: coordinate delivery to appropriate locations (shop or field).

1. Permanent keys and cores: secured delivery direct to Owner's representative.

B. Acceptance at Site: Items individually packaged in manufacturers' original containers, complete with proper fasteners and related pieces. Clearly mark packages to indicate contents, locations in hardware schedule and door numbers.

C. Storage: Provide locked storage area for hardware, protect from moisture, sunlight, paint, chemicals, etc.

1.6 PROJECT CONDITIONS:

A. Where exact types of hardware specified are not adaptable to finished shape or size of members requiring hardware, provide suitable types having as nearly as practical as the same operation and quality as type specified, subject to Architect's approval.

1.7 SEQUENCING AND COORDINATION:

A. Coordinate with concrete.

B. Reinforce walls.

C. Coordinate finish floor materials and floor-mounted hardware.

D. Conduit and raceways as needed for electrical, electronic and electro-pneumatic hardware items. Fire/life-safety system interfacing. Point-to-point wiring diagrams plus riser diagrams to related trades.

E. Furnish manufacturer templates to door and frame fabricators.

F. Use hardware consultant to check Shop Drawings for doors and entrances to confirm that adequate provisions will be made for proper hardware installation.

1. Confirm that door manufacturers furnish necessary UBC-7-2 compliant seal packages.

1.8 WARRANTY:

A. Part of respective manufacturers' regular terms of sale. Provide manufacturers' warranties:

1. Closers: Thirty years mechanical, two years electrical.
2. Exit Devices: Three years.
3. Hinges: Life of Building.
4. Other Hardware: Two years.

1.9 COMMISSIONING:

A. Test door hardware operation with climate control system and stairwell pressurization system both at rest and while in full operation.

B. Test electrical, electronic and electro-pneumatic hardware systems for satisfactory operation.

C. Test hardware interfaced with fire/life-safety system for proper operation and release.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Provide hardware items required to complete the work in accordance with these specifications and manufacturers' instructions.

1. Include items inadvertently omitted from this specification. Note these items in submittal for review.
2. Where scheduled item is now obsolete, bid and furnish manufacturers updated item at no additional cost to the project.

2.2 HANGING MEANS:

A. Conventional Hinges: Hinge open widths minimum, but, of sufficient throw to permit maximum door swing. Steel or stainless steel pins and concealed bearings.

1. Three hinges per leaf to 7 foot, 6 inch height. Add one for each additional 30 inches in height, or any fraction thereof.
2. Extra heavy weight hinges on doors over 3 foot, 5 inches in height..
3. Outswinging exterior doors: non-ferrous with non-removable (NRP) pins.
4. Non-ferrous material exteriors and at doors subject to corrosive atmospheric conditions.
5. All hinges shall be non-removable tips – (NRP)
6. Provide shims and shimming instructions for proper door adjustment.

B. Continuous Hinges: Ives Aluminum Geared Continuous
1. UL 10C listed (90 minutes)
2. ANSI Certified-ANSI 156.25 Grade 2
3. Supports weights up to 450 lbs. 4'0" max. dr. width
4. Material to be extruded aluminum 6063-T6
5. Lengths- 83",85",95", 120""- Custom Lengths available
6. Available Electric Modifications-EPT,TW, TWM, EC
7. All continuous geared hinges to be heavy duty-Amount of bearings varies by size 83", 85"-32 bearings, 95"-36 bearings,120"-47 bearings
   a. Finishes Clear (CL)

2.3 LOCKSETS, LATCHSETS, DEADBOLTS:

A. General Requirements:
1. Locks shall be cylindrical and mortise locks with trim selected to match building standard design, confirm trim before hardware submittal submission. Mfg. Schlage Lock Company – ND-Series/L-Series x 626

2. Meet with Architect and Owner to finalize keying requirements and obtain keying instructions in writing. Keying schedule shall be coordinated with Owner's Locksmith in compliance with specific requirements determined in consultation with Owner. Locks shall be masterkeyed to the existing Schlage key system.

3. Provide temporary construction keying system during construction period. Permanent keys shall be furnished to Owner's Representative prior to occupancy. Owner or Owner's Security Agent will void operation of construction keys.

4. All temporary cores shall be returned to the supplier to avoid additional charges.

B. Cylinders:
1. Permanent cylinders shall fit Owner's existing Schlage keyway- keyed to the existing masterkey system and configured into sets or subsets, master keyed or great grand master keyed as directed by Owner.
2. Permanent keys and cylinder cores shall be engraved with industry standard keying nomenclature. These visual key control marks or codes shall not include actual key cuts.
   a. Key and cylinder identification stamping shall be approved by Architect and Owner. Failure to properly comply with these requirements shall be cause for replacement of cylinders and keys involved at no additional cost to Owner.
   b. Functions as listed in hardware sets. Key system – Schlage, confirm keying requirements. All cylinders must work under the existing Schlage Key System. Owner's locksmith is Arnold's Safe & Lock, 3615 Haddonfield Road, Pennsauken, NJ 08179,Phone # 1-856-665-1311 – POC is Ed Fitzgerald

2.4 EXIT DEVICES/PANIC HARDWARE

A. Exit Devices – Von Duprin 98 Series
General features:

1. Independent lab-tested 1,000,000 cycles.
2. Push-through touch pad design. No exposed touch bar fasteners, no exposed cavities when operated. Return stroke fluid dampeners and rubber bottoming dampeners, plus anti-rattle devices.
3. ¾" throw deadlocking latchbolts.
4. No exposed screws to show through glass doors.
5. Non-handed basic device design with center case interchangeable with all functions, no extra parts required to effect change of function.
6. Releasable with 32 lb. maximum pressure under 250 lb. load to the door.
7. Where NL-OP designations are listed – confirm through presence of locking cylinder if the door shall receive a cylinder preparation. If no cylinder is listed then do not prepare for cylinder, but include with material the trim ring, mounting cup, fasteners, and instructions for the NL-OP assembly.

B. Specific features:

1. Non-Fire Rated Devices: cylinder dogging.
2. Lever Trim: Breakaway type, forged brass or bronze escutcheon min .130" thickness, match lockset lever design.
3. Rod and latch guards with surface vertical rod devices.
4. Fire-Labeled Devices: UL label indicating "Fire Exit Hardware". Vertical rod devices less bottom rod (LBR) unless otherwise scheduled.
5. Inpact recessed devices:
6. Delayed Egress Devices: Function achieved within single exit device component, including latch, delayed locking device, request-to-exit switch, nuisance alarm, remote alarm, key switch, indicator lamp, relay, internal horn, door position input, external inhibit input plus fire alarm input. NFPA 101 "Special Locking Arrangement" compliant.

7. Electrically Operated Devices: Single manufacturer source for electric latch retraction devices, electrically controlled trim, power transfers, power supplies, monitoring switches and controls.
8. Removable Mullions: Removable with single turn of building key. Securely reinstalled without need for key. Furnish storage brackets for securely stowing the mullion away from the door when removed.

2.5 CLOSERS

A. Surface Closers: LCN 4111/4011 Series : To match existing;

1. Full rack-and-pinion type cylinder with removable non-ferrous cover and cast iron body. Double heat-treated pinion shaft, single piece forged piston, chrome-silicon steel spring.
2. ISO 2000 certified. Units stamped with date-of-manufacture code.
3. Independent lab-tested 8,000,000 cycles.
4. Thru-bolts at wood doors unless doors are provided with closer blocking. Non-sized, non-handed, and adjustable. Place closer inside building, stairs, and rooms.
5. Plates, brackets and special templating when needed for interface with particular header, door and wall conditions and neighboring hardware.
6. Opening pressure: Exterior doors 8.5 lb., interior doors 5 lb., labeled fire doors 15 lb.
7. Separate adjusting valves for closing speed, latching speed and backcheck, fourth valve for delayed action where scheduled.
8. Extra-duty arms (EDA) at exterior doors scheduled with parallel arm units.
9. Exterior door closers: tested to 100 hours of ASTM B117 salt spray test, furnish data on request.
10. Exterior doors do not require seasonal adjustments in temperatures from 120 degrees F to –30 degrees F, furnish data on request.
11. Non-flaming fluid will not fuel door or floor covering fires.
12. Confirm mounting condition requirements for automatic door opener provide proper arm required, mounting plates, and frame reinforcement as required for proper installation.
13. Automatic Openers shall be LCN Senior Swing.

2.6 OTHER HARDWARE

A. Automatic Flush Bolts: Low operating force design, "LBR" type.

B. Overhead Stops: Stainless steel (450 & 900 series). Non-plastic mechanisms and finished metal end caps. Field-changeable hold-open, friction and stop-only functions.

C. Kick Plates: Four beveled edges, .050 inches minimum thickness, height and width as scheduled. Sheet-metal screws of bronze or stainless steel to match other hardware.

D. Magnetic Door Holders: Install magnetic door holders for maximum degree of opening, coordinate with door closer template. Confirm voltage with security contractor before ordering.

E. Hinge-Guards – product specified is to establish a level of design criteria.

F. Door Stops: Provide stops to protect walls, casework or other hardware.

1. Unless otherwise noted in Hardware Sets, provide wall type with appropriate fasteners. Where wall type cannot be used, provide overhead type.

G. Seals: Finished to match adjacent frame color. Resilient seal material: solid high-grade neoprene. UL label applied to seals on rated doors. Substitute products: certify that the products equal or exceed specified material's thickness and durability. Proposed substitutions: submit for approval. Manufacturer: National Guard Products (NGP)

H. Thresholds: As scheduled and per details. Substitute products: certify that the products equal or exceed specified material's thickness. Proposed substitutions: submit for approval.

1. Exteriors: Set in full bed of butyl-rubber or polyisobutylene mastic sealant complying with requirements in Division 7 "Thermal and Moisture Protection". Non-ferrous ¼ inch fasteners and lead expansion shield anchors, or Red-Head #SFS-1420 (or approved equivalent) Flat Head Sleeve Anchors (SS/FHSL).
2. Each specific door opening requires field measurement and confirmation of their individual sill condition. Product specified is for this reason. Size the thresholds per opening, the excessive width may not be required, so this is a base-line for budget purposes.
3. Sound control openings: Set in bed of mastic sealant.

I. Fasteners: Generally, exposed screws to be Phillips or Robertson drive. Pinned TORX drive at high security areas. Flat head sleeve anchors (FHSL) may be slotted drive. Sheet metal and wood screws: full-thread. Sleeve nuts: full length to prevent door compression.

J. Silencers: Interior hollow metal frames, 3 for single doors, 4 for pairs of doors. Omit where adhesive mounted seal occurs. Leave no unfilled/uncovered pre-punched silencer holes. Not required on doors receiving smoke gasketing.

2.7 FINISH:

A. Generally BHMA 626 Satin Chromium

1. Areas using BHMA 626 to have push-plates, pulls and protection plates of BHMA 630, Satin Stainless Steel, unless otherwise noted.

B. Door closers: factory powder coated to match other hardware, (BHMA 689) unless otherwise noted.

C. Aluminum items: match predominant adjacent material. Seals to coordinate with frame color.

2.8 KEYING REQUIREMENTS:

A. Key System: Key to existing key system
B. All cylinders and cores to match existing key system requirements and be combinated per the Owner's instructions.

C. Furnish all locks & cylinders with temporary construction cores, plastic temp. cores are not permitted..

D. Initiate and conduct meetings(s) with Owner's Representative to determine the Schlage system keyway(s) and structure, Furnish Owner's written approval of the system.
   1. Furnish 12 construction keys.
   2 Furnish 3 construction control keys.
   3 Furnish 3 emergency keys
   4 Furnish 6 keys per change, 5 Master Keys per group and 3 Grand-Master keys

E. Cylinders/cores: keyed at factory of lock manufacturer where permanent records are maintained. All removable cores to be factory stamped with keying . Provide bitting list to Owner.

F. Permanent keys: secured shipment direct from point of origination to Owner.

G. Bitting List: Secured shipment direct from point of origination to Owners completion.

H. Confirm the final key count in hardware submittal.

PART 3 - EXECUTION

3.1 ACCEPTABLE INSTALLERS:

A. Factory trained, certified, and carries a factory-issued card certifying that person as a "Certified Installer". Alternative: can demonstrate suitably equivalent competence and experience. Provide references upon request.

3.2 PREPARATION:

A. Ensure that walls and frames are square and plumb before hardware installation.

B. Locate hardware per SDI-100 and applicable building, fire, life-safety, accessibility, and security codes.

   1. Notify Architect of any code conflicts before ordering material.
   2. Where new hardware is to be installed near existing doors/hardware scheduled to remain, match locations of existing hardware.

C. Existing frames and doors scheduled to receive new hardware: carefully remove existing hardware, tag and bag, and turn over to Owner.

   1. Patch and fill wood frames and doors with solid wood stock or dowel material before cutting for new hardware. Do not reuse existing screw holes - - fill and re-pilot.
   2. Metal doors/frames: Weld or fasten with screws: filler pieces in existing hardware cut-outs and mortises not scheduled for re-use by new hardware. Leave surfaces smooth - - no applied patches.

3.3 INSTALLATION

A. Install hardware per manufacturer's instructions and recommendations. Do not install surface-mounted items until finishes have been completed on substrate. Set units level,

plumb and true to line and location. Adjust and reinforce attachment substrate for proper installation and operation.

1. Gaskets: install jamb-applied gaskets before closers, overhead stops, rim strikes, etc. Install sweeps across bottoms of doors before astragals, cope sweeps around bottom pivots, trim astragals to tops of sweeps.
2. When hardware is to be attached to existing metal surface and insufficient reinforcement exists, use RivNuts, NutSerts or similar anchoring device for screws.

B. Locate floor stops not more than 4 inches from the wall.

C. Drill pilot holes for fasteners in wood doors and/or frames.

D. Lubricate and adjust existing hardware scheduled to remain. Carefully remove and give to Owner items not scheduled for reuse.

3.4 FIELD QUALITY CONTROL.

A. Contractor shall employ and pay for services of a qualified independent Architectural Hardware Consultant (AHC) to perform inspections and to prepare inspection reports. Inspection Service:

B. After installation of door hardware is complete, the Awarded Hardware Distributor will inspect door hardware for proper application of finish hardware in compliance finish hardware schedule and keying schedule. In addition, check hardware for adjustment and proper operation.

C. Contractor to provide written certification from a qualified AHC (Certified Architectural Hardware Consultant) that the hardware, cores and keying has been installed and tested in every door and is 100% complete for each phase or the total project whichever comes first

D. Prepare and submit, to Contractor, Architect, and Owner, a written report of inspection stating whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted. Report shall be submitted within 3 days following site visits.

3.5 ADJUSTING

A. Initial Adjustment:
1. Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
2. Adjust door closer sweep period so that from an open position of 70 degrees door will take at least 3 seconds to move to a point 3" from latch measured to leading edge of door.

B. Final Adjustment:
1. Return to Project during week prior to Substantial Completion and make final check and adjustment of hardware items.

2. Adjust hardware so doors operate in perfect order. Test and adjust hardware for quiet, smooth operation, free of sticking, binding, or rattling. Adjust closers for proper, smooth operation.
3. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

C. Six Month Adjustment:
1. Approximately six months after Date of Substantial Completion, installer shall perform following:
   a. Examine and readjust each item of door hardware as necessary to ensure function of doors, door hardware.
   b. Consult with, and instruct, Owner's personnel on recommended maintenance procedures.
   c. Replace door hardware items that have deteriorated or failed due to faulty design, materials, or installation.

D. Twelve Month Adjustment:
1. Approximately six months after Date of Substantial Completion, installer shall perform following:
   a. Examine and readjust each item of door hardware as necessary to ensure function of doors, door hardware.
   b. Consult with, and instruct, Owner's personnel on recommended maintenance procedures.
   c. Replace door hardware items that have deteriorated or failed due to faulty design, materials, or installation.

3.6 CLEANING

A. Exposed hardware shall be carefully cleaned by methods not injurious to finish, immediately preceding occupancy. Replace defective, damaged, or missing hardware.

B. Clean adjacent surfaces soiled by hardware installation.

C. Clean operating items as needed to restore proper function and finish.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes.

3.8 PROTECTION

A. Provide final protection and maintain conditions that ensure door hardware shall be without damage or deterioration at time of Substantial Completion.

B. Protect door hardware items from abuse, corrosion and other damage until Owner accepts Project as complete.

3.9 HARDWARE SCHEDULES TO FOLLOW: Please note that the Hardware Schedule has basis of design manufacturers listed. Equivalent manufacturers will be considered in accordance with Specification Section 01300 – Submittals.

HW SET: 001

DOORS:
09 10 11

EACH TO INCLUDE:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	3CB1HW 4.5 X 4.5 NRP		652	IVE
1	EA	CLASSROOM SECURITY	L9071T 17A L283-711		626	SCH
2	EA	FSIC CORE	23-030 CKC		626	SCH
1	EA	SURFACE CLOSER	4111 SCUSH		690	LCN
1	EA	CUSH SHOE SUPPORT	4110-30		689	LCN
1	EA	KICK PLATE	8402 10" X 2" LDW B-CS		630	IVE
1	EA	MOP PLATE	8402 4" X 1" LDW B-CS		630	IVE
1	EA	WALL STOP	WS401/402CCV		US26D	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER
1	EA	DOOR SWEEP	8191AA		AA	ZER
1	EA	THRESHOLD	MARBLE THRESHOLD BY CONTRACTOR		TBD	TBD

HW SET: 002

DOORS:
02 03

EACH TO INCLUDE:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	3CB1HW 4.5 X 4.5 NRP		652	IVE
1	EA	CLASSROOM SECURITY	L9071T 17A L283-711		626	SCH
2	EA	FSIC CORE	23-030 CKC		626	SCH
1	EA	SURFACE CLOSER	4011 DEL		689	LCN
1	EA	KICK PLATE	8402 10" X 2" LDW B-CS		630	IVE
1	EA	MOP PLATE	8402 4" X 1" LDW B-CS		630	IVE
1	EA	WALL STOP	WS401/402CCV		US26D	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER
1	EA	DOOR SWEEP	8191AA		AA	ZER
1	EA	THRESHOLD	MARBLE THRESHOLD BY CONTRACTOR		TBD	TBD

HW SET: 003

DOORS:
06

EACH TO INCLUDE:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	3CB1HW 4.5 X 4.5 NRP		652	IVE
1	EA	CLASSROOM LOCK	L9070T 17A		626	SCH
1	EA	FSIC CORE	23-030 CKC		626	SCH
1	EA	WALL STOP	WS401/402CCV		US26D	IVE
3	EA	SILENCER	SR64		GRY	IVE

HW SET: 004

DOORS:
04

EACH TO INCLUDE:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	3CB1HW 4.5 X 4.5 NRP		652	IVE
1	EA	PRIVACY W/DB & IND	L9496T 17A L583-363 L583-375		626	SCH
1	EA	FSIC CORE	23-030 CKC		626	SCH
1	EA	SURFACE CLOSER	4011 DEL		689	LCN
1	EA	KICK PLATE	8402 10" X 2" LDW B-CS		630	IVE
1	EA	MOP PLATE	8402 4" X 1" LDW B-CS		630	IVE
1	EA	WALL STOP	WS401/402CCV		US26D	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER
1	EA	DOOR SWEEP	8191AA		AA	ZER
1	EA	THRESHOLD	MARBLE THRESHOLD BY CONTRACTOR		TBD	TBD

HW SET: 005

DOORS:
08

EACH TO INCLUDE:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	CONT. HINGE	224HD		628	IVE
1	EA	PANIC HARDWARE	CD-98-NL-OP-110MD		626	VON
1	EA	RIM CYLINDER	20-057 ICX		626	SCH
1	EA	MORTISE CYLINDER	20-061 ICX X K510-730 XQ11-948 36-083		626	SCH
2	EA	FSIC CORE	23-030 CKC		626	SCH
1	EA	SURFACE CLOSER	4111 SCUSH SRI		689	LCN
1	EA	MOUNTING PLATE	4110-18 SRI	✓	689	LCN
1	EA	CUSH SHOE SUPPORT	4110-30 SRI		689	LCN
1	EA	KICK PLATE	8402 10" X 2" LDW B-CS		630	IVE
2	EA	THRESHOLD	269A-NH-224		A	ZER
1	EA	THRESHOLD	674A-224		A	ZER
2	EA	THRESHOLD	675A-224		A	ZER
2	EA	THRESHOLD	68A-224		A	ZER
1	EA	RAIN DRIP	142AA		AA	ZER
1	EA	DOOR CONTACT	679-05HM	✓	BLK	SCE
	EA	FLUSH PULL	BY FRP DOOR SUPPLIER/INSTALLER		630	TBD
	EA	NOTE: FIELD VERIFY EXISTING SILL CONDITION	ORDER REQUIRED OVERALL WIDTH (FRONT TO BACK)		TBD	ZER
1	EA	PROVIDE FACTORY POINT TO POINT WIRING DIAGRAMS				
1	EA	PROVIDE RISER DIAGRAMS				

HW SET: 006

DOORS:
05

EACH TO INCLUDE:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	3CB1HW 4.5 X 4.5 NRP		652	IVE
1	EA	OFFICE/ENTRY LOCK	L9050T 17A L583-363		613	SCH
1	EA	FSIC CORE	23-030 CKC		626	SCH
1	EA	SURFACE CLOSER	4011		689	LCN
1	EA	KICK PLATE	8402 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS401/402CCV		US26D	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER
1	EA	DOOR SWEEP	8191AA		AA	ZER

HW SET: 007-

DOORS:
01

EACH TO INCLUDE:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	ACCESS CONTROL CARD READER	BY OWNER'S SECURITY INTEGRATOR	✓	TBD	TBD
1	EA	CONT. HINGE	224HD EPT		US28	IVE
1	EA	POWER TRANSFER	EPT10 CON	✓	689	VON
1	EA	ELEC PANIC HARDWARE	SD-RX-QEL-98-NL-OP-110MD-CON 24 VDC	✓	626	VON
1	EA	RIM CYLINDER	20-057 ICX		626	SCH
1	EA	MORTISE CYLINDER	20-061 ICX X K510-730 XQ11-948 36-083		626	SCH
2	EA	FSIC CORE	23-030 CKC		626	SCH
1	EA	90 DEG OFFSET PULL	8190HD 12" O		619	IVE
1	EA	SURFACE CLOSER	4111 SCUSH SRI		689	LCN
1	EA	MOUNTING PLATE	4110-18 SRI	✓	689	LCN
1	EA	CUSH SHOE SUPPORT	4110-30 SRI		689	LCN
1	EA	BLADE STOP SPACER	4110-61 SRI		689	LCN
1	EA	RAIN DRIP	142AA		AA	ZER
1	EA	DOOR SWEEP	8198AA		AA	ZER
1	EA	THRESHOLD	1675A-223		A	ZER
1	EA	DESK MOUNT BUTTON	660-PB	✓	628	SCE
1	EA	POWER SUPPLY	PS904 900-KL 900-2RS 900-4RL 900-BBK 120/240 VAC	✓		VON
1	EA	BALANCE OF HARDWARE BY DOOR SUPPLIER				
1	EA	PROVIDE FACTORY POINT TO POINT WIRING DIAGRAMS				
1	EA	PROVIDE RISER DIAGRAMS				

HW SET: 008

DOORS:
07

EACH TO INCLUDE:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	3CB1HW 4.5 X 4.5 NRP		652	IVE
1	EA	STOREROOM LOCK	L9080T 17A		626	SCH
1	EA	FSIC CORE	23-030 CKC		626	SCH
1	EA	OH STOP	100S		630	GLY
1	EA	SURFACE CLOSER	4011		689	LCN
1	EA	MOUNTING PLATE	4020-18		689	LCN
1	EA	KICK PLATE	8402 10" X 2" LDW B-CS		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER
1	EA	DOOR SWEEP	8191AA		AA	ZER

END OF SECTION 08710

SECTION 08800 – GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:

1. Windows
2. Doors.
3. Store Front.

1.2 DEFINITIONS

A. Interspace: Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.

B. Deterioration of Coated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in metallic coating.

C. Deterioration of Insulating Glass: Failure of hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

D. Deterioration of Laminated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1.3 PERFORMANCE REQUIREMENTS

A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Glass Design: Glass thickness designations indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites in the thickness designations indicated for various size openings, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:

1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:
   a. Design Wind Loads: Determine design wind loads applicable to Project from basic wind speed indicated in 130 miles per hour at 33 feet (10 m) above grade, according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 6.5, "Method 2-Analytical Procedure," based on mean roof heights above grade indicated on Drawings.
      1) Seismic Loads: IBC 2018, NJ Edition.
      2) Design wind load velocity at the project site is 100 mph
      3) Importance factor is 1.15
      4) Exposure category is "C"

   b. Specified Design Snow Loads: 30 PSF, but not less than snow loads applicable to Project as required by ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 7.0, "Snow Loads." Probability of Breakage for Vertical Glazing: 8 lites per 1000 for lites set vertically or not more than 15 degrees off vertical and under wind action.
      1) Load Duration: 60 seconds or less.

   c. Minimum Glass Thickness for Exterior Lites: Not less than 1/4".
   d. Thickness of Tinted and Heat-Absorbing Glass: Provide the same thickness for each tint color indicated throughout Project.

C. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

   1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

D. Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:

   1. For monolithic-glass lites, properties are based on units with lites 6.0 mm thick of thickness indicated.
   2. For laminated-glass lites, properties are based on products of construction indicated.
   3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite 1/4", 6.0 mm thick and a nominal 1/2-inch-12.7-mm-) wide interspace.
   4. Center-of-Glass Values: Based on using LBL-44789 WINDOW 5.0 computer program for the following methodologies:
      a. U-Factors: NFRC 100 expressed as Btu/ sq. ft. x h x deg F (W/sq. m x K).
      b. Solar Heat Gain Coefficient: NFRC 200.
      c. Solar Optical Properties: NFRC 300.

1.4 SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

B. Samples: 12-inch- (300-mm-) square, for each type of glass product indicated, other than monolithic clear float glass.

C. Glazing Schedule: Use same designations indicated on Drawings.

D. Preconstruction Adhesion and Compatibility Test Report: From glazing sealant manufacturer.

1.5 QUALITY ASSURANCE

A. Preconstruction Adhesion and Compatibility Testing: Submit to elastomeric glazing sealant manufacturers, for testing according to ASTM C 1087, samples of each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member that will contact or affect elastomeric glazing sealants:

B. Glazing for Fire-Rated Door Window Assemblies: Glazing for assemblies that comply with NFPA 80 and that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 257 and 16 CFR 1201.

C. Safety Glazing Products: Comply with testing requirements in 16 CFR 1201 and IBC 2015 NJ Edition.

D. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publications: GANA Laminated Division's "Laminated Glass Design Guide" and GANA's "Glazing Manual."
2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "Glazing Guidelines for Sealed Insulating Glass Units."

E. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the Insulating Glass Certification Council.

F. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockups as shown on Drawings for one bay or curtain wall or one unit window.

2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 WARRANTY

A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form, made out to Owner and signed by coated-glass manufacturer agreeing to replace coated-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

1. Warranty Period: 10 years from date of Substantial Completion.

B. Manufacturer's Special Warranty on Laminated Glass: Manufacturer's standard form, made out to Owner and signed by laminated-glass manufacturer agreeing to replace laminated-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

1. Warranty Period: Ten years from date of Substantial Completion.

C. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form, made out to Owner and signed by insulating-glass manufacturer agreeing to replace insulating-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified or equivalent.

2.2 GLASS PRODUCTS

A. Heat-Treated Float Glass: ASTM C 1048; Type I (transparent flat glass); Quality-Q3; of class, kind, and condition indicated.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed, unless otherwise indicated.
2. Provide FT (fully tempered) float glass.

B. Laminated Glass: ASTM C 1172, and complying with other requirements specified and with the following:
1. Interlayer: Polyvinyl butyral of thickness indicated with a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after laminating glass lites and installation.

C. Insulating-Glass Units, General: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, and complying with ASTM E 774 for Class

CBA units and with requirements specified in this Article and in Part 2 "Insulating-Glass Units" Article.

1. Provide FT (fully tempered) float glass.
2. Overall Unit Thickness and Thickness of Each Lite: Dimensions indicated for insulating-glass units are nominal and the overall thicknesses of units are measured perpendicularly from outer surfaces of glass lites at unit's edge.
3. Sealing System: Dual seal.
4. Spacer Specifications: Manufacturer's standard spacer material and construction.
5. Spacer Specifications: Manufacturer's standard spacer material and construction complying with the following requirements:

    a. Spacer Material: Stainless Steel warm edge spacer OR Aluminum with mill or clear anodic finish.
    b. Corner Construction: Manufacturer's standard corner construction.

2.3 GLAZING GASKETS

A. Dense Compression Gaskets: Molded or extruded gaskets of material indicated below, complying with standards referenced with name of elastomer indicated below, and of profile and hardness required to maintain watertight seal:

1. Neoprene, ASTM C 864.
2. EPDM, ASTM C 864.
3. Silicone, ASTM C 1115.
4. Thermoplastic polyolefin rubber, ASTM C 1115.
5. Any material indicated above.

B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned gaskets of material indicated below; complying with ASTM C 509, Type II, black; and of profile and hardness required to maintain watertight seal:

1. Neoprene.
2. EPDM.
3. Silicone.
4. Thermoplastic polyolefin rubber.
5. Any material indicated above.

2.4 GLAZING SEALANTS

A. General: Provide products of type indicated, complying with the following requirements:

1. Compatibility: Select glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.

3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

B. Elastomeric Glazing Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

1. Single-Component Neutral-Curing Silicone Glazing Sealants:

a. Products:
1) See Section 07920 - Joint Sealants.
2) Type and Grade: S (single component) and NS (nonsag).
3) Class: 100/50.
4) Use Related to Exposure: NT (nontraffic).
5) Uses Related to Glazing Substrates: M, G, A, and, as applicable to glazing substrates indicated, O.

2.5 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based elastomeric tape with a solids content of 100 percent; non-staining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C 1281 and AAMA 800 for products indicated below:

1. AAMA 804.3 tape, where indicated.

B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; packaged on rolls with release liner protecting adhesive; and complying with AAMA 800 for the following types:

1. Type 1, for glazing applications in which tape acts as the primary sealant.
2. Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.6 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions with a Shore, Type A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.7 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

2.8 INSULATING GLASS UNITS (STANDARD AND LAMINATED GLASS UNITS)

A. Passive Solar Low-E Insulating-Glass Units IG-1 (Standard Units):

1. Products:

    a. PPG Industries
    b. Interpane Glass Company
    c. Guardian Industries Corp.
    d. Or equivalent

2. Overall Unit Thickness and Thickness of Each Lite: 1" overall thickness, 1/4" interior and 1/4" exterior glass lites, ½" warm edge (specifier verify if warm edge spacer req'd) air space with Argon Gas Infill.
3. Interspace Content: Argon.
4. Outdoor Lite: Class 2 (tinted) ¼" tempered float glass.

    a. Tint Color: Owner to select from manufacturer's standard grey and/or bronze tint colors.
    b. Kind FT (fully tempered)

5. Indoor Lite: Class 1 (clear) ¼" tempered float glass.

    a. Kind FT (fully tempered).
    b. Solarban 60 Low-E coating #3 surface.

6. Low-E Coating: Pyrolytic or Sputtered on 3rd surface.
7. Visible Light Transmittance: 32 percent minimum.
8. Winter Nighttime U-Factor: 0.28 maximum.
9. Summer Daytime U-Factor: 0.26 maximum.
10. Solar Heat Gain: Coefficient: 019.
11. Outdoor Visible Reflectance: 6 percent maximum.
12. Shading Coefficient: 0.22

B. Passive Solar Low-E Insulating-Glass Units IG-2 (Security/Laminated Units):

1. Products:

   a. PPG Industries
   b. Interpane Glass Company
   c. Guardian Industries Corp.
   d. Or equivalent

2. Overall Unit Thickness and Thickness of Each Lite: 1" overall thickness, 5/16" laminated interior and 1/4" exterior glass lites, 7/16" warm edge (specifier verify if warm edge spacer req'd) air space with Argon Gas Infill.
3. Interspace Content: Argon.
4. Outdoor Lite: Class 2 (tinted) ¼" tempered float glass.

   a. Tint Color: Owner to select from manufacturer's standard grey and/or bronze tint colors.
   b. Solarban 60 Low-E coating #2 surface.
   c. Kind FT (fully tempered)

5. Indoor Lite: Class 1 (clear) 5/16" laminated glass.

   a. 1/8" clear - .060 PVB - 1/8" clear (laminated sandwich panel).

6. Low-E Coating: Pyrolytic or sputtered on 2nd surface.
7. Visible Light Transmittance: 32 percent minimum.
8. Winter Nighttime U-Factor: 0.28 maximum.
9. Summer Daytime U-Factor: 0.26 maximum.
10. Solar Heat Gain: Coefficient: 019.
11. Outdoor Visible Reflectance: 6 percent maximum.
12. Shading Coefficient: 0.22

2.9 LAMINATED GLASS UNITS

A. Laminated Glass:

1. Products:

   a. PPG Industries
   b. Interpane Glass Company
   c. Guardian Industries Corp.
   d. Or equivalent

2. Class 1 (clear) 5/16" laminated glass with laminate film sandwiched between two panes of glass.

   a. 1/8" clear tempered glass lite - .060 PVB - 1/8" clear tempered glass lite

PART 3 - EXECUTION

3.1 GLAZING

A. General: Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

1. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.
2. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
3. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.
4. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
5. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
6. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).
7. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

B. Tape Glazing: Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

1. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.
2. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
3. Apply heel bead of elastomeric sealant.
4. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
5. Apply cap bead of elastomeric sealant over exposed edge of tape.

C. Gasket Glazing (Dry): Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

1. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
2. Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
3. Install gaskets so they protrude past face of glazing stops.

D. Sealant Glazing (Wet): Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

1. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
2. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.2 CLEANING AND PROTECTION

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended by glass manufacturer.

B. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

END OF SECTION 08800

SECTION 09255 - GYPSUM BOARD ASSEMBLIES

1.1 GENERAL

A. Sound Transmission Characteristics: For gypsum board assemblies with STC ratings, provide materials and construction identical to those of assemblies whose STC ratings were determined according to ASTM E 90 and classified according to ASTM E 413 by a qualified independent testing agency.

B. Fire Resistance: Where fire resistance rated gypsum board assemblies are indicated, provide gypsum board assemblies that are identical to assemblies tested for fire resistant according to ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

1.2 PRODUCTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or equivalent:

1. Steel Framing and Furring:

a. Clark Steel Framing, Inc.
b. Consolidated Systems, Inc.
c. Dale Industries, Inc.
d. Dietrich Industries, Inc.
e. Marino/Ware (formerly Marino Industries Corp.).
f. National Gypsum Co.; Gold Bond Building Products Division.
g. Unimast, Inc.
h. Or equivalent.

2. Grid Suspension Assemblies:

a. Armstrong World Industries, Inc.
b. Chicago Metallic Corp.
c. USG Interiors, Inc.
d. Worthington Steel Company (formerly National Rolling Mills).
e. Or equivalent.

3. Gypsum Board and Related Products:

a. GP Gypsum, LLC
b. National Gypsum Co.; Gold Bond Building Products Division (NG).
c. United States Gypsum Co. (USG).
d. Or equivalent.

B. Steel Framing Components for Suspended and Furred Ceilings: Provide components complying with ASTM C 754 for conditions indicated.

1. Powder-Actuated Fasteners in Concrete: Corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing according to ASTM E 1190.
2. Wire Ties: ASTM A 641 (ASTM A 641M), Class 1 zinc coating, soft temper, 0.062 inch (1.6 mm) thick.

3. Wire Hangers: ASTM A 641 (ASTM A 641M), Class 1 zinc coating, soft temper, 0.162-inch (4.1-mm) diameter.
4. Hanger Rods: Mild steel and zinc coated or protected with rust-inhibitive paint.
5. Flat Hangers: Mild steel and zinc coated or protected with rust-inhibitive paint.
6. Channels: Cold-rolled steel, 16 ga minimum thickness of base metal and 7/16-inch- (11.1-mm-) wide flanges, and as follows:

    a. Carrying Channels: 2 inches (50.8 mm) deep, 590 lb/1000 feet (88 kg/100 m), unless otherwise indicated.
    b. Finish: ASTM A 653, G 60 (ASTM A 653M, Z 180) hot-dip galvanized coating for framing for exterior soffits and where indicated.

C. Steel Studs for Furring Channels: ASTM C 645, in depth indicated and with 0.0179 inch (0.45 mm) minimum base metal thickness, unless otherwise indicated.

1. Protective Coating: ASTM A 653, G 40 (ASTM A 653M, Z 90) hot-dip galvanized coating for framing for exterior soffits and ceiling suspension members in areas within 10 feet (3 m) of exterior walls.

D. Steel Resilient Furring Channels: Standard product fabricated from steel sheet complying with ASTM A 653 (ASTM A 653M) or ASTM A 568 (ASTM A 568M) to form ½-inch-(12.7-mm-) deep channel of the following configuration unless otherwise indicated:

1. Double-Leg Configuration: Hat-shaped channel with 1-1/2-inch- (38.1-mm-) wide face connected to flanges by double-slotted or expanded-metal legs (webs).

E. Grid Suspension System for Interior Ceilings: ASTM C 645, manufacturer's standard direct-hung system.

F. Steel Framing for Walls and Partitions: Provide a minimum of 20 gauge interior non-bearing steel framing members complying with the following requirements: (for all bearing walls refer to structural drawings)

1. Protective Coating: ASTM A 653, G 40 (ASTM A 653M, Z 90) hot-dip galvanized coating for framing members attached to and within 10 feet (3 m) of exterior walls.
2. Steel Studs and Runners: ASTM C 645 in depth indicated 20 gauge minimum base metal thickness, unless otherwise indicated.

INTERIOR NON-BEARING GYPSUM STUD PARTITION HEIGHT LIMITATION & GAUGE TABLE

INTERIOR NON-BEARING GYPSUM STUD PARTITION			
1 5/8" STUD 16" O.C.	2 1/2" STUD 16" O.C.	3 5/8" STUD 16" O.C.	6" STUD 16" O.C.
X	18 GA. UP TO 12'-6"	18 GA. UP TO 16'-6"	16 GA. UP TO 22'-0"
20 GA. UP TO 8'-10"	20 GA. UP TO 11'-6"	20 GA. UP TO 15'-0"	X
SEE STRUCTURAL DRAWINGS FOR OTHER FRAMING GAUGE & SIZE			

G. Steel Rigid Furring Channels: ASTM C 645, hat shaped, in depth indicated and with 20 gauge, minimum base metal thickness unless otherwise indicated.

H. Fasteners for Metal Framing: Type, material, size, corrosion resistance, holding power, and other properties required to fasten steel framing and furring members securely to substrates involved; complying with the recommendations of gypsum board manufacturers for applications indicated.

I. Gypsum Board Products: Types indicated in maximum lengths available that will minimize end-to-end butt joints in each area indicated to receive gypsum board application.

1. Gypsum Wallboard: ASTM C 1396, C 1178, C 1658, in thickness indicated.

a. Type: Regular for vertical surfaces. (ToughRock® Mold-Guard™ by GP Gypsum or equivalent), unless otherwise indicated.
b. Type: Foil backed where indicated.
c. Type: Type X where required for fire-resistance-rated assemblies.
d. Type: For ceiling surfaces (ToughRock® Mold-Guard™ by GP Gypsum or equivalent), unless otherwise indicated.

e. Type: Moisture and mold resistant gypsum panel for wet locations without tile surfaces (ToughRock® Mold-Guard™, DensArmor Plus® interior panel by GP Gypsum, Gold Bond Brand XP Gypsum Board by NG, Fiberock Aqua-Tough Interior panel by USG, or equivalent).
f. Type: Water and mold resistant with tile surfaces. (DensShield® Tile Backer by GP Gypsum or equivalent)
g. Type: Proprietary type as required for specific fire-resistance-rated assemblies.
h. Type: Impact/Abuse Resistant. (Gold Bond High Impact XP by NG or equivalent)
i. Type: Sound Resistant. (Gold Bond Soundbreak XP by NG or equivalent)

2. Proprietary Gypsum Board Products: Subject to compliance with requirements, provide one of the following products or equivalent where proprietary gypsum wall board is indicated:

a. ToughRock® Fireguard® C, DensArmor Plus® Type C, by GP Gypsum or equivalent
b. Fire Shield G; National Gypsum Company; Gold Bond Building Products Division.
c. SHEETROCK Brand Gypsum Panels, FIRECODE C Core; United States Gypsum Company.
d. SHEETROCK Brand Gypsum Panels, ULTRACODE Core; United States Gypsum Company.
e. Or equivalent.

J. Gypsum Board Base Layer(s) for Multilayer Applications: ASTM C 1396 in thickness indicated:

1. Type: Type X where indicated or required for fire-resistance-rated assemblies.
2. Type: Sag-resistant type for ceiling surfaces, unless otherwise indicated.

K. Accessories for Interior Installations: Cornerbead, edge trim, and control joints complying with ASTM C 1047, formed metal or plastic, with metal complying with the following requirement:

1. Steel sheet zinc added space coated by hot dip proceed or rolled zinc.

L. Joint Treatment Materials: Provide joint treatment materials complying with ASTM C 475 and the recommendations of both the manufacturers of sheet products and of joint treatment materials for each application indicated.

1. Joint Tape for Gypsum Board: Paper reinforcing tape, unless otherwise indicated.

a. Use pressure-sensitive or staple-attached, open-weave, glass-fiber reinforcing tape with compatible joint compound where recommended by manufacturer of gypsum board and joint treatment materials for application indicated.

2. Setting-Type Joint Compounds for Gypsum Board: Factory-packaged, job-mixed, chemical-hardening powder products formulated for uses indicated.

    a. For prefilling gypsum board joints, use formulation recommended by gypsum board manufacturer.
    b. For filling joints and treating fasteners of water-resistant gypsum backing board behind base for ceramic tile, use formulation recommended by gypsum board manufacturer.
    c. For topping compound, use sandable formulation.

3. Drying-Type Joint Compounds for Gypsum Board: Factory-packaged vinyl-based products complying with the following requirements for formulation and intended use.
    a. Ready-Mixed Formulation: Factory-mixed product.

        1. Taping compound formulated for embedding tape and for first coat over fasteners and face flanges of trim accessories.
        2. All-purpose compound formulated for both taping and topping compounds.

M. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 that is effective in reducing the airborne transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

N. Miscellaneous Materials: Provide auxiliary materials for gypsum board construction that comply with referenced standards and recommendations of gypsum board manufacturer.

1. Laminating Adhesive: Special adhesive or joint compound recommended for laminating gypsum panels.
2. Spot Grout: ASTM C 475, setting-type joint compound recommended for spot-grouting hollow metal door frames.
3. Fastening Adhesive for Metal: Special adhesive recommended for laminating gypsum panels to steel framing.
4. Steel drill screws complying with ASTM C 1002 for the following applications:

    a. Fastening gypsum board to steel members less than 0.033 inch (0.84 mm) thick.
    b. Fastening gypsum board to gypsum board.

5. Steel drill screws complying with ASTM C 954 for fastening gypsum board to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
6. Foam Gaskets: Closed-cell vinyl foam adhesive-backed strips that allow fastener penetration without foam displacement, 1/8 inch (3.2 mm) thick, in width to suit metal stud size indicated.
7. Sound-Attenuation Blankets: Unfaced mineral-fiber blanket insulation to comply with ASTM C 665 for Type I.
8. Polyethylene Vapor Retarder: ASTM D 4397, thickness and maximum permeance rating as follows:

    a. 6 mils (0.15 mm), 0.13 perms (7.5 ng/Pa x s x sq. m).

9. Vapor Retarder Tape: Pressure-sensitive tape of type recommended by vapor retarder manufacturer for sealing joints and penetrations in vapor retarder.

1.3 EXECUTION

A. Install steel framing to comply with ASTM C 754 and with ASTM C 840 requirements that apply to framing installation.

1. Install supplementary framing, blocking, and bracing at terminations in gypsum board assemblies to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
2. Isolate steel framing from building structure at locations indicated to prevent transfer of loading imposed by structural movement.

a. Where building structure abuts ceiling perimeter or penetrates ceiling.
b. Where partition framing and wall furring abut structure, except at floor.

3. Do not bridge building control and expansion joints with steel framing or furring members. Independently frame both sides of joints with framing or furring members as indicated.

B. Installing Steel Framing for Suspended and Furred Ceilings: as follows:

1. Sway-brace suspended steel framing with hangers used for support.
2. Install suspended steel framing components in sizes and at spacings indicated, but not less than that required by the referenced steel framing installation standard.
3. Grid Suspension System: Attach perimeter wall track or angle where grid suspension system meets vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

C. Installing Steel Framing for Walls and Partitions: Install steel studs and furring at spacings indicated.

1. Where studs are installed directly against exterior walls, install asphalt felt strips or foam gaskets between studs and wall.
2. Extend partition framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.
3. Cut studs 1 inch short of full height to provide perimeter relief.
4. For STC-rated and fire-resistance-rated partitions that extend to the underside of floor/roof slabs and decks or other continuous solid structural surfaces to obtain ratings, install framing around structural and other members extending below floor/roof slabs and decks, as needed, to support gypsum board closures needed to make partitions continuous from floor to underside of solid structure.
5. Frame door openings to comply with GA-219, and with applicable published recommendations of gypsum board manufacturer, unless otherwise indicated.
6. Frame openings other than door openings to comply with details indicated or, if none indicated, as required for door openings. Install framing below sills of openings to match framing required above door heads.

7. Install polyethylene vapor retarder where indicated to comply with the following requirements:

    a. Extend vapor retarder to extremities of areas to be protected from vapor transmission. Secure in place with mechanical fasteners or adhesives. Extend vapor retarder to cover miscellaneous voids in insulated substrates, including those filled with loose mineral-fiber insulation.
    b. Seal vertical joints in vapor retarders over framing by lapping not less than 2 wall studs. Fasten vapor retarders to framing at top, end, and bottom edges, at perimeter of wall openings, and at lap joints; space fasteners 16 inches (400 mm) o.c.
    c. Seal joints in vapor retarders caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor retarder tape.
    d. Repair any tears or punctures in vapor retarder immediately before concealing it with the installation of gypsum board or other construction.

D. Gypsum Board Application and Finishing Standards: Install and finish gypsum panels to comply with ASTM C 840 and GA-216.

1. Install sound-attenuation blankets, where indicated, prior to installing gypsum panels unless blankets are readily installed after panels have been installed on one side.
2. Install ceiling board panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in the central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
3. Spot grout hollow metal door frames for solid-core wood doors, hollow metal doors, and doors over 32 inches (813 mm) wide. Apply spot grout at each jamb anchor clip and immediately insert gypsum panels into frames.
4. Form control and expansion joints at locations indicated and as detailed, with space between edges of adjoining gypsum panels, as well as supporting framing behind gypsum panels.
5. Isolate perimeter of nonload-bearing gypsum board partitions at structural abutments, except floors, as detailed. Provide 1/4- to ½-inch- (6.4- to 12.7-mm-) wide spaces at these locations and trim edges with U-bead edge trim where edges of gypsum panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
6. Where STC-rated gypsum board assemblies are indicated, seal construction at perimeters, behind control and expansion joints, openings, and penetrations with a continuous bead of acoustical sealant including a bead at both faces of the partitions. Comply with ASTM C 919 and manufacturer's recommendations for location of edge trim and closing off sound-flanking paths around or through gypsum board assemblies, including sealing partitions above acoustical ceilings.
7. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's recommendations.
    a. Space screws a maximum of 12 inches (304.8 mm) o.c. for vertical applications or as required by fire resistive design.
8. Space fasteners in panels that are tile substrates a maximum of 8 inches (203.2 mm) o.c.
9. Install water-resistant gypsum backing board panels at sink and where indicated. Install with 1/4-inch (6.4-mm) open space where panels abut other construction or penetrations.

10. Single-Layer Fastening Methods: Apply gypsum panels to supports as follows:

    a. Fasten with screws.

11. Multilayer Fastening Methods: Apply base layers of gypsum panels and face layer to base layers as follows:

    a. Fasten both base layers and face layers separately to supports with screws.

E. Installing Trim Accessories: For trim accessories with back flanges, fasten to framing with the same fasteners used to fasten gypsum board. Otherwise, fasten trim accessories according to accessory manufacturer's directions for type, length, and spacing of fasteners.

1. Install cornerbead at external corners.
2. Install edge trim where edge of gypsum panels would otherwise be exposed. Provide edge trim type with face flange formed to receive joint compound, except where other types are indicated.

    a. Install LC-bead where gypsum panels are tightly abutted to other construction and back flange can be attached to framing or supporting substrate.
    b. Install L-bead where edge trim can only be installed after gypsum panels are installed.
    c. Install U-bead where indicated.

    d. Install control joints according to ASTM C 840 and manufacturer's recommendations and in specific locations approved by Architect for visual effect.

F. Finishing Gypsum Board Assemblies: Treat gypsum board joints, interior angles, flanges of cornerbead, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration.

1. Prefill open joints, rounded or beveled edges, and damaged areas using setting-type joint compound.
2. Apply joint tape over gypsum board joints, except those with trim accessories having flanges not requiring tape.
3. Levels of Gypsum Board Finish: Provide the following levels of gypsum board finish per GA-214-15.

    a. Level 1 for ceiling plenum areas, concealed areas, and where indicated, unless a higher level of finish is required for fire-resistance-rated assemblies and sound-rated assemblies.
    b. Level 4 for gypsum board surfaces, for all exposed areas unless otherwise indicated.

4. Where Level 5 gypsum board finish is indicated, embed tape in joint compound and apply first, fill (second), and finish (third) coats of joint compound over joints, angles, fastener heads, and accessories; and apply a thin, uniform skim coat of joint compound over entire surface. For skim coat, use joint compound specified for third coat, or a product specially formulated for this purpose and acceptable to gypsum board manufacturer. Touch up and sand between coats and after last coat as needed to produce a surface free of visual defects, tool marks, and ridges and ready for decoration.
5. For Level 4 gypsum board finish, embed tape in joint compound and apply first, fill (second), and finish (third) coats of joint compound over joints, angles, fastener heads, and accessories. Touch up and sand between coats and after last coat as needed to produce a surface free of visual defects and ready for decoration.
6. Finish water-resistant gypsum backing board to comply with ASTM C 840 and gypsum board manufacturer's directions.

END OF SECTION 09255

SECTION 09300 – CERAMIC TILE

1.1 General

A. ANSI Tile Standards: Comply with ANSI A137.1 Standard Specification for Ceramic Tile and ANSI 108 series of tile installation standards included under "American National Standard Specifications for the Installation of Ceramic Tile."

B. TCNA Installation Guidelines: The current edition of the TCNA "Handbook for Ceramic, Glass, and Stone Tile Installation"; comply with TCNA installation method F112 for recessed wet set floor construction, W223and W202I for interior wall construction.

C. Submittals: With manufacturer's product data and installation instructions for tile work, submit samples of each type, color, and texture of tile mounted on 12-inch-square backing with joints grouted.

D. Attic Stock: Provide 5 percent of amount installed, packaged with protective covering for storage, and identified with labels clearly describing contents, before installation begins. Furnish attic stock: Furnish not less than 1 box for each 50 boxes or a fraction thereof, of each type, color, pattern, and size as installed.

1.2 Products

A. Colors, Textures, and Patterns: For tile, grout, and other products requiring selection of colors, surface textures, patterns, and other appearance characteristics, comply with the following requirements:

1. Provide selections made by Architect from manufacturer's full range of standard colors, textures, and patterns for products of type indicated.
2. The Architect may use multiple color patterns.

B. Sizes and Thicknesses: 4 ¼" x 4 ¼" x 5/16" thick for wall tiles. 2" x 2" x ¼" thick for all floor tiles.

C. Tile Grade: Provide category one and two standard grade color selection samples for field use and up to category four color selection samples for accent tiles. When the Contract Documents call to match existing tile, the Contractor shall include "color match" by QTCO distributed by Daltile or equivalent.

D. Factory-Applied Temporary Protective Coating: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating them with a continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.

E. Unglazed Ceramic Mosaic Floor Tile: Factory-mounted flat tile and as follows:

1. Composition: Porcelain with abrasive admixture.
2. Face: Standard design with cushion edges.

F. Glazed Wall Tile: Factory-mounted flat tile and as follows:

1. Face: Plain with cushion edge.
2. Mounting: Back-mounted.

G. Backer Board: Provide ¼" thick cement backer board at all existing CMU wall surfaces to receive new ceramic tile finish. Backer boards shall be fabricated with 90% Portland cement and sand mixture to resist damage from moisture. Formulation and structure must provide strength, uniform composition and excellent tile adhesion. Provide HardieBacker by James Hardie or equivalent.

H. Quarry tile: 6" x 6" x ¾" with abrasive grain used in kitchen area. Plain face including 6" wall base in kitchen area.

I. Trim Shapes: Same material, size, color, and texture as field tile. Provide cove base, inside and outside vertical coves and beads.

J. Marble Thresholds: Group "A"; ASTM C 503, for exterior use with minimum hardness of 10.0 per ASTM C 241; white with honed finish unless otherwise indicated.

K. Surface Preparation Materials: Provide surface preparation materials as follows:

1. Trowelable Floor/Wall Patch and Render Mortar: Quick-Setting, Polymer-Modified, Fiber-Reinforced, Cementitious Rendering, Patching, and Leveling Mortar, can be applied at 1/8 inch to 1-1/4 inch (3 mm to 32 mm).

   a. Product: MAPEI, Planitop 330 Fast.
   b. Or equivalent

2. Trowelable Concrete Floor Patch: High-Performance, Fast-Setting Cementitious Patching Compound. Can be applied at 1/16 inch to 1-1/2 inches (1.5 mm to 38 mm) neat and from 1-1/2 inches to 3 inches (38 mm to 76 mm) neat in areas no larger than 24 sq ft (2.23 sq m).

   a. Product: MAPEI, Mapecem Quickpatch.
   b. Or equivalent

L. Self-Leveling Underlayments: Provide self-leveling underlayments as follows:
1. Quick-Setting, Hydraulic Cement Underlayment: Polymer-modified, self-leveling, hydraulic cement. Applied Minimum Uniform Thickness: 1/8 to 1 inch (3 to 25 mm).

   a. Product: MAPEI, Novoplan 2 Plus.
      1) Primer required: MAPEI, Primer T.
      2) or equivalent

M. Waterproof and Crack Isolation Membranes: Provide Waterproof and Crack Isolation membranes as follows:

1. Fluid-Applied Membrane: Advanced liquid-rubber; extremely quick-drying, premium waterproofing and crack- isolation membrane, IAPMO-listed, ANSI A118.10 and A118.12.

   a. Product: MAPEI, Mapelastic AquaDefense. (or equivalent)
      1) With MAPEI, Reinforcing Fabric (or equivalent)

N. Setting Materials: Provide setting materials as follows:

1. Portland Cement Mortar: Materials complying with ANSI A 108.1 and as follows:

   a. Latex additive (water emulsion) as follows, replacing part or all of gauging water, specifically recommended by latex additive manufacturer for use with job-mixed portland cement and aggregate mortar bed.

      1) Latex Additive: Manufacturer's standard.
         a) Product: MAPEI, Planicrete AC.
         b) Or equivalent

2. Dry-Set Portland Cement Mortar: ANSI A118.1.

3. Latex-Portland Cement Mortar: ANSI A118.4.

   a. Prepackaged dry mortar mix composed of portland cement, graded aggregate, and the following dry polymer additive in the form of a reemulsifiable powder to which only water is added at job site.

      1) Dry Polymer Additive: Manufacturer's standard.
         a) Product: MAPEI, Ultraflex 2.
         b) Or equivalent

4. Improved Modified Dry-Set Cement Mortar: Non-Sag, for Large and Heavy Tile; ANSI A118.4HTE, ANSI A118.11, ANSI A118.15HTE, and ISO 13007 C2TES1P1.
   a. Product: MAPEI Ultraflex LFT.
   b. Or equivalent

5. Improved Modified Dry-Set Cement Mortar: ANSI A118.4E, ANSI A118.11, ANSI A118.15E, and ISO 13007 C2ES2P2.
   a. Product: MAPEI Kerabond and Keralastic System
   b. or equivalent

6. Latex additive as described below, replacing part or all of gauging water, combined at job site with prepackaged dry mortar mix specified by latex additive manufacturer.
   a. Latex Type: Manufacturer's standard.
      1) Product: MAPEI, Kerabond/Keralastic System.
      2) Or equivalent

7. Organic Tile Adhesive: ANSI A136.1, Type I.

O. Grouting Materials: Provide grouting materials as follows:

1. Latex-Portland Cement Grout: ANSI A118.6 of the following composition.

   a. Latex additive (water emulsion) replacing part or all of gauging water, added at job site with dry grout mixture, with type of latex and dry grout mix as follows:
      1) Latex Type: Manufacturer's standard.

2) Dry Grout Mixture: Commercial portland cement specified or supplied by latex additive manufacturer.

2. High Performance Cement Tile Grout: For grout joints from 1/16 to 3/4 inch (1.5 to 19 mm) and meeting ANSI A118.7 and ISO 13007 CGWAF.

a. Product: MAPEI; Ultracolor Plus FA.
b. Or equivalent

3. Commercial Industrial Grade Water-Cleanable Epoxy Grout: For grout joints from 1/8 to 5/8 inch (3 to 16 mm), ANSI A118.3 and ISO 13007 RG.

a. Product: MAPEI, Kerapoxy IEG CQ. Or equivalent
b. Provide product with a VOC content of 65000 ppm (65 grams per L) or less when calculated according to 40 CFR 59, Subpart D.
c. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 140 degrees F (60 degrees C) and 212 degrees F (100 degrees C), respectively, and certified by manufacturer for intended use.

P. Elastomeric Sealants: Manufacturer's standard chemically curing, elastomeric sealants of base polymer indicated that comply with requirements of Division 7 Section "Joint Sealers" including ASTM C 920 as referenced by Type, Grade, Class, and Uses.

1. One-Part Mildew-Resistant Silicone Sealants: ASTM C 920, Type S, Grade NS, Class 25, Uses NT, G, A, and O (for use in joints in nontraffic areas).

a. Product: MAPEI; Mapesil T.
b. Or equivalent

Q. Miscellaneous Materials: Provide the following materials:

1. Metal Edge Strips: Stainless steel or zinc alloy, 1/8-inch wide at top edge.

2. Temporary Protective Coating: As follows, formulated to protect exposed surfaces of tile against adherence of mortar and grout, compatible with tile and mortar/grout products, and easily removable without damaging grout or tile.

a. Petroleum paraffin wax, fully refined, tasteless, odorless, containing at least 0.5 percent oil, with a melting point of 120 deg F (49 deg C) to 140 deg F (60 deg C) per ASTM D 87.

3. Sulfamic Acid Crystals: Cleaner and problem-solver for nonporous, acid-resistant tile and natural stone. Removes cured cement grout haze, mortar residue, rust stains and mineral deposits such as efflorescence.

a. Product: MAPEI, UltraCare Sulfamic Acid Crystals.
b. Or equivalent

4. Grout release: high-performance sacrificial coating that protects the tile surface from grout stains, improves cleanability and reduces the risk of grout haze or film residue, interior and exterior applications on all-natural stone; marble, limestone, sandstone, slate, granite and travertine, porcelain/ceramic tiles, masonry and quarry tiles.

   a. Product: MAPEI, UltraCare Grout Release.
   b. Or equivalent

5. Solvent-Based Penetrating Sealer: Natural-look providing maximum protection against most common stains. For use on interior and exterior natural stone; marble, limestone, sandstone, slate, granite, travertine, unglazed porcelain and ceramic tiles, masonry, quarry tiles and cement grout. Can also be used as a pre-grouting sealer.

   a. Product: MAPEI, UltraCare Penetrating SB Stone, Tile and Grout Sealer.
   b. Or equivalent

6. Neutral pH Cleaner: Highly concentrated, zero-VOC, for ceramic, porcelain and natural stone surfaces and prevent soap scum buildup and hard water deposits.

   a. Product: MAPEI, UltraCare Concentrated Tile and Grout Cleaner.
   b. Or equivalent

7. High-Alkaline Cleaner: Highly concentrated and degreaser that quickly removes waxes, grease, oil, light soap scum, mildew and algae stains. For areas that have been neglected or subject to heavy use.

   a. Product: MAPEI, UltraCare Heavy-Duty Stone, Tile and Grout Cleaner.
   b. Or equivalent

1.3 Execution

A. Field-Applied Temporary Protective Coating: Where indicated under or needed to prevent adhesion or staining of exposed tile surfaces by grout, precoat tile with a continuous film of temporary protective coating indicated below:

   1. Petroleum paraffin wax.

B. Installation: Follow TCNA Installation Guidelines. TCNA "Handbook for Ceramic Tile Installation"; comply with TCNA installation method F112-2007, F113-2007 for recessed wet set floor construction, W202-2007, W223-2007 for wall construction.

C. Existing Floor Preparation: Assume that major floor preparation and leveling will be required on concrete subfloor. Provide positive slope to the floor drain. Assume that up to 1 ½" of leveling may be required on existing concrete subfloor.

D. Joint Pattern: Use grid pattern with 1/16-inch-wide joints unless otherwise indicated.

E. Expansion, Control, Contraction, and Isolation Joints: As indicated per TCNA Method EJ171.

1. Seal tile joints with elastomeric sealants to comply with Division 7 Section "Joint Sealers."

F. Edge Strips: Provide at exposed edge of tile meeting carpet, wood, or resilient flooring, unless otherwise indicated.

G. Cleaning: Upon completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

1. Remove latex-portland cement grout residue from tile as soon as possible.
2. Unglazed tile may be cleaned with acid solutions only when permitted by tile and grout manufacturer's printed instructions but no sooner than 14 days after installation. Protect metal surfaces, cast iron, and vitreous plumbing fixtures from effects of acid cleaning. Flush surface with clean water before and after cleaning.
3. Remove temporary protective coating, by method recommended by coating manufacturer that is acceptable to brick and grout manufacturer. Trap and remove coating to prevent it from clogging drains.
4. Floor drain: Slope setting mortar bed to floor drain for positive water flow. Remove and clean the drain cover after grouting and final cleaning.

END OF SECTION 09300

SECTION 09510 - ACOUSTICAL CEILINGS

PART-1 GENERAL

1.01 Summary:

A. This Section includes acoustical ceilings consisting of suspended exposed-grid systems with lay-in acoustical panels.

1.02 Submittals:

A. Product Data: Manufacturer's complete technical descriptive literature for each item required, including specifications and installation recommendations.

B. Coordination Drawings: Reflected ceiling plans draw n to scale and coordinating penetrations and ceiling-mounted items. Within 60 days after award of Contract, submit coordination drawings for all new or altered areas, draw n accurately to a scale no less than 1/8" = 1 ' - O ", coordinating penetrations and ceiling-mounted items. Coordinate with other prim e contractors to obtain necessary information and agreement on location of penetrations and ceiling-mounted items. Upon review and acceptance by Architect, incorporate revisions (if any) into an AutoCAD -based file. Furnish one hard copy of accepted shop drawings and one updated CAD-file copy to all other applicable prim e contractors for their further information and use. Show the following:

1. Ceiling suspension system members.
2. Method of attaching hangers to building structure.
3. Bulkheads, soffits, areas with drywall ceilings (if any), and areas of exposed structure (if any).
4. Room names and numbers, ceiling types, and ceiling elevations above the finished floor.
5. Special moldings at walls, column penetrations, and other junctures with adjoining construction, including all curved walls and bulkheads.
6. Ceiling-mounted items, including light fixtures; HVAC air distribution devices; speakers; fire alarms; sprinkler heads; and other similar devices or fixtures.

C. Shop Drawings: Show details and information pertinent to construction, installation, and placement of all components required for continuous, smooth wall angles at curved walls, bulkheads and circular columns. Include sections of typical curved wall angle.

1.03 Quality Assurance:

A. Installer Qualifications: Engage an experienced installer who has completed acoustical tile ceilings and finishes similar in material, design, and extent to that indicated for this Project and with a minimum five-year record of successful in-service performance.

B. Source Limitations for Ceiling Units: Obtain all acoustical panel and grid systems from one single source.

1.04 Delivery, Storage and Handling:

A. Deliver acoustical materials and suspension system components to Project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other detrimental conditions.

B. Before installing acoustical materials, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical tiles and panels carefully to avoid chipping edges or damaging units in any way.

1.05 Project Conditions:

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. The work area shall be broom clean and the structure in proper condition to receive acoustical materials. Acoustical work shall follow the installation of ductwork, piping and conduit located in ceiling space above ceilings.

1.06 Coordination:

A. Coordinate layout and installation of acoustical materials and suspension systems with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.07 Extra Stock:

A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.

1. Acoustical Ceiling Units:

a. ACT Type A: One extra carton of full-size units of each type.

PART-2 PRODUCTS

2.01 Acoustical Ceilings. General:

A. Humidity Resistance: Unless indicated otherwise, ceiling panels shall be rated for 90% humidity conditions and shall have a 10-year sag- and warp-resistance warranty, comparable to Armstrong's "HumiGuard Plus" or equivalent.

B. Acoustical Ceiling Colors: Manufacturer's standard white, unless indicated otherwise.

C. Fire-Test-Response Characteristics: Provide ceilings (ceiling panels/tiles, grids and accessories) that comply with the following requirements:

1. Fire-response tests were performed by UU, ITS/Wamock Hersey, or another independent testing and inspecting agency that is acceptable to authorities having jurisdiction and that performs testing and follow-up services.
2. Surface-burning characteristics of acoustical panels shall comply with ASTME 1264 for Class A materials as determined by testing identical products per ASTME 84.

D. Dimensions: Length by width dimensions for lay-in ceiling panels are nominal dimensions. Actual dimensions are to be factory-cut sizes that fit within suspended ceiling grids having standard modular dimensions matching the specified panel nominal length and width.

2.02 Acoustical ceiling systems:

A. ACT-A: 24 in. x 48 in. x 7/8 in. lay-in panels with square edge profile; wet-formed panel composed of mineral fiber with a factory-applied, vinyl latex paint finish; minimum light reflectance (LR) rating of 0.84; minimum ceiling attenuation class (CAC) of 40; and minimum noise reduction coefficient (NRC) of 0.70. Suspension system - Type A.

1. Subject to compliance with requirements, provide one of the following panel products oe equivalent:

a. Armstrong World Industries; School Zone Fine Fissured #1714
b. USG Interiors; Radar Clima Plus, High-NRC #22441
c. or equivalent

2.03 Suspension Systems:

A. General: Unless indicated otherwise, suspension grids shall comply with ASTMC 635 "Intermediate Duty" Classification.

B. Suspension System Types:

1. Type A, C and D: Exposed grid system with 15/16 in. wide face, shall be HDG steel, Class A Fire Rated, White.

2. Type B: Exposed grid system with 15/16 in. wide face white aluminum capping.

C. Suspension System Accessories: Provide all accessories necessary to complete installation, including, but not limited to, the following:

1. Preformed, factory-finished, bull-nosed comers to match grid material and finish. Provide comers w here grid meets bull-nosed block.
2. Provide impact clips at toilet room and gymnasium ceilings.

3. Provide retention clips for ceilings located in wind locks and vestibules.
4. Provide white, dual durometer polyvinylchloride (PVC) bellow s-style filler for 1-inch expansion joints in suspended lay-in acoustical ceilings, selected from the following options or equivalent:

    a. Allway HC/HC W Series; Construction Specialties, Inc.
    b. DX Series; M M Systems Corp.
    c. Wabo Fast Wrap CES Series; Watson Bowman Acme Corp.
    d. or equivalent

PART-3 EXECUTION

3.01 Ceiling Installation:

A. Suspend main beams spaced at 24 in. or 48 in. o.c., as indicated on Drawings, from structure above by minimum #12 gauge galvanized wire hangers spaced not more than 48 in. o.c.

B. Install interlocking cross-tees at 24 in. o.c. to form a 24 in. x 48 in., or 24 in. x 24 in. grid pattern.

C. System shall be accurately leveled to within 1/8 in. in 12 ft. 0 in. Deflection shall not exceed 1/360 of the span of any component.

D. Provide matching perimeter molding around separate room areas, abutting walls, and around columns and similar protrusions, unless indicated otherwise.

    1. At radiused bulkheads and walls, provide curved wall angle, factory-formed to match diameter of bulkheads and walls; aluminum, finished to match ceiling grid. Field cut and formed edges made up of straight sections will not be permitted.

E. Where perimeter molding meets expansion joint trim, provide a clear break in the molding equal to no less than the expansion joint width.

F. Scribe and cut panels at borders and penetrations to provide a neat, precise fit. Coordinate with work of HVAC, plumbing and electrical trades.

302 Cleaning:

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

SECTION 09651 - RESILIENT TILE FLOORING

1.1 GENERAL

A. Submittals: As follows:

1. Product Data: For each type of product specified.
2. Samples of each different color and pattern of resilient product specified.
3. Maintenance Data: For resilient floor tile to include in the maintenance manuals specified in Division 1.

B. Extra Materials: Deliver extra materials to Owner as follows:

1. Furnish not less than one box for each 50 boxes or fraction thereof, of each type, color, pattern, class, wearing surface, and size of resilient tile flooring installed.
2. Furnish not less than 10 linear feet (3 linear m) for each 500 linear feet (150 linear m) or fraction thereof, of each type, color, pattern, and size of resilient accessory installed.

1.2 PRODUCTS

A. Vinyl Composition Floor Tile: Products complying with ASTM F 1066 (nonasbestos formulated) and with 12" x 12" x 1/8" thickness. Color and pattern selected from manufacturer's standard package. The pattern for all areas may be as many as three (3) different colors used in a pattern that does not require cut accent color tiles per the Owner's / Architect's direction.
1. Provide Armstrong Standard Excelon Imperial or Equivalent.
2. Color to be selected by Owner from manufacturer's full range of color options.

B. Slip-Retardant Tile Flooring

1. Description: Vinyl tile composed of polyvinyl chloride resin, plasticizers, fillers, pigment, and grit. Tile shall have a nominal 0.020 in. (0.51 mm) thick pattern layer containing aluminum oxide grit.
2. Tile shall meet size, thickness, indentation, impact, deflection, dimensional stability, resistance to chemicals, squareness, and resistance to heat requirements of ASTM F 1066 Standard Specification for Vinyl Composition Tile, Class 2, through pattern.
3. Provide Armstrong Safety Zone Tile or Equivalent, 12 x 12 x 1/8, color to be selected from manufacturer's full range of available choices.

C. Vinyl Wall Base: Products complying with ASTM F-1861, Type II, Style B-Coved, 6" high by 1/8" thick. Color selected from manufacturer's standard package.

D. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based formulation provided or approved by flooring manufacturer for applications indicated.

E. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

F. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edge of tiles, and in maximum available lengths to minimize running joints.

PART 2 - EXECUTION

A. Examine substrates, areas, and conditions where installation of resilient products will occur, with Installer present, for compliance with manufacturer's requirements. Verify that substrates and conditions are satisfactory for resilient product installation and comply with requirements specified.

1. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by flooring manufacturer.
2. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Preparation: Comply with resilient product manufacturer's written installation instructions for preparing substrates indicated to receive resilient products.

C. Tile Installation: Comply with tile manufacturer's written installation instructions.

1. Lay out tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half of a tile at perimeter.

    a. Lay tiles square with room axis, unless otherwise indicated.

2. Match tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered.

    a. Lay tiles with grain running in alternate direction.

3. In the corridors only, match the existing layout pattern or install in accordance with Owner's selection for pattern from whole tile standard colors. The pattern shall be made up of no more than three colors.

D. Resilient Accessory Installation: Install resilient accessories according to manufacturer's written installation instructions.

1. Apply resilient wall base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

    a. Install wall base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
    b. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
    c. Do not stretch base during installation.
    d. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient wall base with manufacturer's recommended adhesive filler material.
    e. Form corners on job from straight pieces of maximum lengths possible, without whitening at bends.

2. Place resilient accessories so they are butted to adjacent materials and bond to substrates with adhesive. Install reducer strips at edges of flooring that would otherwise be exposed.
3. Apply resilient products to stairs as indicated.

E. After installation and prior to any construction foot traffic, clean and protect resilient products according to manufacturer's written recommendations. Strip all VCT flooring and apply three coats of wax. All products to be utilized shall be in accordance with manufacturer's recommendations. A final cleaning of resilient products before Substantial Completion is required.

END OF SECTION 09651

SECTION 09653 - RESILIENT WALL BASE AND ACCESSORIES

PART 1 GENERAL

A. Submittals: As follows:

1. Product Data: For each type of product specified.
2. Samples: In manufacturer's standard sizes of each product color and pattern specified.

B. Extra Materials: Furnish not less than 10 linear feet (3 linear m) for each 500 linear feet (150 linear m) or fraction thereof, of each different type, color, pattern, and size of resilient product installed. Deliver extra materials to Owner.

PART 2 PRODUCTS

A. Manufacturers

1. Basis-of-Design: Roppe Corporation, 1602 N Union St., Fostoria, OH 44830. P: (800) 537 – 9527
2. Johnsonite
3. or Equivalent

B. Rubber Cove Wall Base : Pinnacle – Rubber, Vulcanized Thermoset, Standard Toe, 6" high x 1/8" thick, Style B, Cove, Color shall be the manufacturer's standard choices.

C. Vented Cove Base: Products complying with ASTM F-1861, Type II, Style B-Coved, 4" high with a 3" toe by 1/8" thick. Color selected from manufacturer's standard package.

D. Rubber Stair Treads: Provide low profile raised circular treads with rubber non-slip insert of a contrasting color strip to aid the visually impaired.

E. Rubber Risers: Products of same manufacturer as stair treads and complying with requirements specified in the Resilient Wall Base and Accessory Schedule.

F. Rubber Accessories: Products complying with requirements specified in the Resilient Wall Base and Accessory Schedule.

G. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based formulation provided or approved by resilient product manufacturer for applications indicated.

H. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

PAT 3 EXECUTION

A. Examine substrates, areas, and conditions where installation of resilient products will occur, with Installer present, for compliance with manufacturer's requirements, including those for maximum moisture content. Verify that substrates and conditions are satisfactory for resilient product installation and comply with requirements specified. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Preparation: Comply with manufacturer's written installation instructions for preparing substrates indicated to receive resilient products.

C. Installation: Install resilient products according to manufacturer's written installation instructions.

1. Apply resilient wall base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

   a. Install wall base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
   b. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
   c. Do not stretch base during installation.
   d. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient wall base with manufacturer's recommended adhesive filler material.
   e. Form corners on job, from straight pieces of maximum lengths possible, without whitening at bends.

2. Place resilient products so they are butted to adjacent materials and bond to substrates with adhesive. Install reducer strips at edges of flooring that would otherwise be exposed.
3. Apply resilient products to stairs as indicated.

D. Clean and protect resilient products according to manufacturer's written recommendations. Clean resilient products after installation and not more than 4 days before dates scheduled for inspections intended to establish date of Substantial Completion in each area of Project.

END OF SECTION 09653

SECTION 09900 – PAINTING

1.1 GENERAL

A. This Section includes surface preparation and field painting of exposed exterior and interior items and surfaces.

1. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.

B. Paint exposed surfaces, except where the paint schedules indicate that a surface or material is not to be painted or is to remain natural. Block fill prime paint all CMU walls full height to the roof deck above ceiling and behind all built in casework, lockers, etc. If the paint schedules do not specifically mention an item or a surface, paint the item or surface the same as similar adjacent materials or surfaces whether or not schedules indicate colors. If the schedules do not indicate color or finish, the Architect will select from standard colors and finishes available.

C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.

1. Labels: Do not paint over Underwriters Laboratories (UL), Factory Mutual (FM), or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

D. Submittals: For each paint system specified, provide the following:

1. Material List: Provide an inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
2. Manufacturer's Information: Provide manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material proposed for use.

E. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for each type of finish-coat material indicated. After color selection, the Architect will furnish color chips for surfaces to be coated.

F. Samples for Verification: Of each color and material to be applied, with texture to simulate actual conditions, on representative Samples of the actual substrate.

1. Provide stepped Samples, defining each separate coat, including block fillers and primers. Use representative colors when preparing Samples for review. Resubmit until required sheen, color, and texture are achieved.
2. Provide a list of materials and applications for each coat of each sample. Label each sample for location and application.
3. Submit Samples on the following substrates for the Architect's review of color and texture only:
   a. Concrete: Provide two 4-inch- (100-mm-) square samples for each color and finish.
   b. Concrete Masonry: Provide two 4-by-8-inch (100-by-200-mm) samples of masonry for each finish and color.
   c. Stained or Natural Wood: Provide two 4-by-8-inch (100-by-200-mm)

samples of natural- or stained-wood finish on actual wood surfaces.

d. Ferrous Metal: Provide two 4-inch- (100-mm-) square samples of flat metal and two 8-inch- (200-mm-) long samples of solid metal for each color and finish.

G. Source Limitations: Obtain block fillers, primers, and undercoat materials for each coating system from the same manufacturer as the finish coats.

H. Benchmark Samples (Mockups): Provide a full-coat benchmark finish sample of each type of coating and substrate required on the Project. Comply with procedures specified in PDCA P5. Duplicate finish of approved prepared samples.

1. The Architect will select one room or surface to represent surfaces and conditions for each type of coating and substrate to be painted. After permanent lighting and other environmental services have been activated, apply coatings in this room or to each surface as specified.

a. After finishes are accepted, the Architect will use the room or surface to evaluate coating systems of a similar nature.

I. Deliver materials to the Project Site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label.

J. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F (7 deg C). Maintain containers in clean condition, free of foreign materials and residue. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily.

K. Project Conditions: Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85 percent; or at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

L. Additional Material: Provide one gallon for each 200 gallons paint used in each color and type (minimum one gallon) to Owner.

1.2 PRODUCTS

A. Material Compatibility: Provide block fillers, primers, undercoats, and finish-coat materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified. Paint-material containers not displaying manufacturer's product identification will not be acceptable.

1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers.

C. Colors: Match colors indicated by reference to manufacturer's color designations.

1.3 EXECUTION

A. Examine substrates, areas, and conditions under which painting will be performed for compliance with paint application requirements. Do not begin to apply paint until unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.

B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates.

C. Preparation: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of the size or weight of the item, provide surface-applied protection before surface preparation and painting. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.

D. Cleaning: Before applying paint or other surface treatments, clean the substrates of substances that could impair the bond of the various coatings. Remove oil and grease before cleaning. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

E. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition.

1. Cementitious Materials: Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation. Use abrasive blast-cleaning methods if recommended by paint manufacturer.

    a. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition. Do not paint surfaces where moisture content exceeds that permitted in manufacturer's written instructions.

2. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.

    a. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.
    b. Prime, stain, or seal wood to be painted immediately on delivery. Prime edges, ends, faces, undersides, and backsides of wood, including cabinets, counters, cases, and paneling.
    c. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately on delivery.

3. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with the Steel Structures Painting Council's (SSPC) recommendations.

   a. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with the same primer as the shop coat.

4. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.

F. Materials Preparation: Mix and prepare paint materials according to manufacturer's written instructions.

1. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
2. Use only thinners approved by paint manufacturer and only within recommended limits.

G. Application: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.

1. Paint colors and finishes shall be selected during construction. Contractor shall allow for use of up to (4) four different wall colors and (2) two different trim colors throughout the building interior, including use of accent walls and use of different colors within the same room/space. Contractor shall allow for use of (2) two different exterior paint colors. Additionally, the contractor may have to color match and paint items to match immediately adjacent pre-finished items and existing items as necessary throughout construction.
2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
3. Provide finish coats that are compatible with primers used.
4. The term "exposed surfaces" includes areas visible when permanent or built-in items are in place. Extend coatings in these areas, as required, to maintain the system integrity and provide desired protection.
5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before the final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
6. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
7. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
8. Sand lightly between each succeeding enamel or varnish coat.

H. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

1. The number of coats and the film thickness required are the same regardless of application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
2. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
3. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and where application of another coat of paint does not cause the undercoat to lift or lose adhesion.

I. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.

J. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate. Provide the total dry film thickness of the entire system as recommended by the manufacturer.

K. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.

L. Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by the manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn through or other defects due to insufficient sealing.

M. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

N. Field Quality Control: The Owner reserves the right to engage the services of an independent testing agency to sample the paint material being used. Samples of material delivered to the Project will be taken, identified, sealed, and certified in the presence of the Contractor.

1. The testing agency will perform appropriate tests as required by the Owner.
2. If tests show material being used does not comply with specified requirements, the Contractor shall remove noncomplying paint from the site, pay for testing, and repaint surfaces previously coated with the rejected paint. If necessary, the Contractor may be required to remove rejected paint from previously painted surfaces if, on repainting with specified paint, the 2 coatings are incompatible.

O. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from the site.

1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping. Be careful not to scratch or damage adjacent finished surfaces.

P. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.

Q. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.

1. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

R. Paint Schedules: Provide the following paint systems for the various substrates indicated by Sherwin Williams (SW), PPG Paints or equivalent products:

S. **Exterior Paint Systems:**

1. Ferrous Metal:

a. Full gloss enamel finish - rust inhibitive primer with acrylic finish

Primer:	SW:	ProIndustrial Pro-Cryl Primer
	PPG:	Paints MultiPrime Low VOC Universal Primer 4360
1st Coat:	SW:	DTM Acrylic Finish, semi-gloss
	PPG:	Paints Pitt Tech Plus DTM Acrylic Semi-Gloss 4216
2nd Coat:	SW:	DTM Acrylic Finish, semi-gloss
	PPG:	Paints Pitt Tech Plus DTM Acrylic Semi-Gloss 4216

2. Non-Ferrous Metal:

a. Full gloss enamel finish - galvanized metal primer with acrylic finish (Lintels, Railings, Bollards, etc.)

Primer:	SW:	ProIndustrial Pro-Cryl Primer
	PPG:	Paints Pitt Tech Plus DTM Acrylic Primer 4020
1st Coat:	SW:	DTM Acrylic Finish, semi-gloss
	PPG:	Paints Pitt Tech Plus DTM Acrylic Semi-Gloss 4216
2nd Coat:	SW:	DTM Acrylic Finish, semi-gloss
	PPG:	Paints Pitt Tech Plus DTM Acrylic Semi-Gloss 4216

T. **Interior Paint Systems:**

1. Concrete, Masonry (not including CMU):

a. Acrylic epoxy

Primer:	SW:	Loxon Concrete Masonry Primer
	PPG:	Paints Speedhide zero Interior Latex Primer 6-4900XI
2nd Coat:	SW:	ProIndustrial Pre-Catalyzed Epoxy
	PPG:	Paints Pitt Glaze WB1 Pre-Catalyzed Epoxy 16-xxx
3rd Coat:	SW:	ProIndustrial Pre-Catalyzed Epoxy
	PPG:	Paints Pitt Glaze WB1 Pre-Catalyzed Epoxy 16-xxx

2. Concrete Masonry Units (CMU): Typical Walls (Block fill prime paint all CMU walls full height and behind all built in casework, lockers, etc.)

a. Acrylic epoxy – eggshell finish

Filler:	SW:	Loxon Block Surfacer
	PPG:	Paints Speedhide Latex Block Filler 6-15XI
2nd coat:	SW:	ProIndustrial Pre-Catalyzed Epoxy, eggshell
	PPG:	Paints Pitt Glaze WB1 Pre-Catalyzed Epoxy 16-310
3rd Coat:	SW:	ProIndustrial Pre-Catalyzed Epoxy, eggshell
	PPG:	Paints Pitt Glaze WB1 Pre-Catalyzed Epoxy 16-310

b. Acrylic epoxy – semi-gloss finish (Kitchen areas)

Filler:	SW:	Loxon Block Surfacer
	PPG:	Paints Speedhide Latex Block Filler 6-15XI
2nd coat:	SW:	ProIndustrial Pre-Catalyzed Epoxy, semi-gloss
	PPG:	Paints Pitt Glaze WB1 Pre-Catalyzed Epoxy 16-510
3rd Coat:	SW:	ProIndustrial Pre-Catalyzed Epoxy, semi-gloss
	PPG:	Paints Pitt Glaze WB1 Pre-Catalyzed Epoxy 16-510

3. Drywall and Plaster:

a. Acrylic latex

Primer:	SW:	ProMar 200 zero VOC Primer
	PPG:	Paints Speedhide zero Interior Latex Primer 6-4900XI
2nd Coat:	SW:	ProIndustrial Pre-Catalyzed Epoxy
	PPG:	Paints Pitt Glaze WB1 Pre-Catalyzed Epoxy 16-xxx
3rd Coat:	SW:	ProIndustrial Pre-Catalyzed Epoxy
	PPG:	Paints Pitt Glaze WB1 Pre-Catalyzed Epoxy 16-xxx

4. Wood:

a. Acrylic epoxy

Primer:	SW:	Multi-Purpose Primer
	PPG:	Paints Seal Grip Interior Primer/Finish 17-951
2nd Coat:	SW:	ProIndustrial Pre-Catalyzed Epoxy
	PPG:	Paints Pitt Glaze WB1 Pre-Catalyzed Epoxy 16-xxx
3rd Coat:	SW:	ProIndustrial Pre-Catalyzed Epoxy
	PPG:	Paints Pitt Glaze WB1 Pre-Catalyzed Epoxy 16-xxx

b. Transparent Stain with urethane finish

1st coat:	SW:	Minwax 250 Stain
	PPG:	Deft Interior Low VOC Oil Stain DFT400
2nd Coat:	SW:	Wood Classic Water Based Urethane
	PPG:	Deft Waterbased Polyurethane DFT 15x
3rd Coat:	SW:	Wood Classic Water Based Urethane
	PPG:	Deft Waterbased Polyurethane DFT 15x

5. Ferrous Metal:

a. Gloss Finish - rust inhibitive primer with acrylic finish

Primer:	SW:	ProIndustrial Pro-Cryl Primer
	PPG:	Paints Pitt Tech Plus DTM Acrylic Primer 4020
1st Coat:	SW:	DTM Acrylic Finish, semi-gloss
	PPG:	Paints Pitt Tech Plus DTM Acrylic Semi-Gloss 4216
2nd Coat:	SW:	DTM Acrylic Finish, semi-gloss
	PPG:	Paints Pitt Tech Plus DTM Acrylic Semi-Gloss 4216

6. Non-Ferrous Metal (New Galvanized and Aluminum):
   - Primer: SW: ProIndustrial Pro-Cryl Primer
     PPG: Paints Pitt Tech Plus DTM Acrylic Primer 4020
   - 1st Coat: SW: DTM Acrylic Finish, semi-gloss
     PPG: Paints Pitt Tech Plus DTM Acrylic Semi-Gloss 4216
   - 2nd Coat: SW: DTM Acrylic Finish, semi-gloss
     PPG: Paints Pitt Tech Plus DTM Acrylic Semi-Gloss 4216

7. Concrete Floors – light traffic (janitor closets and utility spaces)
   - Primer: SW: ArmorSeal Tread Plex Primer
     PPG: Paints Breakthrough Satin Acrylic V51 Series
   - 2nd coat: SW: ArmorSeal Tread Plex Finish
     PPG: Paints Breakthrough Satin Acrylic V51 Series

8. Concrete Floors – High Traffic Epoxy
   - Primer: SW: ArmorSeal 8100 Urethane Epoxy @ 3.0-5.0 mils dft
     PPG: Paints High Gloss Epoxy 95-501 @ 3.0-5.0 mils dft
   - 2nd coat: SW: ArmorSeal 8100 Urethane Epoxy @ 3.0-5.0 mils dft
     PPG: Paints High Gloss Epoxy 95-501 @ 3.0-5.0 mils dft

9. Concrete Floors – Heavy Duty Vehicular Traffic Epoxy (Garages/Apparatus Bays)
   - Primer: SW: ArmorSeal 33 Epoxy Primer @ 8.0 mils dft
     PPG: TBD
   - 2nd coat: SW: ArmorSeal 1000 HS 2-Part Polyamide Epoxy @ 3.0-5.0 mils dft
     PPG: TBD
   - 3rd coat: SW: ArmorSeal 1000 HS 2-Part Polyamide Epoxy @ 3.0-5.0 mils dft
     PPG: TBD
   - Additive: Include manufacturer recommended anti-slip additive. Provide samples for selection by Owner, (3) minimum, fine, medium-fine and medium.

10. Exposed Ceiling Deck – dryfall coating
    - Primer – Ferrous Metal:
      SW: ProIndustrial Pro-Cryl Primer
      PPG: Paints MultiPrime Low VOC Universal Primer 4360
    - Primer – Non-Ferrous Metal:
      SW: ProIndustrial Pro-Cryl Primer
      PPG: Paints Pitt Tech Plus DTM Acrylic Primer 4020
    - Finish 1-2 coats:
      SW: Waterborne Acrylic Dryfall
      PPG: Paints Speedhide Super Tech Flat Dryfall 6-725XI

END OF SECTION 09900

SECTION 10156 - TOILET COMPARTMENTS (Plastic)

PART I SCOPE

A. Requirements of the general conditions and special conditions apply to the work in this section.

B. References
1. ASTM International:
   a. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
   b. ASTM D 1735 - Standard Practice for Testing Water Resistance of Coatings Using Water Fog Apparatus
   c. ASTM D 2247 - Standard Practice for Testing Water Resistance of Coatings in 100 percent Relative Humidity.

C. Work not included in this section:

1. Toilet room accessories

PART II SUBMITTALS

A. Submit electronic shop drawings, including details and a sample of each item of hardware for Architect's approval.

B. Provide drawings showing location for adequate steel reinforcements of wood blocking in walls to be provided by others for proper securement of the finished work.

C. Provide the manufacturer's standard thirteen (13) color options and textures for Owner Selection that meet the NFPA 286 test.

D. Furnish documentation on hardware, headrail, and continuous wall bracket to meet specification as outlined.

E. Provide certified test results showing the High Density Polyethylene (HDPE) passes NFPA 286 test.

PART III MATERIALS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or equivalent:

1. ASI Global Partitions
2. or equivalent

B. Toilet compartment shall be floor mounted, overhead braced, with non-corrosive doors, panels, and pilasters.

C. Panels, doors and pilasters shall be fabricated from High Density Polyethylene (HDPE) that is certified and passes the NFPA 286 test, containing a minimum of 10% postindustrial recycled material manufactured under high pressure forming a single component section which is waterproof, nonabsorbent, and has a self-lubricating surface that resists marking with pens, pencils, or other writing utensils.

D. Provide the manufacturer's standard thirteen (13) color options and textures for Owner Selection that meet the NFPA 286 test.

E. Characteristics:

1. Dual component compression molded high density polyethylene (HDPE), virgin resin materials in colors that extend throughout the surface; the panels, doors and pilasters shall have combined recycled and/or virgin material (HDPE) as the core material.
2. Doors, panels and pilasters shall be a minimum of 1" thick and all edges machined to a radius of .250" and all exposed surfaces to be free of saw marks.

F. Fabrication:

1. Dividing panels shall be 55" high and mounted at 14" above finished floor.
2. Doors shall be 55" and mounted 14" above finished floor.
3. Pilasters shall be 82" high, mounted within a stainless steel shoe with one way theft proof, stainless steel sex bolts.
4. Aluminum edging strips to be fastened to the bottom edge of all doors and panels using vandal proof stainless steel fasteners.
5. Minimum clear height from finish floor to bottom of top rail shall be 80"

G. Technical Data:

1. Solid Plastics Products to be independently certified in writing by the manufacturer indicating compliance to appropriate building codes governing the project as it applies to the use of plastic in a commercial building.
2. The Product must comply with National Fire Protection Association (NFPA) 286 test.

H. Manufacturer to supply a written warranty covering all components and hardware against breakage, corrosion, and delamination for a period of 15 years.

PART IV HARDWARE

A. Door hardware shall be as follows:

1. Hinges 8 inches long, fabricated from heavy-duty extruded aluminum with bright dip anodized finish, wrap-around flanges, adjustable on 30-degree increments, through bolted to doors and pilasters with stainless steel, sex bolts. Hinges operate on field-adjustable nylon cams, field adjustable in 30 degree increments.
2. Each handicapped door to include (1) door pull and (1) wall stop.
3. Door strike and keeper shall be fabricated from heavy aluminum extrusion (6364-T5 Alloy) with clear anodized finish with wraparound flange surface mounted and thru-bolted to door with one-way de-burred bolts. Size of strike shall be 6" in length.
4. Door latch housing shall be fabricated from heavy aluminum extrusion (6364-T5 alloy) with clear anodized finish, surface mounted, and thru-bolted to door with one-way de-burred bolts. Slide to bolt and button shall be heavy aluminum with Tuff-Coat Black anodized finish.

B. Pilaster Sleeves shall be 3 inches high, stainless steel shoe secured to pilaster with stainless steel tamper resistant sex bolt.

C. Provide full length double ear continuous extruded aluminum wall brackets. Brackets shall be used for all panels to pilaster, pilasters to wall, and panel to wall connections. Wall brackets shall be thru-bolted to panels and pilasters with one-way de-burred bolts. Attachment of brackets to adjacent wall construction shall be accomplished by 12" #14 stainless steel tamper proof head screws anchored directly behind the vertical edge of panels and pilasters at 13" intervals along with full length of bracket and each 13" interval alternately spaced between anchor connections.

D. Headrail shall be heavy aluminum extrusion (6364-T5 Alloy) clear anodized finish in anti-grip configuration weighing not less than 1.188 lbs per linear foot. Headrail shall be fastened to tops of pilasters and headrail brackets by thru-bolting with one-way stainless steel de-burred bolts (no cadium plated bolts allowed).

E. Hinge hold-open setting shall be 30 degrees for all non-handicapped stall doors. Handicapped doors shall be self-closing.

F. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent door from hitting compartment-mounted accessories.

G. Urinal screens shall be of a design with integrated leg to floor.

SECTION V INSTALLATION

Erection of partitions, etc. shall be in accordance with the manufacturer's standard recommendations and the following:

A. All parts shall be erected in a substantial manner, straight, level and plumb.

B. No evidence of drilling, cutting or patching shall be visible in the finished work.

C. Clearance at vertical edges of doors shall be uniform top to bottom and shall not exceed 1/4".

D. Finish surfaces shall be cleaned after installation and left free of imperfections.

E. Authorized factory installers to be utilized.

F. Adjust doors and latches to operate correctly.

END OF SECTION 10156

SECTION 10416 - BUILDING MAP DIRECTORY AND BULLETIN BOARD

1.1 General:

A. The General Contractor shall provide one of each.

B. Submittals: Submit the following:

1. Product Data: Manufacturer's construction details relative to materials, dimensions of individual components, profiles and finishes.
2. Shop Drawings: Include elevations, sections of typical members, and components. Show anchors, reinforcement, layout and finishes.

a. Include setting drawings, templates, and installation directions for anchor bolts and anchorages installed under other sections.

3. Samples: For initial selection of colors, patterns, and textures, as required, and verification of compliance with requirements.

1.2 Products:

A. Manufacturers: Subject to compliance with requirements, provide products of one of the following or equivalent:

1. Bulletin Board:
   a. ABC Bulletin & Directory Division of Nelson Harkins Industries.
   b. Andco Industries Corporation
   c. Apco Graphics
   d. Claridge Products and Equipment, Inc.
   e. Greensteel, Inc.
   f. Poblocki and Sons

B. Bulletin Board: See plan for locations. Unless stated otherwise all bulletin boards are 48" x 48" in size.

C. Fasteners: Screws, bolts, and other exposed fastening devices of same material as items fastened. Fasteners exposed to the weather may be hot-dip galvanized, stainless steel, or aluminum. Use theft-proof fasteners where exposed to view.

1.3 Execution:

A. Installation: Install units plumb and level, in locations and with mountings shown. Attach to supporting structure with concealed fasteners, in accordance with manufacturer's instructions.

B. Cleaning: At completion of the installation, clean surfaces in accordance with manufacturer's instructions.

C. Protection: Protect installed directories and bulletin boards from damage until acceptance by the Owner.

END OF SECTION 10416

SECTION 10425 - SIGNS

1.1 GENERAL

A. Submittals: Submit the following:

1. Shop Drawings: Provide plans, elevations, and sections showing typical members, anchors, layout, reinforcement, accessories, and installation details. Include the following:

A. Message list for each sign with wording and letter layout.
B. Setting drawings, templates, and directions for installing anchors.

2. Samples: For initial selection of color, pattern, and surface texture, and for verification of compliance with requirements indicated.

A. Cast Acrylic Sheet and Plastic Laminate: 8-1/2-by-11-inch sample panel for each material, color, texture, and pattern. Show graphic image process showing style, colors and finishes.

B. Marking and Identification:

1. At all new or existing firewalls, fire barriers, fire partitions, smoke barriers and smoke partitions or any other wall required to have protected openings or penetrations within the work area where there is accessible concealed floor, floor-ceiling or attic space provide permanent signage in the concealed space as follows.

A. Signage to be either signs or stenciled.
B. Be located within 15 feet of the end of each wall and in intervals not exceeding 30 feet measured horizontally along the wall or partition.
C. include lettering not less than 3 inches in height with a minimum 3/8-inch stroke in contracting color.
D. Wording: "FIRE AND/OR SMOKE BARRIER – PROTECT ALL OPENINGS" or other wording.
E. Provide shop drawings of concealed space identification

1. Floor plan with all firewalls, fire barriers, fire partitions, smoke barriers and smoke partitions or any other wall required to have protected openings or penetrations located.
2. Message list for each sign with wording and letter layout.

1.2 PRODUCTS

A. Acrylic Sheet: Cast methyl methacrylate monomer plastic sheet with 16,000-psi minimum flexural strength, and minimum allowable continuous service temperature of 176 deg F (80 deg C).

1. Opaque Sheet: Colored opaque acrylic sheet in colors and finishes indicated.

B. ABS Plastic: Provide high-impact thermoplastic composed of copolymers of acrylonitrile, butadiene, and styrene.
C. Fasteners: Concealed noncorrosive metal.

D. Colored Coatings for Acrylic Plastic Sheet: Nonfading colored coatings, including inks and paints for copy and background colors.

E. Panel Signs: Comply with requirements for materials, thicknesses, finishes, colors, designs, shapes, sizes, and construction details. Produce smooth, even, level sign panel surfaces.

1. Framed Panel Signs: Fabricate frames to profile indicated.

A. Material: Injection molded ABS plastic.
B. Corner Condition: Square corners.

2. Laminated Sign Panels: Permanently laminate face panels to backing sheets. Attach to sign frame using Velcro.

F. Graphic Content and Style: Provide sign copy that complies with size, style, spacing, content, position, material, finishes, and colors of letters, numbers, and other graphic devices. Also include braille lettering to meet the handicapped and ADA requirements.

G. Raised Copy: Machine-cut copy characters from matte-finished opaque acrylic sheet and chemically weld onto the acrylic sheet forming sign panel face.

1. Panel Material: Matte-finished opaque acrylic sheet.
2. Raised Copy Thickness: 1/8 inch.

1.3 EXECUTION

A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.

1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Install signs so they do not protrude or obstruct according to the accessibility standard.
3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.

B. Signage Used for Room Identification: Install in locations on walls as indicated and according to ADA accessibility standards.

C. Mounting Methods:

1. Through Fasteners: Drill holes in substrate using predrilled holes in sign as template. Countersink holes in sign if required. Place sign in position and flush to surface. Install through fasteners and tighten.

2. Two-Face Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position, and push to engage tape adhesive.

1.4 ADJUSTING AND CLEANING

A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

B. Remove temporary protective coverings and strippable films as signs are installed.

C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner

END OF SECTION 10425

SECTION 10522 - FIRE EXTINGUISHERS, CABINETS, AND ACCESSORIES

71.1 GENERAL

A. Submittals: Submit the following:

1. Product Data: Include rough-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type and materials, trim style, door construction, panel style, and materials.
2. Samples for Initial Selection: Manufacturer's color charts showing full range of colors, textures, and patterns available for each finish indicated or exposed to view.

B. Coordination: Verify that cabinets are sized to accommodate type and capacity of extinguishers indicated.

C. UL-Listed Products: Fire extinguishers shall be UL listed with UL listing mark for type, rating, and classification of extinguisher.

D. FM-Listed Products: Fire extinguishers approved by Factory Mutual Research Corporation for type, rating, and classification of extinguisher with FM marking.

1.2 PRODUCTS

A. Fire Extinguishers: Provide fire extinguishers for each cabinet and for other locations indicated.

1. Multipurpose Dry Chemical Type: Type MP-10, UL-rated 4-A:60-B:C, 10 lb nominal capacity, in enameled steel container.

B. Cabinet Construction: Box with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated. Weld joints and grind smooth. Miter and weld perimeter door frames.

1. Fire-Rated Cabinets: UL listed with UL listing mark with fire-resistance rating of wall where it is installed.
2. Cabinet Type: Suitable for containing the following:
   a. Fire extinguisher.
3. Cabinet Mounting: Suitable for the mounting indicated:
   a. Semirecessed: Partially recessed in walls of shallow depth.
4. Trim Style: One piece with corners mitered, welded, and ground smooth.
   a. Exposed Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge.

      1) Rolled-edge with 2-1/2-inch backbend depth.
      2) Metal: Same metal and finish as door.

C. Door Material and Construction: Manufacturer's standard of material indicated, coordinated with cabinet types and trim styles selected.

1. Enameled Steel: Hollow construction with tubular stiles and rails.

2. Door Glazing: Fully tempered float glass complying with ASTM C 1048, Condition A, Type I, Quality q3, Kind FT, and Class as follows:
   a. Class 1 (clear).

3. Identify fire extinguisher in cabinet with FIRE EXTINGUISHER lettering applied to door. Provide lettering to comply with authorities having jurisdiction for letter style, color, size, spacing, and location.
   a. Application Process: Silk screen.

D. Door Style: Manufacturer's standard design.

1. Full-Glass Panel: Fully tempered, Float glass, 1/8 inch thick.

E. Door Hardware: Provide door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated. Provide lever handle with cam-action latch, or exposed or concealed door pull and friction latch. Provide concealed or continuous-type hinge permitting door to open 180 degrees.

F. Cabinet Finishes: Comply with NAAMM "Metal Finishes Manual." Protect exposed finishes from damage by application of temporary strippable covering prior to shipment.

G. Steel Cabinet Finishes: Solvent-clean surfaces to remove dirt, oil, grease, and other contaminants that could impair paint bond. Remove mill scale and rust from uncoated steel.

1. Baked-Enamel Finish: Immediately after cleaning and pretreatment, apply a two-coat baked-enamel finish consisting of prime coat and thermosetting topcoat. Comply with paint manufacturer's instructions for application and baking to achieve a minimum dry film thickness of 2.0 mils.
   a. Color and Gloss: As selected from manufacturer's standard choices for color and gloss. Paint the following:
      1) Exterior of cabinet except for surfaces indicated to receive another finish.
      2) Interior of cabinet.

1.3 EXECUTION

A. Installation: Follow manufacturer's printed instructions.

B. Install at heights indicated, or if not indicated, at heights to comply with applicable regulations of governing authorities and meet State and handicapped codes and ADA requirements.

1. Prepare wall recesses for cabinets as required by type and size of cabinet and style of trim and to comply with manufacturer's instructions.
2. Fasten mounting brackets and fire extinguisher cabinets to structure, square and plumb.

END OF SECTION 10522

SECTION 10800 - TOILET AND BATH ACCESSORIES

1.1 GENERAL

A. Submittals: Manufacturer's product data for each toilet accessory item specified, including details of construction relative to materials, dimensions, gages, profiles, mounting methods, specified options, and finishes.

B. Samples: Full-size samples of the following toilet accessory items to verify design, operation, and finish requirements. Acceptable samples will be returned and may be used in the Work:

1. Paper Towel Dispenser.
2. Stainless steel framed mirror unit.
3. Toilet tissue dispenser.
4. Soap Dispenser.
5. Grab Bar.
6. Waste Receptacle.
7. Sanitary Napkin Disposal.
8. Napkin/Tampon Vendor.
9. Trash Container.
10. Toilet seat cover dispenser

1.2 PRODUCTS

A. Manufacturers: Subject to compliance with requirements, all items shown in this section are Bobrick Products. Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following or equivalent:

1. A & J Washroom Accessories
2. American Specialties, Inc.
3. Bobrick Washroom Equipment, Inc.
4. Bradley Corporation
5. General Accessory Manufacturing Co.
6. McKinney/Parker
7. Kimberly/Clark
8. Georgia Pacific

B. Materials, General: Fabricate toilet accessory items from the following materials and according to requirements specified for individual accessory items:

1. Stainless Steel: AISI Type 302/304, with polished No. 4 finish, 0.034-inch (22-gage) minimum thickness, unless otherwise indicated.
2. Brass: Leaded and unleaded, flat products, ASTM B 19; rods, shapes, forgings, and flat products with finished edges, ASTM B 16; Castings, ASTM B 30.
3. Sheet Steel: Cold-rolled, commercial quality ASTM A 366, 0.04-inch (20-gage) minimum thickness, unless otherwise indicated. Surface preparation and metal pretreatment as required for applied finish.
4. Galvanized Steel Sheet: ASTM A 527, G60.
5. Chromium Plating: Nickel and chromium electro-deposited on base metal, ASTM B 456, Type SC 2.
6. Baked Enamel Finish: Factory-applied, gloss white, baked acrylic enamel coating.

7. Mirror Glass: Tempered Glass Nominal 6.0-mm (0.23-inch) thick, conforming to ASTM C 1036, Type I, Class 1, Quality q2, and with silvering, electro-plated copper coating, and protective organic coating.
8. Galvanized Steel Mounting Devices: ASTM A 153, hot-dip galvanized after fabrication.
9. Fasteners: Screws, bolts, and other devices of same material as accessory unit, or of galvanized steel where concealed.
10. Keys: Provide universal keys for access to toilet accessory units requiring internal access for servicing, resupply, etc. Provide a minimum of six keys to Owner's representative.

C. Double-Roll Toilet Tissue Dispenser: Size to accommodate core type tissue to twin roll, high impact plastic finish body. Georgia Pacific #59209 or equivalent.

D. Waste Receptacle: 22 gallons with funnel top. Rubbermaid #3546 and #3548 top or equivalent.

E. E. Trash Container: 28 ½ quarts, Rubbermaid #2956 and #3066 or equivalent.

F. Surface-Mounted Soap Dispenser: Holds 1 Lt. foam skin cleanser, high impact plastic finish Kimberly/Clark Model 92144 or equivalent.

G. Surface-Mounted Napkin/Tampon Vendor: Stainless steel all weld construction. 22 GA cabinet, 18 GA door, coin operation American Specialties, Inc. 0864 or equivalent.

H. Surface-Mounted Sanitary Napkin Disposal: Stainless steel construction, Bobrick B-254 or equivalent.

I. Stainless Steel Grab Bars: Provide grab bars with wall thickness not less than .050 inch (18 gage), Bobrick Model B-6806 or equivalent and as follows:

1. Mounting: Concealed, manufacturer's standard flanges and anchorages.
2. Clearance: 1-1/2-inch clearance between wall surface and inside face of bar.
3. Gripping Surfaces: Smooth, satin finish.
4. Heavy-Duty Size: Outside diameter of 1-1/2 inches.

I. Stainless Steel Channel-Framed Mirror Units: Fabricate frame with channel shapes not less than 0.04 inch (20 gage), with square corners carefully mitered to hairline joints and mechanically interlocked. Provide in Type 430, bright polished finish. Bobrick Model B-165 Series or equivalent.

J. Fabrication: Only a maximum 1-1/2-inch diameter, unobtrusive stamped manufacturer logo, as approved by Architect, is permitted on exposed face of toilet or bath accessory units. On either interior surface not exposed to view or back surface, provide additional identification by means of either a waterproof, printed label or a stamped nameplate, indicating manufacturer's name and product model number.

K. Surface-Mounted Toilet Accessories, General: Except where otherwise indicated, fabricate units with tight seams and joints, exposed edges rolled. Hang doors or access panels with continuous stainless-steel piano hinge. Provide concealed anchorage wherever possible.

L. Framed Mirror Units, General: Fabricate frames for tempered glass mirror units to accommodate wood, felt, plastic, or other glass edge protection material. Provide mirror backing and support system that will permit rigid, tamperproof glass installation and prevent moisture accumulation, as follows:

1. Provide galvanized steel backing sheet, not less than 0.034 inch (22 gage) and full mirror size, with non-absorptive filler material. Corrugated cardboard is not an acceptable filler material.

M. Mirror Unit Hangers: Provide system of mounting mirror units that will permit rigid, tamperproof, and theft-proof installation, as follows:

1. Heavy-duty wall brackets of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.

N. Toilet Seat Cover Dispenser: Georgia Pacific Model # 57710 (White) or equivalent.

O. Paper Towel Dispenser: In-sight Sanitouch HRT 1.75" by Kimberly Clark or equivalent.

1.3 EXECUTION

A. Installation: Install toilet accessory units according to manufacturers' printed installation instructions, using fasteners appropriate to substrate as recommended by unit manufacturer. Install units plumb and level, firmly anchored in locations and at heights indicated.

1. Secure mirrors to walls in concealed, tamperproof manner with special hangers, toggle bolts, or screws. Set the units plumb, level, and square at locations indicated, in accordance with manufacturer's instructions for type of substrate involved.
2. Adjust toilet accessories for proper operation and verify that mechanisms function smoothly. Replace damaged or defective items.
3. Clean and polish all exposed surfaces strictly according to manufacturer's recommendations after removing temporary labels and protective coatings.

END OF SECTION 10800

SECTION 11040 - CLASSROOM/OFFICE FURNITURE AND MISCELLANEOUS EQUIPMENT

1.1 GENERAL

A. Submittals: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections:

1. Product data for each type of classroom furniture and miscellaneous equipment specified.
2. Shop drawings detailing each type of classroom furniture and miscellaneous equipment assembly, and indicating details, layout and individual unit dimensions, required clearances, component parts, method of field assembly, and anchorage to surrounding construction.
3. Samples: 6" by 6" samples of each exposed finish required.

1.2 PRODUCTS

All manufacturers and model numbers listed below are for specification of design intended. "Or equivalent" will be accepted if item meets or exceeds the specified number.

A. Bulletin Board: (Item #133, #135, #136) 6'-0" x 4'-0", 4'-0" x 4'-0", 8'-0" x 4'-0", aluminum frame cork bulletin board Series 900 by Claridge or equivalent.

1. Surface quality natural cork is reinforced with sturdy back panels. Frames are of 1-1/4" satin finish aluminum. Factory assembled and equipped with concealed hangers for permanent wall fastening individually packed.

B. White Board: (Item #139, #142) 12'-0" x 4'-0", 4'-0" x 4'-0" aluminum frame with white LCS writing surface. LCS 24 by Claridge or equivalent.

1. White porcelain enamel writing surface.
2. Heavy satin aluminum frame.
3. Full width top map rail with cork insert.
4. Full width chalk trough at bottom. (Series 1)
5. Provide optional flag holder and five map clips for each board assembly (one set per classroom minimum).
6. Music Room has ruled white board as noted.
7. #69 has fused lines and lettering by the Owner/Architect.

C. Fire Extinguisher. See Specification Section 10522.

D. Surface Mounted Paper Towel Dispenser: (Item #408) Model B-2621 of Bobrick Washroom Equipment, Inc., or equivalent. Dispenser shall be constructed of type 304, 22 gauge (0.8 mm) stainless steel; welded construction. Exposed surfaces shall have satin finish. Door shall be equipped with full length stainless steel piano hinge and a knob latch. Unit shall be capable of dispensing C-fold or 275 multifold paper towels without adjustment of adapters.

Surface Mounted Paper Towel Dispenser Materials:

1. Cabinet: 18-8, type 304, 22 gauge (0.8 mm), stainless steel with satin finish; welded construction.
2. Door: 18-8, type 304, 22 gauge (0.8 mm), stainless steel with satin finish. Door is attached to cabinet with full length stainless steel piano hinge; secured with knob latch.
3. Operation: Unite dispenses all makes of C-fold and multifold paper towels without adjustment of adapters. Capacity: 200 C-fold or 275 multifold paper towels. Slot in sides of cabinet indicated refill time.
4. Installation: Surface mounted on wall with four screws furnished by manufacturer at four mounting points indicated by "S". For plaster or drywall construction, use screws furnished to provide 1/8" (3mm) toggle bolts; provide concealed backing to comply with local building codes. For masonry wall, use screws furnished by manufacturer with fiber plugs or expansion shields, or provide expansion bolts.

1.3 EXECUTION

A. Installation: Install units at locations indicated, in continuous ranges made up of number of units shown, complying with manufacturer's instructions. Set units plumb and level; use noncorrosive metal shims as required.

1. Install accessory items in locations indicated.

B. Adjust and Clean: Adjust units after installation to ensure that units are level and that moving parts operate freely and in manner intended. Clean exposed surfaces and touch-up or replace damaged marred finishes.

END OF SECTION 11040

SECTION 11070 - SCIENCE LABS & PREP ROOM FURNITURE & EQUIPMENT

HERITAGE OAK

PART 1 GENERAL

1.01 WORK DESCRIPTION

This section of the specification pertains to wood laboratory casework and related equipment in Science Labs and Prep Rooms including the relocation and set up of existing labs and prep room furniture and equipment.

1.02 WORK INCLUDED

1. Laboratory casework and equipment, covered by this specification and accompanying drawings, are manufactured or supplied by one manufacturer to avoid divided responsibility.

    a. See drawings for items specified in this project.

2. Laboratory equipment contractor will:

    a. Furnish equipment as listed in specifications, equipment schedule and drawings. This includes delivery to the building, setting in place, leveling and scribing to walls and floors.
    b. Furnish built-in sinks, supply parts of outlets, gas fittings, nipples, locknuts and receptacles if it is not built-in furniture or equipment.
    c. Remove debris, dirt and rubbish accumulated as a result of this installation; leaving premises clean and orderly.
    d. Furnish and cover installed casework with 4 mil. polyethylene film to protect from soiling until other trades have completed their work.

3. Plumbing and Electrical Connections to the Furniture or Equipment:

    a. The Contractor shall furnish and install laboratory equipment. However, "roughing in" and "final connections" of all services will be installed by the Plumbing Contractor and/or the Electrical Contractor, as applicable, from an approved "roughing in" and "furniture" shop drawing submitted by the Contractor.
    b. The Contractor shall furnish plumbing and electrical fixtures as specified, including nipples and lock nuts needed to secure each fixture to the equipment. Fixtures are furnished unassembled and loose in cartons for installation by other trades. If required, modify the casework for electrical or plumbing connections. The work should be done by the General or Furniture Contractor.
    c. The Plumbing and Electrical Contractors shall include the supplying, installing and connection of all service lines - waste, vent, water, air, gas, drain lines, piping, electrical receptacles, outlets and wiring, within equipment, through, under or along the backs of working surfaces **to "sink outlets"**. The Plumbing and Electrical Contractors shall also include the installing and connecting of all service fixtures and sinks with the exception of epoxy resin sinks which are to be installed by the casework supplier.
    d. It shall be the responsibility of the Plumbing Contractor and the Electrical Contractor to check the approved "roughing in" shop drawings before installing their respective piping and services, and to report any and all discrepancies and/or deviations from the contract drawings to the Architect in writing prior to the installation of any such equipment.

1.03 RELATED WORK NOT INCLUDED

1. Division 1 - General:

   a. Furnish materials generally classified as maintenance or supply items.
   b. Provide hoisting or elevator service at no charge.
   c. Furnish security and protection during and after laboratory equipment installation.

2. Division 9 - Finishes:

   Furnish and install 4 inch high, cove base.

1.04 SUBMITTALS

Samples and certifications are to be submitted in order that the casework contractor demonstrate his ability to provide casework and furnishings, according to the Architect's specifications. Samples and certification literature will be received by the Architect no later than ten days prior to bid opening date. All questions will be answered in detail to remove confusion or doubt over what is being provided. Failure to meet submittal requirements is sufficient reason to reject the bid.

1. Samples:

   Supplier is permitted only one submittal of samples. Approved sample units may be held until completion of work. Samples will be removed when Architect requests. Submit, as required by the architect.
   a. Base cabinet with drawer and cupboard with full depth, adjustable shelf, hinged door and applicable hardware.
   b. Wall case with full-depth, adjustable shelf, hinged door and applicable hardware.
   c. Tall case with full-depth, adjustable shelves, fixed center shelf, hinged door and applicable hardware, including a 3-point latching system.
   d. One set of samples for countertop(s) specified.
   e. One set of casework finish samples.

2. Test Reports - Certifications:

   Submit: In the Shop Drawing Package:

   a. **All Laboratory Casework manufacturers must be a current and active member of SEFA. Submit test report from SEFA approved independent test facility showing compliance with SEFA-8 standards. Failure to provide information is cause for rejection.**
   b. Test reports certifying that the casework finish complies with chemical and other resistance requirements of the specifications.
   c. Performance test reports from an independent testing lab on each specified top material.

1.05 QUALITY ASSURANCE

1. The intent of this specification is to establish minimum standards for materials, hardware, finish, construction, design, function, and workmanship of wood laboratory casework, furniture and equipment; and, to exclude inadequate or inferior products.

2. Qualified wood laboratory casework and equipment manufacturer's bids must comply with these specifications. A bid proposing a change, modification, or substitution must clearly state variances to the minimum standard. Alterations are subject to the Architect's approval; the decision to accept, or reject, is final and not subject to further debate.
3. No later than ten days prior to bid opening, bidders must provide the following information as proof of their ability to perform. Failure to meet these requirements is sufficient reason to reject the bid.
   Provide:
   a. Proof of five years of experience in the manufacturing of wood casework and furnishings, as specified.
   b. Proof of five completed installations, equal in size and educational requirements, which are available for inspection prior to the awarding of the contract.
   c. Evidence of sufficient financial and technical resources to avoid delays in completion of the work, and to assure prompt and satisfactory production, delivery and installation of wood laboratory casework and equipment.
   d. Test Reports certifying that the casework is SEFA 8 Certified
   e. "American Made" Casework to be wholly manufactured and assembled in the USA.
4. Owner reserves the right of refusal and can award the contract to other than the lowest bidder; if, in his opinion, it will ensure a higher level of performance, function, quality, or value.
5. Contractor will not award subcontract to a wood laboratory casework supplier who is not on the approved list, unless the Architect has approved that supplier's samples, certificates, individual product drawings, and proof of ability to perform.

1.06 PROJECT CONDITIONS

1. For delivery and installation of laboratory casework and equipment, building conditions shall be as follows:
   a. Building is secure and weather tight, with windows and doors installed, heat and air conditioning systems functional. Walls and openings are plumb, straight and square.
   b. Concrete floors must be level within acceptable trade tolerances. Specifically, the floor must be within 1/8" of level per 10-foot run, non-accumulative, when tested with a straight edge in any one direction. Flooring required to be placed under casework and equipment must be installed.
   c. Wood or metal blocking (wall grounds) must be supplied and installed by the Contractor within partitions prior to delivery of casework and furnishings to allow for immediate installation on delivery.
   d. Heat and air conditioning systems providing consistent temperature and humidity conditions as required by Architectural Woodworking Institute (AWI). Relative humidity must be maintained at not less than 25%, nor more than 55%. Temperatures must not range lower than 65° F, nor exceed 80° F in areas of material installation.
   e. All overhead mechanical, electrical or plumbing rough-in work is completed. Any "wet" operations performed by other trades must be complete prior to delivery.
   f. Ceiling grids (with or without ceiling tiles), overhead soffits, ductwork and lighting are installed.
   g. Painting is completed.

1.07 DRAWINGS

1. The successful bidder will prepare and submit six (6) copies of shop drawings, including floor plans, rough-ins, elevations, and other details necessary to fully illustrate and describe the casework and equipment being furnished. Shop drawings will be coordinated with other trades.

1.08 WARRANTY

1. ICI International, Inc., (or manufacturer that provided products) warrants the Campbell Rhea line of casework to be free from defects in materials and workmanship, under normal use and service, for one year from date of delivery. Within the warranty period, ICI, Inc., (or manufacturer that provided products) shall, at its option, repair, replace, or refund the purchase price of defective casework. ICI, Inc., (or manufacturer that provided products) shall be notified immediately of defective products and be given a reasonable opportunity to inspect the goods prior to return. ICI, Inc., (or manufacturer that provided products) will not assume responsibility, or compensation, for unauthorized repairs or labor. ICI, Inc., (or manufacturer that provided products) makes no other warranty, expressed or implied, to the merchantability, fitness for a particular purpose, design, sale, installation, or use, of its casework; and, shall not be liable for incidental or consequential damages, losses or expenses, resulting from the use of its products.
2. The warranty with respect to products of another manufacturer sold by ICI, Inc., is limited to the warranty extended by that manufacturer to ICI, Inc.
3. Manufacturers:
   a. Campbell Rhea Heritage Oak (ICI, Inc.)
   b. Sheldon Lab Systems (Modified to meet Campbell Rhea Standards)
   c. Kewaunee (Modified to meet Campbell Rhea Standards)
   d. Diversified Wood Crafters (Modified to meet Campbell Rhea Standards)
   e. Or equivalent.

PART 2: PRODUCTS

2.01 MATERIALS

1. Lumber
   a. Oak lumber is red oak, grade FAS or better, air dried and kiln dried to a 6 percent moisture content, then tempered to 7-8 percent prior to fabrication. Red oak lumber exposed to view, is free of stains, splits, shakes, season checks and other similar defects.
   b. Other hardwoods are grade FAS or better, air dried to a 6 percent moisture content, then tempered to 7-8 percent prior to fabrication. Other hardwoods are used in semi-exposed, or unexposed, areas and comply with NHLA grading for FAS or better lumber.

2. Plywood
   a. Oak plywood is red oak, grade A-2, plain sliced, slip-matched, cross banded, and has a solid core. The ¾ inch red oak plywood is a minimum of 7-ply, ½ inch is a minimum of 5- ply, ¼ inch is minimum of 3-ply, and 3/32 inch is 3-ply. All plywood shall be CARB Phase 1 compliant.

b. Other hardwood plywoods are sound grade, have a solid core and are suitable for semi-exposed or unexposed areas. The ¾ inch hardwood plywoods are a minimum of 7-ply, ½ inch are a minimum of 5- ply, ¼ inch are a minimum of 3-ply, and 3/32 inch are 3-ply. All plywood shall be CARB Phase 1 compliant.

3. Hardboard
   a. Hardboard is service tempered and consists of steam-exploded wood fibers, highly compressed into a hard, dense, ¼ inch thick, homogeneous sheet, using natural resins and other added binders. Physical properties: Average modulus of rupture is 5,300 lbs./sq. inch; density is 50 to 60 lbs./cu. foot; and tensile strength of 3,500 lbs./sq. inch. All hardboard shall be CARB Phase 1 compliant.

4. Particleboard
   a. Particleboard is industrial grade, with the following physical properties: Density, 46 to 50 lbs./cu. ft.; modulus of rupture, minimum, 2,200 psi; modulus of elasticity, minimum, 450,000 psi.

5. Glass
   a. DSB glass is double strength, grade "B", and 1/8 inch thick.
   b. Float glass is poured, clear glass, ¼ inch thick, with a minimum of 88 percent clarity.
   c. Laminated safety glass consists of two outer plies of glass with a vinyl interlayer and is either 7/32 inch or ¼ inch thick.
   d. Tempered safety glass is specially heat-treated glass, ¼ inch thick with a minimum of 88 percent clarity.

2.02 CONSTRUCTION

1. Drawers:
   a. Components:
      1. Drawer front: 13/16 inch oak lumber. Particle board or Plywood cores are not acceptable.
      2. Drawer sides and back: ½ inch, 9-ply laminated hardwood plywood.
      3. Drawer bottom: ¼ inch service tempered hardboard.
   b. Construction: All four corners of the drawer are dovetailed and glued. Edges of the drawer front are radiused to form a lip and overlap the opening ¼ inch on all sides. Drawer fronts are one piece of lumber, whenever possible, providing consistency in color and grain within each drawer front. The back perimeter of the drawer front is routed so the drawer front is recessed into the opening and projects 13/32 of an inch. The top edge of drawer sides and back are radiused. Drawer bottom is let in on four sides, and securely glued underneath with a continuous bead of glue around the perimeter of the drawer bottom. In cabinets 24 inches or less in width, drawers have one, AL-1 aluminum pull, surface mounted with two screws, four inches on centers. In cabinets over 24 inches wide, drawers have two, AL-1 aluminum pulls. Drawers are supported on DS-1 slides which are side mounted, heavy duty, electrostatically epoxy powder coated, cold rolled steel, and have a 100 lb. load capacity. Slides are equipped with heavy-duty, ball bearing nylon rollers for smooth effortless operation. DS-1 slides have automatic, positive stop levers to prevent drawer's accidental removal, but allow for quick removal without tools. File drawers are supported on side mounted FD-1, full extension steel slides. File drawers have an interior, screw mounted, metal bottom track and an adjustable metal file follower. Lock SL-1 is furnished when indicated.

2. Doors, Hinged:
   a. Hinged solid doors, 48 inches or less in height:
      1. Components:
         aa. Core ply: Solid oak 2 ¼ red oak lumber rails on four edges framing a hardwood oak plywood core. See detail xxx on drawing xxx (3mm applied wood edge on **particleboard cores are not acceptable**).
         bb. Hardwood plywood crossbands: Two laminated on the sides of the solid core.
         cc. Red oak veneer: Face and back; one applied to each side.

      2. Construction: Hinged solid doors, 48 inches or less in height, are 13/16 inch thick, machine radiused on the edges to form a lip and overlap opening ¼ inch on all sides. The back perimeter of the door is routed so the door is recessed into the opening and projects 13/32 inch. The left door of double doors has a center machined integral astragal. Doors have one, AL-1 aluminum pull, surface mounted with two screws, four inches on centers. Door has two SS-1 stainless steel, heavy duty, institutional type, 5-knuckle hospital tipped hinges; each attached with three tempered steel screws into solid oak framing of the door, and three Euro screws into the end panel. Doors are secured by a zinc plated steel, friction roller catch, with a positive action, spring cushioned, polyethylene roller, and a metal strike plate. Catch and strike plate are mounted with screws. Lock SL-1 is furnished when indicated.

   b. Hinged solid doors over 48 inches in height:
      1. Components:
         aa. Core ply: Solid oak 2 ¼ red oak lumber rails on four edges framing a hardwood oak plywood core See detail xxx on drawing xxx (3mm applied wood edge on **(particleboard cores are not acceptable**).
         bb. Hardwood plywood crossbands: Two laminated on the sides of the solid core.
         cc. Red oak veneer: Face and back; one applied to each side.
      2. Construction: Hinged solid doors over 48 inches in height, are one inch thick, machine radiused on the edges to form a lip and overlap opening ¼ inch on all sides. The back perimeter of the door is routed so the door is recessed into the opening and projects 13/32 of an inch. Single doors and right door of double doors have a LH-1 latching handle, which is 4-1/4 inches long, streamline design, with a dull chrome plated finish. Handle operates with ¼ turn. Left door of double doors has a fixed handle, which is the same size and finish as a LH-1 latching handle. A three point latching system provides single doors and right door of double doors positive engagement at the top and bottom of the door with tapered aluminum rods which engage plastic strike plates and pull the door snug. The rods are 5/16 inch in diameter and move in nylon guides attached to the back of the door. The middle of the door is secured by a latch plate which engages the side of the case, or latches behind the left door on cases with double doors. Right door of double doors lap over the machined integral astragal on left door, securely holding door shut. Doors have three, SS-1 stainless steel, heavy duty, institutional type, 5-knuckle hospital tipped hinges; each attached with three tempered steel screws into solid oak framing of the door, and three Euro screws into the end panel. On double doors, left door is additionally secured with

two positive action, zinc plated, friction roller catches, which have a spring cushioned, polyethylene roller, and a metal strike plate. Catch and strike plate are mounted with screws. Locking handle LK-1 is furnished when indicated.

3. Base Cabinets
   a. Components:
      1. Frame and rails:
         aa. Horizontal front top frame member: 2-1/2 inch by 1 inch, solid oak.
         bb. Horizontal rear top frame members: 2-1/2 inch by 1 inch, solid hardwood.
         cc. Horizontal side top frame members: 1-3/4 inch by ¾ inch, solid hardwood
         dd. Front intermediate rails: 2-1/2 inch by ¾ inch, solid oak.
         ee. Back intermediate rails as required: 2-1/2 inch by ¾ inch solid hardwood.

      2. Backs:
         aa. Exposed exterior backs: ¾ inch oak plywood.
         bb. Cabinets with exposed interiors but unexposed exteriors: backs are ¼ inch oak plywood.
         cc. Cabinets with unexposed interiors and exteriors: backs are ¼ inch service tempered hardboard.

      3. End panels:
         aa. Cabinets with exposed interiors: end panels are ¾ inch oak plywood.
         bb. Cabinets with exposed exteriors: end panels are ¾ inch oak plywood.
         cc. Cabinets with unexposed interiors and one exposed end panel and one unexposed end panel: exposed end panel is ¾ inch oak plywood, and unexposed end panel is ¾ inch hardwood plywood.
         dd. Cabinets with unexposed interiors and unexposed exteriors: end panels are ¾ inch hardwood plywood.

      4. Bottom, shelves, and dividers:
         aa. Cabinets with exposed interiors: all are ¾ inch oak plywood.
         bb. Cabinets with unexposed interiors: all are ¾ inch hardwood plywood.

      5. Exposed edges of end panels, bottom, shelves, & dividers are edge-banded with 1/8 inch solid oak.

      6. Drawer separators, furnished only when specified, are ¼ inch service tempered hardboard.

   b. Construction: All base cabinets are rigidly constructed, integral units with the strongest most advanced joinery methods utilized of bored, doweled, dadoed, glued and screwed construction. Each base cabinet is completely enclosed without the use of common partitions, and has flush construction with overlapping doors and drawers, which provides a dust resistant interior. A base cabinet has a full horizontal top frame with bored, doweled and glued joints, intermediate front rails and a ¾ inch plywood bottom; rear horizontal parting rails and separators are provided as required. Horizontal top frame, intermediate parting rails and the bottom are bored, doweled and glued. Separators where indicated, are let into routed intermediate rails. Backs are recessed and encapsulated into dadoed end panels and further secured with glue

blocks on each side, except where they need to be removable for access to plumbing. Backs are screwed to the top frame and further secured with glue blocks on each side. An enclosed toe space, 2-1/4 inches by 4 inches, is provided, with the toe rail bored, doweled and glued to end panels. Cabinets with sliding doors have ¼ inch solid oak molding on the front interior, vertical edge of end panels, providing a dust strip for sliding doors. Adjustable shelves are supported on heavy-duty, plastic coated, brass plated steel shelf clips, which fit into holes drilled 32 mm on centers, in the cabinet end panels.

4. Wall and Upper Cases:
   a. components:
      1. Top panel, bottom panel:
         aa. Cases with exposed interiors: all are 1-inch oak plywood.
         bb. Cases with unexposed interiors: all are 1-inch hardwood plywood.

      2. Adjustable shelves:
         aa. Cases with exposed interiors: all are ¾ inch oak plywood.
         bb. Cases with unexposed interiors: all are ¾ inch hardwood plywood.

      3. Backs:
         aa. Cases with exposed interiors: back is ¼ inch oak plywood.
         bb. Cases with unexposed interiors: back is ¼ inch service tempered hardboard.

      4. End panels:
         aa. Cases with exposed interiors: end panels are ¾ inch oak plywood.
         bb. Cases with exposed exteriors: end panels are ¾ inch oak plywood.

         cc. Cases with unexposed interiors and one exposed end panel and one unexposed end panel: exposed end panel is ¾ inch oak plywood; the unexposed end panel is ¾ inch hardwood plywood.
         dd. Cases with unexposed interiors and unexposed exteriors: end panels are ¾ inch hardwood plywood.

      5. Exposed edges of end panels and shelves are edge-banded with 1/8 inch solid oak.

      6. Exterior hanger rails: 3 inch by ¾ inch hardwood plywood.

   b. Construction: All wall and upper cases are rigidly constructed, integral units with the strongest most advanced joinery methods utilized of bored, doweled, dadoed, glued and screwed construction. Each case is completely enclosed without the use of common partitions, and has flush construction with overlapping doors, which provides a dust resistant interior. Top panel is bored, doweled and glued into end panels. Bottom panel is bored, doweled and glued into end panels; and glued and screwed to the back. Backs are recessed and encapsulated into dadoed end panels, and further secured with glue blocks on each side. Exterior hanger rails, at the top of the back, are glued to the back and then screwed to the top panel and end panels. Exterior hanger rails, at the bottom of the back, are glued to the back and then screwed to the bottom panel and end

panels. Cases with sliding doors have ¼ inch solid oak molding on the front interior, vertical edge of end panels, providing a dust strip for sliding doors. Adjustable shelves are supported on heavy-duty, plastic coated, brass plated steel shelf clips, which fit into holes drilled 32 mm on centers, in the case end panels.

5. Tall Cases:
   a. Components:
      1. Top panel:
         aa. Cases with exposed interiors: all are 1-inch oak plywood.
         bb. Cases with unexposed interiors: all are 1-inch hardwood plywood.

      2. Bottom panel:
         aa. Cases with exposed interiors: all are ¾ inch oak plywood.
         bb. Cases with unexposed interiors: all are ¾ inch hardwood plywood.

      3. Adjustable shelves:
         aa. Cases with exposed interiors: all are ¾ inch oak plywood
         bb. Cases with unexposed interiors: all are ¾ inch hardwood plywood.

      4. Backs:
         aa. Cases with exposed interiors and exposed exteriors: back is ¼ inch oak plywood.
         bb. Cases with unexposed interiors and unexposed exteriors: back is ¼ inch service tempered hardboard.

      5. End panels:
         aa. Cases with exposed interiors: end panels are ¾ inch oak plywood.
         bb. Cases with exposed exteriors: end panels are ¾ inch oak plywood.
         cc. Cases with unexposed interiors and one exposed end panel and one unexposed end panel: exposed end panel is ¾ inch oak plywood; unexposed end panel is ¾ inch hardwood plywood.
         dd. Cases with unexposed interiors and unexposed exteriors: end panels are ¾ inch hardwood plywood.

      6. Exposed edges of end panels, dividers and shelves are edge-banded with 1/8 inch solid oak.
      7. Exterior back cross rails: 3 inches by ¾ inch hardwood plywood.

   b. Construction: All tall cases are rigidly constructed, integral units with the strongest most advanced joinery methods utilized of bored, doweled, dadoed, glued and screwed construction. Each case is completely enclosed without the use of common partitions, and has flush construction with overlapping doors, which provides a dust resistant interior. Top panel is bored, doweled and glued into end panels. Bottom panel is bored, doweled and glued into end panels and glued and screwed to the back. An exterior back cross rail is provided at the top of each case, glued to the back, and then screwed to the top panel and the end panels. Additional back cross rails are provided, as required. Backs are recessed, let into dadoed end panels, and further secured with glue blocks at the sides. An enclosed toe space, 2-1/4 inches by 4 inches high, is provided with toe rail securely bored, doweled and glued to end panels and bottom panel. Cases with sliding doors have ¼ inch, solid oak molding

running the full height of case opening, on the front interior edge of each end panel, providing a dust strip for the sliding doors. Adjustable shelves are supported on heavy-duty, plastic coated, brass plated steel shelf clips, which fit into holes drilled 32 mm on centers, in the case end panels.

6. Open Frame Tables:
   a. Components:

      1. Exterior rails:
         aa. Plain: 4-1/8 inches by ¾ inch, solid oak.
         bb. With drawers or compartments: 5-1/2 inches by ¾ inch, solid oak.
      2. Interior rails: ¾ inch solid hardwood plywood.
      3. Compartment bottoms: ¼ inch oak plywood.
      4. Legs: 2-1/4 inch square solid oak.
      5. Leg stretcher, when indicated: 2 inch square laminated solid oak.

   b. Construction: Exterior table rails are solid oak. Openings are routed in the one piece rail when drawers or compartments are required. A minimum of two interior cross rails are mortised and tenoned, glued and stapled into exterior rails. Compartment bottoms are let into grooves in cross rails and the front and back rails, then glued on all four edges. Exterior rails are grooved at corners to receive heavy steel corner braces, attached with screws. Legs are secured to the steel corner brace and table rails with a 5/16 inch threaded hanger bolt, machine screwed into the leg a depth of at least 2 inches. Legs have molded black polyethylene, closed bottom, leg shoes. Exterior rails are also grooved to accept "Z" clips for attaching the top.

7. Pedestal Tables:
   a. Components:
      1. Center rail: 4-1/2 inches by 1-inch, solid oak.
      2. End rails: 4-1/2 inches by 1-inch, solid oak.

      3. Pedestal legs: 1-3/16 inch particleboard overlayed on both sides with 3/32 inch oak plywood. Vertical edges are edge-banded with 1/8 inch solid oak.
      4. Feet: 2-1/4 inch thick and 2-1/4 inch high overall, solid oak.
      5. Leg stretcher: 3 inches high by 1-inch thick, solid oak.

   b. Construction: Pedestal tables have a rigid understructure with a center rail running the length of the table, two end rails across the width, two pedestal legs with feet, and one leg stretcher. Center and end rails are notched to interlock and then fasten to the top and pedestal legs. Feet are routed to receive pedestals. Each pedestal is glued, and fastened to the foot by two, 3 inch by ¼ inch lag bolts. Each foot has two, 1-1/2 inch plastic floor glides. Leg stretcher is secured by four, 3 inch by ¼ inch, lag bolts through the pedestal legs. Plastic "Z" glides for tote trays are attached to the underside of the table top. Tote trays are not included, and must be ordered separately.

2.03 HARDWARE AND ACCESSORIES

1. Pulls
   a. Pull AL-1 is a satin lacquer finished, extruded aluminum bar in a trim, modern design. Pull is mounted with two screws, 4 inches on center and projects from the surface one inch.

2. Handles
   a. Latching handle LH-1 is die cast zinc alloy, 4-1/4 inches long, streamline in design, and has a dull chrome plated finish. Handle operates with ¼ turn. Double door cases have latching handles on the right door and dummy handles on the left door. A three point latching system provides a positive engagement at the top and bottom of the door with tapered aluminum rods which pull the door snug when they engage plastic strike plates. The rods are 5/16 inch in diameter and move in nylon guides attached to the back of the door. The middle of the door is secured by a latch plate which engages the side of the case, or latches behind the left door on cases with double doors.
   b. Locking handle LK-1, furnished where indicated, is a latching handle with a lock mechanism incorporated into the handle head. On double door cases, the left door has a dummy handle, and the right door has the locking handle. Lock is laboratory grade with a 5-disc tumbler mechanism and a dull chrome plated face. Tumblers and keys are brass, while the plug and cylinder are die cast zinc alloy. There are 500 key changes standard. Locks are keyed differently, master keyed and furnished with 2 keys per lock. Locks and corresponding keys are alpha-numerically coded for a quick match.

3. Locks: Provide locks for all drawers, cabinet swing doors.
   a. Lock SL-1 is laboratory grade, cylinder cam lock, with a 5-disc tumbler mechanism, and a dull chrome plated face. Tumblers and keys are brass, while plug and cylinder are die cast zinc alloy. A 180 degree turn of the key moves the lock cam into, or out of, a slot cut to receive it. There are 500 key changes standard. Locks are keyed differently, master keyed and furnished with 2 keys per lock. Locks and corresponding keys are alpha-numerically coded for a quick match. Lock SL-1 is equipped with RemovaCore™ (or equivalent) keying control. If needed, with the use of a control key, the key core of the lock assembly can be removed and a new key core inserted, changing the entire locking system in a matter of minutes. Key cores can be held out of the lock assembly until the project is completed, removing the security risk of lost or stolen keys during installation and construction. Casework manufacturer can provide control keys and replacement cores as required. Locks are furnished only when indicated.
   b. Lock SD-1 is laboratory grade with 5-disc tumbler mechanism, and a dull chrome plated face. Tumblers and keys are brass, while plug and cylinder are die cast steel. Pushing in on the lock while turning the key, engages a lock bolt into the strike plate; a turn of the key, unlocks the bolt. There are 200 key changes standard. Locks are keyed differently, master keyed and furnished with 2 keys per lock. Locks and corresponding keys are alpha-numerically coded for a quick match. Locks are furnished only when indicated.
   c. Lock GL-1 is rachet type, with a disc tumbler mechanism and a polished nickel plate finish. The rachet bar adjusts from 1 inch to 3-3/8 inches. Two keys are provided; master keying is not available. Locks are furnished only when indicated.

4. Hinges
   a. Hinge SS-1 is heavy duty, institutional type, 5-knuckle hospital tipped, and is made from .083 inch thick stainless steel. Hinge is semi-concealed, 2-1/2 inches high and has off-set wings. Each wing has 3 screw holes, one of which is slotted for adjustability.

5. Catches

a. Friction roller catch is a zinc plated steel catch with a positive action, spring cushioned, polyethylene roller, and a metal strike plate. Screw mounted catch and strike plate have slotted holes for adjustability.

6. Drawer Slides

a. Drawer Slides: BHMA A156.9, Type B05091.

1. Heavy Duty (Grade 1HD-100 and Grade 1HD-200): Side mounted; full-extension type; zinc-plated, steel ball-bearing slides.
2. Grades in five subparagraphs below correspond to the following initial load test requirements: Grade 2: 30 lb (13.3 kg); Grade 1: 50 lb (22.2 kg); Grade 1HD-100: 100 lb (44.5 kg); Grade 1HD-200: 200 lb (90 kg).
3. Box Drawer Slides: Grade 1, for drawers not more than 6 inches (150 mm) high and 24 inches (600 mm) wide.
4. File Drawer Slides: Grade 1HD-100, for drawers more than 6 inches (150 mm) high or 24 inches (600 mm) wide.
5. Pencil Drawer Slides: Grade 1, for drawers not more than 3 inches (75 mm) high and 24 inches (600 mm) wide.
6. Keyboard Slides: Grade 1HD-100, for computer keyboard shelves.

7. Shelf Clips
a. Shelf clips are made from steel, then brass plated after fabrication. Clips are angle type with a ¼ inch diameter, ⅜ inch long stud which fits into holes drilled 32 mm on centers. The ¾ inch long ledge is dipped in a non-slip plastic coating, and has a predrilled hole to anchor shelf to the clip, if desired.

8. Leg Shoes
a. Leg shoes are closed-bottom style, 2-1/2 inches square, and molded of 1/8 inch black polyethylene.

9. Crossbars and Greenlaw Arms
a. Crossbars and Greenlaw Arms are ¾ inch diameter, anodized aluminum rods, with ends rounded.

10. Upright Rods
a. Upright Rods are ¾ inch diameter, anodized aluminum, 36 inches long with a rounded top and a tapered bottom to fit rod socket.

11. Clamps
a. Clamps are 1 inch square aluminum stock, with two, ¾ inch diameter openings, at right angles to each other, bored through sides. Openings are for upright rods and crossbars, or Greenlaw Arms. Thumb screws into each end of the clamp, tighten against the rods to hold positions .

12. Burette Rods
a. Burette rods are ½ inch diameter, anodized aluminum, and either 18 or 24 inches long. Rods are furnished with a tapered aluminum adapter to fit rod socket.

13. Rod Sockets

a. Rod sockets are mushroom type, machined from a solid aluminum rod. Sockets are held in place by a heavy aluminum lock nut and washer.

2.04 MECHANICAL SERVICE FIXTURES

1. Service Fixtures: Fixtures for water, gas, steam, or other services, are triple chrome plated, have heavy-duty construction and are specifically designed for laboratory use.
   a. Water Faucets - Hot and Cold: Faucets are cast from red brass, and have four-arm type handles with color coded indexes. Faucets have serrated hose tips, unless specified otherwise. Faucets have patented REX unit ceramic disc cartridges, and replaceable seats. The stem is brass, with full Acme threads, and has a brass cap nut. Goosenecks are rigid. Fixture outlets are tapped ⅜ inch I.P.S. for aerators, vacuum breakers, hose connections, or other accessories. Vacuum breakers are furnished when specified. Faucets with an integral vacuum breaker are furnished when specified.
   b. Gas, Air and Vacuum Cocks: Ground key cocks, made from high grade, brass forgings, have integral ten serration, non-slip hose tips. Wing handle has color-coded index button, is one piece construction, precision ground, and lapped to fit cock chamber. Handle operates with a ¼ turn, and is spring-loaded for constant pressure and automatic take up. *Do not use for oxygen service.* When specified, needle point valves are available for high pressures and oxygen service.
   c. Multiple Service Fixtures: Triple chrome plated fixtures have one cold water faucet and two ground key cocks for gas, air, or vacuum services. Cold water valve has patented REX unit ceramic disc cartridge. Faucet has a rigid gooseneck, one four-arm handle, and serrated hose tip. Vacuum breaker furnished when specified. Faucet with integral vacuum beaker is furnished when specified. Ground key cocks have serrated non-slip hose tip, spring-loaded wing handles and color coded index buttons.
   d. Vacuum Breakers: Watts NLF-9, or comparable, vacuum breakers are brass with polished chrome plating, screw-in type with stainless steel working parts, and durable rubber diaphragm and disc. Vacuum breaker is for hot or cold faucet and has a primary valve with a soft disc that seats against mating part. The secondary check valve utilizes a soft disc to metal seating. Vacuum breaker is tapped ⅜ inch N.P.T. Vacuum breaker is not intended for constant high pressures. Vacuum breakers are furnished when indicated.

2. Electrical Fixtures: Flush power supply unit by Hampden or equivalent. Units shall be 3-wire grounded, 20 A, 125V AC, with stainless steel cover plates and cadmium-plated steel boxes. Pedestal boxes are brushed, cast aluminum with conduit nipples and lock nuts. When specified, G.F.I., ground fault circuit interrupter, fixtures are available. G.F.I. fixtures are 20 A, 125V AC, with a brown nylon face and a LED indicator light. G.F.I. fixtures conform to UL Standard 943 Class A, and have dual slot terminal screw wiring connections and a trip time of 0.025 seconds.

3. Sinks and Sink Outlets

   a. Epoxy resin sinks are non-glaring black, specially modified epoxy resins, molded in one solid piece for optimum physical and chemical resistance. Inside corners are coved and the bottom is dished to the outlet. Outlets are epoxy resin, specially compounded and cured for optimum physical and chemical resistance, and 1-1/2 inches in diameter, unless otherwise specified.

b. Stainless steel sinks have a satin finish. They are 18 gauge, type 304, 18-8 stainless steel, with heavily undercoated bottoms and positive pitch drains. Outlets are chromeplated brass. Drain holes are 3-1/2 inch diameter for 4-1/2 inch stainless steel cup strainers. The cup strainer has a neoprene stopper.

2.05 LABORATORY TOPS

1. Rhearesin: Top is one inch thick, molded from a modified epoxy resin and has optimum physical and chemical resistance. The specially compounded and cured uniform mixture, throughout the thickness of the top, is not dependent on a surface coating for chemical or stain resistance. Standard color is non-glaring black; however, other colors are available. Exposed edges and corners are radiused, and a drip groove is provided on under surface in areas where sinks are installed. Curb is four inches high.

2.06 CASEWORK FINISH

1. Surfaces to be Finished: Exposed exterior and exposed interior surfaces of cabinets receive the full finishing process. The unexposed interior surfaces of cupboards, drawers, wall cases, upper cases, and tall cases receive a baked on protective coat of moisture and chemical resistant catalyzed sealer, and a top coat of clear, catalyzed, conversion varnish. Other unexposed surfaces are processed through standard finishing steps, and receive a baked on protective coat of moisture and chemical resistant catalyzed sealer.
2. Finishing Process: Prior to assembly lumber for doors, drawers and cabinets, and plywood for cabinets, are machine sanded with 120 grit, 180 grit, and finally, 220 grit sand paper. Flat surfaces receive two additional machine sandings: one in a orbital crossbelt sander with 40 micron and 60 micron grit sanding belts; and, one through a rotary polisher with 150 grit sand paper. Door and drawer front edges are machine sanded to a very smooth surface through a profile edge sander utilizing a 100 grit and a 150 grit paper. After assembly, drawers, doors, and casework are thoroughly examined and fine-finished by hand to provide a consistently smooth surface. Prior to the first application in the finishing process, items are placed in the dust-off booth where compressed air is used to remove loose fibers and dust. Selected surfaces are stained with NGR stain to the desired color and allowed to dry. Next a protective coat of moisture and chemical resistant, catalyzed sealer is applied. After flash drying, items are oven baked at 130 degrees F. Following a cool down period, surfaces that receive the final top coat are carefully hand sanded and wiped clean. A top coat of clear, catalyzed, conversion varnish is applied, allowed to dry, and then oven baked at 130 degrees F. The final top coat provides chemical resistance, toughness, durability, and excellent color stability with a smooth finish and high-gloss luster.
3. Finish shall comply with SEFA-8 resistance standard acceptable levels for casework surfaces. An independent 3rd party testing facility's written certification must be provided to establish that final finish has no more than three, SEFA-8 "Level 3" conditions.
4. Any deviations from the specified finishing procedures will be considered defective Work and rejected by the Architect.

5. Chemical Resistance:

Method of testing: Non-volatile chemicals: Five drops of each reagent were applied to the surface and covered with a watch glass for sixty (60) minutes and the temperature maintained from 74 to 80 degrees F. At the end of this period, the reagents were flushed with water, the surface scrubbed with a soft bristle brush under running water, rinsed and dried. After thorough drying, the surface was evaluated.

Volatile chemicals: The test areas were cleaned with a cotton swab soaked in the solvent to be used for the test, a one inch cotton ball saturated with the test solvent was then covered by an inverted two ounce wide mouth bottle to retard evaporation. The test period was for sixty (60) minutes and the temperature maintained from 74 to 80 degrees F. Twenty-four hours after the test period, the test surface was scrubbed with a damp paper towel and dried with paper towels and evaluated. Volatile chemicals are indicated by a "bullet".

The finish of exposed surfaces is capable of withstanding the following chemicals with no effect:

Acetic Acid - 50%
Acetic Acid - 98%
•Acetone
Ammonium Hydroxide - 28%
•Benzene
•Carbon Tetrachloride
•Ethyl Acetate
•Ethyl Alcohol
•Ethyl Ether
Formaldehyde
•Gasoline
Hydrochloric Acid - 10%
Hydrochloric Acid - 20%
Hydrochloric Acid - 37%
•Methanol (Methyl Alcohol)
• Methyl Ethyl Ketone
• Naphtha
Nitric Acid - 10%
Phosphoric Acid - 25%
Phosphoric Acid - 75%
Potassium Hydroxide - 50%
Sodium Carbonate - Saturate
Sodium Hydroxide - 10%
Sodium Hydroxide - 20%
Sodium Hydroxide - 40 %
Sulfuric Acid - 25%
• Toulene
Xylene

Acids that have little to moderate effect on the finish of exposed surfaces are:

Nitric Acid - 30%
Sulfuric Acid - 70%.

2.07 FABRICATION

1. Factory assembly of casework in the largest components possible aids in the installation. Mortise and tenon construction with glued and screwed joints is used for maximum strength; and the use of precision jigs and clamps ensures square corners and plumb vertical surfaces.
2. Fabrication of laboratory casework and equipment is completed to dimensions in the final approved copy of shop drawings.

PART 3: EXECUTION

3.01 COORDINATION

The Contractor and Owner shall cooperate with the laboratory casework and equipment contractor to coordinate delivery and installation of the product.

3.02 INSTALLATION AND ADJUSTMENTS

1. Installation of casework must be plumb, level, true and straight, with no distortions. Use concealed shims as required. When laboratory casework or equipment butts against other finished work, scribe and cut for an accurate fit.
2. Adjustments to casework and hardware may be needed for smooth operation of doors and drawers, without warp or bind. Lubricate operating hardware as recommended by the manufacturer.

3.03 CLEANING AND PROTECTION

1. Inspect casework for damaged or soiled areas; remove, refinish, and touch-up as necessary. Leave area clean.
2. Cover installed casework and equipment with 4-mil polyethylene film as protection against soiling. Advise General Contractor of procedures to protect installed casework and equipment from potential damage by other trades.
3. Required temperature and humidity conditions, consistent with those to be maintained by Owner, must be established for installed casework. Advise Contractor of these requirements.

3.04 DEMONSTRATION

A qualified representative will demonstrate operation procedures and maintenance of the installed equipment to the Owner's personnel. This demonstration may be set at Owner's convenience; however, it must be conducted within 60 days of final installation of casework.

END OF SECTION 11070

SECTION 15010 – GENERAL REQUIREMENTS

PART 1 GENERAL

1.01 SCOPE

1. The General, Supplementary, and Special Conditions, applicable portions of all divisions and the addenda thereto, are made a part of this Contract.

2. All work described in these specifications shall be the responsibility of the mechanical contractor unless otherwise indicated.

3. It is the intent of these specifications to include all material, service and labor necessary to form a complete and properly operating whole.

1.02 CONTRACT DRAWINGS

1. Examine all drawings and specifications and visit the site to become acquainted with the construction and the extent of the work.

2. In referring to drawings, figured dimensions take precedence over scale measurements. Discrepancies must be referred to the Engineer for decision. Each Contractor shall certify and verify all dimensions before ordering material or commencing work.

3. Any work called for in the specifications, but not mentioned or shown on the drawings, or called for on the drawings, but not mentioned in the specifications, shall be furnished as though called for in both. When there is a discrepancy between drawings and specifications, the most considerable shall apply.

4. When any device or part of equipment is herein referred to into singular number, such as "the pump" such reference shall be deemed to apply to as many such devices as required to complete the installation.

5. The term "provide" shall mean "furnish and install". Neither term will be used generally in these specifications but will be assumed. The term "furnish" shall mean to obtain and deliver on the job for installation by other trades.

1.03 CODES AND STANDARDS

1. All work shall comply with all regulations and latest edition of applicable codes and be subject to inspection and approval of authorities having jurisdiction.

2. All electrical work shall comply with latest edition of the NEC National Electrical Code.

3. Where items indicated on contract documents differ from code requirements, contractor shall inform engineer prior to installation. Any construction installed by contractor that is not in compliance with applicable codes, shall be removed, modified, and/or replaced at not additional cost.

4. All equipment shall be labeled by an applicable approved agency.

5. Contractor shall give all notices, obtain and pay for all permits, deposits, and fees necessary.

6. Manufacturer's published data is made a part of these specifications.

7. Wherever a recognized national organization has published standards these shall be complied with (such as ASA Z 21.30 for gas piping).

1.04 SCOPE OF WORK

1. It is the intent of these specifications to include all material, service and labor necessary to form a complete and properly operating whole system.

2. The school will be purchasing the new rooftop unit and all controls.

1.05 PROGRESS

1. See "General Conditions".

1.06 SHOP DRAWINGS AND SUBMITTALS

1. See "General Conditions".

2. Ductwork and piping shop drawings shall be prepared using Auto Cad 2000 or latest edition of Auto Cad @ ¼"scale (minimum).

3. Equipment Manufacturers are required to provide a written report stating whether or NOT any equipment furnished by the Manufacturer qualifies for a Program Incentive payment through the NJ Clean Energy Commercial and Industrial Program (New Jersey SmartStart Buildings®). The report is to be submitted with original shop drawing submittal. Report shall include all supporting equipment specification sheets, applicable AHRI Certificate and any other certifications required. (Note: a negative report MUST be submitted where applicable.) Listed below are the types of qualifying equipment & approved technologies listed by New Jersey SmartStart Buildings® that require the above specified report. Note: a report shall be submitted from each Equipment Manufacturer for each equipment item submitted.

Electric Unitary HVAC

- Unitary HVAC and Split Systems

1.07 EQUIPMENT DEVIATIONS

1. The material and products mentioned in these specifications are given to establish a standard of quality, design and performance. The phrases "equivalent", "acceptable", "or equal" and "equal to" shall be used to indicate that other similar products may be used and provided in accordance with "General Conditions", where applicable, such substitutes are accepted by the Architect as meeting all standards necessary to perform the function intended. Specific products listed without reference to equals or substitutions shall be provided as specified.

2. Where this Contractor proposes to use methods and/or manufacturer other than that specified or detailed on drawings, which will require any changes of the structure, partitions, foundations, piping, wiring or any other part of the design documents, all design, engineering and any new drawings and detailing required by other contractors and/or professionals shall be paid by this Contractor at no additional cost to Owner.

3. Where such deviation requires a different quantity and/or arrangement of duct work, piping, electrical work, wiring conduit and/or equipment that would have been required for equipment specified or indicated on the drawings. This Contractor shall with the approval of the Engineer provide all material, equipment and labor required by the change at no additional cost to the Owner.

4. Where such approved deviation requires a change to the structure, electrical, plumbing or any other Contractor's or Sub-Contractor's work, or any change to the construction as indicated on the design documents. This Contractor shall pay for all costs incurred due to such deviations at no additional cost to the Owner.

1.08 REJECTED MATERIALS

1. See "General Conditions".

1.09 WORKMANSHIP

1. See "General Conditions".

1.10 WARRANTY

1. Provide as part of contract, all belts and other normally replaceable items found defective at start up and/or for a period of 60 days operation equivalent run time. Owner is responsible for normal belt and filter replacement after initial 60 day breaking in period. This does not relieve contractor for replacement of damaged equipment, belts, etc. which are not a result of normal usage.

2. See "General Conditions".

3. At the expiration of the Factory Warranty period, provide a Factory Warranty agreement, to include full coverage, parts and labor, plus emergency service for the new packaged rooftop air conditioning units for an additional three (3) year period, for a total of five (5) years of Factory Warranty.

4. Filter Change - See Specification Section 15010 "Filter Changes".

1.11 AS-BUILT DRAWINGS

1. See "General Conditions".

1.12 FIRE RATING

1. All materials used anywhere in the work must have N.F.P.A. rating and be in accordance with ASTM-E-84 as follows:

   A. Flame Spread - Not Over 25
   B. Smoke Developed - Not Over 50
   C. Fuel Contributed - Not Over 25

2. All materials shall be "Self Extinguishing".

1.13 EQUIPMENT SELECTION AND SERVICEABILITY

1. All equipment shall be located and installed so that it may be serviced. Demonstrate to Owner as part of instructions that there is room to remove all coils, tube bundles, filters, motor and similar equipment. Equipment which is too large or poorly located to permit servicing shall be replaced or repositioned or modifications made to allow for proper servicing at no additional cost to the Owner.

2. Where piping, control diagrams and/or sequencing differ from the recommended piping arrangements of the equipment manufacturer, and will directly affect the equipment performance, the manufacturer's recommendations shall be submitted in writing to the Architect/Engineer for approval, prior to purchasing the equipment involved and piping arrangement, control, etc., as recommended by manufacturer shall be used. This Contractor shall be responsible for obtaining such recommendations from the manufacturers in order to effect correct and proper operation of the equipment at the capacities and temperatures indicated.

1.14 MAINTENANCE SERVICE

1. Contractor shall furnish complete parts and labor service and maintenance of all HVAC systems, equipment, devices, controls, etc., for two (2) years from Date of Substantial Completion as determined by Architect.

2. Provide scheduled maintenance service with three (3) month interval as maximum time period between scheduled service or as indicated elsewhere (applicable only if less than 3-month intervals.

3. Provide 24-hour emergency service on breakdowns and malfunctions.

4. Include maintenance items as outlined in manufacturer's operating and maintenance data.

5. Submit copy of service call work order or report and include description of work performed. Handwritten report acceptable at time of service. Type written report to be provided to Owners' maintenance staff within two (2) weeks of service call.

6. See Specification Section 15930 for additional requirements for control system.

1.15 FACTORY TESTING (BY UNIT MANUFACTURER)

1. All factory assembled packaged equipment shall be factory tested including helium leak testing of the coils, pressure testing of the refrigeration circuit, and run testing of the completed unit. A certified factory Run test report shall be provided for each unit. **The "Run Test Report" shall be submitted to Owner for approval, prior to acceptance of unit for payment.**

1.16 EQUIPMENT FURNISHED BY OTHER TRADES

1. All equipment furnished and/or installed by other trades requiring connections and services by this Contractor shall have such services provided by this Contractor.

2. This Contractor shall verify exact requirements with approved shop drawings supplied by the Equipment Contractor and/or Supplier prior to construction.

3. This Contractor shall verify locations, sizes and requirements of all services to equipment, in field with the Equipment Contractor prior to construction.

PART 2 PRODUCTS

2.01 ELECTRICAL EQUIPMENT

1. This Contractor shall furnish all his equipment complete with motor, controllers, capacitors and starting equipment.

2. Electric motors shall be premium high efficiency (refer to table below for minimum efficiency), open, drip proof induction motors premium high efficiency rated for continuous duty at 15% overload with 40° C. rise; single phase motor shall be capacitor start-induction run. Motors one-half and larger shall be polyphase, motors smaller than one-half horsepower shall be single phase, unless otherwise noted (see Division 16). Starting equipment shall consist of magnetic across-the line starters equal to Furnas Bulletin 14, unless otherwise specified. Thermal overload type, motor rated manual switches shall be furnished for motors ¾ HP and less which do not require magnetic starters for control purposes.
Premium high efficiency motors shall have efficiencies equal to or greater than listed below.

SIZE/HP	1800 RPM ODP NEMA NOMINAL EFFICIENCY	1800 RPM TEFC NEMA NOMINAL EFFICIENCY
1	85.5%	85.5%
1.5	86.5%	86.5%
2	86.5%	86.5%
3	89.5%	89.5%

3. Provide FPE/CDE Type 1C Power Factor correction capacitors size to increase full load power factor to 95%. Capacitors shall be fused, in NEMA enclosure, connected between safety switch and motor starter.

4. Where apparatus is specified as "Packaged", all electrical equipment shall be furnished, set and wired to a single point of connection for apparatus as a unit.

5. This Contractor shall set all electrical equipment furnished by him unless same is to be mounted on an electrical panelboard, junction box or similar piece of electrical equipment and is to be wired by others.

6. Where electrical characteristics are not shown, all electrical characteristics shall be as indicated on electrical plans. Where there is a conflict between model numbers which indicate electrical characteristics and electrical drawings, the electrical drawings shall take precedent.

7. This Contractor shall verify all electrical characteristics of all equipment with the electrical contractor. This Contractor shall submit to electrical contractor location of all motors, starters, all other electrical equipment, voltage and phase required prior to submission of this Contractor's and/or electrical contractors' shop drawings or start of construction. This Contractor shall submit

to the electrical contractor all equipment requiring electrical services and obtain the review of the shop drawings for correct electrical characteristics for the electrical contractor prior to submission for review.

8. Should this Contractor change type of equipment which results in change to electrical characteristics, then this Contractor will be responsible to coordinate these changes with all other trades and pay for all costs required as a result of changes.

9. Should this Contractor change electrical characteristics of equipment from that shown on electrical drawings or does not submit shop drawings to the electrical contractor for his review, he is responsible for all cost required, resulting from such change or failure to submit shop drawings.

2.02 ELECTRICAL WIRING

1. This Contractor shall furnish and install all electric power wiring required for his contract, with the exception of certain wiring shown under Electrical Contract. This contractor shall furnish and install all control wiring required for his contract including power wiring to all ATC devices, panels, etc.

PART 3 EXECUTION

3.01 METHOD OF PROCEDURE

1. The drawings accompanying these specifications are diagrammatic and intended to cover the approximate and relative locations of the systems. Where FMCS plenum-rated cable wiring is allowed it shall be run parallel to or at right angles to the structure, properly supported and installed in a neat and workmanlike manner.

2. Installation, connection and interconnection of all components of these systems shall be complete and made in accordance with the manufacturers instructions and best trade practices. This Contractor shall erect all parts of equipment to be furnished by him under his contract in such time and in such a manner as not to delay or interfere with other Contractors work.

3. This Contractor shall lay out his work and be responsible for the establishment of heights, grades, etc., for all interior and exterior piping, equipment, conduit, duct work etc., included in Contract Documents, in strict accordance with the intent expressed thereby. The establishment of the location of all work shall be performed in consideration of the finished work. In case of conflict, equipment and/or materials shall be relocated without additional cost to the Owner, as directed by the Architect, regardless of which equipment was installed first.

4. Each contractor shall cooperate with other Contractors for the proper securing and anchoring of all work included within these specifications. Extraordinary care shall be used in the erection and installation of all equipment and materials to avoid marring surfaces of the work of other Contractors, as each Contractor will be held financially responsible for all such damage caused by the lack of precaution and due to negligence on the part of his workmen.

3.02 EQUIPMENT IDENTIFICATION

1. All HVAC equipment, control panels and starters shall have engraved plastic equipment tags. Tags shall be 1/16" plastic with mounting holes or adhesive backing to allow tags to be permanently mounted to equipment. Indication shall be for the equipment number, usage and location and where applicable circuit numbers and panel for electrical feed served. Equipment number shall be per the contract documents or where different numbering system is used by the contractor, the number system shall be per as-builts, O & M manuals and/or control drawings. Areas served shall be per room name and number (if applicable) based on architectural plans; contractor to verify prior to submittal. If different room designations and number system is used by Owner/contractor, these shall be used.

2. Size of equipment tags shall be minimum 1"x3". Larger sizes shall be used, 1-1/2" x 4", for equipment requiring additional information.

3. Colors shall be to the extent practical and possible; match duct and pipe marker color.

4. For equipment not ducted or piped, provide same color as adjacent equipment. Engraved plastic equipment tags shall be manufactured by MSI.

5. Equipment location tags shall be used for equipment located above acoustical ceiling and shall be MSI Model 35550 or equivalent. Color coding shall be per Owner. Tags shall be 7/8" dia. with heads that can be written on with a marking pen.

3.03 VISIT TO SITE

1. Due to the nature of the work involved under this Contract, all bidders are required to thoroughly examine the site. Bidding contractors shall thoroughly review Contract Documents prior to visiting the site, take Contract Documents to site and thoroughly explore to any extent necessary, the existing conditions as relating to fulfilling the requirements of this Contract.

2. If discrepancies are noted between requirements of Contract Documents and existing conditions, this Contractor shall so indicate to architect during bidding period and receive clarification before bidding. Failure to comply with this requirement will result in Architect's interpretation during the construction period and architect's decision will be final and binding as the sole interpreter of the Contract requirements.

3. Extras will not be considered for any work relating to connections with existing systems or adaptability of new systems to existing conditions.

3.04 CLEANING

1. Upon completion of the work, this Contractor shall remove all excess material, debris, tools and equipment from the site, and leave the premises in a broom clean condition.

2. Flush out all piping systems with proper solvents to insure removal of all foreign materials. Clean equipment, piping and other surfaces soiled by the work. Remove debris and rubbish on a daily basis.

3. Disposal of all materials shall be this Contractor's responsibility. All solvents and other chemicals, and materials used, shall be disposed of in strict accordance with all applicable environmental codes.

3.05 START-UP AND ADJUSTMENTS

1. Equipment Start-UP

A. The equipment manufacturer shall provide all start-up. Start-up shall be provided by the equipment supplier for all equipment.

B. As part of start up, the equipment manufacturer shall provide a complete checklist of all start up requirements for each piece of equipment. This checklist, when completed, shall be provided to the architect/owner indicating that the equipment has been started up, adjusted, balanced, tested and installed in strict accordance with the equipment manufacturer's requirements and is functioning per specification.

C. This written confirmation shall be the equipment manufacturer's standard checklist for start up. All start-up, adjustments, replacement of equipment, rebalancing, installation, and any other modification to the equipment or system required to provide the correct and/or specified performance shall be made at no additional cost to owner. Any of the above items needed shall be indicated as part of this start up.

D. All equipment start-up provided by the equipment manufacturer shall have written confirmation as specified above and shall be submitted to owner/architect prior to contractor submission of payment for substantial completion. Failure to provide start up reports will result in non-payment of billing for substantial completion.

E. Where any modifications and/or reinstallation is required as specified above and results in additional work to any other contractors or subcontractors work, this work shall be the responsibility of the HVAC contractor and shall be done at no additional cost to Owner/architect.

F. As part of start-up, the owner shall be provided operation and maintenance manuals.

G. This Contractor shall supply the owner with the following literature as furnished by the manufacturer, four (4) weeks prior to start up, and have equipment manufacturer representative available for any questions.

- Three (3) complete sets of installation drawings.
- Field wiring diagrams.
- Installation instructions.
- Start up operation and maintenance instructions.

H. Where start up results in performance which is not in accordance with contract documents or manufacturers' specifications, this Contractor shall submit architect the discrepancies prior to commissioning of work. Any discrepancies shall be the responsibility of the HVAC contractor and be corrected by this Contractor at no additional cost to owner.

3.06 OPERATING AND MAINTENANCE INSTRUCTIONS

1. This Contractor and equipment manufacturer shall furnish qualified personnel to instruct the Owner's people in the operation of the system and must request from the Owner, in writing, a date for such instruction to begin. Contractor's personnel shall remain until such instruction is complete to Owner's satisfaction. This Contractor shall receive from Owner written verification that the Owner's personnel have been thoroughly instructed in the operation, maintenance, and all facets of the system operation.

2. This Contractor shall have manufacturers' representatives, as part of their start-up, provide instruction on equipment.

3. Manuals shall include all equipment, equipment parts lists, complete oiling, recommend spare parts, and complete coiling, cleaning and servicing data compiled in a clearly indexed and easily understood form. The contractor shall obtain this information from the equipment supplier and include in the O & M manuals. The data shall indicate the serial numbers of each piece of equipment and provide complete lists of replacement parts, motor parts, ratings and actual loads.

4. Provide list of any special emergency operating instructions and a list of service organizations (including addresses and telephone numbers) capable of rendering emergency service to the various parts of the system.

5. Certified log of air quantities at all air supply, return and exhaust openings by Owners' balancing contractor.

6. Provide list of all motor data, including standard and actual operating in service data.

7. Provide all manufacturer's equipment guarantees and warranties.

8. Provide a list of units, filter sizes, quantities and recommended changes. For each piece of equipment, locate filter and demonstrate filter change.

3.07 TRAINING AND INSTRUCTION

1. Provide operating instructions shall include wiring and control diagrams showing complete lay out of each system. These instruction periods shall be a minimum of:

   General System - Eight (8) Hours

3.08 PAINTING AND FINISHING

1. All painting is to be done in accordance to Rust-Oleum Corporations printed instructions. All surfaces to receive two (2) coats of primer, exposed surfaces one (1) finished coat, color selected. Aluminum or galvanized metal surfaces are considered finished where concealed.

2. All surfaces to be carefully cleaned and/or pickled and filled as required to provide a proper uniform surface. Factory finished equipment shall be touched up or refinished where required.

3. Where equipment is provided as factory painted and is visible on roofs from grade (as determined by construction manager), exposed in space or otherwise not concealed behind finished surfaces, equipment shall be factory painted in accordance with manufacturers standard painting procedures. The color shall be selected by architect and a color chart shall be submitted for review.

4. All duct exposed and all other exposed equipment, pipe and appurtenances in all other areas unless specifically indicated to be painted by general contractor, to be painted by this Contractor color as selected. Submit for approval. All surfaces shall be prepared for painting and/or constructed of materials suitable to be painted.

3.09 CONSTRUCTION SAFETY

1. All work shall be done in accordance with the following Federal regulations:

   A. Williams-Steiger Occupational Safety and Health Standards, Chapter XVII of Title 29, Codes of Federal Regulations.

2. Comply with local Health and Safety Regulations.

3.10 ENERGY CONSERVATION CODES

1. It is the intent of this specification that all equipment and materials furnished meet the latest enforced edition of the ASHRAE 90.1-2009 or such code as locally applicable, if more restrictive.

3.11 EQUIPMENT LIST

Refer to general conditions. Exclusion of items on list does not relieve Contractor of the responsibility of providing equipment as specified, required to complete work or shown on drawings to be provided by this Contractor.

	MANUFACTURERS			
EQUIPMENT	NUMBER 1	NUMBER 2	NUMBER 3	NUMBER 4
Vibration Isolation	Mason Industries	Vibration Mountings		Or Equivalent
Insulation	Owens Corning	John Manville	Knauf	Or Equivalent
Rooftop Units	Aaon			Or Equivalent
Exhaust Fans	Cook	Greenheck	Pennvent	Or Equivalent
Air Devices	Metal Aire	Tuttle Bailey	Anemostat	Or Equivalent
Valves	Mueller	Stockham	Nebco	Or Equivalent
Ductless Split System	Mitsubishi			Or Equivalent
Electric Heater	Berko			Or Equivalent

3.12 SCHEDULE OF WORK AND COMPLETION DATES

1. The exact times and dates and schedules that the projects will be available for this Contractor to do work, shall be as indicated in General Conditions. Refer to general conditions for completion dates.

3.13 DELIVERY AND STORAGE OF EQUIPMENT

1. This Contractor shall store, take deliveries and install all equipment in accordance with manufacturers' requirements (see "General Conditions").

3.14 PROTECTION OF SERVICES DURING CONSTRUCTION AND DEMOLITION

1. This Contractor shall repair, replace, and maintain in service any utilities, facilities or services (in existing areas where new work and/or demolition is to occur) which are damaged, broken, or otherwise rendered inoperative during the course of demolition and/or construction.

2. This Contractor shall effectively protect, at his own expense, his work, materials and/or equipment which may cause injury to building personnel during the construction period. All openings must be securely covered, or otherwise protected.

3. This Contractor shall be held responsible for all damage so done until his work is fully completed and finally accepted.

4. It shall be the responsibility of this Contractor to protect all existing construction and new motors, HVAC equipment, pumps, electrical equipment, plumbing fixtures and all construction during all phases of construction.

3.15 FILTER CHANGES

1. Contractor to be responsible for two (2) sets of filters. One set installed on equipment from factory by equipment manufacturer and one set of filters is to be provided to the Owner as attic stock by contractor.

3.16 CONTINUITY OF SERVICES - EXISTING BUILDING

1. The work under the contract shall not interrupt services to the existing building or building systems or daily normal operation, except if all the following conditions are met.

   A. Building personnel are notified in advance and approve date and time in writing.

   B. Interruption of service does not exceed one (1) hour unless otherwise approved.

   C. Interruption of service does not occur during normal working hours.

2. No "extra" compensation will be permitted due to the "overtime" hours implicit in the requirements of this Section.

3. Where interruptions will affect life safety and/or other critical systems, proper precautions shall be taken to maintain level of protection and/or system operation.

4. This Contractor is cautioned that the existing building is to remain occupied during construction and that all services to the building are to be maintained. There shall be no interruption of services and, if absolutely necessary, at least seven (7) days prior notice is required.

5. Any interruption of life safety systems (fire alarm sprinkler) the fire department and alarm company shall be notified, and proper precautions taken.

6. There shall be no obstructing the exit ways from existing building.

7. All interruptions of service shall be done at times which cause least disruption of service.

3.17 CONSTRUCTION SEQUENCING

1. Refer to General Conditions for the overall contract staging. However, specific items for HVAC contractor should be noted. The following are suggested methods of staging of construction. Alternate methods to achieve the intent of these specifications will be allowed; however, they must be coordinated with other trades and submitted for review and approval.

2. The sequence of construction shall be as indicated in the General Conditions of the specifications.

3. Where work is shown on mechanical plans where it is outside the phase areas indicated or specified in the General Conditions, this work shall be done at any time. All work shall be done so not to interfere with normal school operations. Where work is done outside normal school occupied areas (boiler room, roof area), this work may proceed at contractor's option. All work, regardless of the location of work, type of work, or extent of work, shall be done with the approval of the School District.

4. Where work in a particular phase requires work to be done outside that phases' construction boundaries, this Contractor shall locate all new duct, pipe, and equipment to allow for new construction and/or to integrate with existing building construction.

5. Where ductwork is to be installed in an unconditioned space (due to space not being constructed when duct, pipe, etc., is required to be installed), the pipe and/or duct shall be insulated as specified for outdoors. Where new pipe is required to be installed in an unconditioned space or space which shall be exposed to freezing, the pipe shall be insulated as specified for outdoors and heat traced to prevent freezing (power wiring by this Contractor).

6. All new ductwork and piping shall be installed and coordinated with proposed new work.

7. All work required to be modified due to non-compliance with this section, General Conditions or Construction Sequencing, shall be removed, replaced and/or modified at no additional cost to Owner.

8. The permanent ATC system shall be operational for any new construction, regardless of phase. Existing and/or new DDC systems and all wiring shall be installed and protected during construction to facilitate phasing. The use of modular control panels (LSIS, SAC's, etc.) will be allowed as long as the system functions can be monitored and controlled from that location for that phase and be connected to main system upon completion of work. Owner to be instructed on operation (not part of instruction period).

9. Where pipe is shown to serve future phases, provide capped outlet suitable for connection when phase is completed. Provide valves for isolation and draining lines without affecting the work installed in earlier phase.

10. The boiler operation and control sequence shall be modified (temporarily) to provide reduced flow and pressure and allow for boiler to be used for Area B.

11. All work associated with compliance of this section shall be the responsibility of this Contractor.

12. Contractor shall provide, prior to doing any work, schedule and provide procedure for accomplishing the work.

3.18 RELOCATION OF EXISTING EQUIPMENT

1. This Contractor shall be responsible for removal, storage, relocation and installation of all existing equipment shown or scheduled to be relocated or as may be required to remove existing equipment and/or install new equipment. This Contractor will be responsible for capping and reconnection of all existing services presently feeding existing equipment which must be relocated and/or modified and shall patch all adjacent surfaces to match existing.

3.19 CUTTING AND PATCHING

1. Unless otherwise specified and/or shown on architectural, HVAC and/or structural plans and specifications, to be done by general contractor, this Contractor shall cut and patch walls, floors, ceilings, roof surfaces and all existing construction for the removal of existing equipment, fixture, piping, controls and other construction for the completion of work under this Contract. All equipment, piping, ductwork, furniture and all construction or materials that are disturbed during construction shall be stored and protected from damage until replaced.

2. Cutting shall be done only after shop drawings have been prepared and with the Architect's approval. This Contractor shall exercise proper care and shall not endanger the structure by indiscriminate cutting and shall be responsible for and shall protect all existing construction to remain from damage. Provide and maintain all necessary temporary protective materials, coverings and barricades.

3. This Contractor may hire the other prime contractors to perform this work or hire a pre-qualified, independent contractor. This Contractor shall be familiar with and assume all responsibility for any conflicts with union policy and provide supervision in such a manner as not to impede the progress of other trades and be responsible for the adequacy and accuracy of same.

4. Wherever previously unfinished areas are exposed by the removal of existing equipment, these areas shall receive new finishes to blend into the adjoining work.

5. Wherever existing chases must be enlarged to encase new work, they shall be enlarged to match the existing construction

6. Wherever fire rated material must be patched, it shall be patched in a manner not to affect its fire rating.

7. All patching work must be done by skilled mechanics in a manner to minimize the patch effect. Wherever new painting is required, it shall be done with at least two coats over new materials.

8. The painting must not only cover the area of the actual patch, but also to the nearest natural break of the newly painted surface. Wherever the surrounding surface to be painted is in poor condition, all loose paint shall be removed before new paint is applied.

9. Patching of existing floor must be done in a manner to assure smooth undersurface and all joints must line up with existing.

10. Wherever new vinyl or rubber bases are to be supplied, they shall match adjoining bases in height and color.

11. Whenever existing ceilings are disturbed, they shall be replaced with new ceiling tiles or patched to match existing and all services, lights, fixtures, etc. supported temporarily and permanently reinstalled.

12. This Contractor shall remove and replace all ceilings required for his work with the exception of ceilings shown to be removed by general contractor on architectural plans.

3.20 NEW ROOF OPENINGS IN EXISTING ROOFS

1. Unless otherwise shown on plans, the general contractor shall cut all new openings in roof. Structural work by steel contractor or general contractor. General contractor to provide flashing and counterflashing for openings. This Contractor shall provide all curbs and equipment. Structural steel must be installed prior to cutting holes.

2. HVAC contractor shall verify opening locations by use of coordination drawing developed by this Contractor. Prior to any cutting or construction, this Contractor shall physically mark locations for all other prime contractors.

3. Once hole is cut by the general contractor, prior to duct or equipment being set, this Contractor shall temporarily protect the opening. After duct and/or curb or equipment is permanently installed by HVAC and flashed and counterflashed by general contractor, and opening is weatherproofed, it shall be the responsibility of the general contractor for any water damage.

4. As part of the coordination, the HVAC, structural and general contractors shall provide a schedule agreed to by all parties so that the new openings are permanently closed as soon possible. No opening shall be left temporarily sealed for an extended period of time, as determined by the construction manager.

3.21 REMOVAL OF EXISTING EQUIPMENT ON EXISTING ROOF

1. This Contractor shall remove existing equipment including all duct, duct supports, pitch pockets, control wiring, electrical wiring (to closet point of termination), all piping and appurtenances. Where removal requires new roofing, this work shall be done by the general contractor.

2. This Contractor shall remove existing equipment and provide shop drawings to all contractors for their review. The shop drawings are to include proposed schedule, locations, sizes and other pertinent details. This Contractor shall provide a temporary waterproof enclosure. Existing curb shall remain. General contractor to provide permanent cap where curbs are to remain. See architectural and structural plans for details.

3. Where existing curbs are to be removed, these shall be removed by general contractor and general contractor to provide permanent roofing.

4. As part of the coordination, the HVAC and general contractor shall provide a schedule agreed to by both parties so that the existing openings are permanently closed as soon possible. No opening shall be left temporarily sealed for an extended period of time, as determined by the construction manager.

3.22 REMOVAL

1. This Contractor shall remove existing systems as indicated on drawings.

2. All equipment, cabinets, ductwork, pipe controls, all pipe insulation (except any asbestos insulation), hangers, electric wiring and all construction and appurtenances shall be removed, to complete all work under this Contract. All work by this Contractor.

3. Equipment identified by Owner, prior to removal, that is to be retained by the Owner, which is not to be re-installed, and is to remain the property of the Owner shall be removed undamaged and stored in the building. Location shall be determined by the construction manager at no additional cost to Owner. This Contractor shall then load, transport and unload equipment from building to a site designated by Owner within 20-mile radius of site.

4. Removed ductwork, registers, equipment, automatic controls, pneumatic tubing, piping, pipe insulation and electric wiring and all debris shall be removed from the building and site in accordance with general conditions and shall be disposed of in accordance with all applicable environmental rules and regulations. Failure to properly dispose of materials in a proper manner that result in fines, penalties or additional cost are the responsibility of this Contractor.

5. All debris in areas occupied by the building personnel during periods of building operation shall be removed daily.

6. This Contractor shall patch all wall, floors and ceilings and roof surfaces to match existing adjacent surfaces where obsolete equipment, piping, ductwork, controls and wiring are removed.

7. Work shown on drawings may not indicate all equipment, pipe, etc., nor exact routes, sizes, locations, etc. The drawings are <u>not</u> to be used for estimating detailed take-off for amount of work required, drawings are for reference only. This Contractor shall visit site to determine extent of work and all conditions.

8. Where existing louvers are shown to be removed, the HVAC contractor shall remove and provide temporary closure and general contractor to provide permanent construction unless otherwise specifically indicated.

3.23 BUILDING ALTERATION WORK

1. This Contractor shall furnish all labor, equipment and materials required to complete alteration work in the building. Unless otherwise indicated on architectural drawings, this Contractor shall remove existing construction and replace, to remove existing equipment and/or install new equipment in conjunction with the work.

2. Cut, patch and paint walls, floors, ceilings, roof surfaces and all construction for the installation of equipment, piping and controls.

3. Cut and patch exterior walls for the installation of air intake and exhaust. Finish to match existing adjacent surfaces.

4. Where existing electrical HVAC or plumbing work, due to removal of existing and/or installation of new equipment, is required to be removed. This Contractor shall disconnect existing equipment, cap services in a safe manner, remove equipment, store in a location to prevent damage, replace equipment, patch construction to match existing conditions and reconnect equipment to existing services.

5. This Contractor shall either retain qualified independent contractors or utilize the other on-site contractors. This Contractor shall assume all requirements for any conflicts with union policy and be responsible for same. This Contractor shall furnish necessary shop drawings and supervision, in such a manner as not to impede the progress of other trades and be responsible for the adequacy and accuracy of same.

END OF SECTION
15010.6001

SECTION 15110 - BASIC MATERIALS AND METHODS

PART 1 GENERAL

1.01 MATERIALS AND EQUIPMENT

1. All material and equipment used for this contract shall be unused and of the latest model or design available. Equipment shall be installed in strict accordance with manufacturer's recommendations and details.

2. Materials not specifically described but indicated or incidentally required shall be acceptable to the Architect and/or Engineer. Submit shop drawings. Materials shall be delivered, stored and handled so as to preclude injury by weather, dirt or abrasion.

3. This Contractor shall use only specifically assigned areas for storage of materials and construction operation, unless other areas are authorized by the Owner. Such areas will be identified after the award of Contract by Owner. Comply with local municipal regulations regarding use of and parking on public streets.

4. This Contractor shall repair streets, drives, curbs, sidewalks and any existing surface where disturbed by construction operations and leave them in as good condition after completion of the work as before operations started.

1.02 PROTECTION

1. All equipment shall be covered to protect it from damage; all damage is the responsibility of this Contractor.

2. Any pipe, equipment or construction in existing building shall be done in such a manner to prevent injury to building personnel. Particular care must be taken for any work which will be done during building's normal operation.

1.03 SLEEVES

1. All materials and construction methods shall be installed in accordance with the manufacturer recommendations and the requirements of the IBC Code or any other applicable code.

PART 2 PRODUCTS

2.01 CONDENSATE REMOVAL

1. All condensate pipe shall be copper and installed at a minimum of ¾" dia. and a constant slope and uniform alignment. All condensate pipe shall be insulated.

2. All connections to units shall have traps and trap depth equal to operating static pressure of unit (i.e. unit with 2" static pressure, minimum depth of water in trap 2").

3. All condensate connections to units less than 15 tons shall be EZ Trap Series 100 cleanable condensate trap kits, or equivalent, consisting of ¾" dia. trap inlet cross and outlet tee with closure cap. Provide for each five (5) traps installed, one (1) brush (minimum 2 brushes).

4. Condensate pipe shall discharge to leaching wells or as indicated on plans per local codes and/or site conditions.

5. All condensate pipe from rooftop units shall not dump on roof but shall extend to closest roof drain and/or gutter. Where roof drain and/or gutter is greater than 50' from unit discharge, condensate shall discharge to roof with splash block. Splash block to be located where roof pooling, due to drain location, will not occur. Condensate discharging to roof shall be piped to a location where it will drain away from unit or low points on roof.

2.02 LINTELS

1. The general contractor will furnish and install all lintels required for the installation and completion of all work of this Contractor, provided that the general contractor is advised in advance of such requirements.

2. Failure to give proper notice and/or to comply with the above, requires this Contractor involved to be financially liable for all work and material necessary for the completion of work to install lintels. Submit shop drawings of all openings requiring lintels to general contractor.

PART 3 EXECUTION

3.01 STRUCTURAL STEEL

1. This Contractor shall furnish and install all structural steel, supports, braces, hangers, etc., required for his contract unless shown as being furnished and/or supplied by others.

2. Structural steel shall conform to "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings", of the American Institute of Steel Construction, and where applicable, "Code for Welding Building Construction", of the American Welding Society.

3. All structural steel design for support of HVAC system shall be the responsibilities of this Contractor. The design shall be prepared by a Registered Professional Engineer licensed in the state where work is being performed, whose seal should be affixed to plans.

3.02 PLENUM AREAS

1. Any duct plenum area, ceiling or room plenum shall not contain any combustible material, and all wiring and/or piping shall be suitable and approved by local authorities for plenum installation.

END OF SECTION
15110.6001

SECTION 15180 - INSULATION

PART 1 GENERAL

1.01 SCOPE

1. All surfaces throughout the work shall be insulated with fiberglass insulation as indicated in applicable section.

2. Removal and replacement of existing insulation for new work.

3. All insulation thickness and R Value shall be installed in accordance with ASHRAE 90.1, latest edition.

1.02 SURFACE TEMPERATURE

1. Where surface temperature can exceed 350° F. substitute calcium silicate insulation.

1.03 UNIT PRICES & ALLOWANCES

1. See General Conditions and Specification Section 15010.

PART 2 PRODUCTS

2.01 DUCT INSULATION

1. All supply ducts in unconditioned spaces and all fresh air ductwork shall be insulated with high density fiberglass rigid insulation, UL labeled faced with aluminum foil covered, glass reinforced, flameproof, kraft paper.

   A. Duct insulation R Values shall be in accordance with 2015 International Energy Conservation Code, Section C403.2.9.

      Unconditioned Space – R=6.0 per requirements indicated for the climate zone of the building.

2. All supply and return ductwork in Boiler Rooms and outside of building insulation envelope shall be insulated as above in 3" thickness.

3. Duct insulation and linings shall not glow, flame or smolder when tested at their rated temperatures in accordance with ASTM-C-411, test temperature 250° F. or greater.

4. Duct coverings shall not penetrate fire resistance rated enclosures nor partitions required to be fire rated. Duct insulation at rated enclosure shall have insulating material in accordance with applicable code.

2.02 INSULATION AT ROOFTOP UNITS

1. Insulate space between bottom of new rooftop unit and existing deck with insulation.

2. Decking shall be maintained inside the rooftop unit roof curb to a clearance of 1/4" maximum around all duct drops, but never contact the duct.

A. Pack all air gaps around duct drops for return and supply with HUSH BATT or equivalent and seal with HUSH SEALAMT HSAC-100 or equivalent.

3. HUSHCORE Model DS-52 or equivalent, In-Curb Composite Acoustical Treatment Performance

A. The combination of all layers shall be tested for Sound Transmission Loss in accordance with procedure ASTM E-90-10. The assembly shall be rated at not less than STC-52 with 1/3 octave performance values as listed below for sound radiation thru the deck inside the curb.

Freq. (Hz)	80	100	125	160	200	250	315	400	500	630	800	1K
TL (dB)	26	27	33	32	35	42	45	45	50	56	29	60

Freq. (Hz)	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000	STC
TL (dB)	62	63	64	65	67	71	74	78	80	80	52

4. The products are manufactured by BRD Noise & Vibration Control, Inc., Wind Gap, PA, 610-863-6300, infor@brd-noise.com.

PART 3 EXECUTION

3.01 INSTALLATION OF DUCT INSULATION

1. Insulation shall be pasted to the duct using "3M" EC-321 or or equivalent with joints butted and taped with "Scotch No. 47A or or equivalent flame-resistant vinyl baked tape and dry dust free surface using nylon sealing tool. Tape to be used to seal joints only, NOT TO HOLD INSULATION TO DUCT.

2. In lieu of pasting insulation to duct it may be impaled on 12-gauge mechanical fasteners welded or glued on 12" to 18" centers with minimum of two (2) rows, per side-seal protruding pin with mastic and secure with metal cap.

3. Duct coverings shall not penetrate fire resistance rated enclosures nor partitions required to be fire rated.

4. Insulation shall fit between seams and stiffeners. All joints tightly butted.

5. All duct insulation shall be installed per manufacturers' requirements.

END OF SECTION
15180.6001

SECTION 15190 - TESTING AND BALANCING

PART I GENERAL

1.01 SCOPE

1. Provide all labor, materials and miscellaneous items as required to perform all the testing and balancing of ALL air and water system devices and/or systems indicated on plans and/or in the specifications as the mechanical contractor's scope of work.

2. Provide all labor, materials and miscellaneous items as required to perform the testing and balancing of ANY air and water system devices and/or system indicated on plans and/or in the specifications to be provided by the Contractor.

3. The Contractor is to furnish and install all sheaves and pulleys for new and existing HVAC equipment where indicated on plans and/or in the specifications.

4. The Contractor shall rebalance 10% of the air and water devices and/or systems after the final balancing report is completed and reviewed by the mechanical engineer. The rebalancing scope shall be as directed by the mechanical engineer's review comments of the final balancing report.

1.02 APPROVALS

1. All work to be done in accordance with the following:

   A. American National Standards Institute (ANSI): Specification for Sound Level Meters

   B. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE): ASHRAE Handbook of Fundamentals latest edition.

   C. Associated Air Balance Council (AABC): 2002 AABC National Standard for Total System Balance

   D. National Environmental Balancing Bureau (NEBB): 1998 Procedural Standards for Testing-Balancing Adjusting of Environmental System; 2nd Edition.

1.03 TESTING AND BALANCING

1. Upon completion of the installation and field testing, performance test and adjust all air, water, and/or steam system to provide the air volume and water flow quantities indicated and sound levels required. Accomplish all work in accordance with the agenda and procedures specified by AABC and standards of the NEBB. Correct air and water system performance deficiencies disclosed by the test before balancing the systems.

1.04 AGENCY QUALIFICATIONS

1. This Contractor shall obtain the services of a qualified testing organization to perform the testing and balancing work. Prior to commencing work the testing organization shall have been approved by the Architect/Engineer.

2. The criteria for determining qualifications shall be membership in the AABC, or certification by the NEBB, or the testing organization shall have submitted proof to satisfy the Architect/Engineer that the organization meets the technical standards for membership of the AABC.

1.05 AGENDA

1. Review plans and specifications prior to installation of any of the affected system. Submit a written report to the architect indicating any deficiencies in the system.

2. An agenda shall be submitted and approved by the architect prior to start of testing and balancing work. Include the following:

   A. General description of each system with its associated equipment, and operation cycles.

   B. A complete listing of all flow and air terminal measurements to be performed.

   C. Proposed selection points for sound measurements.

   D. Specific test procedures and parameters for determining specified quantities; e.g. flow drafts, sound levels, etc.

   E. Samples of forms showing applications of procedures and calculations.

1.06 PROCEDURES, GENERAL

1. Adjust systems and components thereof that perform as required by drawings and specifications.

2. Operating tests of heating and cooling coils, fans and other equipment shall be of not less than 4 hours duration after stabilized operating conditions have been established.

3. Method of application of instrumentation shall be in accordance with the approved agenda.

4. Instruments used for measurements shall be accurate. Calibrate each test instrument by an approved laboratory or by the manufacturer. The engineer has the right to request instrument recalibration, where accuracy of readings is questionable.

5. Comply with manufacturer's certified instructions.

6. Do not install permanently-installed equipment for the tests, e.g. gauges, thermometers, etc., until just prior to the tests to avoid damage and changes in calibration.

1.07 BALANCE & BALANCE REPORT SCHEDULE

1. The HVAC contractor shall provide the balance report and submit to the Architect/Owner as a shop drawing, which shall be distributed and reviewed in accordance with the general conditions.

2. Any and all work required for balancing of the system shall be done prior to the HVAC contractor submission of Billing for Substantial Completion.

3. Balancing shall include initial and final balancing. All adjustments to the system to provide the required flows, pressure temperatures, etc., shall be completed. Where adjustments to the system are required to provide proper specified performance, this work shall be done at no additional cost to owner.

4. Where any modifications, adjustments, replacement of equipment, removal and replacement is required to provide proper system performance, this work shall be done by the HVAC contractor at no additional cost to owner.

5. Where any of the above required modifications, etc., results in the removal, replacement, repair, modification, and/or other work of other prime contractors or subcontractors, the cost of this additional work shall be the responsibility of the HVAC contractor and shall be completed at no additional cost to owner.

6. The final approved balance report shall be provided to the inspecting authority having jurisdiction prior to substantial completion and is a condition to receive the Certificate of Occupancy or Temporary Certificate of Occupancy.

7. It is the HVAC contractors' responsibility to have the system completed and ready for balancing to meet the specified performance, construction and completion schedules per the General Conditions.

8. The requirements of this specification is applicable to all phased projects. For phasing, refer to General Conditions.

PART 2 EXECUTION

2.01 AIR SYSTEMS GENERAL REQUIREMENTS

1. All systems shall be balanced to provide air flow rates measured and adjusted to within 7.5% of the design rates. Provide a typed or computer-generated balance report using standard AABC forms and industry accepted practices for presentation. Where conditions do not allow for system to achieve the specified values, is to be clearly indicated prior to submission of balance report as a separate professionally prepared industry standard form.

2. Review of Documents - It shall be the responsibility of this Contractor and balancing contractor to thoroughly review the design drawings prior to submission of shop drawings and indicate where there may be possible problems with accessibility to equipment to allow for proper balancing or where system design will not allow for proper balancing and provide written description of possible problems. The balancing contractor shall review pipe and sheet metal shop drawings and shall provide written confirmation that this has been done. Coordinate with this Contractor for locations of all volume control devices. Where volume control devices are required for proper balancing of the system, they shall be provided by this Contractor at no additional cost to owner.

3. Air systems shall be balanced in a manner which shall first minimize throttling loses, then fan speed shall be adjusted to meet design flow conditions.

4. Variable Air Volume Distribution Systems - Where the distribution system utilizes a variable speed or variable air design, all main duct between the fan and controlling devices does not have to be balanced, except where automatic dampers with an air quantity are shown, these shall be set for proper air flow at maximum design conditions. All outlets downstream of the control device (VAV box) shall be balanced.

5. After completion to tests, adjustments and balancing under minimum fresh air conditions, set the system for 100% fresh air. Repeat the total CFM tests as specified above to check field versus design conditions. The results under 100% fresh air cycle shall agree with conditions found under "minimum fresh air operation" before the system is considered to be in balance. Adjustments of the proper dampers shall be made to achieve balance.

6. This Contractor shall include as part of his bid, cost to rebalance system after initial and final adjustments based on field conditions, owners' request or problem areas. For purposes of the bid, the contractor shall assume a maximum of 10% of all air devices to be rebalanced, to include rebalancing of the fans associated with the air devices.

7. This Contractor shall be certified by N.E.B.B. or A.A.B.C.

8. This Contractor shall notify Owner or his representative in a timely manner prior to balancing system so that if they elect, they may accompany balancing contractor.

9. The system shall be commissioned as specified and all balancing shall be done accordance with time schedule as specified above and in General Conditions.

2.02 AIR SYSTEM PROCEDURES

1. Adjust all air handling systems to provide the required design air quantity to, or through, each component.

2. Adjust equalizing devices to provide uniform velocity across the inlets.

3. Use flow adjusting (volume control) devices to balance air quantities only.

4. Balancing between runs (submains, branch mains, and branches): Use flow regulating devices at, or in, the divided - flow fitting.

5. Final Measurement of Air Quantity: Make final measurements of air quantity, after the air terminal has been adjusted to provide the optimum air patterns of diffusion.

6. Fan Adjustment: Total air system quantities, generally, shall be varied by adjustment of fan speeds.

7. Except as specifically indicated herein, make pitot tube traverses of each duct to measure air flow therein.

8. Pitot tube traverse may be omitted if the duct serves only a single room or space and its design volume is less than 2,000 cfm.

9. Where ducts' design velocity and air quantity are both less than 1000 (fpm/cfm), air quantity may be determined by measurements at terminals served.

10. Test holes, shall be in a straight duct, as far as possible downstream from elbows, bends, take-offs, and other turbulence generating devices.

11. Air Terminal balancing: Measurement of flow rates by means of velocity meters applied to individual terminals shall be used only for balancing. Measurement of air quantities at each type of air terminal (inlet and outlet) shall be determined by the method approved for balancing agenda.

12. The volume dampers, splitters and deflectors shall be adjusted so that the air velocities and volume will be as specified.

13. A further balance shall be made on temperature basis to maintain uniformity throughout, if so directed.

14. With the fan supply set to handle normal minimum outdoor air, the balancing firm shall perform the following tests and compile the following information.

    A. Air Handling Equipment

        1. Design Conditions

            a. CFM Supply Air
            b. Static Pressure
            c. Motor HP
            d. Code Required Outside air CFM
            e. Outside air CFM
            f. Fan RPM

        2. Installed Equipment

            a. Manufacturer
            b. Size/Model Number
            c. Motor HP, Voltage, Phase, Full Load Amperes

        3. Field Test

            a. Fan Speed
            b. No Load Operating Amperes
            c. Fan Motor Operating Amperes
            d. Calculated BHP

        4. Test for Total Air

            a. Size of discharge, return air, and outside air ducts.
            b. Number and locations of velocity readings taken and Static Pressure readings taken.
            c. Duct Average Velocity

d. Total CFM
e. Outside air CFM
f. Return air CFM

B. Individual Outlets (diffusers, registers and/or grilles):

1. Identify each outlet or inlet as to location area and fan system, outlet, manufacturer, and type, outlet size, free area, core area, or neck area, required FPM and test velocity and CFM and test results.

2.03 AIR DELIVERY AND NOISE

1. This Contractor shall guarantee that all equipment shall operate without objectionable noise or vibration; that all ductwork shall be free from pulsation or objectionable noises; that the volume of air specified will be delivered to all points of supply and exhaust.

2. After this system is in operation, should the ductwork be found to vibrate or chatter, this Contractor will be required to eliminate same.

2.04 AIR TIGHTNESS

1. All ductwork shall be air tight per SMACNA leakage standards. All transverse, joints longitudinal seams and duct wall penetrations shall be sealed in accordance with ASHRAE 90.1 1999 and have adhesive (3M EL-750). Pressure sensitive tape shall only be allowed for supply air duct with design pressures less than 2" W.C. in return air plenums.

2.05 WATER SYSTEM PROCEDURES

1. Adjust heating, cooling, and condensing water systems to provide required quantity to, or through each component.

2. Measure water quantities and pressures with calibrate-meters.

3. Use venturi tubes, orifices, or other metering fittings and pressure gauges. Adjust systems to provide the approved pressure drops, prior to the capacity testing. Where flow metering fittings are not installed, measure temperature differential across the heat transfer equipment.

4. Position automatic control valves for full flow through the heat transfer equipment.

5. Pumps

A. Design Data

- GPM
- Head
- RPM
- BHP

B. Installed Equipment

- Manufacturer
- Size
- Type Drive
- Motor HP
- Volts
- Cycles
- Phase
- Full Load Amperes

C. Field Test

- Discharge pressure at full flow and no flow.
- Suction pressure at full flow and no flow.
- Operating head and GPM.

6. All heat transfer equipment heating and cooling elements and primary and secondary takeoffs.

A. Design Data

- MBH specified
- GPM specified
- Entering Water Temperature (E.W.T.)
- Entering Air Temperature (E.A.T.)
- Water Temperature Drop (W.T.D.)
- Element type specified

7. Water quantities and capacity shall be measured by temperature taken.

2.06 SOUND TEST PROCEDURES

1. Tests to demonstrate compliances with sound requirements shall be made at each selection point included in the agenda.

2. Take sound level measurements at times when the building is unoccupied. Take measurements with all equipment secured. Measure sound levels at any point within a room not less than 6 feet from an air terminal or room unit, and not closer than 3 feet from any floor, wall, or ceiling surface.

3. Measure sound levels with a sound meter complying with the latest ANSI S1.4. Use the "A" scale to measure overall sound level. To determine the specified octave band levels, the above sound levels meter, set on "C" scale, shall be supplemented by an Octave Band Analyzer complying with ANSI S1.11.

4. Determine "equipment components" of room sound (noise) levels for each (of eight) octave bands as follows:

A. Measure room sound pressure level "LP " with equipment to be tested shut off.

B. Measure room sound pressure level "LP " with equipment to be tested turned on.

C. Calculate LP; If this value is less than one, applicable test must be rerun with lower background level (LP) unless LP is within sound pressure level specified for equipment.

D. Determine "C" from table below:

LPt - LPb	(db)	1	2	3	4-4.5	5- 5-1/2	6- 7-1/2	8-12	over 12
	(db)	7	4	3		1.5	1	1/2	0

E. The "equipment component" of room sound level equals LPt-C.

2.07 AIR SYSTEM DATA

1. The certified report shall include for each air handling system the data as indicated in the applicable section of the specifications.

2.08 SOUND LEVEL DATA

1. The certified report shall record data on sound levels, taken at each selected location, as follows:

A. Source of sound and location.

B. Diagram or description of relationship of sound source to measuring instrument.

C. "A" Scale Readings

- Equipment being tested turned off (ambient).
- Equipment being tested turned on (operating conditions).

D. Reading at each specified octave band frequency

- Equipment being tested turned off (ambient).
- Equipment being tested turned on (operating conditions).

E. "Equipment components" of sound (noise) levels with applicable calculations per "Sound Test Procedure".

F. Graph showing relationship between pressure levels specified and recorded readings.

END OF SECTION
15190.6001

SECTION 15651 - ROOFTOP PACKAGED AIR-CONDITIONING UNITS

PART 1 GENERAL

1.01 SCOPE

1. Furnish and install all packaged air conditioning units.

2. Leave equipment completely installed so that only the connection of auxiliary services is required to make ready for start up.

3. Provide all materials, miscellaneous equipment and interconnecting piping required for the proper functioning of the work.

1.02 APPROVALS

1. Unit shall be rated in accordance with ARI Standards 210/240 or 360 and 270. Designed in accordance with UL Standard 1995. Unit shall be designed to conform to ANSI/ASHRAE 15, latest revision. Unit shall be UL tested and certified in accordance with ANSI Z21.47 Standards.

1.03 ENERGY EFFICIENCY

1. Units shall have minimum efficiency per ASHRAE 90.1-2007 and be tested in accordance with applicable ARI requirements.

1.04 FILTERS

1. Provide spare filters per Specification Section 15010.

2. Provide 2" thick fiberglass pleated filters with MERV rating of 13. Clogged filter switch installed at factory. Provide interface to DDC system.

3. Provide 1" aluminum mesh pre- filters mounted over the outside air opening.

1.05 OUTSIDE AIR INTAKES, SCREENS & DAMPERS

1. All outside air intake dampers shall be able to close within 30 seconds after command from system. All outside air intakes shall have hoods with 45° angle openings and have 1.75" square screens.

2. Manufacturer to provide dampers factory mounted. If not factory mounted, equipment manufacturer shall be responsible for purchasing and installing dampers on units. This shall include all interfaces to DDC system, removal and modification to unit.

3. The damper and damper operations shall be an integral part of unit and the unit manufacturer shall be responsible for the proper integration and operation of dampers. All damper actuators shall be modulating (2-10vdc and spring return).

1.06 CO SENSOR

1. For gas-fired heating units, provide self-contained CO sensor, battery operated wall mounted in room served. Where unit serves unit serves more than one room, locate at first room served by supply air. Interlock with units to deenergize units and sound alarm condition to DDC system.

1.07 FACTORY TESTING

1. All factory assembled packaged equipment shall be factory tested including helium leak testing of the coils, pressure testing of the refrigeration circuit, and run testing of the completed unit. A certified factory Run test report shall be provided for each unit. **The "Run Test Report" shall be submitted to Owner for approval, prior to acceptance of unit for payment.**

2. All factory assembled packaged equipment shall be fully quality tested by factor run testing under normal operating conditions. Quality control system shall automatically perform via computer; triple leak check, pressure tests, evacuation and accurately charge system, perform detailed heating and cooling mode tests, and quality cross check all operational and test conditions to pass/fail criteria.

3. Detailed report card will ship with each unit displaying status for critical tests and components.

4. If unit fails on any cross check, it shall not be allowed to ship. Serial numbers will be recorded by factory and furnished to contractor on report card for east of unit warranty status.

PART 2 PRODUCTS

2.01 AIR CONDITIONING UNITS

1. Furnish and install as indicated on plans, factory assembled packaged rooftop mounted air-conditioning units. Units shall be installed on steel dunnage and have a roof curb. Where equipment other than specified equipment is used and results in a different roof location and/or a different steel dunnage design, this contractor to assume all costs (see Section 15010 "EQUIPMENT DEVIATIONS"). Cabinet shall be constructed entirely of G90 galvanized steel with the exterior constructed of 20-gauge or heavier material.

2. Access to filters, blower and heating section. Maintenance shall be through hinged access doors with quarter turn handles. Access doors shall have full-length stainless-steel hinges and full perimeter gasketing. Air side service access doors shall have rain break overhangs.

3. All openings through the base pan of the unit shall have upturned flanges of at least ½" in height around the opening through the base pan.

4. Exterior surfaces paint finish shall be factory painted. Color selection shall be based on manufacturers' optional colors (standard color not acceptable).

5. The interior air side shall be entirely insulated on all exterior panels with 1" thick, 1 ½ lb. density fiberglass insulation.

6. Supply Fans

   A. Blowers shall be entirely self-contained on a slide deck for service and removal from the cabinet.

   B. All belt drive blowers shall have backward inclined blades. Adjustable V-belt drive shall be provided with a minimum rating of 140% of the motor nameplate brake horsepower when the adjustable pulley is at the minimum RPM.

   C. Blowers, drives and motors shall be dynamically balanced. Motors shall be premium efficiency.

7. Condensers

   A. Air-Cooled Condenser Section:

      1. The condensing section shall be equipped with vertical discharge axial flow direct drive fans. Direct drive fans shall be directly connected to and supported by the motor shaft. The condenser coils shall be sloped at least 30° to protect the coils from damage. Condenser coils shall be copper tubes with aluminum fins mechanically bonded to the tubes with marine coating sized for a minimum of 10°F. of refrigerant sub-cooling.

      2. Provide hail guards.

   B. Evaporator Coils

      1. Evaporator coil shall be copper tube with aluminum fins mechanically bonded to the tubes, sine wave rippled with galvanized steel end casings.

      2. Evaporator coil shall have equivalenting type vertical tube headers with thermostatic expansion valve.

      3. Evaporator coil shall be furnished with a double sloped drain pan (fabricated of 304 stainless steel) for the positive drainage of condensate.

8. Refrigeration System

   A. Compressors shall be scroll type with internal thermal overload protection and mounted on the compressor manufacturer's recommended rubber vibration isolators. Compressors shall carry a 5-year non-pro-rated warranty. Each compressor shall be individually staged for capacity control. All units over 6 tons shall be multiple stages and shall have a minimum of stages of capacity control as required by the latest edition of the International Energy Code. Compressors shall be mounted in an isolated compartment to permit operation of the unit without affecting air flow when the door to the compartment is open and isolated from the base pan and supply air. Provide vibration isolation for compressor.

   B. Each refrigerant circuit shall be equipped with thermostatic expansion valve type refrigerant flow control, automatic reset low pressure and manual reset high-pressure refrigerant controls, Schrader type service fittings on both the high pressure and low-pressure sides and refrigerant liquid line driers.

   C. Unit shall be fully factory charged with R-410A refrigerant.

   D. Provide acoustical blanket around compressors. Blanket shall be removable with inner and outer chemical resistant Teflon fiberglass cloth high density material and vinyl. Noise reduction in "A" weighting 100-5000H, 29.5 dba per ASTM test procedure E1222-87. Blanket shall be insulate LT450TAST-2" or equivalent; Shannon Enterprises, distributed by BRD (610-863-6300).

9. Gas Heat Section

   A. Unit shall be provided with a gas ignition system consisting of an electronic igniter to a pilot system.

   B. Unit shall have gas supply piping entrances in the unit base for thru0the-curb gas piping and in the outside cabinet wall for across-the-roof gas piping.

C. Unit shall heat using natural gas and be equipped with a modulating gas valve, adjustable speed combustion blower, stainless-steel tubular heat exchanger and electronic controller. The heat exchanger shall have 25-year non-pro-rated warranty. The completely factory mounted gas heating assembly shall be capable of operating with staged control. A supply air temperature sensor shall be factory wired for field installation in the supply air ductwork. The supply air temperature setpoint shall be adjusted on the electronic controller within the controls compartment.

10. Controls

A. Constant Air Unit Controller

1. The control system supported and installed by the manufacturer for rooftop units shall only be the controls that provide for safeties economizer, and internal unit functions.

2. All controls for fan start/stop, cooling staging, heating control, de-humidification through hot gas reheat and other control functions shall be connected to a DDC controller. Manufacturer shall coordinate wiring and control strategies with ATC contractor. All components necessary and all controls where required for DDC interface and monitoring for the above strategies shall be wired to a factory terminal strip.

3. The DDC contractor shall connect to terminal strip and provide all control and monitoring functions to achieve the specified sequence of operation.

4. All control functions and monitoring required for the unit to provide the sequence shall be wired to a terminal strip. (See Specification Section 15930 for points and sequence).

5. Per the DDC contractors' option, the controller may be shipped to the unit manufacturer for installation of the unit.

6. Fully modulating economizer with dual enthalpy limit option shall have an outdoor air humidity sensor.

7. The unit shall be completely wired to a junction box, be complete with under voltage and overload protection, and so arranged that a single electrical power connection can be made. Temperature control elements shall be brought to a junction box with terminal strip for external connection. Time delay equipment shall be installed by the manufacturer so that no two motors can start together.

11. Dehumidification System

A. Where indicated on schedule sheet, the unit shall incorporate factory mounted hot gas reheat coil capable of reheating cooled air to space neutral temperatures. Unit shall incorporate refrigerant diverting valve capable of diverting refrigerant to reheat circuit or condensing circuit as necessary.

B. Unit shall divert refrigerant as necessary to hot gas reheat coil in the supply air stream when in dehumidification mode to reheat dehumidified supply air to space neutral temperature.

C. Unit shall use refrigerant sub-cooling circuit in condensing section as necessary to maintain dehumidification capacity, supply air temperature, and unit efficiency.

D. In the hot gas reheat mode of operation, the reheat coil shall provide as a minimum 15°F. of reheat based on specified supply air volume.

12. Economizer

A. Economizer cycle shall include return air, relief air and outside air motorized dampers, outdoor and relief hood, and fully modulating control system with enthalpy changeover control and adjustable mixed air thermostat. Economizer control shall be capable of introducing up to 100% outdoor air. The control changeover from mechanical cooling to economizer operation shall be fully automatic through an adjustable enthalpy control device. Provide low leakage dampers, gravity or motorized relief air. Minimum damper leakage shall be per ASHRAE Standard 2010 90.1, Table 6.4.3.4.4.

Intake – 10 cfm/Sq.Ft. @ 1.0" wg.
Relief – Non-Motorized; 20 cfm/Sq.Ft. @ 1.0" w.g.
Motorized; 10 cfm/Sq.Ft. @ 1.0" w.g.

B. Economizer shall be fully integrated to allow system to operate with economizer and compressors between 75°F. (adj.) and 55°F.

13. Bi-polar Ionization

A. Provide bi-polar Ionization in rooftop units. The system shall be and be field installed and/or factory mounted. All power and control requirements for unit shall be internal to unit.

14. Provide CO sensor for each unit located in room served by unit CO sensor and shall upon a rise above set point, signal to control system and shut off unit.

2.02 ATC COORDINATION

The following is the suggested demarcation between equipment and controls (DDC contractor).

1. Items supplied and installed by the rooftop unit manufacturer:

A. Refer to Specification Section 15930, Part 4 for sequence of operation.
B. Fan motor stop / start relay
C. Refrigeration stop / start relays, contactors or sequencing modules
D. Economizer control with enthalpy sensors
E. Clogged filter switch
F. Fan Failure switch
G. Discharge air sensor (10k thermistor)
H. Low ambient control
I. Compressor protection via capillary bulb imbedded in the face of the evaporator coil.
J. Compressor protection controller designed to open the compressor disable circuit based on a coil temperature of 10° (+/-) 5°.

2. Items supplied, installed, and wired by the contractor and/or DDC sub-contractor:

A. Duct mounted CO2 sensor (as applicable)
B. Zone sensor with set point dial
C. Zone mounted CO2 sensor (as applicable)

D. Zone mounted humidity sensor
E. Exhaust fan interlock
F. Wall mounted Relative Humidity Sensor
G. B3 Controller and all wiring from input/output channels to terminal strip and external points.

PART 3 EXECUTION

3.01 EQUIPMENT INSTALLATION

1. All units shall be supported on supporting steel and roof curb as indicated on plans. Where units are supported on steel, main supporting steel to be provided by the structural steel contractor, refer to structural plans. This Contractor to provide all additional steel required to support the units. The structural steel layout as shown on the plans is for the specified basis of design equipment. Where equipment other than the specified equipment is to be provided, this Contractor, prior to shop drawing submittal (for review and approval) shall submit the substituted equipment to the architect, structural engineer and steel contractor. Alternate design will be prepared, and this Contractor shall assume additional cost for design and modifications at no additional cost to Owner.

2. Where specified equipment locations differ due to field conditions from what is shown on plans, this Contractor to provide alternate layout and submit to architect and structural engineer and provide all modifications and additional costs associated with field conditions at no additional cost to Owner.

3. Submit supports and weights to Structural Engineer and/or Steel Fabricator for approval and/or coordination. Relocation of unit based on final layouts shall be the contractors' responsibility. The contractor shall provide all additional steel for units at no additional cost.

4. Units shall be factory painted color selected. Provide color chart for review and approval.

5. Rooftop unit manufacturer shall provide for each and every unit an additional 8 man-hours on site per unit to provide DDC control coordination and installation assistance to DDC subcontractor and this Contractor. This shall be in addition to and over and beyond any other specified training or site labor.

6. All disconnects and electrical devices that are installed externally on the unit by contractor are to be set at a maximum dimension of 6'-0" above roof deck. Contactor is cautioned that the units are to be installed on sloped curbs which are to match the new and/or existing roof slope. Contractor to verify exact slope of roof prior to equipment purchase.

7. Roof curbs shall include an insulated panel under compressor section. Provide sound insulating material between roof deck and bottom of unit, see Specification Section 15180. Continue roof deck under unit and cut roofing as required for duct and connections. Where roof deck cannot be continued or where there is no existing roof deck, provide sheet metal same or heavier gauge than roof deck. Space between sheet metal and bottom of unit shall be filled with acoustical insulation, see Specification Section 15180. Provide additional vibration isolation curb where internal vibration is not provided. Provide sloped roofed curbs for all units.

END OF SECTION
15651.6001

SECTION 15810 - AIR HANDLING EQUIPMENT

PART 1 GENERAL

1.01 SCOPE

1. Furnish and install all fans and air handling units. Leave equipment completely installed so that only the connection of auxiliary services is required to make ready for startup. Provide all materials, miscellaneous equipment and interconnecting piping required for the proper function of the work.

1.02 CERTIFICATION

1. All fans shall have AMCA Certified ratings for sound and performance and bear UL label and manufacturer be 150 9001 certified facility.

1.03 ENERGY EFFICIENCY

1. All motors shall be premium high efficiency type.

1.04 BALANCING

1. Balance all equipment per manufacturer requirements and Section 15190.

PART 2 PRODUCTS

2.01 FANS

1. All fans to be manufacturer type, size, quantity and capacity shown on drawings. All rooftop fans shall have self-flashing Unibeam roof curbs and disconnect switch. All fan motors shall be premium high efficiency.

2. Rooftop centrifugal fan shall be a spun aluminum, roof mounted, belt-driven, downblast centrifugal exhaust ventilator.

   A. Fan shall be manufactured at an ISO 9011 facility and be listed by UL: 705. Fan shall bear the AMCA Certified Ratings Seal for Sound and Air Performance.

   B. Fan shall be of bolted and welded construction utilizing corrosion resistant fasteners. The spun aluminum shall be bolted to a rigid aluminum support structure. The aluminum base shall have continuously welded curb cap.

   C. Top cap shall have stainless steel quick release latches to provide access into the motor compartment. An integral conduit chase shall be provided through the curb cap.

   D. The motor, bearings and drives shall be mounted on a minimum 14-gauge steel power assembly, isolated from the unit structure with rubber vibration isolators, enclosed in a weather-tight compartment, separated from the exhaust air stream.

   E. Lifting lugs shall be provided. Unit shall bear an engraved aluminum nameplate. Nameplate shall indicate design CFM, static [pressure and maximum fan RPM. Unit shall be shipped in ISTA Certified Transit Tested Packaging.

F. Wheel shall be centrifugal backward include, constructed of 100% aluminum with aerodynamic aluminum inlet cone. Wheel shall be balanced in accordance with AMCA Standard 204-96.

G. Motor shall be premium efficiency heavy-duty type with permanently lubricated sealed ball bearings.

H. Bearings shall be for use in air handling applications. Construction shall be heavy-duty re-greaseable ball type in a cast iron pillowblock housing selected for a minimum L50 life in excess of 200,000 hours. Belts shall be oil and heat resistant, non-static type.

I. Drives shall be precision machined cast iron type, keyed and securely attached to the wheel and motor shafts. Drives shall be sized for 150% of the installed motor horsepower. The variable pitch motor drive must be factory set to the specified fan RPM. Fan shall have disconnect switch, backdraft damper, birdscreen, galvanized sound self-flashing curb.

J. Paint fan color selected. Provide name tag.

PART 3 EXECUTION

1. Provide all hanging materials and vibration isolation prior to hanging any unit, verify supports with Structural Engineer.

2. Provide prefabricated roof curbs for all roof mounted equipment. Unibeam Sonotrol type, minimum 12", all galvanized continuously welded construction with integral cants. Minimum 2" thick walls filled with insulation. Provide additional wood nailers so that fan bases rest level on curbs.

3. Provide wall caps or roof caps for ceiling fans flashed and secured as required.

4. All rooftop fans, gravity ventilators and utility sets shall be factory painted color selected.

5. All fans with duct connections or connections to building construction shall have flexible connections as specified in Section 15860.

END OF SECTION
15810.6001

SECTION 15860 - DUCT SYSTEMS

PART 1 GENERAL

1.01 SCOPE

1. The work under this heading shall include the furnishing and installation of:

   A. All sheet metal work required for the various systems, including installation of control devices and connections to equipment and all materials and specialties required for the proper functioning of the work.

   B. All acoustical treatment required for the work as hereinafter specified.

   C. Removal of existing ducts and all appurtenances as indicated on drawings as required for execution of design intent of new systems.

1.02 DUCTWORK CLEANLINESS AND STORAGE

1. Comply with SMACNA, "Duct Cleanliness for New Construction Guidelines", and follow the requirements for the "Advanced Level". After fabrication, seal ductwork and maintain the sealed conditions during transportation, storage and after installation until final cleaning is complete. All ductwork shall be sealed either by blanketing or capping the duct ends, bagging small fittings, surface wrapping or shrink wrapping. Store in a clean, dry environment. Do not install ductwork until the building is clean and dried and maintain the integrity of the sealed ends until final "white glow cleaning" is complete and dust free.

1.03 CONSTRUCTION

1. All ducts shall be constructed of prime quality, re-squared, galvanized steel sheets in accordance with "Duct Manual and Sheet Metal Construction for Ventilating and Air Conditioning Systems" of the "Sheet Metal and Air Conditioning Contractors National Association", (SMACNA) Sections 1 and 2.

2. Gauges shall be as recommended for the use intended in the applicable SMACNA Manuals. All ductwork and other sheet metal shall be properly stiffened and supported as per the applicable recommendations of SMACNA Manuals. Only first quality, smooth, cold rolled sheets of the best grade steel shall be used and shall be guaranteed to double seam without showing fracture.

1.04 DIMENSIONS

1. Duct dimensions are INSIDE CLEAR DIMENSIONS: Increase metal duct size to allow for thickness of inside insulation.

1.05 BALANCING AND TESTING

1. See Specification Section 15190.

PART 2 PRODUCTS

2.01 FITTINGS

1. Round elbows shall be formed or stamped type; use 5-piece construction where stamped fittings are available, centerline radius equal to 1.5 times the duct diameter minimum.

2. All round take offs to be expanded to 90-degree conical type of 45-degree branches.

3. Obstructions: Where possible, avoid locating any pipe, wire or structural member in a duct. Where such obstructions cannot be avoided, duct shall be eased, split or transformed as the Engineer may direct.

4. Transformation: Where changes result in an increase of area slope shall not exceed one (1) in seven (7); where areas remain constant or decrease, slope shall not exceed one (1) in four (4), but one (1) in seven (7) is preferable.

5. Changes in direction: Changes in direction shall be made with elbows or tees as conditions necessitate in the following order or preference:

   A. Unvaned ell, centerline radius equal to 1.5 times duct width.
   B. 6" throat radius with full radius vanes and heel radius.
   C. 3" throat radius with full radius vanes and heel radius.
   D. 3" throat radius with 3" heel radius, double thickness vanes.
   E. No square elbows without turning vanes allowed.

6. Branch Takeoffs: Made, in order of preference, with radius elbow, radius tap-in or suitable vanes in a square takeoff.

2.02 JOINTS

1. All connections of duct shall be installed in strict accordance with SMACNA standards, except that all exposed non-spiral duct with design pressure less than 2" W.C. or 2,500 fpm velocity in finished areas shall use streamline joints.

2. Mechanical joint fasteners, such as "Ductmate" or equivalent, will be allowed and shall be installed in strict accordance with manufacturers' requirements. Where mechanical fasteners are used, contractor shall coordinate joint locations with all other trades for clearances. Where use of mechanical fasteners result in an increased requirement for space and clearance and results in modification, removal, replacement, or new work for this Contractor or other contractors work; the work shall be done at this Contractors' expense and with no additional cost to Owner. These joints shall not be used for exposed duct in furnished areas.

3. Where any joint is installed in any duct below 7'0", installation shall have protection as specified under ductwork installation.

4. All joints shall be sealed as specified for air tightness.

2.03 DAMPERS

1. Furnish and install all dampers. Dampers for automatic operation shall be minimum leakage, multi-opposed type with neoprene balloon edge and snap steel side.

2. Outside air dampers for rooftop units shall be able to be closed within 30 seconds.

2.04 VOLUME DAMPERS, SPLITTERS AND ADJUSTABLE DEFLECTORS

1. Volume dampers shall be installed in all of the trunk and branch ducts, no exceptions. The balancing trade shall not depend upon register shutters or dampers for balancing. The sheet metal contractor shall submit shop drawings to the balancing contractor for his review of location, type, size, and quantity of balancing dampers. Where additional control devices or alternate methods of duct installation are suggested and/or required, these shall be provided, and all modifications made at no additional cost to Owner.

2. Volume dampers shall be Everlock locking type manual volume dampers as manufactured by Rossi HVAC Hardware (www.RossiHardware.com – infor@rossihardware.com – (818) 252-3811 or equivalent.

3. Bracket – Cold rolled Steel (ASTM A-1008), 18-gauge nominal thickness of 0.0478 with tolerance range of 0.0438 to 0.0518. single cut and formed bracket for use with 1.5" or 2.0" insulation wrapping or any other such stand-off applications. Finished with a white Chromate plating.

4. Handle and Thumb Trigger – Polyamide 66 (PA66), flame retardant, glass reinforced, "Zytel" or equivalent.

5. Retaining Spring – Ext. self-lock TX-75ST-ZF carbon steel SAE 1074 with zinc bright plating. C-scale Rockwell hardness 47 to 51.

6. Blades

   A. 4" to 14" dia. single blade (or disc). ASTM-A527 LFO G90, 20-gauge reinforced to equal strength of 18-gauge material.

   B. 3/8" full length bar fits through formed channel in center of damper blade.

7. Bars – 3/8" square aluminum bar.

8. Bearings

   A. Snap-in bearings for medium and low-pressure systems. Polyamide 66 (PA66), flame retardant, glass reinforced, "Zytel".

   B. B-lined bearings for lined duct. Polyamide 66 (PA66), flame retardant, glass reinforced, "Zytel".

9. Splitter dampers shall be installed where shown on drawings. Splitters shall be made of 18-gauge galvanized steel or heavier and shall be cross broken and flanged or hemmed for rigidity. Splitters shall be made easily adjustable and readily accessible for adjustment.

10. Adjustable deflectors and adjustable turning-vane devices for diverting air flow from a duct main into a branch duct shall be multi-blade assembly hinged at one end and so constructed that, as it is closed, the air passage between the blades narrows until no air passage remains when the assembly is in the fully-closed position.

2.05 FIRE DAMPERS

1. Fire dampers shall be provided and installed at all places where duct passes through a floor, fire wall, fire rated ceiling or other fire division, or as required by applicable codes.

2. Steel curtain dampers may be used in any system but are required 100% free area.

3. Fire dampers shall comply with UL-555 and shall bear the label of an approved agency. Fire dampers shall be installed in accordance with manufacturers' installation instructions.

4. Provide access doors at all fire dampers.

5. This Contractor shall, prior to shop drawing preparation, coordinate with general contractor, the location of all fire dampers based on architectural plans and/or existing construction. Where access doors are required behind any inaccessible area, this Contractor shall furnish and install access panels in general construction which shall be suitable for servicing of dampers.

6. Where due to existing and/or new construction of any trades, access to fire dampers are not possible prior to duct installation. This Contractor shall notify the architect and/or engineer.

2.06 ACCESS DOORS

1. Access doors of suitable sizes minimum 18"x18" shall be provided for access to all coils, dampers, controls, etc.; in insulated duct, door shall be double panel, insulated type.

2.07 FLEXIBLE CONNECTIONS

1. Flexible connections shall be provided to motorized equipment, made with at least 3" of neoprene coated fiberglass cloth with 1" slack material (except kitchen hood exhaust).

2.08 FAN DISCHARGE, BACK DRAFT AND RELIEF DAMPERS

1. Air/Dynamic as manufactured "Air Balance" or equivalent.

2.09 DUCT IDENTIFICATION

1. Provide for all concealed insulated and non-insulated duct and duct exposed in non-finished areas; self-adhesive color-coded labels for identification of air flow and equipment.

2. Markers shall be installed at every turn in direction and minimum every 25'.

3. Markers shall have color coding per the manufacturer. In addition to marking, the duct shall have flow directions located next to duct markers.

4. Flow directional tape shall be completely around all visible portions of duct and termination shall be 1' +/- past visible corner. Flow directional tape shall be ASME A13.1 color coding. Color to match duct markers. Arrows shall be white on green, red or blue and black on yellow, green or orange.

5. The duct shall have flow direction located next to flow direction. Indication shall be MS900 flow directional tape; 2" wide for duct up to 12' +/- AFF and 4" wide for duct above 12' +/- AFF.

6. Markers shall have color coding and lettering per the manufacturer and meet ASME A13.1 Standards.

7. Duct markers shall be; duct up to 12' +/- AFF – 2-1/4" x 13" and duct above 12' +/- AFF – 4" x 24".

8. Duct markers shall be MSI MS-900 or equivalent.

PART 3 EXECUTION

3.01 AIR DELIVERY AND NOISE

1. This Contractor shall guarantee that all equipment shall operate without objectionable noise or vibration; that all ductwork shall be free from pulsation or objectionable noises; that the volume of air specified will be delivered to all points of supply and exhaust.

2. After this system is in operation, should the ductwork be found to vibrate or chatter, Contractor will be required to eliminate same.

3.02 TESTING OF AIR DISTRIBUTION SYSTEM

1. The volume and velocities of air at all terminals, outlets and inlets, shall be tested.

2. The volume dampers, splitters and deflectors shall be adjusted so that the air velocities and volume will be as specified.

3. See Section 15010 "Start Up and Adjustments" and 15190 for balancing and testing.

3.03 DUCTWORK INSTALLATION

1. All ductwork shall generally be installed in the location and manner shown and detailed on the drawings with all fittings and connections made in accordance with the applicable SMACNA Manuals. Duct shown on drawings are diagrammatic. Contractor to determine in field exact routing, size and configuration. All modifications or deviations required by job conditions must be approved prior to any fabrication.

2. Prepare all ductwork and set it in place before furring begins. Extend all damper operators and serviceable or adjustable devices to accessible locations.

3. All connections from sheet metal assemblies such as ductwork, plenums, etc., to operating machines and/or mechanisms such as fans, air conditioners, etc., shall have flexible connections.

4. Where any ductwork is mounted lower than 7'-0" above a finished floor line, all seams in ducts shall be flattened and filed so that no standing seams or angle bracing protrudes from the duct in any manner which could cause injury to personnel. Covering of standing seams with an approved flexible bumper material, like split Armaflex pipe insulation, is acceptable.

5. Coordinate exact location of all duct in field with existing construction. Coordinate location of all duct with truss manufacturer.

6. All ductwork shall be delivered and sealed in accordance with SMACNA requirements and sealing shall only be removed prior to installing duct. After installation, duct shall still be protected from water damage.

3.04 ACOUSTICAL TREATMENT

1. Unless otherwise noted, all duct from all fans and units with fans to 20' from fans shall be acoustically insulated. Ducts to be acoustically insulated shall be insulation in the interior of the duct with 1" thick, 1-1/2# density fiberglass meeting ASTM C1071, coated with acrylic treated EPA registered anti-microbial agent proven to resist microbial growth as determined by ASTM G21 and G22, K value :25 at 75 deg. F., N.R.C. .65 or higher based on type A mounting and listed in accordance to ASTMC-423.

2. Rectangular duct shall be secured using full coverage water based adhesive meeting ASTM C916. Secure insulation with mechanical lines fasteners per SMACNA, NAIUI or manufacturers' requirements. All exposed edges of the insulate shall be factory or field coated. Repair liner surfaces with adhesive. Insulate may be installed after duct fabricator at contractors' option. Increase duct size to allow for insulation thickness.

3. Insulation shall be pasted to the metal surface with "3M" EC-890 or equivalent, before duct is made up. On large ducts, stick pins stud-welded or pasted, shall be used as additional support. Insulation may be installed after duct is fabricated at Contractor's option.

4. Duct insulation and linings shall not glow, flame or smolder when tested at their rated temperatures in accordance with ASTM-C-411, test temperature 250° F. or greater. Duct liners shall be interrupted at fire damper and fire doors.

5. Where acoustical insulation is installed, exterior duct wrap is not required unless acoustical insulation does not meet the specifications for duct insulation R Values as indicated in Specification Section 15180.

6. All acoustical insulation shall be plenum rated.

3.05 ROOF PENETRATIONS

1. All roof penetrations shall have roof curb minimum 12" high with cant strip, flashing collars, flashing and counterflashing.

2. Provide sloped roof curbs at sloped roofs. Verify all curbs with roof conditions prior to shop drawing submission.

3. All roof curbs shall be installed per SMACNA requirements.

4. Where re-roofing work requires higher curbs due to new insulation, these shall be used. Coordinate with general contractor for exact location.

5. Gooseneck terminations are not permitted.

3.06 AIR TIGHTNESS

1. All ductwork shall be airtight as defined by ASHRAE and SMACNA. All transverse joints, longitudinal seams and duct wall penetrations shall be sealed in accordance with ASHRAE 90.1 latest edition and have adhesive (3M EL-750 or equivalent). Pressure sensitive tape shall only be allowed for supply air duct with design pressures less than 2" W.C. in return air plenums.

3.07 FAN DUCT CONNECTION

1. All duct connections to fans and/or equipment with fans shall be installed in strict accordance with fan manufacturer's requirements. Ducts shall be installed to eliminate any system effects pressure losses. Where ducts are shown or are required to be installed that are not in compliance with manufacturers requirement, the additional pressure losses due to the system effect shall be added to the fans specified static pressure and fan size increased accordingly. All work shall be done at no additional cost.

2. Where elbows are required at discharge, they shall be full radius elbow R/W = 1.5 or greater.

3. All discharge dampers shall be arranged and installed in accordance with manufacturers' requirements and to avoid any system effects.

END OF SECTION
15860.6001

SECTION 15870 - TEMPERED AIR TERMINAL UNITS

PART 1 GENERAL

1.01 SCOPE

1. Furnish and install all air terminal devices in sizes, types and capacities shown on the drawings.

1.02 RATINGS

1. Manufacturer shall rate all terminals in accordance with Air Diffusion Council (where applicable).

PART 2 PRODUCTS

2.01 REGISTERS AND GRILLES

1. All supply air registers shall be METAL*AIRE Model V4004D-1 or equivalent consisting of two (2) banks of fins, front bank vertical, second bank horizontal, with one (1) bank of multi-opposed damper blades operated by a concealed screwdriver operator.

2. All return and exhaust air registers shall be METAL*AIRE Model RHD-1 or equivalent consisting of one (1) bank of horizontal fins fixed at a 45-degree angle with one (1) bank of multi-opposed damper blades operated by a concealed screwdriver operator.

3. Where grilles are shown, omit the damper.

4. All registers and grilles shall be of aluminum construction with baked enamel finish.

2.02 DIFFUSERS

1. All ceiling diffusers shall distribute air in a horizontal pattern parallel to the ceiling.

2. All diffusers shall be equipped with opposed blade dampers operated from the diffuser face by unobtrusive screw operator.

3. All diffusers shall be perforated style METAL*AIR Model 7500-6 AF or equivalent for lay-in ceilings. Face size shall be 24"x24". All diffusers shall be steel construction with aluminum face plates. The finish shall be white baked enamel with black back pan and interiors.

PART 3 EXECUTION

3.01 INSTALLATION

1. All devices shall be mounted true and square, pulled up tightly without distortion.

2. Provide equalizing deflectors and/or air extractors where required to achieve proper air distribution.

3.02 FIRE RATED CONSTRUCTION

1. All devices in fire rated construction shall be provided with approved fire dampers, "tents", or other devices as required to conform to applicable regulations.

3.03 VISIBILITY

1. Where registers and grilles are at floor level and inside duct is visible, provide acoustic insulation (black) or where insulation is not specified or required, paint all visible inside surfaces of duct flat black.

END OF SECTION
15870.6001

SECTION 15930 - FACILITY MANAGEMENT CONTROL SYSTEM

PART ONE – GENERAL

1.01 SCOPE

1. Provide a fully integrated Web Browser Control System incorporating Direct Digital Control (DDC) Technology with energy management, equipment monitoring, and remote communications for the systems at schools and buildings where new work is shown.

2. The Facility Management Control System (FMCS) shall be comprised of a network of interoperable, stand-alone digital controllers communicating on an open protocol network to the Individual Building Master Network controller. Access to the various Building Management Control Systems shall be locally from any computer or from the existing computer located in the building or remotely from any web access site and shall be accomplished through a Graphical User Interface using Web browser technology via the Internet.

3. The Facility Management and Control System (FMCS) as provided in this specification shall be based on a hierarchical architecture. Equivalent products must be approved in writing by the contractor per Specification Section 01300, "Submittals," Item 2.1 "Substitutions.".

4. The schools' Information Technology Department will provide IP drops for integration into the Information Technology System.

5. Connections to all equipment requiring connections to the control medium whether furnished under this Section or not.

6. The system shall us the latest technologies available from the manufacturer in the implementation of Direct Digital Electronic Control for the HVAC system and its management.

7. The systems shall be installed by factory trained technicians, regularly employed by the manufacturer and factory trained in the installation and calibration of the product.

8. This Contractor shall be responsible for all software data drops, programming, calibration, the proper operation and adjustment of all controls, dampers and appurtenances to provide required sequence of operations and protection against freeze-ups. Provide system in accordance with specifications.

9. All software, equipment, training and all work shall be of the same manufacturer and/or ATC sub-contractor. Independent ATC companies and/or contractors owned by or represented by, or in any manner associated with the specified manufacturers are not considered to be the specified manufacturer.

10. This Contractor shall provide all labor, material, equipment and software not specifically referred to herein or on the plans, that are required to meet the functional intent of the 15930 specifications and shall be provided without any additional cost to the Owner. This Contractor shall furnish all electrical control and interlock wiring connected to the controls and instrumentation systems. All 110 VAC or greater voltage power wiring to main control panels shall be provided by this contractor, unless indicated otherwise in the Contract Documents.

11. All materials and equipment used shall be standard components, regularly manufactured for this and/or other systems and shall not be custom designed especially for this project. All components shall have been thoroughly tested and proven in actual use.

12. This Contractor shall be responsible for installation of all field equipment and the communication transmission bus. This Contractor shall supply all necessary electrical power to each controller and provide transformers as required from electrical power panel source.

13. Provide system in accordance with specifications.

14. The mechanical contractor shall name the DDC pre-qualified installing contractor in the bid form at the time of bid.

15. This Contractor shall have project's lead technician attend all commissioning meetings.

16. The installing contractor shall be certified in network security. Upon award, this Contractor shall provide the Owner a certified compliance statement document that the system has been protected against outside network intrusion. It is a requirement of this installation of this FCMS that this system is compliant with the information security policies and procedures of this School District. Upon completion of the installation of this system, a vulnerability assessment shall be performed to identify current vulnerabilities and reduce the information security risk for the School District, architect and MEP professionals. The awarded contractor shall provide expert advice and consultation to maintain a security posture for the organization. FCMS must be designed with a credentialed information security professional. Contractor personnel involved with vulnerability assessments and information security consulting must possess a current Certified Information System Profession (CISSP) Certification and be a member of ISCC2. An ISC2 CISSP Certification is required. These certifications shall be provided upon award of bid. "NO EXCEPTIONS"

1.02 CONTROL CONTRACTOR

1. Extend the existing Johnson/Honeywell Web-Based Tridium Niagara Building Automation/Energy Management System by Peterson Service Company, Inc. The facility management control system shall have engineered, programmed and installed by the following facility management and control system manufacturers:

   - Peterson Service Company, Inc., 609-714-3699, estimating@petersonservice.com
   - Or equivalent by Owner.

1.03 WARRANTY

1. Provide the following warranties by the installing Automatic Temperature Controls (ATC) Manufacturer:

   A. Warranty on equipment.

   B. Warranty on software upgrades.

   C. Warranty on firmware upgrades.

2. Labor and materials for the control system specified shall be warranted free from defects for a period as indicated in "General Conditions". Control system failures during the warranty period shall be adjusted, repaired, or replaced at no additional cost or reduction in service to the Owner. This Contractor shall respond to the Owner's request for warranty service with 24 hours during normal business hours.

3. All work shall have a single warranty date.

4. The Owner shall grant to the temperature control sub-contractor, reasonable access to the FMCS during the warranty period. The owner shall allow the contractor to access the FMCS from a remote location for the purpose of diagnostics and troubleshooting, via the Internet, during the warranty period.

1.04 MAINTENANCE SERVICE

1. In addition to warranty periods per the General Conditions, provide maintenance service per Specification section 15010, Part 1.11.

2. The base contract shall include a 2-year service/maintenance term in addition to the 2-year bonded General Contract warranty. The 2-year controls services shall include:

   A. **Daily trending:** and logging remotely from the controls' provider remote from the building. A sampling of rooms as agreed by the owner include at least 20% of the rooms shall be trended to confirm proper temperature ranges are maintained.

   B. Daily **alarm monitoring.** The alarm reports shall be monitored remotely, and all alarm issues need to be addressed daily. The weekly report must summarize the alarm issues.

   C. The trending shall be summarized in a **weekly email report** to the owner. All rooms outside of the temperature and proper operating ranges shall be highlighted in the report.

   D. The weekly email report shall be discussed in a pre-set time **conference call** that occurs every week.

   E. Once a month, a project specific technician shall **meet onsite** with Owner to review the weekly reports. The meeting onsite shall be a minimum of 4 hours with onsite verification, tweaking, calibrating and replacing necessary parts and operations as required to maintain the system.

   F. Continued **Owner training** over the 2-year term of 40 hours.

1.05 QUALITY ASSURANCE

1. All system components shall be fault tolerant and provide satisfactory operation without damage at 110% and 85% of rated voltage and at + 3 hertz variation in line frequency.

2. Provide static, transient, and short circuit protection on all inputs and outputs. Communication lines shall be protected against incorrect wiring, static transients and induced magnetic interface. All bus connected devices shall be a.c. coupled or equivalent so that any single device failure will not disrupt or halt equipment operation.

3. The Manufacturer of the Facility Management Control System shall provide documentation supporting compliance with ISO-9002 (Model for Quality Assurance in Design/Development, Production, Installation and Servicing). The intent of this specification requirement is to assure that the products from the Temperature Control System Manufacturer are delivered through a

Quality System and Framework that will assure consistent quality in the products delivered for this project.

4. Product literature provided by the Building Management Control System Manufacturer in the submittal package shall contain the ISO-9002 Certification Mark from the applicable registrar.

1.06 TRAINING

1. All training materials shall be by the FMCS manufacturer and shall utilize specified manuals, as-built documentation, and the on-line help utility

2. Operator training shall include ten (10) separate 8-hour sessions (times per Owner) encompassing:

- Sequence of Operation review.
- Sign on-Sign off
- Selection of all displays and reports.
- Commanding of points, keyboard and mouse mode.
- Modifying English text.
- Use of all dialog boxes and menus.
- Modifying alarm limits and start-stop times.
- System initialization.
- Download and initialization of remote controllers.
- Purge and/or dump of historical data.
- Troubleshooting of sensors (determining bad sensors).
- Password modification.

1.07 SUBMITTALS

1. Shop drawings and Product Data: Submit under provisions of General Conditions, shop drawings.

2. Product Data: Catalog sheets, specifications, control/wiring, schematic drawings, installation instructions for each item furnished. Include the valve and damper schedules and communications layout of DDC Control System.

3. Shop Drawings:

A. List of connected data points, including connected control unit and input device.

B. System graphics indicating monitored systems, data (connected and calculated) point addresses, and operator notations.

C. System configuration with peripheral devices, batteries, power supplies, diagrams, modems and interconnections.

D. Descriptive data and sequence of operation of operating, user and application software including Web Browser software/hardware integrations.

E. Flow charts showing the logic sequence for each panel. Provide a non-jargon description for each step in the sequence. In addition, identify which variables are built into the system programming, and which have variable names and can be changed by the operator(s) from the Central Processing Unit.

4. Maintenance Data and Operation Instructions: Upon completion of the work and prior to final acceptance, provide copies of "Systems Operation and Maintenance Manuals" for the installed control systems. Manuals shall consist of copies of all temperature control submittals, including schematic diagrams, panel drawings, components parts, Web Browser Networks, accessories, operation and maintenance instructions, recommended spare parts inventory and complete warranty information.

1.08 SYSTEM DESCRIPTION

1. This specification defines the minimum equipment and performance requirements for a complete Facility Management Control System for the listed buildings HVAC/Mechanical Systems including terminal equipment.

2. It shall be understood that the drawings and specifications describe the approximate locations of the work. Do not scale the drawings to determine exact positions and clearances.

3. Details of construction and of workmanship where not specifically described herein or indicated on the drawings shall be subject to review by the school district. It is the intent of these specifications to provide a complete system, left in good working order, ready for operation, including necessary labor and materials, whether or not specifically shown on the drawings or mentioned herein.

4. Before submitting proposals, examine the specifications and all drawings relating to the work and become fully informed as to the extent and character of the work and the relation of the work to that of other Sections. Examine the drawings of other Buildings Control Systems to become familiar with all the problems and details of the building construction.

5. Automatic temperature control field monitoring and control system using field programmable micro-processor-based units with web browser communications are the intent of this design.

6. Central and remote hardware, software, and interconnecting wire and conduit. User access to new control system shall be from new web browser network.

7. Entire system is to be installed by the System Manufacturer or factory authorized representative.

8. The installation shall comply with local, state, and federal code requirements as applicable.

9. This contract also includes the creation of Systems Graphics at the new FMCS front end computer. The Graphics Programming includes Graphics Creation and Dynamic Point editing to reflect all HVAC systems and Hardware System Points specified in Part 4.

1.09 REPLACEMENT OF EXISTING SYSTEMS & CONTROLS

1. Existing equipment that is shown to remain shall have existing controls removed and new controls installed. The new controls installed shall include all wiring, new sensors, new controller, new control valves, new automatic dampers, new control sequences and all appurtenances to provide full integration, monitoring and control for all new equipment.

PART 2 PRODUCTS

2.01 FACILITY MANAGEMENT CONTROL SYSTEM

1. The Facility Management Control System (FMCS) shall be comprised of a network of interoperable, stand-alone digital controllers. All controllers and software within FMCS shall be ISO-9002 compliant and shall be supported by compliance documentation from the manufacturer.

2.02 SPECIFICATION NOMENCLATURE

FMCS	Facility Management Control System
SDC	Standalone Digital Controller
IDC	Interoperable Digital Controller
ILC	Interoperable Logic Controller
LIDC	Lighting Interface Digital Controller
GDC	Gateway Digital Controller
GP	Graphical Programmer
HMI	Human Machine Interface
PAC	Personnel Access Controller
GUI	Graphical User Interface

2.03 NETWORK - OPEN, INTEROPERABLE, INTEGRATED ARCHITECTURES

1. The intent of this specification is to provide a peer-to-peer networked, stand-alone, distributed control system. The FMCS requires the incorporation of Direct Digital Controls Technologies using Free Topology Transceivers (FTT-10), and specific conformance to the Interoperability Association's v3.

2. Ethernet communications protocol will be used on the communication network between FMCS controllers and other system devices to assure interoperability between all devices within the network.

3. The FMCS shall support the direct integration of standard and non-standard communicating systems. At a minimum, the FMCS shall deliver connectivity at the Lon, IP, and HMI levels through standard offerings. The FMCS shall offer as a standard available solution, a minimum of 300 individual communicating interfaces to third party products.

4. The FMCS shall provide a standard available test kit for development of additional interfaces by others, in addition to the FMCS manufacturer.

5. The FMCS shall provide compliance with the ASHRAE standard 135-P for BACnet interoperability with all devices within the FMCS. The FMCS shall provide a high-speed Network Interface that shall plug directly into the SDC which supports one of the following types of communication standards between SDCS.

6. The Owner will provide internet protocol connections (IP) along with addressing to all network control panels for Ethernet connection to the Building Information Technology Systems.

7. The Local Area Network (LAN) shall be either a 10 or 100 Megabits/sec Ethernet network supporting BACnet, Java, XML, HTTP, and CORBA IIOP for maximum flexibility for integration of building data with enterprise information systems and providing support for multiple Network Area Controllers (SCs), user workstations and, if specified, a local host computer system.

8. Local area network minimum physical and media access requirements:

   - Ethernet; IEEE standard 802.3
   - Cable; 10 Base-T, UTP-8 wire, category 5
   - Minimum throughput; 10 Mbps, with ability to increase to 100 Mbps

   A. Access

      1. For Local Area Network installations, provide access to the LAN from a remote location, via the Internet. The Owner shall provide a connection to the Internet to enable this access via high speed cable modem, asynchronous digital subscriber line (ADSL) modem, ISDN line, T1 Line or via the customers' Intranet to a corporate server providing access to an Internet Service Provider (ISP).

      2. The Owner shall provide a connection to the Internet to enable this access via high-speed cable modem, asynchronous digital subscriber line (ADSL) modem, ISDN line or T1 Line.

   B. Ethernet

      1. The Network Interface shall employ Carrier Sense Multiple Access/Collision Detect (CSMA/CD) contention shall type protocol, which adheres to the industry standard format IEEE 802.3. 'nc content of messages be the manufacturer's standard. The Network Interface shall be fully Internet Protocol (IP) compliant allowing connection to currently installed IEEE 802.3 compliant Ethernet Networks.

      2. The Network Interface shall directly support connectivity to a variety of cabling types. As a minimum provide the following connectivity; IOBase2 (ThinNet RG-58 A/U Coaxial cabling with BNC Connectors), IOBaseT (Twisted-Pair RJ-45 terminated UTP cabling).

2.04 SUPERVISORY CONTROLLER (SC)

1. The Network Area Controller (SC) shall provide the interface between the LAN or WAN and the field control devices, and provide global supervisory control functions over the control devices connected to the SC. It shall be capable of executing application control programs to provide:

- Calendar functions
- Scheduling
- Trending
- Alarm monitoring and routing
- Time synchronization
- Integration of LON Works controller data and BACnet controller data
- Integration of Johnson Controls legacy N2 controllers' data

2. The Network Area Controller must provide the following hardware features as a minimum:

   - One Ethernet Port – 10/100 Mbps
   - One RS-232 port
   - One LON Works Interface Port – 78KB FTT-10A
   - One RS-485 Interface Port - N2 Port
   - Battery Backup
   - Flash memory for long term data backup (if battery backup or flash memory is not supplied, the controller must contain a hard disk with at least 1 gigabyte storage capacity)
   - The SC must be capable of operation over a temperature range of 0 to 55°C
   - The SC must be capable of withstanding storage temperatures of between 0 and 70 °C
   - The SC must be capable of operation over a humidity range of 5 to 95% RH, non-condensing

3. The SC shall provide multiple user access to the system and support for ODBC or SQL. A data base resident on the SC shall be an ODBC-compliant database or must provide an ODBC data access mechanism to read and write data stored within it.

4. The SC shall support standard Web browser access via the Intranet/Internet. It shall support a minimum of 16 simultaneous users.

5. Event Alarm Notification and Actions

   A. The SC shall provide alarm recognition, storage; routing, management, and analysis to supplement distributed capabilities of equipment or application specific controllers.

   B. The SC shall be able to route any alarm condition to any defined user location whether connected to a local network or remote via dial-up, telephone connection, or wide-area network.

   C. Alarm generation shall be selectable for annunciation type and acknowledgement requirements including but limited to:

      - To alarm
      - Return to normal
      - To fault

   D. Provide for the creation of an unlimited number of alarm classes for the purpose of routing types and or classes or alarms, i.e.: security, HVAC, fire, etc.

   E. Provide timed (schedule routing of alarms by class, object, group, or node.

F. Provide alarm generation from binary object "runtime" and / or event counts for equipment maintenance. The user shall be able to reset runtime or event count values with appropriate password control.

6. Control equipment and network failures shall be treated as alarms and annunciated.

7. Alarms shall be annunciated in any of the following manners as defined by the user:

   A. Screen message text

   B. Email of the complete alarm message to multiple recipients. Provide the ability to route and email alarms based on:

      - Day of week
      - Time of day
      - Recipient

   C. Pagers via paging services that initiate a page on receipt of email message

   D. Graphic with flashing alarm object(s)

   E. Printed message, routed directly to a dedicated alarm printer

   F. Audio messages

8. The following shall be recorded by the SC for each alarm (at a minimum):

   - Time and date
   - Location (building, floor, zone, office number, etc.)
   - Equipment (air handler #, access way, etc.)
   - Acknowledge time, date, and user who issued acknowledgement.
   - Number of occurrences since last acknowledgement.

9. Alarm actions may be initiated by user defined programmable objects created for that purpose.

10. Defined users shall be given proper access to acknowledge any alarm, or specific types or classes of alarms defined by the user.

11. A log of all alarms shall be maintained by the SC and/or a server (if configured in the system) and shall be available for review by the user.

12. Provide a "query" feature to allow review of specific alarms by user defined parameters.

13. A separate log for system alerts (controller failures, network failures, etc.) shall be provided and available for review by the user.

14. An error log to record invalid property changes or commands shall be provided and available for review by the user.

15. The SC shall have the ability to collect data for any property of any object and store this data for future use.

16. The data collection shall be performed by log objects, resident in the SC that shall have, at a minimum, the following configurable properties:

    A. Designating the log as interval or deviation.

    B. For interval logs, the object shall be configured for time of day, day or week and the sample collection interval.

    C. For deviation logs, the object shall be configured for the deviation of a variable to a fixed value. This value, when reached, will initiate logging of the object.

    D. For all logs, provide the ability to set the maximum number of data stores for the log and to set whether the log will stop collecting when full, or rollover the data on a first-in, first-out basis.

    E. Each log shall have the ability to have its data cleared on a time-based event or by a user-defined event or action.

17. All log data shall be stored in a relational database in the SC and the data shall be accessed from a server (if the system is so configured) or a standard Web Browser.

18. All log data, when accessed from a server, shall be capable of being manipulated using standard SQL statements.

19. All log data shall be available to the user in the following data formats:

    - HTML
    - XML
    - Plain text comma or tab separated values

20. Systems that do not provide log data in HTML and XML formats at a minimum shall not be acceptable.

21. The SC shall have the ability to archive its log data either locally (to itself), or remotely to a server or other SC on the network. Provide the ability to configure the following archiving properties, at a minimum:

    - Archive on time of day
    - Archive on user-defined number of data stores in the log (buffer size)
    - Archive when log has reached its user-defined capacity of data stores
    - Provide ability to clear logs once archived

22. Provide and maintain an Audit Log that tracks all activities performed on the SC. Provide the ability to specify a buffer size for the log and the ability to archive log based on time or when the log has reached its user-defined buffer size. Provide the ability to archive the log locally (to the SC), to another SC on the network, or to a server. For each log entry, provide the following data:

- Time and date
- User ID
- Change or activity: i.e., Change setpoint, add or delete objects, commands, etc.

23. The SC shall have the ability to automatically backup its database. The database shall be backed up based on a user-defined time interval.

24. Copies of the current database and, at the most recently saved database shall be stored in the SC. The age of the most recently saved database is dependent on the user-defined database save interval.

25. The SC database shall be stored, at a minimum, in XML format to allow for user viewing and editing, if desired. Other formats are acceptable as well, as long as XML format is supported.

2.05 STANDALONE DIGITAL CONTROLLERS (SDC)

1. The SDC controllers shall permit the simultaneous operation of all control, communication facilities management and operator interface software, as programmed by the Contractor or User. Modification of on-board SDC controller database shall be performed on-line using the built-in interface. Systems that require the SDC to be removed from service while DDC control sequences are modified shall not be acceptable.

2. SDC controllers shall utilize true floating-point arithmetic capabilities. To accommodate totalization of large totalized values, SDCs with reporting capability shall support the calculation, accumulation and display of values within the range of +/-10 to the 10^{th} power. The SDC shall employ a multitasking, multi-user operating system.

3. All programming defining the functions to be performed by the SDC, including but not limited to application programs and point database within each SDC shall be protected from loss due to power failure for a minimum of six months. Systems not providing non-volatile memory shall not be acceptable.

4. SDC controllers shall be equipped with a minimum of two operator service ports for the connection of serial devices such as the GP, HMI, modems, printers, etc. Connection of a service device, to a service port, shall not cause the SDC controller to lose communications with its peers or other networked device controllers. The SDC shall be able to route alarms, trends, and reports to any serial device connected to the network. This shall also include the auto dialing to remote locations. The SDC shall be capable of dialing out to a minimum of ten remote locations for the annunciation of alarms. Alarms shall include the time, date, and alarm condition, in addition to a user-defined detailed message detailing the condition.

5. The SDC shall provide Alarming, point trending and Energy report generation capabilities. Alarming points shall be uniquely definable, with multiple alarms assignable to a single point. Such alarms shall be provided with a unique 80-character message. Systems utilizing an alarm messages library shall describe the size of the library and verify how all alarming within the SDC will be guaranteed unique 80-character messages.

6. The quantities of trended point values shall be limited only by total controller memory space. If necessary, a SDC may be dedicated fully to a trending task, allowing all controller memory to be available for the trend storage. Each unique trend report shall contain a minimum of 4 different points and a minimum of 128 samples per point. Trending frequency for each report shall be

operator definable from a sample once a second to a sample once every 24 hours. Trend reports shall be internally formatted by the SDC and shall be reportable directly to a serial printer, a VT-100 display terminal, a CCS, CHS or any other device capable of receiving a formatted ASCII data file.

7. The energy reports shall not be limited in quantities only by available memory within the GDC. Each Energy report shall be fully formatted and reportable t a serial printer, a VT-100 display terminal, a CCS, a CHS or any other device capable of receiving a formatted ASCII data file. As a minimum, each Energy report shall provide a daily report and a monthly report with summary information such as outside air temperature, outside air humidity, total energy consumed and degree-day calculations.

8. The SDC controller shall provide a built-in operator interface, which consists of an alphanumeric LCD display of 4 lines x 20 characters, and a multi-function keyboard. Devices without such built-in displays shall provide a permanently connected HMI as described elsewhere in this specification, one per Network Segment.

9. The SDC shall provide for logical grouping of network variables and allow for viewing and editing of system parameters. Logical grouping menus shall allow for detailed descriptions of system variables of a minimum of 20 characters. The SDC shall communicate via the FMCS Network Interfaces to the enterprise LAN, whether dedicated or common.

10. The SDC shall provide connectivity to the currently marketed FMCS solutions offered by the manufacturer. The SDC shall be interoperable these FMCS offerings for scheduling, global data sharing, energy demand limiting, alarming, optimized start/stop, and systems integrations for all other data within the entire FMCS. In addition, the SDC shall provide connectivity to existing DDC controllers currently marketed by the manufacturer.

2.06 INTEROPERABLE LOGIC CONTROLLERS (ILC)

1. General

   A. Controls shall be microprocessor based Interoperable LOGIC Controllers (ILC), bearing the applicable interoperability logo on each product delivered. ILCs shall be provided for VAV terminal boxes, unit ventilators, fan coil units, reheat units, unit heaters, exhaust fans and other applications as detailed in project specifications. The application control program shall be resident within the same enclosure as the input/output circuitry, which translates the sensor signals.

   B. To simplify controls and mechanical service troubleshooting, the ILC shall be mounted directly in the control compartment of the unitary system. The ILC shall be provided with a sheet metal or polymeric enclosure that is constructed of material allowing for the direct mounting within the primary air stream, as defined by UL-465. The direct mounting shall allow all controls maintenance and troubleshooting to be made while at the unitary equipment.

   C. The ILCs shall communicate with the SDC at a baud rate of not less than 78.8K baud. The ILC shall provide LED indication of communication and controller performance to the technician, without cover removal.

   D. The ILCs shall be fully supported and communicate with any and all GUI(s) on the bus.

2. ILC Sensor

   A. The ILC sensor shall connect directly to the ILC and shall not utilize any of the I/O points of the controller. The ILC sensor shall provide two or four-wire connection to the controller that is polarity and wire type insensitive. The ILC sensor shall provide a communications jack for connection to the LON communication trunk to which the ILC controller is connected. The ILC sensor, the connected controller, and all other devices on the bus shall be accessible by the graphical programming tool.

   B. The ILC sensor shall be supplied in the following variations:

      - Tamper-resistant (no display)
      - Tamper-resistant with tenant override.
      - Basic user functions (LCD display and setpoint adjustment and tenant override)
      - Full user functions (LCD display and network-variable access and tenant override)
      - ASHRAE 95 compliance (LCD display and sub-base functionality)

   C. The ILC sensor shall be provided in a modular configuration that allows for the rough in of all wiring without the presence of the electronics or esthetic covering. The ILC sensor shall allow for the customization of the color on the esthetic covering as a standard offering. User interface with the ILC sensor shall be provided as a configurable function by the FMCS and shall offer password protection for access to network variable editing. Multiple network variables shall be accessible and editable by the ILC sensor. Icons shall be utilized to represent sensor and controller function status, affording independence from a single language for use interface.

3. ILC Functionality

   A. The ILC shall provide a –40 to 140°F. ambient operating temperature range when installed in unconditioned space. The ILC shall be provided in a modular configuration that allows for the rough in of all wiring without the presence of any of the ILC electronics. ILC devices that require the electronics to be present at the time of wiring, will require an additional controller to be provided for every ten (10) devices on the drawings, to allow for the pre-configuration and storing for service purposes.

   B. All input/output signals shall be directly hardwired to the ILC. For all non-VAV terminal applications, a minimum of two input points of the ILC shall employ a universal configuration that allows for flexibility in application ranging from dry contact, resistive, to voltage/current sourced inputs. If universal points are not available, a minimum of two input points (each) of the dry contact, resistive and analog voltage/current types must be provided on every controller. The outputs of the ILC shall be of the relay and universal analog form. All digital outputs shall be relay type. ILC devices utilizing non-relay outputs shall provide an interface relay for all points. All analog outputs shall be programmable for their start points and span to accommodate the control devices. Configuration of all I/O points shall be accomplished without physical hardware jumpers, switches or settings. Troubleshooting of input/output signals shall be easily executed with the Graphical Programming Tool (GP) or a volt-ohm meter (VOM). All I/O points shall be utilized by the local ILC or shall be available as I/O points for other controllers throughout the network.

C. All ILCs shall be fully application programmable and shall at all times maintain their certification. Controllers offering application selection only (non-programmable), require a 10% spare point capacity to be provided for all applications. All control sequences within or programmed into the ILC shall be stored in non-volatile memory, which is not dependent upon the presence of a battery, to be retained.

D. The ILC shall be provided with the ability to interface with the graphical programming tool. The interface port shall be provided at the wall sensor or within the unitary equipment, as specified on the plans. The interface port shall allow the GP to have full functionality as described in GP section of this specification. Through the connected controller all ILC devices on the bus shall be accessible by the graphical programming tool.

2.07 INTEROPERABLE DIGITAL CONTROLLERS (IDC)

1. Controls shall be microprocessor based Interoperable Digital Controllers (IDC) providing interoperability with all devices. IDCs shall be provided for any equipment applications as required. The application control program shall be resident within the same enclosure as the input/output circuitry, which translates the sensor signals.

2. All IDCs shall be fully application programmable utilizing graphical objects. All control sequences programmed into the IDC shall be stored in non-volatile memory, which is not dependent upon the presence of a battery, to be retained. Systems that only allow selection of sequences from a library or table are not acceptable.

3. The IDC shall be provided with the ability to interface with the graphical programming tool. The interface port shall allow the GP to have full functionality as described in GP section of this specification. Through the interface port all IDC devices on the bus shall be accessible by the graphical programming tool.

4. The IDCs shall communicate with the SDC at a baud rate of not less than 78.8K baud. The IDC shall have as a minimum ambient operating temperature rate of 32 to 122°F.

5. The IDC shall be fully supported by the Graphic User Interface (GUI) and web browser software system.

6. All input/output signals shall be directly hardwired to the IDC. All controllers shall employ a universal input configuration that allows for flexibility in application ranging from dry contact, resistive, to voltage/current-sourced inputs. If universal points are not available, a minimum of one spare input point (each) of the dry contact, resistive and analog voltage/current types must be provided for each input point utilized. IDC devices shall provide digital and analog output types and quantities consistent with the requirements of the application requirements. Troubleshooting of input/output signals shall be easily executed with the graphical programming tool or a volt-ohm meter (VOM). All I/O points shall be utilized by the local ILC or shall be available as I/O points for other controllers throughout the network.

7. To simplify controls and mechanical service troubleshooting, the IDC shall be mounted directly in or on the control compartment of the air handling system. The IDC shall be mounted directly in or on the control be provided in a NEMA 1 enclosure to accommodate direct mounting on the equipment to be controlled. The IDC shall be constructed in a modular orientation such that service of the failed components can be done quickly and easily. The modular construction should limit the quantities of printed circuit boards to a maximum of two. All logic, control

system, power supply and input/output circuitry shall be contained on a single plug-in circuit board. All wiring terminations shall be made to serviceable connections allowing controller reconfiguration without the removal of any terminated wires. This shall allow all controls maintenance and troubleshooting to be made while at the air handling unit. The IDC shall be directly wired to sensor devices, staging relays or modulating valves for heating and cooling.

8. The FMCS contractor shall provide and field install all IDCs specified under this contract.

2.08 GRAPHICAL USER INTERFACE (GUI)

1. The Graphical User Interface shall reside on the communication bus to allow the operator to view, configure, and edit values from multiple controllers on the bus. The GUI shall be completely programmable using standard user-definable graphical icons associated with any displayed variable. Variables such as alarms, trends, setpoints, analog, and digital values may be displayed and/or edited using the GUI.

2. Multiple GUIs shall be capable of residing on the LAN and shall be capable of displaying common and/or unique parameters of the system controllers. The GUI shall be menu based displaying a minimum of 16 menus, and 256 unique system parameters.

2.09 GRAPHICAL PROGRAMMER (GP)

1. One Graphical Programmer's utility tool shall also be provided. The utility shall reside on a new portable laptop also provided with a Intel Quad @ 2.5 GHz CPU and 3 Gigabytes of RAM. The computer shall include a PCC-10 network interface card to allow for direct connection to the bus. These functions shall include Network Management services such as device installation, device configuration, diagnostics, maintenance, and defining network data connections between system controllers, known as "binding". All ILCs and IDCs shall be programmed using the GP. The utility shall be capable of downloading application programs to all of the devices within the FMCS.

2.10 GATEWAY DIGITAL CONTROLLER (GDC)

1. Gateway Digital Controllers (GDCs) shall be provided for the purpose of integrating microprocessor based, communicating, direct digital control systems from vendors other than the primary, selected controls manufacturer, that do not comply with the open, interoperability requirements of this specification. GDCs shall work from software program memory that is physically located in the GDC. All communications interface control programs shall be resident within the GDC. All GDCs shall exist at the LAN level with the SDCs and HMIs. The GDCs shall support the protocol interface driver tool defined in the FMCS section of this specification. FMCS' that do not offer GDCs and the protocol driver tool kit shall not be acceptable.

2.11 HUMAN MACHINE INTERFACE (HMI)

1. Provide new human interface hardware.

2.12 GRAPHICAL USER INTERFACE SOFTWARE

1. Operating System:

   A. The GUI shall run on Microsoft Windows NT Workstation 4.0, Service Pack 4 or later.

2. The GUI shall employ browser-like functionality for ease of navigation. It shall include a tree view (similar to Windows Explorer) for quick viewing of, and access to, the hierarchical structure of the database. In addition, menu-pull downs, and toolbars shall employ buttons, commands and navigation to permit the operator to perform tasks with a minimum knowledge of the HVAC Control System and basic computing skills. These shall include, but are not limited to, forward/backward buttons, home button, and a context sensitive locator line (similar to a URL line), that displays the location and the selected object identification.

3. Real-Time Displays. The GUI, shall at a minimum, support the following graphical features and functions:

   A. Graphic screens shall be developed using any drawing package capable of generating a GIF, BMP, or JPG file format. Use of proprietary graphic file formats shall not be acceptable. In addition to, or in lieu of a graphic background, the GUI shall support the use of scanned pictures.

   B. Graphic screens shall have the capability to contain objects for text, real-time values, animation, color spectrum objects, logs, graphs, HTML or XML document links, schedule objects, hyperlinks to other URL's, and links to other graphic screens.

   C. Graphics shall support layering and each graphic object shall be configurable for assignment to a layer. A minimum of six layers shall be supported.

   D. Modifying common application objects, such as schedules, calendars, and set points shall be accomplished in a graphical manner.

      1. Schedule times will be adjusted using a graphical slider, without requiring any keyboard entry from the operator.

      2. Holidays shall be set by using a graphical calendar, without requiring any keyboard entry from the operator.

   E. Commands to start and stop binary objects shall be done by right clicking the selected object and selecting the appropriate command from the pop-up menu. No entry of text shall be required.

   F. Adjustments to analog objects, such as set points, shall be done by right clicking the selected object and using a graphical slider to adjust the value. No entry of text shall be required.

4. System Configuration. At a minimum, the GUI shall permit the operator to perform the following tasks, with proper password access:

   - Create, delete or modify control strategies.
   - Add/delete objects to the system.
   - Tune control loops through the adjustment of control loop parameters.
   - Enable or disable control strategies.
   - Generate hard copy records or control strategies on a printer.
   - Select points to be alarmable and define the alarm state.
   - Select points to be trended over a period of time and initiate the recording of values automatically.

5. On-Line Help. Provide a context sensitive, on-line help system to assist the operator in operation and editing of the system. On-line help shall be available for all applications and shall provide the relevant data for that particular screen. Additional help information shall be available through the use of hypertext. All system documentation and help files shall be in HTML format.

6. Security. Each operator shall be required to log on to that system with a username and password in order to view, edit, add, or delete data. System security shall be selectable for each operator. The system administrator shall have the ability to set passwords and security levels for all other operators. Each operator password shall be able to restrict the operators' access for viewing and/or changing each system application, full screen editor, and object. Each operator shall automatically be logged off of the system if no keyboard or mouse activity is detected. This auto log-off time shall be set per operator password. All system security data shall be stored in an encrypted format.

7. System Diagnostics. The system shall automatically monitor the operation of all workstations, printers, modems, network connections, building management panels, and controllers. The failure of any device shall be annunciated to the operator.

8. Alarm Console

   A. The system will be provided with a dedicated alarm window or console. This window will notify the operator of an alarm condition and allow the operator to view details of the alarm and acknowledge the alarm. The use of the Alarm Console can be enabled or disabled by the system administrator.

   B. When the Alarm Console is enabled, a separate alarm notification window will supersede all other windows on the desktop and shall not be capable of being minimized or closed by the operator. This window will notify the operator of new alarms and un-acknowledged alarms. Alarm notification windows or banners that can be minimized or closed by the operator shall not be acceptable.

9. Web Browser

   A. The system shall be capable of supporting an unlimited number of clients using a standard web browser such as Internet Explorer™ or Netscape Navigator™. Systems requiring additional software (to enable a standard web browser) to be resident on the client machine.

   B. The web browser software shall run on any operating system and system configuration that is supported by the Web browser. Systems that require specific machine requirements in terms of processor speed, memory, etc., in order to allow the Web browser to function with the FMCS, shall not be acceptable.

   C. The web browser shall provide the same view of the system, in terms of graphics, schedules, calendars, logs, etc., and provide the same interface methodology as is provided by the Graphical User Interface. Systems that require different views or that require different means of interacting with objects such as schedules, or logs, shall not be permitted.

   D. The web browser client shall support at a minimum, the following functions:

1. User log-on identification and password shall be required. If an unauthorized user attempts access, a blank web page shall be displayed. Security using Java authentication and encryption techniques to prevent unauthorized access shall be implemented.

2. Graphical screens developed for the GUI shall be the same screens used for the Web browser client. Any animated graphical objects supported by the GUI shall be supported by the web browser interface.
3. HTML programming shall not be required to display system graphics or data on a Web page. HTML editing of the Web page shall be allowed if the user desires a specific look or format. Storage of the graphical screens shall be in the Network Area Controller (SC), without requiring any graphics to be stored on the client machine. Systems that require graphics storage on each client are not acceptable.

4. Real-time values displayed on a web page shall update automatically without requiring a manual "refresh" of the web page.

5. Users shall have administrator-defined access privileges. Depending on the access privileges assigned, the user shall be able to perform the following:

    a. Modify common application objects, such as schedules, calendars, and set points in a graphical manner.

        1. Schedule times will be adjusted using a graphical slider, without requiring any keyboard entry from the operator.

        2. Holidays shall be set by using a graphical calendar, without requiring any keyboard entry from the operator.

    b. Commands to start and stop binary objects shall be done by right-clicking the selected object and selecting the appropriate command from the pop-up menu. No entry of text shall be required.

    c. View logs and charts

    d. View and acknowledge alarms

        1. The system shall provide the capability to specify a user's (as determined by the log-on user identification) home page. Provide the ability to limit a specific user to just their defined home page. From the home page, links to other views, or pages in the system shall be possible, if allowed by the system administrator.

        2. Graphic screens on the web browser client shall support hypertext links to other locations on the internet or on intranet sites, by specifying the Uniform Resource Locator (URL) for the desired link.

2.13 HMI SYSTEM SECURITY

1. System Security shall be on an application by application basis. System Administrator shall setup and define access privileges per user, per application and per setpoint levels. The Users shall be assigned discrete password names and codes, both of which must be entered in order to have access to any particular application or function within the system. Access privileges shall also be assignable for entry into the standard MS Windows NT or array of applications such as

File Manager, Task Manager or others. A minimum of 10,000 levels of assignable access must be provided. Systems not supporting this level of customization and flexibility for system security must define delivered capabilities and may not be accessible.

2.14 HMI DISPLAY FRAMES

1. The Dynamic Graphic portion of this HMI shall allow the operator to access any system information via a "system penetration" method. "System penetration" shall allow the operator to penetrate into the facility until the detailed color graphic display of a specific area of the facility is represented. All system travel shall be 100% accessible via the mouse, no keyboard commands shall be necessary to edit dynamic data.

2. The ability to import background images for the display frames shall include as a minimum, photos, digital images, bitmaps and standard image formats. Systems that utilize a proprietary background image format are not acceptable.

3. As a minimum, a graphic display shall be provided for overall site, for each subsystem within the site and for all individual locations associated with each subsystem. All graphics shall be logically linked to allow the operator to traverse through the overall system and at any time return immediately to the associated subsystem, or overall site plan, via a graphic element.

4. The system shall allow for the easy development and editing of dynamic graphics. Wizards shall be utilized to assist the operator with their manipulation of the graphic system. The operator shall be able to, through a single mouse function, select between the dynamic display mode and the graphic edit mode for the currently viewed graphic frame, assuming appropriate access level is provided to the operator. Systems requiring multiple mouse or operator keyboard commands to enter the graphic edit mode are not desirable and require through definition of steps involved to accomplish function.

5. Animation of system data shall be provided via graphic elements on the display frames. Standard graphic element library shall be provided to assist the operator with their implementation. The ability to define and add new animated graphic elements shall be provided. As a minimum, the ability to move, size, draw, arrange, align, layer, space, rotate, invert, duplicate, cut, copy, paste, erase any animated element shall be provided. System parameters and setpoints shall be assignable and modifiable by the animated graphic elements, relieving the need for keyboard commands for system manipulation.

6. The ability to simultaneously display a dynamic X/Y chart of selected points, shall be provided. The chart shall be an element of the graphic display and shall automatically update with the display data. The chart shall allow for dynamic manipulation to modify the range, rate, and timeframe of view, in both a real-time as well as historical configuration. A minimum of 4 values shall be included on any chart display element. There shall not be a limit to the quantity of chart elements displayed on a graphic frame. Trace colors and X values shall be User configurable. Systems not providing this capability are required to provide an equivalent charting package with the HMI offering.

7. Full on-line system documentation shall be provided. It shall not be necessary to maintain printed copies of user or programming manuals. Context sensitive help files shall be provided for all applications within the FMCS area of the HMI. The ability to update on-line documentation must be provided via electronic updates, definition of update procedure shall be provided.

8. By pointing and clicking on any individual graphic element, the following shall be available for display or modification, but not be limited to the current value or state may be edited. A self-prompting pop-up window shall be displayed providing the ability to modify the selected point value. Instructions assisting the operator in their use of the pop-up window shall be provided.

9. The ability to provide graphically displayed global scheduling and editing functions shall be provided. The ability to link these functions to the associated equipment or zone frames shall be a standard feature. A calendar shall be provided for display and modification of the SDC time clock functions. The User shall be able to view a daily, weekly, monthly, annual, special or holiday schedule from a defined display frame. A list of served areas shall be displayed on the same screen, this list shall be displayed at all times, pull down menus or other means of accessing these areas shall not be acceptable. The user shall only have to click on a served area to view its time clock schedule.

2.15 HMI ALARMING

1. The HMI shall provide, as standard, alarm annunciation of system data. On every display frame, the ability to view, acknowledge, delete and manipulate real-time and historical alarms shall be provided. The ability to provide a unique and custom alarm display for every display frame shall be provided. The ability to continuously or upon request, view the alarm display, shall be provided.

2. Alarm conditions shall be capable of invoking, as a minimum; a display frame, response instruction display, an audible annunciator, full conversation instructions, visual real-time video display, and any executable file.

3. Alarm logging shall be provided in a user definable configuration. All alarms shall be displayed and/or routed as follows, as a minimum; HMI display frame, local printer, server printer, client printer, logged to file, and archived in standard format for information management. Alarm groupings shall be hierarchical in nature allowing up to 8 alarm groups and 16 sub-groups. The HMI shall not possess any limits on the quantity of alarms that can be logged, including historical data archiving. Systems possessing limits must define the restrictions and may not be acceptable.

4. Alarm provide shall provide up to 999 alarm priorities with up to 5 alarm color changes, per priority, according to alarm status.

2.16 HMI TRENDING

1. The HMI shall automatically perform time based, user defined, and periodic collection of real time point data. The data shall be presented as an X/Y chart in the display frame. The data shall be stored and archived in a file format that allows for the manipulation and utilization of the data by third party applications.

2. A dynamic trend shall be defined as a group of at least 4 data points, with a circular buffer of 2000 data points. A historical trend shall be defined as a group of at least 8 data points, with the sampled points limited only by archival disk space. Sampling rates shall be user selectable from instantaneous (one per second) to once a week. Collection of data shall be user selectable to start and stop on a specific time and date. There shall be no limit to the number of X/Y charts within a display frame.

3. X/Y charting and column and row reporting shall be an integral part of the HMI. All points shall be chartable or reportable. Analytical data shall be displayed for any of the selected points in a clearly displayed X/Y chart. This analytical data shall consist of at least the following: Average Mean, Standard Deviation, Simple Average, Current Value, Cycle Length, Cycle High and Cycle Low.

4. X/Y charting shall provide for the following chart manipulation: display, zoom, scroll, centering, pen legend and export to Excel, Text via Dynamic Data Exchange.

2.17 HMI REPORTING

1. The report section of the HMI shall be the window to the HMIs database for all solicited and unsolicited data collected and shall provide for an easy means of reporting and information management. The HMI shall provide daily, weekly, monthly scheduling of reports or intervals custom to the needs of the user. The report generator shall allow an operator to easily and quickly define the contents of a report as well as define a print time and date. Information contained in the reports, as a minimum, shall be derived from alarm history and trend data.

2. The operator shall be able to compile reports by user, company/department, time and date period, point or points, with the ability to print a combination report. The combination report option shall allow the operator to define any or all of the information types to be reported, within one compilation, sorted by the above definitions and displayed, archived and/or printed. A report definition shall be able to be printed once or printed on a time and date schedule with a cover page that automatically identifies the operator, the time and date, and the parameters by which the report was compiled.

2.18 DAMPERS

1. Modulating dampers shall be opposed blade type. Air handling unit outdoor, relief and return air dampers shall be parallel blade type arranged to combat stratification. Two (2) position dampers shall be parallel blade type. Damper frames shall be not less than 13-gauge galvanized steel. Damper blade shall not be over 8" in width and 48" in length.

2. Blade edges shall have inflatable seal edging rated for less than 10 CFM per square foot of damper area. Damper hardware shall be zinc plated; bearings shall be nylon, Teflon, Oilite or equivalent.

3. Damper operators shall be mounted outside of duct on device unless factory installed or internally mounted with access panels.

4. Damper operators shall be mounted outside of duct unless factory installed or internally mounted with access panels. All dampers on equipment exposed in finished spaces shall have internal mounted operators, increase duct size accordingly.

5. Damper end switches shall sense blade position and not controller output.

6. Dampers for outside air intakes for equipment shall be per equipment section specification.

2.19 VALVES

1. Valves shall have hardened and polished stainless-steel stems. Valves shall have brass bodies. Packing shall be Teflon, spring loaded self-adjusting type.

2. Where packing is required valves shall back seat to permit repacking under pressure.

3. Water flow control valves shall be fully proportional action two port and/or 3-way mixing or diverted valves. Valves designed for 150 psig WWP and pass required volume of water with not greater than 12' head loss. Indicate pressure drop on shop drawings. Valves to be ANSI Class 125.

4. All valves in systems where equipment and/or pipes which valves feed are subject to freezing conditions shall be normally open. Valves used as part of hot water system (loss of power), shall be normally open.

5. Furnish as part of ship drawing, valve schedule indicating Cv of valves, valve sizes, types and valve positions (N.O., N.C. last position).

2.20 PROTECTIVE FREEZESTATS, FIRESTATS AND SMOKE DETECTORS

1. Provide all new air handling systems to include rooftop units shall have freezestat located on the inlet side of hydronic coils. When its setting is exceeded, perform the following:

   A. Open control valve on heating coil to full heating and/or close outside air damper and stop fans.

   B. All protective devices shall be manually reset and shall send an alarm signal to DDC system.

2. Smoke detector in system greater than 2,000 cfm shall have smoke detector installed in return downstream of filters.

3. Smoke detector well, interlock, control wiring and all appurtenances shall be by this Contractor.

4. Upon activation, the smoke detectors shall shut down the air distribution system.

5. Smoke detectors shall be supplied by electrical contractor and wired to fire alarm panel by electrical contractor. Smoke detectors shall be installed by HVAC contractor.

6. The electrical contractor shall verify smoke detector auxiliary contacts.

7. The interlocking of smoke detectors with HVAC equipment shall be by this Contractor.

2.21 CONTROL

1. Temperature, relative humidity and pressure transmitters shall be direct acting instruments capable of transmitting an electronic signal in direct proportion of the medium change.

2. All controls that are exposed to the outdoor elements shall be mounted in weatherproof boxes. These boxes will in no way interfere with the operation or sensing of these controls.

3. All controllers shall be externally mounted on indoor units (none in finished spaces). Controller mounted in finished areas shall be internally mounted in equipment and have access doors.

2.22 ELECTRONIC OPERATORS

1. Size electronic actuators to operate their appropriate dampers or valves with sufficient reserve power to provide smooth modulating action or two (2) position action as specified.

2. Provide unit outside air damper motors with adjustable minimum settings so that ventilation requirements may be adjusted for each space or room.

3. Provide spring return for outside air dampers.

2.23 ROOM SENSORS

1. Room sensors shall be electronic. Sensors shall be adjustable from rooms with limitations set from DDC system. All sensors in non-supervised areas (toilet rooms, cafeteria, gym, corridors and similar areas) shall have lockable metal covers. For sensors on exterior walls, provide insulation (minimum 2" thick R=8.0). Provide with pushbutton occupied/unoccupied override.

   A. Wall Mounted Combination Sensors (Demand Control Ventilation System Only) - provide wall mounted combination sensors which shall contain a space temperature sensor and CO_2 sensors in a single, decorative housing. The CO_2 sensor shall use single-beam absorption infrared diffusion technology (non-dispersive infrared) and shall have integral programming to perform automatic baseline calibration without use interface. The recommended manual recalibration period shall not be less than five years. Other features of wall-mounted combination sensors shall include:

   - Operating Conditions: 60°F.- 90°F. (15°C to 30°C.) and O% to 95% RH, non-condensing
   - Power Supply: 18-30 VAC, 50/60 Hz (18-42 VDC polarity protected)
   - CO_2 Sampling Method: Diffusion
   - CO_2 Sensor Output: 4 to 20 mA or 0 to 10-volt signal
   - Sensitivity: ±20 ppm
   - Accuracy: ±100 ppm to 60°F.- 90°F. (15°C. to 32°C.) and 760 mmHg
   - CO_2 Sensor Calibration: Single point calibration via push button and LED
   - Space Temperature Sensor: 10K ohm ±2% at 77°F. (25°C.) thermistor

   B. Combination sensors shall be provided with the manufacturers' recommended carbon dioxide calibration kit. The quantity shall be suitable to initially calibrate each sensor provided for the project.

PART 3 EXECUTION

3.01 ELECTRIC WIRING

1. All power and control wiring in connection with the temperature control system shall be furnished and installed under this contract and shall be per applicable NEC.

2. All electrical controls and switches shall be suitable either for 120 volts, 60 Hz or 24 VAC.

3. For control circuits of 115 volts and above, all wire shall be rated for 600 volts and may be either single or multi-conductor cable.

4. For control circuits below 30 volts, all wire shall be rated for 300 volts and may be either single or multi-conductor cable.

5. All electrical sensing element wire shall be in accordance with manufacturers' recommendation with the proper number of conductors, equivalent to Beldon No. 8770 and installed in "EMT" conduit in mechanical room. This cable shall not be installed in the same conduit with any conductors for voltages of 115 or above.

6. Electrical work provided shall include, but not limited to:

   A. Wiring from all control devices furnished to the respective equipment being controlled.

   B. Furnishing and installation of all necessary conduit and wire.

   C. Interlocking wiring between rooftop units, exhaust fans and radiation as specified in the sequence of operations, shown on the drawings or otherwise required.

   D. Installation of smoke detectors by the mechanical contractor and wiring to fan starter by the FMCS contractor.

   E. Wiring of flow switches, sequence relays, thermostats and permissive circuits to boilers.

7. Metal raceways shall be installed where pipe cannot be installed in construction and shall be stamped one-piece metal minimum 18-gauge, factory painted color selected and secured to prevent vandalism.

8. In locations where wire cannot be installed above ceiling, wire shall be run in metal raceways.

9. Except for motor feeders and for existing wiring between motors, motor controllers, feeder panels, fuses, circuits breakers and buss bars, all of the new electrical work required for the facility management control system including but not limited to time switches, damper motors, damper switches, electric thermostats, electric relays, interlocking wiring, wire, conduit, etc. shall be provided and installed by the FMCS Contractor. It shall be the FMCS Contractor's responsibility to provide all wiring required to achieve the functions called for in these specifications.

10. All exposed wiring shall be in EMT or rigid conduit.

11. Control wiring in plenums shall be furnished and installed in EMT or conduit or an approved shielded cable for plenum use.

3.02 ROOM SENSORS

1. Sensors shall be located so that they will not be influenced by the mechanical system or heat producing equipment. Sensors installed not in accordance with above shall be relocated and construction repaired at no additional cost to Owner.

2. Mount all sensors as required by ADA unless otherwise directed or required by code.

3. The exact location of sensors and/or thermostats to be determined in field with Owner and be coordinated with the final furniture layout. Submit location for review with shop drawings.

4. As part of bid, Contractor to include sufficient wire to relocate sensor 10'± from location shown and where interference occurs, sensors shall be relocated (after final installation) at no additional cost to Owner. This shall be for all sensors.

5. Where sensors are shown to be located behind grilles, provide hinged access and mark location.

3.03 DRAWINGS AND LAYOUT

1. This Contractor shall provide diagrams of the automatic temperature control system, which shall show all control equipment and the function of each item.

2. The following data/information shall be submitted in accordance with General Conditions;

   - Complete sequence of operation.
   - Color coded control system CAD generated drawings including all pertinent data to provide a functional operating system.
   - Valve and damper schedules showing size, configuration, pressure losses, capacity and location of all equipment.
   - A description of the installation materials including conduit, wire flex, etc.

3.04 EQUIPMENT CONTROLS

1. All controls required and/or specified to be installed by the DDC contractor in equipment to be furnished under this contract except those control normally provided by the equipment manufacturer, shall be sent to the equipment manufacturer and be factory installed.

2. The controls may be field assembled by DDC contractor. However, this Contractor shall assume all responsibility for proper operation of the mechanical equipment and coordination of the work.

3. When controls, dampers, valves, etc., are mounted in equipment furnished by others, the DDC contractor shall provide all required electric wiring and appurtenances and include connection to the equipment as required for system to function as specified.

4. Where controls are to be field installed and controls are not factory installed and wired, the following is a recommended interface.

   A. The HVAC equipment suppliers shall provide a terminal strip in the control compartment of their equipment to allow their equipment to provide the specified sequence.

      Economizer Control - The HVAC equipment shall accept a single 0-10-volt signal from the DDC system to modulate the outdoor air, return air, and relief air dampers. The dampers and actuators are to be provided by the HVAC equipment supplier and the damper actuators are to be spring return. The damper actuators shall be powered from the HVAC equipment and wired at the factory. A 0-volt signal shall make the outdoor and relief dampers fully closed and the return damper fully open.

      Note - At contractors' option, alternate methods of interface may be used; submit for review.

5. It is the intent of these specifications that the controllers for rooftop units be located either in rooftop units or remotely located. Controllers for equipment other than rooftop units and controllers for rooftop units not installed in units shall be located as specified below.

A. All unitary controllers shall be located as close to units they service. Controllers may be located above ceiling, except where there is no ceiling or where equipment is located in close proximity to normally unoccupied spaces (storage rooms, janitor closets, electric rooms, etc.) For these areas, controllers shall be located as high as practical below ceiling on walls. All controllers shall be accessible and clearly marked by permanent color-coded indicators on ceiling.

3.05 INSTALLATION OF VALVES AND DAMPER MOTORS

1. All control valves and damper motors shall be furnished by temperature control manufacturer and installed by this Contractor or manufacturer of equipment in whose work it is to be mounted, regardless of who furnished equipment.

2. Where damper motors are provided by equipment manufacturer, they shall be completely integrated with the DDC system. The contractor is responsible for all coordination of work not in accordance with above at no extra cost to Owner.

3.06 VALVE, DAMPER AND CONTROL DEVICE LOCATION AND ACCESSIBILITY

1. All control equipment requiring service or adjustment located above suspended acoustical ceiling shall have their locations permanently marked on ceiling. Markings shall consist of a color scheme. The markings shall be permanently applied to surface with legend and location agreed to and provided to Owner. Provide in addition to chart, a permanently mounted graphic display as to locations of the devices.

2. All devices shall be located to be accessible and easily maintained and if found inaccessible, shall be relocated by this Contractor at no additional expense to Owner, regardless of the trades involved.

3. Where devices are behind general construction, provide access doors.

3.07 ATC PANELS

1. The location and quantity of ATC panels are to be determined and verified in field. Panels to have emergency power electrical connections. The final location and quantity of panels are to be verified with owner. This Contractor shall be responsible to coordinate all power wiring requirements as to location, quantity, and wire size with electrical contractor. Extension of services, new power wiring for additional panels, and all modifications to panels which affect electrical contractor shall be the responsibility of the ATC contractor.

2. All DDC panels, controllers, and equipment that require continuous uninterrupted power supply are to remain in operation and shall have battery and/or UPS back-up provided by this Contractor. The back-up shall be for a minimum of 3 hours and shall allow for an orderly shutdown. The resetting, rescheduling, and/or reprogramming of the controls will not be allowed; based upon failure to meet the intent of this specification.

3. No unit controllers or DDC panels shall be located above the ceiling.

3.08 ECONOMIZERS

1. All economizers shall be enthalpy type for rooftop units.

3.09 CO2 SENSORS

1. Where indicated on plans or specified for all units with field-installed controls and shall meet all sections of specifications and provide CO2 sensors. Where units are specified to be packaged, the unit manufacturer shall meet all sections of the specification; including the Sequence of Operation.

2. CO2 sensors are to be located in return air path and are modulate outside air dampers.

3.10 ACCEPTANCE TESTING

1. Upon completion of the installation, this Contractor shall load all system software and start-up the system. This Contractor shall perform all necessary calibration, testing and de-bugging and perform all required operational checks to ensure that the system is functioning in full accordance with these specifications.

2. This Contractor shall perform tests to verify proper performance of components, routines, and points. Repeat tests until proper performance results. This testing shall include a point-by-point log to validate 100% of the input and output points of the DDC system operation.

3. Upon completion of the performance tests described above, repeat these tests, point by point as described in the validation log above in presence of Owner's representative, as required. Properly schedule these tests so testing is complete at a time directed by the Owners' representative. Do not delay tests so as to prevent delay of occupancy permits or building occupancy.

4. System Acceptance: Satisfactory completion is when this Contractor has performed successfully all the required testing to show performance compliance with the requirements of the contract documents to the satisfaction of the Owners' representative. System acceptance shall be contingent upon completion and review of all corrected deficiencies.

5. Any found defective existing mechanical equipment and/or control devices (examples; control valves, freezestats, temperature sensors, actuators, CO2 sensors, humidity sensors, etc.) are to be listed and reported to Engineer and Owner.

3.11 ROOFTOP UNIT DEHUMIDIFICATION CYCLE

1. Upon a rise above setpoint of room humidistat and unit in cooling occupied mode; energize units' hot gas reheat cycle and close outside air damper. Whenever outside relative humidity is higher than inside outside, air damper shall remain closed for minimum of 1 hour. After that time, CO2 sensor shall allow damper to be cycled between open and closed based on indoor humidity. Upon a continued rise above space humidity sensor and a fall below space temperature and hot water is available; modulate hot water valve heat coil to maintain room temperature. Upon a rise above setpoint, the reverse shall occur.

PART 4 HARDWARE POINTS

1. Exhaust, Supply & Transfer Fans

   - Fan Start/Stop
   - Supply Fan Status - Current Transducer

- Automatic Damper Operation (where applicable)
- Room Temperature Setting (where applicable for ventilation)

2. Packaged VAV Rooftop Unit

- Supply Fan Start/Stop
- Supply Fan and adjustment Exhaust Fan (where applicable) VFD Status (0% to 100% of maximum setpoint)
- Alarm State
- Exhaust/Return Fan Start/Stop (If Applicable)
- Supply Fan Status
- Supply Duct Static Pressure
- Exhaust/Return Fan Status (If Applicable)
- Outside Air Temperature/Humidity
- Return Air Temperature/Humidity
- Mixed Air Temperature/Humidity
- Discharge Air Temperature
- Return CO_2 (U.N.O. setpoint to be 700 PPM above ambient)
- Economizer Command
- Heating Demand (modulating gas heat control)
- Stage 1 Cooling (Where Applicable)
- Stage 2 Cooling (Where Applicable)
- Return Air Smoke Detector

PART 5 SEQUENCE OF OPERATIONS

Sequence of operations are typical for all equipment of the type identified.

SPACE SETPOINTS

	SPACE SETPOINT
Occupied Heating	68°F.
Morning Warm-up	68°F.
Unoccupied Heating	60°F.
Occupied Cooling	74°F.
Cool-down	74°F.
Unoccupied Cooling	80°F.
Relative Humidity	55% RH

Note: All setpoints to be adjustable by Owner via FMCS.

OCCUPIED/UNOCCUPIED PERIODS

The purpose of this schedule is to establish a base line for equipment operation and sequencing. This is to allow system to provide optimum effectiveness and increase efficiency. The hours of operation shall be reviewed with the school prior to occupancy. The contractor shall provide as part of their training, instructions to Owner for changing and adjusting sequences and times of operation. The hours of operation shall also be able to be adjusted for individual equipment and/or zones.

Occupied Heating 6AM

Optimal start-up with adjustment based on system requirements.

Occupied Heating (Outside Air)

Operation of outside air system; damper open, outside air and heat recovery where applicable delayed approximately one hour after occupancy (adj.) and one hour prior to end of school (adj.).

Unoccupied Heating 3PM

Schedule for after school usage shall adjust this period.

Occupied Cooling 7AM

Optimal smart start-up with adjustment based on system requirements.

Occupied Cooling (Outside Air)

Operation of outside air system; outside air damper open and heat recovery where applicable delayed approximately one hour after occupancy (adj.) and one hour prior to end of school (adj.). In addition, where CO2 sensor below operational setpoint and outside relative humidity is higher, adjust damper opening time to allow for delayed opening.

Unoccupied Cooling 3PM

Schedule for after school usage shall adjust this period.

5.01 FANS

1. Destratification Fans - Provide room control 0-4 hours to energize fan.

5.02 GYMNASIUM

1. Provide control panel for Gymnasium located per Owners' direction, which shall provide the following:

   A. Operation of system from occupied to unoccupied, 7 days/24 hours/365 days, capable of three (3) modes each day. Note – Provide an interface with DDC system.

   B. Manual (lockable) override switch of system from unoccupied to occupied without accessing DDC system.

   C. Manual indexing of system from normal gymnasium to full gymnasium mode.

   D. Manual switch for starting 1st and 2nd units.

   E. Manual starting of auxiliary heaters.

2. Occupied Cycle Heating - When indexed to occupied cycle and room sensor requires heat; all units shall be energized. Outside air to be under control of CO2 sensor. Upon a rise above its set point; outside air damper shall go from closed to minimum on first unit. Upon a continued rise above CO2 set point; modulate 2nd units' outside air damper. Energize unit and supply air fan, modulate gas heat. Note – hot water heater may be able to be used. Provide control to enable heaters.

3. Occupied Cycle Cooling - When indexed to occupied cycle and room sensor requires cooling; first energize one unit with refrigeration and start fan on other units with no refrigeration. Outside air damper controlled from CO2 sensor. After a predetermined time or upon a continued rise above set point, allow second unit with compressor operation to be energized. When indexed to full gymnasium, all units shall run. Unit mounted economizers shall modulate outside and relief air dampers and return air damper as required to provide free cooling. Upon a further rise in space temperature, reduce outside air quantities to minimum position, return to maximum, energize refrigeration in steps.

4. Unoccupied Cycle Heating - When indexed to unoccupied cycle; all exhaust fans de-energized, outside air dampers closed, energize hot water unit heaters and after time delay, energize one units' supply air fan and modulate gas heat. After a predetermined time and upon a continued fall below set point, allow 2nd unit to be energized.

5. Cooling Unoccupied Mode - When indexed to unoccupied mode by central control or by manual override. All associated exhaust fans to be de-energized and relief and outside air dampers closed. Upon a rise above night sensor, unoccupied cooling space temperature as sensed by ATC system, zone sensors and interior enthalpy is above outside exterior enthalpy, energize units' economizer system to 100% outside air and 100% exhaust air to provide purge mode. Provide purge mode until satisfied. Provide time delay minimum 30-minute run time. Provide space low limit temperature and space high humidity thru DDC system shall override purge mode upon a fall below or rise above set points.

6. Morning Warm-Up - When indexed to morning warm-up from central time clock; energize hot water unit heaters and after time delay, one unit to run and outside air dampers closed and then modulate gas heat. Upon a continued fall; energize 2nd unit in sequence until morning warm-up sensor is satisfied, at which time system reverts to normal occupied mode.

7. Cool-Down Mode in Summer – When indexed to occupied mode from unoccupied from central control time clock or manual override; the system shall first go to cool-down mode. One unit shall be energized with compressors operational, 100% return. The remaining unit shall be energized with supply air fan only; no outside air and no refrigeration. The unit shall run and the units' fans shall run for a pre-determined time (initial setting 30 minutes adj.). After initial run time; a space humidity and temperature sensor shall allow full refrigeration for first unit. Remaining unit refrigeration to be energized only if space conditions are below dew point of supply air temperature. Determine exact sequence of units, fans and temperatures in field. This shall be run for a predetermined period until the space sensor is below dew point of expected final supply air temperature (with all compressors), then energize the remaining units' compressor until the space sensor is satisfied, then system reverts to normal occupancy.

   A. Normal Gymnasium Cooling Mode (not full Gym) – This cooling mode shall be indexed from the central panel and shall energize one unit (after cool-down). Remaining unit shall have fan run only at and upon a continued rise above set point. CO_2 sensors shall modulate outside air damper for first two units only.

B. Full Gymnasium Cooling Mode – This cooling mode shall be indexed from the central control and shall energize both units after cool-down.

8. Control panel shall have two (2) occupied modes.

5.03 HVAC SYSTEM EMERGENCY SHUT-DOWN SWITCH'S

1. Upon manual operation of single switch, shut down all HVAC equipment that uses outside air for ventilation, combustion air or any other purpose which may cause outside air to enter building by equipment use.

2. Switch shall be for all equipment.

3. Switch shall be a manual switch labeled and lockable and shall be located per Owners' direction.

4. Switch shall also send signal for quick closing outside air dampers to close.

5. Provide clear plastic liftable cover and a 12" x 4" engraved sign; "Emergency HVAC Shutdown."

5.04 COVID OPERATION

1. For all units, provide a 2-hour (adj.) occupying and post occupancy mode which shall allow for units to run @ 100% outside air.

2. Control of units (to prevent excess humidity, high and/or low temperature) shall be per purge mode sequence, except that there shall be an external manual override. When manual override is energized upon a rise above room humidity setpoint, low/or high temperatures shall initiate alarm condition.

3. System shall have outside air dampers open override control for CO2. Minimum setting shall be adjustable. When CO2 sensor override is energized upon a rise above room humidity setpoint, low/or high temperatures shall initiate alarm condition.

4. When indexed pre-purge, post-purge mode by central control or by manual override, system shall go to 100% outside air, open VAV primary dampers. Provide purge mode for indicated period. Provide time delay minimum 30-minute run time. Provide space low limit temperature and space high humidity thru DDC system shall override purge mode upon a fall below or rise above setpoint and reduce outside air damper until fall below setpoint.

5. Start-Up Purge Cycle

A. The normal start up shall be as indicated above. The DDC system and unit control shall have a separate start up purge cycle which shall only be used if desired by Owner. The control logic sequence of operations shall be provided.

B. The sequencing of the system from normal start up to purge cycle start up shall be automatically initiated. The DDC system shall, during the normal operation, track and trend the conditions at start up, and if determined after a period of normal operation, that a purge start up cycle is required, then the system shall initiate a purge condition. This shall also

alert operation and allow for manual override. Purge cycle shall only be initiated under outside conditions where economizer operation allows for free cooling.

C. When the unit starts, the outdoor air damper shall open and exhaust fan to track supply fan, initiating a timed purge cycle. The outdoor air damper shall modulate to maintain the mixed airflow at 30% outdoor air. The purge period shall be adjustable and shall initially be set for 30 minutes.

D. The unit shall modulate its preheat control to maintain the discharge air temperature set point if the mixed air temperature falls below the AHU discharge air temperature falls below the unit discharge air temperature set point. At the conclusion of the timed cycle, the outdoor air damper shall modulate closed and exhaust fan speed reset to maintain the base ventilation rate of outdoor air, and the demand-controlled ventilation control algorithm shall be enabled.

END OF SECTION
15930.6042

SECTION 15015 – GENERAL REQUIREMENTS

PART 1 GENERAL

1.01 SCOPE

1. The General, Supplementary, and Special Conditions, Applicable portions of all divisions and the addenda thereto, are made a part of this Contract.

2. All work described in these specifications shall be the responsibility of the plumbing contractor unless otherwise indicated.

3. It is the intent of these specifications to include all material, service and labor necessary to form a complete and properly operating whole.

1.02 CONTRACT DRAWINGS

1. Examine all drawings and specifications and visit the site to become acquainted with the construction and the extent of the work.

2. In referring to drawings, figured dimensions take precedence over scale measurements. Discrepancies must be referred to the Engineer for decision. Each Contractor shall certify and verify all dimensions before ordering material or commencing work.

3. Any work called for in the specifications, but not mentioned or shown on the drawings, or called for on the drawings, but not mentioned in the specifications, shall be furnished as though called for in both.

4. When any device or part of equipment is herein referred to as a singular number, such as "the pump" such reference shall be deemed to apply to as many such devices as required to complete the installation.

5. The term "provide" shall mean "furnish and install". Neither term will be used generally in these specifications but will be assumed. The term "furnish" shall mean to obtain and deliver on the job for installation by other trades.

1.03 CODES AND STANDARDS

1. All work shall comply with all regulations and be subject to inspection and approval of authorities having jurisdiction.

2. Where items indicated on contract documents differ from code requirements, contractor shall inform engineer prior to installation. Any construction installed by contractor that is not in compliance with applicable codes, shall be removed, modified, and/or replaced at not additional cost.

3. All equipment shall be labeled by an approved agency.

4. Contractor shall give all notices, obtain and pay for all permits, deposits, and fees necessary.

5. Manufacturer's published data is made a part of these specifications.

6. Wherever a recognized national organization has published standards these shall be complied with (such as ASA Z 21.30 for gas piping).

1.04 REJECTED MATERIALS

1. See "General Conditions".

1.05 WORKMANSHIP

1. All work and the execution of same shall be completed in a first class, workmanlike manner and shall conform to the best mechanical practice.

1.06 SHOP DRAWINGS

1. See "General Conditions".

1.07 AS-BUILT DRAWINGS

1. See "General Conditions".

1.08 WARRANTY

1. See "General Conditions".

1.09 FIRE RATING

1. All materials used anywhere in the work must have N.F.P.A. rating as follows:

   A. Flame Spread - Not Over 25
   B. Smoke Developed - Not Over 50
   C. Fuel Contributed - Not Over 25

2. All materials shall be "Self Extinguishing".

1.10 EQUIPMENT SELECTION AND SERVICEABILITY

1. All equipment shall be located and installed so that it may be serviced. Demonstrate that there is room to remove all tube bundles, motor and similar equipment. Equipment which is too large or poorly located to permit servicing shall be replaced or repositioned at no additional cost to the Owner.

2. Where piping or control diagrams or sequencing differ from the recommended piping arrangements of the equipment manufacturer, and will directly affect the equipment performance, the manufacturer's recommendations shall be submitted in writing to the Architect/Engineer for approval, prior to purchasing the equipment involved. This Contractor shall be responsible for obtaining such recommendations from the manufacturers in order to effect correct and perfect operation of the equipment at the capacities and temperatures indicated.

1.11 EQUIPMENT FURNISHED BY OTHER TRADES

1. All equipment furnished and/of installed by other trades requiring connections and services by this Contractor shall have such services provided.

2. This Contractor shall verify exact requirements with shop drawings.

3. This Contractor shall verify all locations, sizes, requirements of services required for equipment in field with Contractor furnishing equipment.

1.12 FIRE SAFING

1. Provide fire safing and duct safing per 2018 IBC New Jersey Edition, Proseal Systems - Proseal plug device per 93 UL Directory, No 545, F rating for precast concrete. 3M Brand Fire Barrier CP25WB and caulk CAJ 1044 and CAJ 5001, WL1003, WL5011, or equivalent.

PART 2 PRODUCTS

2.01 ELECTRICAL EQUIPMENT

1. This Contractor shall furnish all his equipment complete with motor, controllers, capacitors and starting equipment.

2. Electric motors shall be open, drip proof induction motors rated for continuous duty at 15% overload with 40° C. rise; single phase motor shall be capacitor start-induction run. Motors one-half horsepower shall be single phase, unless otherwise noted (c.f. Division 16). Starting of magnetic across-the line starters equivalent to Furnas Bulletin 14 or equivalent, unless otherwise specified. Thermal overload type, motor rated manual switches shall be furnished for motors ¾ HP and less which do not require magnetic starters for control purposes.

3. Provide FPE/CDE Type 1C Power Factor correction capacitors size to increase full load power factor to 95%. Capacitors shall be fused, in NEMA enclosure, connected between safety switch and motor starter.

4. Where apparatus is specified as "Packaged", all electrical equipment shall be furnished, set and wired to a single point of connection for apparatus as a unit.

5. This Contractor shall set all electrical equipment furnished by him unless same is to be mounted on an electrical panel board, junction box or similar piece of electrical equipment and is to be wired by others.

6. Where electrical characteristics are not shown, all electrical characteristics shall be as indicated on electrical plans. Where there is a conflict between model numbers which indicate electrical characteristics and electrical drawings, the electrical drawings shall take precedent.

7. This Contractor shall verify all electrical characteristics of all equipment with electrical contractor. This Contractor shall submit to electrical contractor location of all motor, starters, other electrical equipment voltage and phase required prior to submission of this Contractors' and electrical contractors' shop drawings.

8. Should this Contractor change type of equipment which results in change to electrical characteristics, then this Contractor will be responsible to coordinate these changes with all other trades and pay for all required changes.

9. Should this Contractor change electrical characteristics of equipment from that shown on electrical drawings, he is responsible for any extra cost resulting from such change.

2.02 ELECTRICAL WIRING

1. This Contractor shall furnish and install all electric wiring required for his contract, with the exception of certain wiring shown under Division 16.

2.03 RELIEF VALVES

1. Provide ASME labeled relief valve on each closed fluid system, set to relieve full code capacity at design pressure. Pipe discharge to closed drain or approved receptor.

2.04 THERMOMETERS

1. Thermometers shall be 5" diameter dial type with stainless steel cases and separate wells. Ashcroft T-7173T or equivalent, adjustable to any angle.

2.05 TAGS

1. This Contractor shall provide a 2" diameter brass tag with stamped service designation and numbers, fastened to each valve with brass chain and "S" hook.

2. Each control, starter, disconnect switch, etc., shall be provided with ¾" x 2½" metal name tag securely fastened to device.

3. Omit name tags on controls exposed in finished spaces.

2.06 UNDERGROUND PIPE WITHIN BUILDING

1. All underground pipe within building shall be installed in an approved conduit system. Conduit shall be of a size that will allow for pipe to be installed without penetration of conduit. Conduit shall be made airtight. All end connections shall be sealed. Connection to existing pipe trench shall be sealed. Extend conduit outdoors as indicated on plans. Conduit shall be installed in accordance with gas company requirements.

2. Provide separate test of gas pipe within conduit as well as pressure test of conduit system. All testing shall be in accordance with gas company and International Fuel Gas Code.

PART 3 EXECUTION

3.01 METHOD OF PROCEDURE

1. The drawings accompanying these specifications are diagrammatic and intended to cover the approximate and relative locations of the system.

2. Installation, connection and interconnection of all components of these systems shall be complete and made in accordance with the manufacturer's instructions and best trade practices. This Contractor shall erect all parts of equipment to be furnished by him under his Contract at such time and in such manner as not to delay or interfere with other Contractors.

3. This Contractor shall lay out his work and be responsible for the establishment of heights, grades, etc., for all interior and exterior piping, drains, fixtures, conduit, etc., included in Contract Documents, in strict accordance with the intent expressed thereby; and all the physical conditions to be met at the building and finished grade, and shall be responsible for accuracy thereof. The establishment of the location of all work shall be performed in consideration of the finished work. In case of conflict, equipment and/or materials shall be relocated without cost to the Owner, as directed by the Architect, regardless of which equipment was installed first.

4. This Contractor shall cooperate with other contractors for the proper securing and anchoring of all work included within these specifications. Extraordinary care shall be used in the erection and installation of all equipment and materials to avoid marring surfaces of the work of other trades, as this Contractor will be held financially responsible for all such damage caused by the lack of precaution and due to negligence on the part of his workmen.

5. Do not run pipe or conduit for plumbing systems in any concrete slab 3" or less in thickness. Do not place any pipe or conduit in any slab where the outside diameter of the pipe or conduit is more than one-quarter the thickness of the slab.

6. All piping, conduit and other plumbing materials and equipment shown to be mounted below ceilings are to be kept as close to ceiling areas as possible unless otherwise noted.

7. Items such as valves, cleanouts, etc., that will be concealed in construction shall be installed and so arranged as to be fully accessible for adjustment, service and maintenance.

3.02 VISIT TO SITE

1. Due to the nature of the work involved under this Contract, all bidders are required to thoroughly examine the site. Bidding contractors shall thoroughly review Contract Documents prior to visiting the site, take Contract Documents to site and thoroughly explore to any extent necessary, the existing conditions as relating to fulfilling the requirements of this Contract.

2. If discrepancies are noted between requirements of Contract Documents and existing conditions, this Contractor shall so indicate to architect during bidding period and receive clarification before bidding. Failure to comply with this requirement will result in Architect's interpretation during the construction period and architect's decision will be final and binding as the sole interpreter of the Contract requirements.

3. Extras will not be considered for any work relating to connections with existing systems or adaptability of new systems to existing structures.

3.03 CLEANING

1. Upon completion of the work, this Contractor shall remove all excess material, debris, tools and equipment from the site, and leave the premises in a broom clean condition.

2. Flush out all piping systems with proper solvents to insure removal of all foreign materials. Clean fixtures, equipment, piping and other surfaces soiled by the work. Remove debris and rubbish on a daily basis.

3.04 START-UP AND ADJUSTMENTS

1. After all testing is complete, start each system and make final adjustments for proper flow, temperature and quietness of operation. Record all final results including flows, balance settings, temperature adjustments, pertinent notes and recommendations. Furnish copies of report for review and record.

2. Report shall show actual data as recorded. Variations are expected due both to "normal" variations in field readings and to settings deliberately made to achieve proper operating conditions rather than design guidelines. Correct operation and maintained conditions will be sufficient evidence of proper setting.

3.05 OPERATING AND MAINTENANCE INSTRUCTIONS

1. This Contractor shall prepare complete sets of bound operating and maintenance instructions including valve chart framed under glass or laminated with clear plastic mounted on masonite board, indicating number, location and purpose of each valve. Two (2) charts and one (1) mylar copy shall be provided for each mechanical room or as designated. The instructions prepared shall be black on white and shall be complete enough so that men generally familiar with the type of system will need no further data to properly perform the indicated procedures.

2. This Contractor shall furnish qualified personnel to instruct the Owner in the operation of the system and must request from the Owner, in writing, a date for such instruction to begin. Contractor's personnel shall remain until such instruction is complete to Owner's satisfaction. Contractor shall receive from Owner written verification that the Owners' personnel have been thoroughly instructed in the operation, maintenance and all facets of the system operation.

3. Manuals shall include all equipment, equipment parts lists, complete oiling, recommend spare parts, complete coiling, cleaning and servicing data compiled in a clearly indexed and easily understood form the data shall indicate the serial numbers of each piece of equipment and provide complete lists of replacement parts motor parts ratings and actual loads.

4. Provide operating instructions shall include wiring and control diagrams showing complete lay out of each system.

5. Any special emergency operating instructions and a list of service organizations (including addresses and telephone numbers) capable of rendering emergency service to the various parts of the system.

6. ASME and State pressure vessel inspection forms, all motor data, including standard and actual operating in service data and copies of all manufacturer's equipment, guarantees and warranties.

7. Provide separate manuals, reports, instructions, etc. for each school.

3.06 PAINTING AND FINISHING

1. All painting is to be done in accordance to Rust-Oleum Corporations or equivalent printed instructions. All surfaces to receive two (2) coats of primer, exposed surfaces one (1) finished coat. Aluminum or galvanized metal surfaces are considered finished where concealed.

2. All surfaces to be carefully cleaned and/or pickled and filled as required to provide a proper uniform surface. Factory finished equipment shall be touched up or refinished where required.

3.07 CONSTRUCTION SAFETY

1. All work shall be done in accordance with the following Federal regulations:

   A. Williams-Steiger Occupational Safety and Health Standards, Chapter XVII of Title 29, Codes of Federal Regulations.

2. Comply with local Health and Safety Regulations.

3.08 ENERGY CONSERVATION CODES

1. It is the intent of this specification that all equipment and materials furnished meet the latest enforced edition of the Energy Code or such code as locally applicable, if more restrictive.

3.09 FLASHINGS

1. All piping passing through roofs shall be provided with Stoneman "Stormtite" seamless lead flashing (or equivalent).

3.10 DELIVERY AND STORAGE OF EQUIPMENT

1. This Contractor shall store, take deliveries and install all equipment in accordance with manufacturers requirements. (see General Conditions)

3.11 STERILIZATION

1. After final testing for leaks, all new potable water lines shall be thoroughly flushed, by plumbing contractor, to remove foreign material. Before placing the system in service, Contractor shall engage a qualified service organization to sterilize the new water lines in accordance with the following procedure:

   A. Through a ¾" hose connection in the main entering the building, pump in sufficient sodium hypochlorite to produce a free available chlorine residual of not less than 100 ppm.

   B. Proceed upstream from the point of chlorine application opening all faucets and taps until chlorine is detected. Close faucets and taps when chlorine is evident.

   C. When chlorinated water has been brought to every faucet and tap with a minimum concentration of 100 ppm chlorine, retain this water in the system for at least two (2) hours.

D. At the end of the retention period, no less than 10 ppm of chlorine shall be present at the extreme end of the system.

E. Proceed to open all faucets and taps and thoroughly flush all new lines until the chlorine residual in the water is less than 1.0 ppm.

F. Obtain representative water samples from the system for analysis by a recognized Bacteriological Laboratory.

G. If all samples tested for coliform organisms are negative, a letter and laboratory reports shall be submitted by the service organization to the Contractor, certifying successful completion of the sterilization.

H. If any samples tested indicate the presence of coliform organisms, the entire sterilization procedure shall be repeated.

3.12 PLENUM AREAS

1. Any duct plenum area, ceiling or room plenum shall not contain any combustible material, and all insulation, wiring and/or piping shall be suitable and approved by local authorities for plenum installation.

3.13 SCHEDULE OF WORK

1. The exact times and dates and schedules that the schools will be available for contractor to do work, shall be as indicated in General Conditions.

3.14 CONTINUITY OF SERVICES - EXISTING BUILDINGS

1. The work under the Contract shall not interrupt services to the existing buildings, except if all the following conditions are met:

   A. Building personnel are notified in advance and approve date and time in writing.

   B. Interruption of service does not exceed one (1) hour unless otherwise approved.

   C. Interruption of service does not occur during normal working hours.

2. No "extra" compensation will be permitted due to the overtime" hours implicit in the requirements of this section.

3. Where interruptions will affect life safety and/or other critical systems, proper precautions shall be taken to maintain level of protection or system operation acceptable to Owner and/or authorities having jurisdiction.

4. This Contractor is cautioned that the existing building is to remain occupied during construction and that all services to the building are to be maintained. There shall be no interruption of services and, if absolutely necessary, at least seven (7) days prior notice is required.

5. Any interruption of life safety systems (fire alarm sprinkler) the fire department and alarm company shall be notified, and proper precautions taken.

6. There shall be no obstructing the exit ways from existing building.

7. All interruptions of service shall be done at times which cause least disruption of service.

3.15 RELOCATION OF EXISTING EQUIPMENT

1. This Contractor shall be responsible for removal, storage, relocation and installation of all existing equipment shown or scheduled to be relocated. This Contractor will be responsible for capping of all existing services presently feeding existing equipment which is to be relocated and shall patch all surfaces to match existing as required.

2. All patching work shall be done by workmen skilled in this craft and shall in no way affect the stability, finish or operation of the casework or other equipment.

3. All equipment requiring plumbing connections shall be the responsibility of this Contractor. A composite crew shall be used using mechanics skilled in their field.

3.16 PROTECTION OF SERVICES DURING CONSTRUCTION AND DEMOLITION

1. This Contractor shall repair, replace, and maintain in service any utilities, facilities or services (in existing areas where demolition is to occur) which are damaged, broken, or otherwise rendered inoperative during the course of demolition.

2. This Contractor shall effectually protect, at his own expense, such of his work, materials or equipment that may be subject to damage during the construction period.

3. All openings must be securely covered, or otherwise protected.

4. This Contractor shall be held responsible for all damage so done until his work is fully done and finally accepted.

5. It shall be the responsibility of this Contractor to protect existing and new motors, pumps, electrical equipment, plumbing fixtures and all phases of construction.

3.17 EQUIPMENT LIST

1. Refer to General Conditions. Exclusion of items on list does not relieve Contractor of the responsibility from providing equipment as specified, required to complete work as shown on drawings that is to be provided by this Contractor.

	MANUFACTURER			
EQUIPMENT	NUMBER 1	NUMBER 2	NUMBER 3	NUMBER 4
Plumbing Fixtures	American Standard	Kohler		Or equivalent
Electric Water Cooler	Halsey Taylor	Haws	Sunroc	Or equivalent
Sinks	Elkay	Moen	American Standard	Or equivalent
Valves	Mueller	Stokham	Nibco	Or equivalent
Insulation	Owens/Corning	Johns Manville		Or equivalent
Carriers	Josam	J.R. Smith	Zurn	Or equivalent
Plumbing Specialties	Josam	J.R. Smith	Zurn	Or equivalent
Floor Drains	Josam	J.R. Smith	Zurn	Or equivalent
Trap Primers	J.R. Smith	Josam	Zurn	Or equivalent
Lavatory Fittings	Symmons	American Standard	Kohler	Or equivalent
Sink Fittings	American Standard	Symmons		Or equivalent
Sink Fittings	Elkay	American Standard		Or equivalent
Hot Water Heater	Bradford White	Navion		Or equivalent
Water Mixing Valves	Powers			Or equivalent

3.18 UNIT PRICES (See General Conditions)

1. See "General Conditions".

3.19 ALTERNATE BID

1. See "General Conditions". Refer to drawings and specifications for extent of work.

3.20 REPAIR AND PATCHING OF EXISTING SURFACES

1 Unless otherwise shown to be done by general contractor, this Contractor shall cut and patch walls, floors, ceilings, roof surfaces and all existing construction for the removal of existing equipment, fixture, piping, controls and other construction for the completion of work under this Contract. All equipment, piping, ductwork, furniture and all construction or materials that are disturbed during construction shall be stored and protected from damage until replaced.

2. Cutting shall be done only after shop drawings have been prepared and with the Architect's approval. This Contractor shall exercise proper care and shall not endanger the structure by indiscriminate cutting and shall be responsible for and shall protect all existing construction to remain from damage and shall provide and maintain all necessary temporary protective materials, coverings and barricades.

3. This Contractor may hire the other prime contractors to perform this work or hire qualified, independent contractors. This Contractor shall be familiar with and assume all responsibility for any conflicts with union policy and provide supervision in such a manner as not to impede the progress of other trades and be responsible for the adequacy and accuracy of same.

4. Wherever previously unfinished areas are exposed by the removal of existing piping or related equipment, these areas shall receive new finishes to blend into the adjoining work.

5. Wherever existing chases must be enlarged to encase new work, they shall be enlarged to match the existing.

6. Wherever fire rated material must be patched, it shall be patched in a manner not to affect its fire rating.

7. All patching work must be done by skilled mechanics in a manner to minimize the patch effect. Wherever new painting is required, it shall be done with at least two coats over new materials.

8. The painting must not only cover the area of the actual patch, but also to the nearest natural break of the newly painted surface.

9. Wherever the surrounding surface to be painted is in poor condition, all loose paint shall be removed before new paint is applied.

10. Patching of existing floor must be done in a manner to assure smooth undersurface and all joints must line up with existing.

11. Wherever new vinyl or rubber bases are to be supplied, they shall match adjoining bases in height and color.
12. Whenever existing ceilings are disturbed, they shall be replaced with new ceiling tiles or patched to match existing and all services, lights, fixtures, etc. supported temporarily and permanently reinstalled.

13. In all spaces in which the contractor is working, he shall protect all existing surfaces.

14. This Contractor shall remove and replace all ceilings required for his work with the exception of ceilings shown to be removed by general contractor on architectural plans.

3.21 REMOVAL

1. This Contractor shall remove existing systems as indicated on drawings.

2. All equipment, cabinets, ductwork, pipe controls, all pipe insulation (except any asbestos insulation), hangers, electric wiring and all construction and appurtenances shall be removed, to complete all work under this contract.

3. Equipment identified by Owner, prior to removal, that is to be retained by the Owner, which is not to be re-installed, shall remain the property of the Owner and shall be removed undamaged and stored in a suitable location where directed by the Architect. This Contractor shall then load, transport and unload equipment from building to site designated by Owner within a twenty (20) mile radius of project.

4. Removed piping, equipment, fixtures, pipe insulation and all debris shall be removed from the building and site in accordance with general conditions.

5. All debris in areas occupied by the building personnel during periods of building operation shall be removed daily.

6. This Contractor shall patch all wall, floors and ceilings and roof surfaces to match existing adjacent surfaces where obsolete equipment, piping, controls and wiring are removed.

7. Work shown on drawings may not indicate all equipment, pipe, etc., nor exact routes, sizes, locations, etc. The drawings are not to be used for estimating detailed take-off for amount of work required, drawings are for reference only. This Contractor shall visit site to determine extent of work and all conditions.

3.22 BUILDING ALTERATION WORK

1. This Contractor shall furnish all labor, equipment and materials required to complete alteration work in the building. Remove existing construction and replace, to remove existing equipment and/or install new equipment in conjunction with the work.

2. Cut, patch and paint walls, floors, ceilings, roof surfaces and all construction for the installation of equipment, piping and controls.

3. Cut and patch exterior walls for the installation of air intake and exhaust. Finish to match existing adjacent surfaces.

4. Where existing electrical HVAC or plumbing work, due to removal of existing and/or installation of new equipment, is required to be removed. This contractor shall disconnect existing equipment, cap services in a safe manner, remove equipment, store in a location to prevent damage, replace equipment and patch construction to match existing conditions and reconnect equipment to existing services.

5. This Contractor shall either retain qualified independent contractors or utilize the other on site contractors. This Contractor shall assume all requirements for any conflicts with union policy and be responsible for same. This Contractor shall furnish necessary shop drawings and supervision, in such a manner as not to impede the progress of other trades and be responsible for the adequacy and accuracy of same.

3.23 CONSTRUCTION SEQUENCING

1. Refer to General Conditions for the overall contract staging. However, specific items for plumbing contractor should be noted. The following are suggested methods of staging of construction. Alternate methods to achieve the intent of these specifications will be allowed; however, they must be coordinated with other trades and submitted for review and approval.

2. The sequence of construction shall be as indicated in the General Conditions of the specifications.

3. Where work is shown on plumbing plans where it is outside the phase areas indicated or specified in the General Conditions, this work shall be done at any time. All work shall be done so not to interfere with normal school operations. Where work is done outside normal school occupied areas (boiler room, roof area), this work may proceed at contractor's option. All work, regardless of the location of work, type of work, or extent of work, shall be done with the approval of the School District.

4. Where work in a particular phase requires work to be done outside that phases' construction boundaries, this Contractor shall locate all new duct, pipe, and equipment to allow for new construction and/or to integrate with existing building construction.

5. All new ductwork and piping shall be installed and coordinated with proposed new work.

6. All work required to be modified due to non-compliance with this section, General Conditions or Construction Sequencing, shall be removed, replaced and/or modified at no additional cost to Owner.

7. Where pipe is shown to serve future phases, provide capped outlet suitable for connection when phase is completed. Provide valves for isolation and draining lines without affecting the work installed in earlier phase.

3.24 CONNECTION TO SCIENCE ROOM FIXTURES

1. The contractor shall furnish and install all equipment as indicated on the architectural plans. The contractor shall provide rough-in from an approved roughing-in shop drawing.

2. Science Room lab sinks shall be an integral part of casework and shall be furnished and installed by the contractor.

3. Furnishing of sink faucets and countertop fixtures (including water and gas fittings) shall be by the general contractor. The contractor shall install all pipe, faucets, fittings and appurtenances.

4. The Science Room casework and equipment subcontractor shall turn over to the plumbing contractor in a package, all countertop equipment fixtures and faucets for installation and final connection by the plumbing contractor. The contractor shall furnish and install all tailpieces, strainers, gas cock shutoffs, sink drainage fittings, equipment, pipe and appurtenances. All items furnished by plumbing contractor shall be per casework equipment manufacturers' requirements.

5. It shall be the responsibility of all subcontractors to check the approved roughing-in shop drawings with other prime contractors before installing their respective piping and services, and to report any and all discrepancies and/or deviations from the contract drawings to the Architect in writing prior to the installation of any such equipment and/or their rough-in and final connection.

6. Unless otherwise shown on the contract drawings, respective services shall be "stubbed" a minimum of 8" above the floor, out of the walls, or down from ceilings, and valved for pressure lines at accessible locations or capped off for waste lines ready for final connections.

7. Final connections necessary to put this equipment in working order will be completed by the contractor. Final connections by the contractor shall include all traps, faucets, stops, and such related items as may be required for complete installation.

8. The contractor shall pressure test his pipe for integrity and also test pipe for cross connections to other systems and provide written confirmation of all pressure and cross connection tests.

9. The contractor shall be responsible to cut, repair, provide access to disassemble and reassemble, repaint, and refinish all casework to perform work. shall review the shop drawings of the casework and to coordinate with contractor for any openings required prior to shipment of equipment. All contractors shall coordinate thru a marked-up set of shop drawings all openings, cuts in equipment, and modifications to the equipment.

10. All pipe to the science equipment shall be located within the furniture to avoid additional pipe drops, chases, etc. Where practical, the pipe shall come up into the furniture. Where pipes are offset in the furniture, it shall be within pipe chases provided by the contractor. Offsets may be done in the toe kick space within equipment or in chases. Coordinate exact locations and all work with the manufacturer/general contractor. The final locations of pipes shall be verified in the field and these locations shall be indicated on the marked-up shop drawings.

11. The contractor shall provide all laboratory equipment to the maximum extent possible, with chases and modifications to his furniture to accommodate these pipe locations. Modifications to include additional pipe chases, enclosures, rearrangement of drawers, etc. and shall be done at no additional cost to Owner.

END OF SECTION
15015.6001

SECTION 15115 - BASIC MATERIALS AND METHODS

PART 1 GENERAL

1.01 MATERIALS AND EQUIPMENT

1. All material and equipment used for this contract shall be unused and of the latest model or design available. Equipment shall be installed in strict accordance with manufacturer's recommendations and details.

2. Materials not specifically described but indicated or incidentally required shall be acceptable to the Architect and/or Engineer. Submit shop drawings. Materials shall be delivered, stored and handled so as to preclude injury by weather, dirt or abrasion.

3. This Contractor shall use only specifically assigned areas for storage of materials and construction operation, unless other areas are authorized by the Owner. Such areas will be identified after the award of Contract by Owner. Comply with local municipal regulation regarding use of and parking on public streets.

4. This Contractor shall repair streets, drives, curbs, sidewalks and any existing surface where disturbed by construction operations and leave them in as good condition after completion of the work as before operations started.

1.02 PROTECTION

1. No pipe shall be left open any longer than is required to affix the next piece. If pipe ends are to be left for a protracted period they shall be closed with approved plugs or caps.

2. All equipment shall be covered to protect it from damage; all damage is the responsibility of this Contractor.

3. Any pipe, equipment or construction in existing building shall be done in such a manner to prevent injury to building personnel. Particular care must be taken for any work which will be done during building's normal operation.

1.03 IDENTIFICATION OF PIPING

1. Use color scheme for painting listed in "Scheme for Identification of Piping System", ANSI/ASME A13.1 and Rust-Oleum Corporation Form # 117 or equivalent. Paint identifying bank of color near each valve and fitting, on both sides of pipes passing through wall, and on long pipe runs approximately every 30' (closer when directed), throughout building. Exposed piping in mechanical rooms and all other areas including insulation, hangers, supports, valves and all appurtenances shall be painted color selected.

2. Stencil on pipe, near each valve, name of pipe contents in abbreviated form, size of pipe, and arrow indicating direction of flow. Place legend in such location that it can be read from floor. Size of stencil letters shall vary with the size of pipe.

3. Seaton "SETMARK" pipe markers or equivalent are acceptable.

1.04 TESTING

1. At the completion of all work, and before any covering is applied, all piping except drainage shall be tested hydrostatically at a pressure equal to 150% of the working pressure or to material test pressure, if lower. All piping concealed in any manner shall be tested before being concealed. Maximum drop in pressure permissible shall be two (2) psi in 24 hours.

2. The drainage system shall have openings plugged and be filled with water to the level of the main gutter or top of vent pipes and allowed to stand at least thirty minutes. Each stack may be tested separately.

3. Testing shall be in accordance with ANSI B31.1 in all test gauges, traps and all other apparatus which may be damaged by the test pressure shall be removed or valved off from the system before tests are made.

4. In existing building all required tests on new and/or existing systems shall only be done after normal working hours. All tests done in building shall be done in such a manner as to avoid injury to building personnel and damage to existing and/or new construction. Protect all new and existing construction from damage which may occur as a result of the test or failure of test material.

5. This Contractor shall be responsible for all costs associated with damage to materials or liability due to injury to personnel, as a result of tests or failure of tests.

1.05 PRESSURE RATINGS

1. All equipment and materials shall have a working pressure as determined by A.S.M.E. (or similar body), of not less than 125 psi.

1.06 SLEEVES

1. All pipes passing through construction shall be fitted with flush sleeves of sufficient diameter to pass the insulation. Sleeves shall be 20 USG galvanized iron, except in masonry, where steel pipe sleeves shall be used. Sleeves in waterproof construction shall be steel pipe, waterproofed with modular mechanical synthetic rubber seals equal to "Link Seals" (Thunderline, or equivalent). In floors they shall extend on inch above the floor.

2. In fire divisions, sleeves shall be constructed of fire-retardant material and shall be installed to maintain the fire integrity of the fire division.

3. All materials and construction methods shall be installed in accordance with the manufacturer recommendations and the requirements of the IBC Code or any other applicable codes.

PART 2 PRODUCTS

2.01 PIPE

1. Steel pipe shall be Schedule 40, electric welded, ASTM-A53, Grade A, plain or galvanized as specified under applicable system.

2. Copper tubing shall be hard temper "Type L" except that all piping underground shall be "Type K", conforming to ASTM-B-88.

3. Cast iron soil pipe shall be extra heavy Bell and Spigot spun type conforming to ASTM-A-74. Standard or medium weights may be used, if permissible under local code.

4. PVC Pipe

   A. Polyvinyl chloride pipe (PVC) shall be Schedule 40 conforming to ASTM-D-2241.

   B. Sound rating exposed PVC pipe in finished areas shall have sound rating equal to or less than the sound radiated from cast iron pipe (25-30 DB).

   C. Where sound ratings are greater, contractor shall install insulation wrap to reduce the radiated sound to less than the sound radiated for cast iron pipe.

   D. Contractor to install PVC pipe with supports at intervals required by the applicable plumbing code.

   E. Provide fire listed fire stop devices or collars in accordance with ASTM E814 on both sides of pipe penetrations of fire rated assembly temperature.

   F. PVC pipe shall not be used where temperatures exceed 140°F.

   G. All underground pipe to be installed in accordance with ASTM D2321.

2.02 PIPE FITTINGS

1. All welded fittings shall be of the same thickness and material as the pipe meeting ASTM-A234. Branch connections shall be made with Weldolets or welding fittings.

2. All flanges shall conform to A.S.A. B-16 using gaskets suitable for the service.

3. Cast iron drainage fittings shall be standard weight galvanized cast iron, banded and recessed.

4. Malleable iron fittings shall be 150 psi wsp conforming to ASTM-A-338.

5. Fittings for copper tubing shall be wrought copper of the solder Type conforming to A.S.A. B16.22.

6. Extra heavy cast iron soil pipe fittings shall conform to ASTM-A-74, all changes in direction being made with "Y" branches or 1/8" (or less) bends.

7. A.S.A. A21.10 or AWWA Class 250 cast iron fittings shall be used on cast iron water pipe and A.S.A.11 Class 250 mechanical joint pipe. All piping shall be properly blocked. Use lined fittings in lined pipe.

8. Fittings for polyvinyl chloride (PVC) shall be socket fittings or solvent welded.

2.03 BALL, GLOBE AND CHECK VALVES

1. All valves 2" or smaller shall be ball valves; bronze solder end valves in copper tubing and screwed end in other lines. Globe and swing check valves shall be of similar construction with renewable composition disc.

2.04 PLUG AND BALL VALVES

1. Plug and Ball Valves shall be 150 psi WOG with full port. Valves to be lever operated, screwed or solder end in sizes up to 2". Valves used for balancing shall have infinite throttling handle and adjustable stops. All valves bubble tight shut-off.

2.05 UNIONS

1. Unions shall be installed where needed to facilitate the removal of equipment.

2. Unions 2" and smaller in copper tubing shall be all brass, ground joint, solder end. In other lines, screw end, malleable iron, 125 psi WSP, 300 psi WOG of the ground type.

2.06 ESCUTCHEON PLATES

1. Where any pipe passes into a finished space, there shall be provided a solid brass, chrome plated, escutcheon plate held to the pipe mechanically or fastened to the building construction.

2.07 ANCHORS

1. Anchors of approved design shall be provided where shown or required for the proper control of the stress due to expansion. Anchors shall be heavy metal sections securely fastened to the building construction.

2.08 DRIP PANS

1. Provide drip pans for all pipes and equipment carrying liquid or, liquid vapors where pipes pass over areas or electrical equipment. Drip pans shall be constructed of galvanized metal. Provide drain line to closest sanitary line.

2.09 ACCESS PANELS

1. Furnish and install access panels not smaller than 18"x18", for access to all concealed valves, and equipment, accessories, etc.

2. Access panels shall be all steel construction with a No. 16-gauge wall or ceiling frame and a 16-gauge wall or ceiling frame and a 14-gauge panel door with not less than 1/8" insulation secured to inside of door.

3. Doors shall have concealed hinges and cylinder lock except doors for wall panels may be secured with suitable clips and countersunk screws.

4. Access panels shall be flush with finished wall or ceiling and shall be painted to match adjacent surfaces. Access panels behind finished surfaces shall have color coded marking on finished surface to indicate location of doors and type of equipment.

5. Access panels in fire rated construction shall be fire rated.

2.10 ANCHOR BOLTS

1. Contractor shall furnish and install anchor bolts as required for the equipment. Anchor bolts shall be DECO's standard anchor with floating nut, adjustable ½" in any direction. Grout all bases.

2.11 HANGERS

1. All piping shall be supported by hangers, concrete inserts, and insulation saddles conforming to MSS-SP-58.

2. Hangers for cast iron pipe shall be spaced at least one per length, but not more than 7'apart. For steel and copper pipe, pipe shall be spaced not over 8' apart.

3. Vertical runs of pipe shall be supported by riser clamps except that pipe 1¼" and smaller may be braced by galvanized malleable iron fasteners.
4. Hangers for copper tubing shall be copper plated, and completely encircle the tubing. A hanger shall be placed no further than 24" from each change in direction of piping.

5. Hangers shall not be connected to or supported from other pipe, conduit or equipment, but shall be supported from building structure.

2.12 STRAINERS

1. Strainers to be self-cleaning ("Y" type), cast iron body installed ahead of all control valves and pumps; screens to be Monel or stainless steel with proper perforations for the service, ends to be screwed to 2" size, flanged for sizes 2½" and larger.

2. Provide ceramic magnets in each strainer used in systems containing iron.

PART 3 EXECUTION

3.01 EXCAVAION AND BACKFILL

1. This Contractor shall do all excavating and backfilling necessary and repair finished surfaces that are disturbed. Contractor shall remove or distribute all earth remaining as directed, and/or provide required backfill.

2. Excavate all substances encountered to the depths and sections shown on drawings. Excavation for pipes, manholes, catch basins, drain inlets, and other accessories shall have 12" clearance on all sides.

3. Areas adjacent to any excavation shall be graded to prevent water running in. Excavation shall not be carried below the required level, and if so carried; shall be backfilled with gravel or sand and tap to proper compaction.

4. This Contractor shall do bracing, sheathing, shoring, and pumping necessary for proper completion of the work and for protection of excavations or as required for safety. Temporary bridges or crossings shall be built where required to maintain traffic.

5. After proper inspection and tests all excavation shall be backfilled with approved material, free from large stones, clods or frozen earth, wood and other objectionable material. Contractor shall haul away excess material or provide additional fill as required.

6. Backfill for pipes shall be placed evenly and carefully around and over the pipe in six-inch minimum layers. Each layer shall be thoroughly and carefully rammed by hand until one-foot cover exists over the pipe. The remainder of the backfill shall then be placed, moistened and compacted to a density equal to that of adjacent original materials using mechanical tamping machines.

7. Backfill for sewage ejector and other structures shall be placed symmetrically on all sides in one-foot maximum layers and shall be compacted with mechanical or hand tampers to density equal to 90% of laboratory density in accordance with ASTM-D698 test.

8. Where trenches pass under footings backfill with tamped concrete, 2,500 psi minimum, around steel pipe sleeve.

3.02 INSTALLATION OF PIPING

1. All fittings, offsets, etc., may not be shown. Contractor shall determine their necessity by investigating conditions at the site.

2. Contractor shall use shop drawings for exact locations.

3. All piping above ground shall be run parallel with the lines of the building in the most direct manner, concealed in furred spaces where possible.

4. Pipes shall be cut accurately and placed without springing or forcing all burrs removed.

5. All water piping inside the building shall be properly graded to drain ½", hose outlet, angle drain valves.
6. All changes in size of piping shall be made by reducing fittings; no bushing will be permitted unless approved.

7. This Contractor shall determine, with approval, where expansion joints, loops or anchors will be required due to space restrictions prohibiting proper run-out flexibility.

8. Valves, air vents, balancing cocks, etc., shall be placed in accessible positions, and flush metal access doors, (12"x12" minimum size), with necessary lintels, etc., provided where they are concealed.

9. All piping shall be located to prevent freezing. Where pipe is located in areas subject to freezing, provide freeze protection and insulation. Refer to Specification Section 15185.

3.03 CLEANING OF GRAVITY SYSTEMS – INITIAL CLEANING

1. Prior to start of construction and/or renovation work, this Contractor shall provide a hydro-jet cleaning and a video inspection of the entire existing gravity sanitary system.

2. The cleaning shall be all sanitary pipe to 5' +/- outside of building.

3. This Contractor is responsible for all work and all cost of work. This Contractor shall utilize a certified independent sub-contractor using the latest technology to perform the hydro-jet cleaning and video inspection.

4. Work shall be done so that any debris and blockages encountered shall be removed. Take proper precautions (i.e. screening, etc.) to prevent the debris and material from entering the municipal sewer system.

5. Any blockages encountered which cannot be removed by hydro-jet cleaning shall be the responsibility of this Contractor to remove.

6. Any leaks encountered shall be reported to Owner.

7. At the completion, provide video with a written test report to Owner.

3.04 CLEANING OF GRAVITY SYSTEMS – FINAL CLEANING

1. At completion of project, prior to owner occupancy, this Contractor shall provide a hydro-jet cleaning and a video inspection of the newly installed gravity sanitary systems, storm system and acid waste system. The scope of work are all existing and new gravity systems installed in building and outside building as indicated in Section 3.03 for initial cleaning.

2. This Contractor is responsible for all work and all cost of work. This contractor shall utilize a certified independent sub-contractor using the latest technology to perform the hydro-jet cleaning and video inspection.

3. Work shall be done so that any debris and blockages encountered shall be removed. Take proper cautions (i.e. screening, etc.) to prevent the debris and material from entering the municipal sewer system.

4. Any blockages due to new construction work which cannot be removed by this hydro-jet cleaning shall be the responsibility of this Contractor to remove. Remove and replace all existing construction, pipe and equipment necessary to access pipe system to clean pipes and clean system to the satisfaction of the owner, engineer and local authorities having jurisdiction.

5. Any leaks due to new construction and/or renovation work shall be the responsibility of this Contractor to repair to the satisfaction of the owner, engineer and local authorities having jurisdiction.

6. At the completion provide video with a written test report to Owner.

3.05 DRAINAGE PIPING

1. All vent piping may not be shown. This Contractor shall install all vents that may be required by local authorities.

2. All piping shall be so installed that any point in the system can be cleaned by a standard-length snake.

3. It is intended that no horizontal pipe be built into masonry.

4. Vent piping shall be extended full size (minimum 3") above the roof. Offset vents at roof to clear structure.

5. Provide cleanouts at all traps, the bases of all stacks and rain conductors, changes of direction greater than 45 degrees and other points shown on drawings or required by authorities having jurisdiction, on 4" dia. pipe or less, maximum 75' and 5" dia. pipe and larger; 100' maximum. Cleanouts in buried piping shall be brought up flush to finished floors, outside to 18" below finished grade. Cleanout shall be full size for pipe up to 4", and 4" in larger pipes.

6. Exterior cleanouts shall be cast brass raised plug type.

7. Interior cleanouts shall be similar with polished nickel bronze access cover for flush mounting.

8. In concrete floors cleanouts shall be cast brass countersunk plug type with nickel bronze adjustable head and heavy duty scoriated cover.
9. Provide two-way cleanouts at all sanitary laterals at exterior of building.

10. Coordinate locations of all cleanouts with other trades. Relocate or add cleanouts when interferences occur at no additional cost to Owner.

11. Where pipe is installed in previously compacted fill, this Contractor shall be responsible, at no additional cost to Owner, to backfill and compact soil to within tolerances provided by Architect.

3.06 JOINING PIPE

1. Steel piping shall be of welded or flanged construction in sizes 2½" and larger; screwed or welded construction in sizes 2"and smaller. All screwed fittings to be cast iron unless otherwise specified. All threads shall be conformity with A.S.A. B-21.

2. All screwed pipe joints shall be made with Teflon Dry Thread Sealer (3M-#48) applied to male threads only.

3. Soldered joints shall be made with non-acid flux and lead-free solder (ASTM 32-60AT). Fluxes shall be used sparingly, and excess wiped from copper.

4. For domestic hot and cold water pipe branches 1½" below, contractor may use Pro-Press system.

3.07 JOINING DISSIMILAR METALS

1. Where copper is jointed to steel, joints shall be made by means of brass or bronze adapter in a cast iron fitting or by means of an electrochemically insulated union.

2. Hangers supporting copper tubing shall be copper, or copperized. Copper tubing lines shall not be, even temporarily supported or secured to ferrous metals.

3.08 FOUNDATIONS

1. Foundations shall be provided by this contractor for all equipment mounted on concrete floors and shall be of concrete construction not less than 6" high unless otherwise shown.

2. Details of all foundations shall be submitted for approval.

3. Foundations or footings for structural steel supports shall be carried to a point not less than 12 inches below the underside of the floor slab, except where rock is encountered at less depth, then foundation may set on the rock.

4. All foundations shall be built to templates and reinforced as required by the load to be imposed upon them.

3.09 STRUCTURAL STEEL

1. This Contractor shall furnish and install all structural steel, supports, braces, hangers, etc., required for his Contract unless shown as being supplied by others.

2. Structural steel shall conform to "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings", of the American Institute of Steel Construction, and where applicable, "Code for Welding Building Construction", of the American Welding Society.

3.10 ERECTION AND RIGGING

1. This Contractor shall do all rigging, hoisting and setting-in place of all equipment furnished by him or as shown on drawings or as specified herein.

3.11 NATURAL GAS

1. The gas piping system shall be installed, and final connections made as part of the section titled, "GAS PIPING".

2. Any contractor supplying gas-fired equipment shall leave such equipment complete and ready to operate so that only the final connection of gas piping will be required.

END OF SECTION
15115.6001

SECTION 15185 - INSULATION

PART 1 GENERAL

1.01 SCOPE

1. All surfaces throughout the work shall be insulated with fiberglass insulation as indicated in applicable section.

2. Removal, repair and/or replacement of existing insulation on all existing pipe and equipment due to new work or connection of new work to existing.

1.02 SURFACE TEMPERATURE

1. Where surface temperature can exceed 350° F. substitute calcium silicate insulation.

PART 2 PRODUCTS

2.01 PIPE INSULATION

1. All piping throughout the work shall be insulated with fiberglass pipe insulation in thickness, indicated in 3.04, of high density and with jacket indicated in the applicable section. (Except that outside thickness shall be doubled.) Vapor barrier jackets shall have self-sealing lap joint, and joints between sections shall be covered with a 4" wide strip to self-sealing vapor barrier materials.

2. Aluminum bands shall be applied, two to a section on all indoor insulation.

3. On outdoor installations, double insulation thickness and provide metal jacket banded or with sheet metal screws.

4. All pipe exposed in finished areas shall be painted color selected. Where insulation is subject to damage or is located below 7'- 0" AFF, insulation shall have stainless steel jacket with no exposed joints or seams.

5. All insulation shall be "plenum rated".

6. Provide protective covering for all exposed insulated storm pipe in new gym.

PART 3 EXECUTION

3.01 INSTALLATION OF PIPE INSULATION

1. All pipe insulation shall be applied over dry, clean surface with joints tightly butted and jacket firmly and securely attached and smoothed. Insulation shall be continuous through wall, floor or ceiling openings and sleeves.

2. All valve bodies and fittings shall be insulated with preformed fittings of thickness equivalent to adjacent insulation and jacketed with same material. At Contractor's option, except in plenums, outdoors and where not permitted by code; provide precut fiberglass insulation blanket of same insulation thickness as adjacent insulation with a preformed snap on type molded PVC jacket, cover edges with vapor barrier adhesive or vapor barrier tape.

3. Provide metal shields under all hangers or pipe supports on outside of insulation; on roller supports provide pipe shoe cavity with insulation. Provide insert between support shield and piping on piping 1 1/2" dia. and larger. Insulation inserts shall be heavy duty insulation material length 12" up to 6" dia. pipe 16" long on 8" & 10" pipe, and 22" long on 12" pipe and larger. **HANGERS SHALL NOT PENETRATE PIPE INSULATION.**

4. On outdoor insulation, double insulation thickness, provide metal jacket; and prefabricated, removable and replaceable metal jacket at fitting and valves.

5. Locate insulation and cover seams in least visible locations, neatly finish insulation at supports, protrusions and interruptions.

3.02 EQUIPMENT INSULATION

1. All equipment containing fluids whose piping is specified to be insulated or whose surface temperatures will be low enough to cause condensation (60° F.), or high enough to burn persons touching same (110°F.), shall be insulated with a minimum of 1½" thick fiberglass block firmly butted and wired in place, and covered with ½" thick coat of insulating cement troweled over one inch galvanized hexagonal wire mesh and finished cement troweled smooth. Metal corners beads shall be applied to protect corners.

3.03 INSULATION THICKNESS

1. Minimum pipe insulation thickness shall be in accordance with the ASHRAE 90.1-2007, local requirements, or the following table:

PIPING SYSTEM CLASSIFICATION	FLUID TEMP. RANGE,F.	INSULATION THICKNESS IN INCHES FOR PIPE SIZES		
		1"and LESS	1-1/4 to 2	2-1/4 to 4 and over
Domestic Hot Water Supply and Return	120-200	1"	1"	1"
Domestic Cold Water	40-60	1"	1"	1"

2. Where piping runs outdoors, double insulation thickness.

3. This Contractor shall provide heat tape (electric) to prevent freezing of outdoor piping and all other piping subject to freezing. Electric heat tape to be Chromalox Type M1 cable, furnished with all controls, power wiring and appurtenances. Size and capacity per manufacturers' requirements.

END OF SECTION
15185.6001

SECTION 15410 - WATER SUPPLY SYSTEMS (INTERIOR)

PART 1 GENERAL

1.01 SCOPE

1. The work under this heading shall include furnishing and installation of:

   A. All domestic water piping, insulation, plumbing material and specialties required for the proper functioning of the work. Connections to all equipment requiring domestic water connections whether furnished under this section or not. Sloped piping and valves to permit drainage of entire system.

   B. Connection to, modifications, extension, replacement, and/or removal of existing system and equipment for new work.

PART 2 PRODUCTS

2.01 PIPING MATERIAL

1. Water Services - Copper Tubing Type "L", Type "K" underground. All exposed piping under and adjacent to fixtures shall be chrome plated brass pipe. All pipe shall have lead-free solder.

2.02 HOT WATER RECIRCULATION PUMP

1. Hot water recirculating pumps shall be centrifugal pumps especially designed for domestic water service, B&G model NBF-9U/LW (or equivalent); 41 watts, 2,300 rpm, 1" dia. flange size, bronze fitted.

2. Provide B&G timer Model 113210 (or equivalent) and B&G aquastat Model AQS-1/2 (or equivalent) (3/4) to de-energize pump for all recirculation pumps. Pump shall have check valve and shutoff valve on pump discharge and shutoff valve on pump suction, all valves same size as recirculation line.

2.03 STORAGE WATER HEATER

1. Furnish and install domestic hot water heaters as shown on plans. Heaters shall have pressure temperature relief valved piped to receptor. Insulate in accordance with ASHRAE-90 requirements.

2. Fuel fired units shall have breeching and flues as required and as specified in Section 15860.

3. Provide emergency shutoff switches with all wiring per code.

4. Provide combustion air and interlock with combustion air to allow for operation of combustion air only during periods of use.

2.04 HIGH EFFICIENCY CONDENSING WATER HEATER

1. Furnish and install ultra-low nox packaged domestic hot water heater.

2. Unit shall have dual fan configuration, dual heat exchanger, built-in digital control and high temperature kit.

3. Unit shall be suitable for mounting on interior of building. Provide Unistrut support to allow for back to back mounting per manufacturer.

4. Provide inlet, strainer and water filter on incoming main from cold water tank.

5. Provide new combustion air intake and venting kits from manufacturer for combustion air tank Provide new vents and intakes thru wall or up thru roof as indicated on plans.

6. Unit shall comply with ultra-low nox requirement. (10NG/JNO)

7. Provide 2-year warranty.

2.05 STORAGE WATER HEATER EXPANSION TANK

1. Provide expansion tank on domestic hot water heaters where required and where heaters are installed with check valve on cold water and/or on installations with backflow preventers on main water service.

2. Expansion tank to be installed on cold water inlet to storage heater.

3. Tank shall be equipped with air inlet and water drain off and shall be diaphragm type tanks (Amtrol Therm-X-Trol Model ST or equivalent), where required provide ASME tanks.

4. Minimum tank volume shall either be as required by Amtrol Form ST-8-89 or equivalent or .11 gallons expansion tank per gallon of storage tank capacity, whichever is greater. Volumes based on 140°F. water temperature, for higher temperatures adjust volumes accordingly.

2.06 CONDENSATE NEUTRALIZING KIT

1. Provide condensate neutralizing tubes for each hot water condensate drain and all flue pipe condensate drains.

2. The condensate tubes shall be designed to raise the PH level 10-30 times more toward the neutral point of the PH being discharged by the hot water heating.

3. The neutralizer tube or tubes shall be Model JM (or equivalent), sized pre-manufacturer and as manufactured by JMM Boiler Works, Weil McLain model or equivalent.

4. Connect all vent condensate drains with P- Traps and unions before the neutralizing tubes.

5. All piping from heater and/or flue. Tube shall be PVC and supplied/installed by this Contractor. All PVC joints shall be glued in place and all barbed fittings shall be secured with tie wraps.

6. The condensate drains shall not be combined into one neutralizer. All piping shall be per manufacturer's piping diagrams and directions. All neutralizing tubes shall be secured to the floor or wall, so as not to be exposed to damage or within a normal walkway.

7. The Contractor shall inform the Owner of any maintenance or scheduled recharge of the tube's limestone aggregate as described in the manufacturers' Operation and Installation manual.

8. Maintenance of tubes shall be for the 2-year maintenance agreement per General Conditions.

PART 3 EXECUTION

3.01 INSULATION

1. See Section titled "INSULATION".

2. Domestic Cold Water, Hot Water and Hot Water Recirculating Line - Fiberglass with all service jacket.

3.02 STERILIZATION

1. After the tests have been completed, and before the system is put into operation, the entire water system shall be sterilized as required in Section 15015.

3.03 BALANCE COCKS AND RECIRCULATION SYSTEM

1. Balancing plug valves shall be installed in each branch of the recirculating system. Install thermometer in each branch of recirculating system near plug valve to facilitate balancing.

3.04 EXPOSED LINES

1. All domestic water pipe in finished areas shall be concealed in drywall and/or concrete block walls. Where installed in concrete block walls, pipe to be installed within cores and done without cutting block. Where it is not possible to locate in wall without removing block, this Contractor shall coordinate with general contractor location and sizes required. This Contractor shall cut and repair block. Finishing of block shall be suitable for painting.

2. Where is determined by construction manager and/or architects that pipe must be exposed in finished area, it shall be enclosed in sheet metal chase constructed per architectural details by this Contractor.

3. No pipe shall be allowed in finished areas, except where specifically indicated (backflow preventers, etc.) Pipe shall be insulated and protected per Specification Section 15185. Exposed pipe runnouts to fixtures shall be chrome plated.

END OF SECTION
5410.6001

SECTION 15420 - SOIL AND WASTE SYSTEM

PART 1 GENERAL

1.01 SCOPE

1. The work under this heading shall include the furnishing and installation of:

   A. All soil, waste and vent piping, including connections to sewers. All materials and specialties required for the proper functioning of the work. Connections to all equipment requiring soil, waste or vent connections whether furnished by this Contractor or not.

   B. Connection to, modification, extension, replacement, and/or removal of existing system and equipment required for new work.

PART 2 PRODUCTS

2.01 PIPING MATERIALS

1. Drainage Systems - Cast iron soil pipe. For all pipe in plenums and above grade, galvanized steel, copper tube, etc., may be acceptable if locally approved for underground and above sanitary.

2. Provide PVC pipe for underground pipe only.

2.02 JOINTS

1. Neoprene gasket joints may be acceptable if locally approved.

2. "No Hub" pipe, fitting and joint material may be acceptable if locally approved.

PART 3 EXECUTION

3.01 MINIMUM COVER FOR EXTERIOR LINES

1. Soil Lines – 3'-0"

3.02 PIPE INSTALLATION

1. Provide minimum slope of 1/8" per foot or as required by local code. Install cleanouts at lower ends of stacks, at each change of direction, where indicated, or required by local code. Support cast iron pipe risers at base of stack and at hubs.

2. Offset vent lines through roof to obtain minimum visibility from front of the building. Extend vents a minimum of 2' above roof line.

3. Flash vents passing through roof with sheet lead (6 lbs./Sq.Ft.). Extend lead vertically up pipe and turn down into bore 2" or terminate in special flashing collar. See Section titled "General Requirements - Flashings".

END OF SECTION
15420.6001

SECTION 15440 - GAS PIPING SYSTEM

PART 1 GENERAL

1.01 SCOPE

1. The work under this heading shall include the furnishing and installation of:

   A. All gas piping including all materials and specialties required for the proper functioning of the work. Connections to all equipment requiring gas connections whether furnished by this Section or not.

   B. Gas service in accordance with local regulations including meter pits if required or shown.

   C. Connection to, modification, extension, replacement, and/or removal of existing system and equipment as required for new work.

PART 2 PRODUCTS

2.01 PIPING MATERIALS

1. Steel pipe with malleable iron fittings unless otherwise required by local authorities. All underground piping shall be coated in accordance with the recommendations of the local utility. Use approved connectors and/or connection details for all equipment. All pipe above 2" dia. Shall be welded.

2. All gas pipe shall be painted "yellow" including but not limited to pipe on roof and above ceilings.

3. Label all gas pipes with "GAS – Gas Pressure".

2.02 GAS REGULATORS

1. All gas regulators shall be sized to handle the maximum connected load of equipment regulator serves and for the minimum and maximum pressure requirements of equipment.

2. All gas regulators shall be 15# burst rated. Indoor regulators shall be vented to outdoors and pipe type, termination locations, pipe size per regulator manufacturer.

3. All regulators shall be shipped with the proper spring (color coded), field installation not allowed.

4. All outdoor valves shall have pipe at vent to prevent moisture infiltration.

5. All valves to be installed in strict accordance with all gas company requirements.

6. Gas regulator installed outdoors shall be suitable for 0° F. operation.

PART 3 EXECUTION

3.01 MINIMUM COVER FOR EXTERIOR LINES

1. Gas - 3'6"

3.02 PIPE INSTALLATION

1. All gas piping shall be installed in accordance with the International Fuel Gas Code, NFPA-54 and the recommendations of the local utility including coating, ventilation and/or protection.

2. All gas pipe shall be painted "yellow" including but not limited to pipe on roof and above ceilings.

3. Label all gas pipes with "GAS - Gas Pressure".

3.03 CONNECTIONS TO EQUIPMENT

1. All connections to equipment shall have shut offs and drip legs and shall be in accordance with equipment manufacturer's requirements. All shutoff valves shall have ⅛" NPT plugged tapping for pressure testing. Verify final location and type of connection in field.

2. All connections to movable equipment shall have flexible connections, quick disconnects. All kitchen equipment shall have stainless steel flexible connections.

3.04 EXPANSION LOOPS

1. Provide expansion loops for all rooftop mounted pipe.

3.05 ROOFTOP PIPE

1. Provide roof supports per details on architectural plans and/or gas company requirements. Provide expansion loops.

3.06 GAS PRESSURE

1. All gas-fired equipment furnished under this Contract shall be rated to operate at minimum 5.0" w.c. gas operating pressure, unless otherwise noted.

2. Prior to installation of gas pipe, this Contractor shall verify the pressure requirement of all gas-fired equipment furnished under this Contract or under other Contracts

3. Where gas pressure exceeds 6.0" WC or where high pressure in excess of 14" WC is utilized, provide pressure regulators in all gas lines where appliances are not rated for higher gas pressure. Pressure regulators shall be sized and installed per manufacturers' requirement. All regulators installed indoors shall be vented outdoors.

END OF SECTION
15440.6001

SECTION 15450 - PLUMBING FIXTURES AND EQUIPMENT

PART 1 GENERAL

1.01 SCOPE

1. Furnish and install complete with all necessary trim, hangers, etc., all plumbing fixtures and equipment required for the Contract.

2. All handicapped fixtures shall be installed per American Disabilities Act (ADA) and applicable guidelines.

3. Install all fixtures at heights indicated on architectural plans.

4. Provide all offset piping and special tail pieces per manufacturer requirements to comply with clearances per ADA.

5. Adjust heights of carriers due to depressed floors in toilet rooms.

6. All fixtures, equipment and appurtenances where manufacturer and manufacturers' model numbers are specified shall be "or equivalent".

PART 2 PRODUCTS

2.01 **P-1** - WATER CLOSETS

1. American Standard "Afwall", (or equivalent) elongated rim, wall mounted bowl, siphon jet with 1½" diameter top spud. Aquameter 2257.103 with Sloan #8111 (or equivalent) battery powered sensor operated flush valve, 1.5 gal./flush. Note: Flush valve requires 25 psi minimum working pressure.

2.02 **P-2** - HANDICAPPED WATER CLOSETS

1. Wall mounted fixtures to be mounted so that height of water closet shall be 17" to 19" above finished floor to top of seat.

2. Seats shall not be sprung to return to a lifted position.

3. Flush valves and controls shall be installed in accordance with ADA guidelines Section 4.16.5 and 4.27.4.

2.03 CLOSET SEATS

1. Heavy duty, open front, cut out back, seat no cover, stainless steel check hinge, solid section, high impact polystyrene white seats.

2. Handicapped Applications - Provide seat cover where required to meet requirements of ADA, Section 4.16.5 and 4.27.4.

2.04 URINALS

1. **P-3** - American Standard "Lynnbrook" 6601.012, (or equivalent) vitreous china blowout urinal, wall hung, 1¼" top spud with Sloan #8180-1 battery powered sensor operated flush valve, 1.0 gallon/flush.

2. **P-4** - Handicapped - Mount as required for handicapped. For battery operated flush valves, use Sloan 8180-1.0 BD (beam deflector) (or equivalent).

2.05 WALL HUNG LAVATORIES

1. **P-5** - American-Standard "Lucerne", 20"x18" (or equivalent), vitreous china wall hung lavatory for concealed arms.

2. **P-6** - Handicapped Applications - Mount unit as required to maintain clearances per local codes.

3. All 20"x18" wall hung china lavatories shall be furnished with "TRUEBRO, INC. LAV SHIELD protective enclosure, Model #2018-AS-L1 or equivalent. Lav Shied shall be constructed of rigid high-impact, stain-resistant PVC, 0.093" nominal wall thickness, shall have UV protection and shall be furnished and installed with seven (7) virtually indestructible – tamper resistant stainless screws with wall anchors. Color shall be china white. Lav Shield shall fit all ADA-conforming 20"x 18" wall hung china lavatories. Lavatories shall paintable with acrylic enamel or latex paint. Lav Shield shall be UL listed in accordance with ADA Article 4.19.4 Flammability ratings; UL-94 V-0, 5VA ASTM D-635-91 4 (ATB) 2.1 (AEB). Lav Shield shall be listed for bacteria/fungus resistance per ASTM G21 and G22 – Result 0 growth.

2.06 LAVATORY TRIM

1. **P-5** – Sloan (or equivalent) BASYS sensor metering solar powered with battery powered hand washing faucet, sensor operated pedestal Model EFX-375.100.0100 (or equivalent) with below deck Model 170LF (or equivalent) thermostatic lead-free mixing valve and faucet and brass grid strainer.

2. **P-6** - "Handicapped Installation" – Similar to P-5 and insulate waste and hot water pipes under sink.

2.07 **P-7** - ELECTRIC WATER COOLERS

1. Halsey-Taylor Model HTV8BL-Q (or equivalent). Provide Self-contained, electric refrigerated wall-mounted bi-level water cooler with softly rounded corners and edges, designed to be easily accessible to physically challenged individuals. Finish to be selected by Architect.

2.09 SUPPLIES, TRAPS, CARRIERS, ETC.

1. Provide chrome plated supplies with screw driver stops for all fixtures.

2. Provide traps, deep seal where required, for all fixtures, chrome plated where exposed.

3. Provide Josam (or equivalent) carriers for all wall hung fixtures. All bases, where required, to be block type. with 4"x3" reducing bushings fabricated steel cabinet with flow control and fresh air inlet.

2.09 FLOOR DRAINS

1. **P-8** - Finished Spaces - Josam 30000-S (or equivalent) with square nickaloy strainer of recommended size with auxiliary inlet for trap primer.

   A. Floor drains installed in tiled floors shall be Josam 30000A (or equivalent) with square nickaloy strainer of recommended size and installed and coordinated with tile layout, so drains are located within the tile pattern in a manner to minimize cutting of tile.

2. **P-8A** – Acid-resistant floor drain.

3. Provide trap primers with J.R. Smith 2699 (or equivalent) for ALL floor drains.

2.10 SHOCK ABSORBERS

1. Josam 75000 Series (or equivalent) in size recommended by P.D.I. on each group of fixtures.

2. Install above chase in ceiling or install where accessible for service.

2.11 **P-9** - SCIENCE ROOM LAB SINKS (LS)

1. This Contractor to provide all domestic water, gas (where applicable) and acid resistant piping. Where indicated on plans, sink to be furnished and installed by general contractor and faucet and drain assembly to be furnished by general contractor and installed by this Contractor, see Section 15015.

2.12 **P-10** - SCIENCE ROOM INSTRUCTION TABLES (IS)

1. This Contractor to provide all domestic water, gas (where applicable) and acid resistant piping. Where indicated on plan, sink furnished and installed by general contractor, faucet and drain assembly to be furnished by general contractor and installed by this Contractor, see Section 15015.

2.13 **P-11** - EMERGENCY EYEWASH & SHOWER

1. Bradley Model S19-310 SC (or equivalent), 10" dia. showerhead with shower valve and pull chain, 10" dia. eye wash bowl with hinged cover, eyewash valve, 1¼" dia. pipe and fittings. Provide privacy curtain Bradley S19-330, water supply Lawler Model 911 (or equivalent), #8334 mixing valve. Locate mixing valve per architectural plans. 1¼" dia. from mixing valve to eyewash.

2.14 **P-12** - SCIENCE ROOM HANDICAPPED SINKS

1. This Contractor to provide all domestic water, gas (where applicable) and acid resistant piping. Where indicated on plan, sink furnished and installed by general contractor, faucet and drain assembly to be furnished by general contractor and installed by this Contractor, see Specification Section 15015.

PART 3 EXECUTION

3.01 INSTALLATION

1. All fixtures shall be installed after finished surfaces are complete; they shall be set neat and flush without damage to adjacent surface.

2. All equipment shall be installed in a neat workmanlike manner.

3. All floor mounted fixtures to be set on silicone caulking as further waterproofing.

END OF SECTION
15450.6001

SECTION 15475 - ACID RESISTANT WASTE VENT & NEUTRALIZING SYSTEM

PART 1 GENERAL

1.01 SCOPE

1. Furnish and install complete acid resistant waste and acid neutralizing interceptor system as shown on the drawings.

2. Leave equipment completely installed so that only the connection of auxiliary services is required to make ready for start up.

3. Provide all materials, miscellaneous equipment and interconnecting piping required for the proper functioning of the work.

4. Provide rough-in and final connection for connection to fixed equipment as specified in Section 15015.

1.02 ACID NEUTRALIZING SUMP

1. Furnish and install where indicated on drawings, an acid neutralizing sump. Sumps shall be located in casework for science room. Unit shall have bolted cover and shall have a vent opening.

2. Connections to sump may be either hub end with caulked joint or threaded.

3. The neutralizing medium with each sump is filled up to the invert of the inlet, should be marble or limestone in pieces of not less than 1" and not more than 3" in size.

4. Materials shall be either calcium or magnesium carbonate or both with a calcium carbonate equivalent of at least 90%. Agricultural limestone meets this specification.

5. Acid neutralizer tank size shall be as indicated on plans and Orion Style 8 or equivalent, nominal 1-1/2 -gallon capacity 12-1/2 x 8-1/2 x 9" H. Locate sump vent pipe in furniture coordinate with general contractor.

6. Provide acid resistant pipe from sink to inlet. Provide acid resistant vent pipe with vent thru roof.

1.03 PIPING MATERIALS

1. Piping material to be as specified in Section 15115.

2. Joints for all piping in easily accessible spaces up to 3" diameter shall be mechanical type or heat fusion.

3. Joints for all piping in accessible spaces 4" dia. and over shall be made by heat fusion only.

4. Joints for all piping in concealed spaces shall be made by heat fusion only.

1.04 EXECUTION

1. Provide acid resistant cleanouts at lower ends of stacks at each change of direction where indicated or where required by local code.

2. Provide minimum slope 1/8"/ft. and minimum 2" diameter on all underslab pipe, or as required by code.

3. Locate neutralizing sump in pit (pit by general contractor). Provide shop drawing and information on sump and piping to general contractor. Coordinate sleeves, pit depth, and all details with general contractor.

END OF SECTION
15475.6001

SECTION 16100 - GENERAL ELECTRICAL

1. GENERAL PROVISIONS

1.1 The applicable provisions of the Division 1 General Conditions, Supplemental Conditions, Special Contract Requirements, Amendments and Additions to the General Conditions, and all project addenda are hereby made an integral part of this section.

1.2 These specifications apply to all electrical work performed.

1.3 When apparent conflict exists between these specifications and the contract drawings, within the specifications, or within the drawings, the engineer will determine the intent.

1.4 The term "provide" means "furnish and install". The terms "contractor", "E.C.", and "EC" mean "electrical contractor", unless otherwise noted. All work indicated in specifications division 16000 and on the electrical drawings is by the electrical contractor, unless otherwise noted.

1.5 The terms "unless otherwise noted" or "unless otherwise indicated" in any form of wording mean "unless specifically indicated otherwise on the electrical drawings, in the electrical specifications, or in the General Conditions and Requirements to the specifications and/or contract". These terms do not mean "unless indicated otherwise on the general construction, mechanical construction, or other disciplines' drawings or specifications", except where specifically so worded on the electrical drawings or electrical specifications.

1.6 Materials and equipment manufacturers and catalog numbers specified constitute the type and quality of design, material, workmanship, ruggedness of construction, resistance to vandalism, exact operating and performance characteristics, features, configuration, dimensions, etc.. Where multiple manufacturers are shown in the drawings and/or specifications, not all manufacturers shown may be capable of providing materials and equipment meeting the specifications, field conditions, etc.. Manufacturers not specifically shown on the drawings or specifications shall be considered, provided the products are equivalent or superior to the requirements of the drawings and specifications (including equivalent or superior to products and/or manufacturers specifically shown on drawings and specifications). Manufacturers, whether shown on the drawings or specifications or not, are acceptable only if they can meet the specifications, conditions, and requirements specific to this project. The terms "equivalent", "equal", "equaling", and "approved equal" mean "equivalent or superior to the item/process specified when approved by the engineer", unless otherwise noted.

1.7 For any equipment indicated on the drawings or specifications as furnished by the owner (or furnished by any other party, including other contractors, subcontractors, or third parties), contact the furnishing party prior to submitting bid to obtain all requirements of such equipment as necessary to provide a complete installation. Provide all ancillary equipment as necessary which is not furnished but which is required for a complete installation of owner furnished equipment.

2. SCOPE OF WORK

2.1 The work governed by these specifications consists of providing all labor, materials, equipment, services, and related items/work necessary to complete all the electrical work as indicated and described in the drawings and specifications.

2.2 Electrical work includes but is not limited to:

A. Electric service and service equipment
B. Power distribution and wiring
C. Interior and exterior lighting
D. Emergency power and lighting
E. Utilization equipment connections
F. Fire alarm system modifications
G. Telephone raceway/pathway system
H. Temporary power and lighting

3. CONTRACT DRAWINGS AND SPECIFICATIONS

3.1 Drawings are diagrammatic and indicate the general arrangement of the various systems and approximate and relative locations of the materials and equipment defined by the specifications. Coordinate with and obtain the approval of the owner, architect, and engineer for the exact locations of all materials and equipment. Check the drawings, specifications, and all fabrication and shop drawings (including fabrication and shop drawings of other trades) to verify space conditions, headroom requirements, characteristics, and for coordination. Where space conditions and headroom requirements appear inadequate, notify the engineer before submitting a bid. No extra consideration, claims, charges, or compensation will be granted under any circumstance for failure to notify the engineer, or for any alleged misunderstanding of the requirements above. Completely furnish, install, connect, and interconnect all components of all systems in accordance with contract requirements, manufacturer's instructions, applicable codes and standards, and best practices of the trade.

3.2 Minor deviations, variations, changes, and corrections from layouts shown on the drawings (based on coordination, conditions, manufacturer's instructions, codes and standards, shop drawings, and verification of measurements and conditions) are permitted to facilitate construction provided the changes do not represent potential changes in scope of work (see the section of these specifications "Changes to the Scope of Work") and provided the changes are acceptable to the owner, architect, and engineer.

3.3 Before submitting bid, examine and check all drawings and specifications relating to all work, including electrical, mechanical, plumbing, general construction, fire protection, and any other trades' drawings and specifications (as well as Division 1 General Conditions) and become fully informed as to the extent and character of work required and its relation to the work of other trades. No extra consideration, claims, charges, or compensation will be granted under any circumstance for any alleged misunderstanding of the work to be performed, or the force and intent of these specifications.

4. VISIT TO SITE

4.1 Before estimating work, visit the project site and verify all measurements and field conditions affecting the work. The contractor is fully responsible for the correctness of all measurements and for any connections to existing work. Submission of bid is considered evidence that this contractor has visited and examined the site. No extra consideration, claims, charges, or compensation will be granted under any circumstance for extra work as a result of the contractor's failure to visit the site or verify conditions and measurements.

5. VERIFICATION OF MEASUREMENTS AND CONDITIONS

5.1 The electrical contractor is solely responsible for verifying field measurements, conditions, and drawing and specifications information (for all trades) before ordering materials and equipment and before commencing work. The electrical contractor is solely responsible for verifying shop drawings (including shop drawings of other trades) before releasing related materials and equipment and before rough in. No extra consideration, claims, charges, or compensation will be granted under any circumstance due to any differences between the actual dimensions and any dimensions indicated on the drawings.

5.2 Report any apparent discrepancies or conflicts found at once to the engineer for consideration and wait for a decision before proceeding with any work in the affected area.

5.3 The engineer's decisions in cases of discrepancies, conflicts, and related to verification of measurements and conditions are final and binding upon the contractor, make all installation accordingly.

6. EXISTING CONDITIONS AND UTILITIES

6.1 Information and data indicated on the drawings regarding existing conditions (including underground utilities) is from the best available sources. However, no assurance is made as to completeness and/or accuracy.

6.2 Contact all utility companies operating in the project vicinity (water, gas, sewage, electric, telephone, cable television, etc.) and the owner's maintenance department (where applicable) and verify all existing underground systems before any excavation commences. Utilize applicable "one-call" or "before you dig" utilities marking services, including paying all associated fees.

6.3 Relocate any existing underground electrical feeders and wiring in areas of construction and around proposed foundations as applicable. Include all costs in bid. If any third-party owned wiring or equipment interferes with construction, notify the engineer.

7. ITEMS NOT SHOWN OR SPECIFIED

7.1 Provide any items of material not indicated on the drawings and/or not specified, but which are required for the complete and proper installation and/or operation of any part of the work, as if indicated and specified.

7.2 Provide any work not indicated on the drawings and/or not specified, but which is required for compliance with applicable codes and regulations, as if indicated and specified.

7.3 No extra consideration, claims, charges, or compensation will be granted under any circumstance for performing work required for complete and proper installation/operation or required for compliance with applicable codes and regulations.

8. REGULATIONS AND CODES

8.1 Perform work in accordance with all respective requirements of the latest adopted editions (as of the date of electrical construction permit approval) of all applicable federal, state, and local codes, standards, regulations, ordinances, laws, etc. and industry standards. This includes applicable requirements of the National Electrical Code (NEC), National Fire Protection Association (NFPA), American National Standards Institute (ANSI), Americans with Disabilities Act (ADA) (as well as all related state disabled access and/or barrier free codes and standards and ANSI A117.1), International Building Code (IBC), International Energy Conservation Code (IECC), International Residential Code (IRC), Factory Mutual (FM), Illuminating Engineering Society of North America (IES, IESNA), Institute of Electrical and Electronic Engineers (IEEE), Insulated Power Cable Engineer's Association, National Electrical Contractors' Association (NECA) "Standard of Installation", National Electrical Manufacturer's Association (NEMA), National Electrical Safety Code (N.E.S.C.), Underwriter's Laboratories (UL), United States Department of Labor Occupational Safety and Health Administration (OSHA), utility companies requirements, etc..

8.2 Where listing or labeling (in any form, i.e. UL, CSA, ETL, etc.) is indicated in the drawings or specifications or is otherwise required by the NEC or other applicable code, provide equipment and materials as either listed or labeled by a qualified product evaluating organization (UL, CSA, ETL, or equivalent) acceptable to local authorities having jurisdiction. Include all costs in bid. No extra consideration, claims, charges, or compensation will be granted under any circumstance associated with providing listed equipment.

A. The electrical contractor is fully responsible for verifying (before submitting bid) the applicability and extent of code required listing with local authorities. Specifically verify if the municipality has any requirements that "listable" (capable of being listed) products must be "listed". Provide accordingly where applicable.

B. Submission and/or approval of shop drawings (which may or may not show listing) do not relieve the contractor of the responsibility to meet listing requirements.

C. Where products required (by specifications/code) as listed are installed without listing or as non-listed (without prior written approval), the contractor shall remove the products and install listed products at no cost to the owner. Written approval will only be considered if all of the following are satisfied:

1) The contractor is fully responsible for (including all costs) and must prepare and submit any and all information necessary for review and evaluation of products (by the authority having jurisdiction, engineer, architect, and owner). This includes all processing costs for all parties involved and costs for any special or independent third party inspections, investigations, evaluations, engineering services (including sealing by a registered professional engineer), etc. which may be required or requested in conjunction with approval. In the absence of listing, the contractor is fully responsible for proving that products are acceptable.

2) The contractor must show one (1) or more of the following:

a) That listed products are not available.
b) That providing available listed products involves excessive costs or hardships.
c) That listing of products involves requirements that unreasonably exceed the requirements of the specifications, codes, and project conditions.

3) Products must meet or exceed all specified requirements, industry standards, code requirements, and conditions specific to the project.

4) There must be no change in contract price (except that the owner reserves the right to require credit pricing).

5) Where acceptable to the owner.

8.3 Where NEC article numbers are referenced in the drawings and specifications, they apply to the latest edition. Where the authority having jurisdiction has not adopted the latest edition, refer to the corresponding applicable code requirement article.

9. PERMITS, CERTIFICATES, AND FEES

9.1 Apply for, obtain, pick-up, and pay for (pay all costs associate with) all permits, licenses, certificates, etc., required for execution of the project. Procure all permits immediately upon notice to proceed with the contract. The contractor is fully responsible for verifying all permits, licenses, certificates, etc. which are required. Submit (see the section of these specifications "Summary of Submissions") copies of all permits, licenses, certificates, etc. in conjunction with this project for record. Prepare all information and data for submittal to any authority in order to obtain permits and certification of compliance for the permits. This specifically includes this contractor reproducing contract drawings for permit submission, which shall be sealed by the electrical engineer upon request.

9.2 Obtain and submit (see the section of these specifications "Summary of Submissions") six (6) copies of inspection certificate(s) from authorities having jurisdiction indicating approval of the electrical installation. Arrange and pay for all electrical inspections (performed by an approved Underwriters Inspection Agency) associated with inspection certificate(s).

9.3 If and when requested by the owner or owner's representative, the electrical contractor shall submit to the owner any information necessary as part of the owner's application or submission for applicable grants, rebate programs, reimbursement programs (including, but not limited to, energy rebate programs such as "smart start" or "clean energy"), or other similar/related programs. Submit all required documentation, including, but not limited to, detailed pricing information on materials and/or labor, bills of materials, invoices, receipts, counts, take-offs, other related cost information, submittals, shop drawings, etc.. Compile information in format as directed by the owner or owner's representative including tables and other formats as requested.

10. GUARANTEE AND WARRANTIES

10.1 The electrical contractor is fully responsible to guarantee all electrical equipment and work (applies to all materials and equipment, including lamps for luminaires) and is fully responsible for all manufacturers' warranties from material purchase (by the contractor), through the date of final acceptance by the owner, to the expiration date(s) of the guarantee and warranties. Guarantee and provide warranties for a period after the date of final acceptance by the owner as per Division 1 General Conditions, unless longer periods are specifically indicated otherwise on the electrical drawings or specifications. Guarantee/warranty periods of less than two (2) years after date of final acceptance are not permitted under any circumstance.

10.2 Wherever "warranties" are indicated elsewhere in the specifications, provide and submit (see the section of these specifications "Summary of Submissions") written manufacturers' warranties for equipment. Include all costs in bid associated with providing specified warranties periods (including purchasing any required extended or special warranties to meet the specified periods). Submission of written warranties showing periods, conditions, or coverage of less than the periods, conditions, and coverage specified does not relieve the contractor or manufacturers of the responsibility to provide warranties with periods, conditions, or coverage as specified. Manufacturers' warranties do not relieve the contractor of any responsibility associated with the electrical contractor's guarantee.

10.3 The electrical contractor shall guarantee, and respective manufacturers shall warranty equipment and materials from defects in workmanship, materials, and operation. Provide guarantee/warranties including all service, maintenance (excluding routine maintenance), materials, labor, travel, all other work, and all expenses required as part of guarantee/warranties. Provide all guarantee/warranties service at no extra cost to the owner under any circumstance. Provide all guarantee/warranties service in timely manner.

10.4 Completely replace or repair, to the satisfaction of the owner, any equipment (as part of this project) improperly installed or damaged before or after installation until expiration of the guarantee period. Completely replace or repair, to the satisfaction of the owner, any equipment (including existing equipment and equipment installed by any other contractor or party) damaged by the electrical contractor (or any subcontractor thereof).

11. SEQUENCE OF WORK

11.1 Perform work in areas or general sequences (including applicable project phasing) as determined and directed by the owner and architect. Submit (see the section of these specifications "Summary of Submissions") a complete schedule of construction for approval, showing delivery of equipment, erection of equipment, pertinent work related to installation, and when equipment will be placed in operation. Fully coordinate exact sequencing, phasing, and scheduling with all contractors, the architect, and the owner in detail and obtain approval of sequencing, phasing, and scheduling before starting work.

11.2 Perform all work in such a manner and associated with sequencing, phasing, and scheduling as applicable and include all costs and manpower allocations in bid. For example, to complete a particular sequence or phase of the work, it may be necessary to perform work in physical areas of the project areas which are covered by and/or part of prior phases or subsequent phases of work (i.e. work in initial phases of the project may involve installing the electrical service and electrical distribution equipment in areas which are proposed for renovation as part of a later phase; this would require installing the electrical service and electrical distribution equipment as part of the initial phase). Verify all such conditions, implications, requirements and include costs in bid. No extra consideration, claims, charges, or compensation will be granted under any circumstance for sequencing, phasing, and scheduling.

11.3 Maintain service at all times (except as provided elsewhere in the drawings and specifications for shutdowns) and minimize disruptions to all active areas, activities, and operations in and around the scope of work. This specifically includes activities and operations of the owner, third parties in the vicinity of the project, roads and highways surrounding the project, and utility companies serving the project. Coordinate specific requirements with the owner before submitting bids.

12. CHANGES TO THE SCOPE OF WORK

12.1 Changes to the scope of work include any change effecting the overall nature or cost of the project. Examples of changes to the scope of work include, but are not limited to, additions or deletions of equipment or items of work, substitutions not equivalent or superior to equipment specified, substitutions with characteristics or operation varying from equipment specified, changes which effect the ultimate use or functioning of equipment or areas of the building, changes considered to be "substantial", any change which any party (contractors, sub-contractors, owner, architect, engineers, etc.) believes may involve a possible change in contract price, etc..

12.2 Make all changes to the scope of work in complete accordance with the general conditions of the specifications. Submit (see the section of these specifications "Summary of Submissions") changes to the scope of work immediately upon proposal of changes. Do not proceed with any work associated with or affected by changes to the scope of work unless the owner approves changes in writing or authorizes proceeding in writing.

12.3 All applicable provisions of the contract drawings and specifications, including addenda and prior changes, apply to all changes to the scope of work, unless specifically indicated otherwise.

12.4 In addition to all requirements of the general conditions, submit all pricing related to changes to the scope of work as indicated below. Pricing will not be reviewed until the required breakdowns (summarized below) are submitted.

12.5 Submit pricing for a proposed change to the scope of work with detailed breakdown as follows.

A. Submit a complete detailed breakdown of all material associated with the proposed change in scope of work. Itemize each unit of material and the respective cost.

B. Submit a complete detailed breakdown of all labor associated with each respective item of the above material breakdown. Itemize labor hours and classification for each item of material. Summarize total labor costs, broken down by worker classification and/or billing rate.

12.6 Where instructed to proceed with a change to the scope of work on a time-and-material (T&M) basis, submit pricing with detailed breakdown as follows.

A. Submit a complete detailed breakdown of all material. Submit copies of all receipts, invoices, and stock material lists.

B. Submit a complete detailed breakdown of all actual labor hours. Submit copies of time sheets. Summarize total labor costs, broken down by worker classification and/or billing rate.

13. TEMPORARY POWER AND LIGHTING

13.1 For this specification section only, the term "responsible" (in any form) means "responsible to pay all costs (pay to the electrical contractor) to erect the described work". For this specification section only, the term "erect" (in any form) means "furnish, install, maintain, and remove".

13.2 The electrical contractor is responsible for temporary power and lighting service/source and distribution during construction. Provide service capacity sufficient for construction. Provide service including any required utility or private metering.

13.3 The electrical contractor is responsible for all temporary lighting, all 120 V power for small construction tools, and all other temporary power not exceeding 120 V or 20 A. Power for large tools and equipment exceeding 120 V or 20 A (including arc welders, etc.) is the responsibility of the contractor requesting such power. Temporary power during construction (exceeding 120 V or 20 A) to permanent equipment installed as part of this project (for installing, testing, operating, etc., including mechanical equipment, elevators, etc.) is the responsibility of the contractor requesting such power.

13.4 Where a general contractor's construction trailer is present, the electrical contractor is responsible for a minimum 60 A, maximum 200 A single phase service to the trailer. Provide service including any required utility or private metering. Temporary service to any other contractor or subcontractor trailer is the responsibility of the contractor requesting such service.

13.5 Where utility power is not available and during shutdowns of utility power, the contractor requesting power under these conditions is responsible for providing portable generator(s), associated temporary wiring, and fuel (sufficient to meet power requirements during these conditions). Generator power to owner loads during construction is not required (unless specifically indicated on the drawings).

13.6 The electrical contractor is responsible for temporary power to existing and/or other owner loads, equipment, and wiring as indicated on the drawings.

13.7 The electrical contractor shall erect all temporary power equipment and wiring for a complete temporary power installation, regardless of the contractor who is responsible for the temporary power.

13.8 Erect all temporary power and lighting during construction in accordance with OSHA and the NEC. This includes required ground fault circuit interrupter (GFCI) protection for personnel and "assured grounding program".

14. TESTING

14.1 After completing installation of equipment and wiring and prior to energizing or placing in service, test all electrical equipment, conductors, systems, and each and every part thereof to insure continuity, proper splicing, freedom from unwanted grounds, acceptable insulation values, proper operation and functioning, and a complete workmanlike installation to the satisfaction of the engineer and owner.

14.2 Completely test all equipment installed. This includes all equipment furnished and installed by the electrical contractor as well as equipment furnished by others and installed by the electrical contractor and equipment furnished and installed by others and wired by the electrical contractor.

A. Visual and mechanical checks are required for all equipment (including all panels, switches, circuit breakers, motors, motor starters, and all other equipment) without exception.

14.3 Test all equipment and wiring as per the latest edition of InterNational Electrical Testing Association (NETA) standards (Acceptance Testing Specifications (NETA-ATS) for new equipment/wiring and Maintenance Testing Specifications (NETA-MTS) for existing equipment/wiring), unless indicated otherwise. For each piece of equipment, perform testing as shown for that equipment in respective NETA standards. Where equipment is not specifically shown in NETA standards, perform testing as shown for equipment most closely resembling the equipment to be tested. Perform all tests shown in respective NETA standards, unless indicated otherwise. Tests shown as "optional" in NETA standards are not required unless specifically indicated otherwise on the drawings or specifications. Utilize suitable instruments in making all tests, as per NETA standards. Battery, magneto, or similar hand-held testers may be used for preliminary conductor continuity checking but are not acceptable for final results, which must be obtained utilizing proper equipment only (i.e. meg-ohm meter, etc.).

14.4 Provide all testing performed by a NETA accredited independent testing firm employed by the electrical contractor, unless indicated otherwise. Provide visual and mechanical checks shown in the NETA standards, testing of transformers 225 kVA and less (with primary and secondary voltages 600 V and less only), and testing of panels, switches, and circuit breakers 1,200 A and less and 600 V and less performed by the electrical contractor's direct employees or by the independent testing firm (at the contractor's option). Provide continuity and insulation resistance meg-ohm meter testing of 600 V and less conductors performed by the electrical contractor's direct employees only.

14.5 If requested by the owner or engineer, utilize a recording type (i.e. "Dranetz") meter to measure phase-to-phase voltage, phase to neutral voltage, phase currents, harmonic content, and surges in the system. Perform testing for a period of one (1) week. Completely set up and take down meter and submit printout tapes formal test results.

14.6 For all testing performed, submit (see the section of these specifications "Summary of Submissions") complete typewritten and tabulated test results for review and approval by the engineer and owner. Submit test result bound together in a single three-ring binder (one (1) binder per set of test results) including a table of contents. Submit quantity of sets as directed in the General Construction specifications, but in no case less than three (3) sets. Submit results upon project completion, except under conditions below.

14.7 Where any abnormal, questionable, "failing", or "borderline" test results are encountered or where discrepancies are noted during testing, submit results immediately to the engineer before energizing equipment. Do not energize until authorized in writing by the engineer. Test results submitted under these circumstances are not required to be bound or complete.

14.8 Where connecting to or otherwise modifying existing wiring, test wiring as follows.

A. Test existing wiring before performing work to confirm integrity (where testing is performed, the electrical contractor is not responsible for the prior existing condition of wiring).

B. Test new wiring before connecting to existing wiring.

C. Test connections of new to existing wiring (test new wiring and existing wiring together) and modified existing wiring after performing work.

Where this testing is not performed, the condition of existing wiring will be assumed to be a direct and sole result of work performed and the electrical contractor will be held fully responsible for the condition of existing wiring. Where this testing is not performed and where existing wiring is not in acceptable condition for maintained use or service, the electrical contractor shall repair or replace wiring to the satisfaction of the owner at no cost to the owner.

15. SUBSTITUTIONS

15.1 Materials and equipment manufacturers and catalog numbers specified constitute the type and quality of design, material, workmanship, ruggedness of construction, resistance to vandalism, exact operating and performance characteristics, features, configuration, dimensions, etc.. The engineer will consider substitutions of similar equipment superior to specified equipment (meeting or exceeding all characteristics of the specified equipment).

15.2 Submit shop drawings associated with substitutions complete with documentation necessary to establish compliance with the specifications (see the sections of these specifications "Shop Drawings" and "Summary of Submissions"). Submit samples of substitutions where requested (see the sections of these specifications "Samples" and "Summary of Submissions"). If documentation and/or samples are not submitted when required, the request for substitution will be denied.

15.3 Determination of compliance with specifications rests with the engineer. When a request for substitution is denied, furnish the equipment specified. The engineer's decisions in cases of substitutions are final and binding upon the contractor, provide equipment accordingly.

15.4 Pay all costs associated with a substitution where granted. For the provisions of this section, "substitutions" includes equipment where characteristics or operation vary significantly from equipment specified (including equipment of the specified manufacturer). This includes costs incurred by any party (electrical contractor, other contractors, sub-contractors, owner, architect, engineers, etc.), costs resulting from differences of details, configuration, ratings, operation, characteristics, and dimensions between the specified and substituted equipment, costs to provide features of the specified equipment which may be manufacturer's options of the substituted equipment, and costs to remove and replace work already installed and any other remedial work as a result of substitutions. Approval of substitutions is conditional upon there being no cost change to the contract, unless specifically indicated on the shop drawings submittal and corresponding approval. The electrical contractor is fully responsible for coordinating with the owner, architect, and other trades to identify all possible cost impacts associated with any substitution before releasing equipment and before any party proceeds with work effected by the substitution.

15.5 Submit bid based on the items as specified. Substitutions will be considered only after a contract has been awarded.

16. SHOP DRAWINGS

16.1 Submit a product list indicating all proposed items of products, materials, and equipment as directed in the general construction specifications.

16.2 Submit (see the section of these specifications "Summary of Submissions") shop drawings of all equipment and materials proposed to be furnished for review and approval by the engineer. Submit quantity of sets as directed in the general construction specifications, but in no case less than ten (10) sets.

16.3 Submit shop drawings for all equipment and materials including, but not limited to luminaires, solid state energy saving ballasts, raceways, conductors, cable, termination methods, grounding, wiring devices, safety switches, enclosed circuit breakers, branch and distribution panels, transformers, contactors, time clocks, photocells, fire alarm system, emergency power and lighting system equipment, engraved plastic nameplates, and any other items requested by the owner, architect, any code official, or engineer.

16.4 Stamp or mark shop drawings with the contractor's approval, as evidence that they were checked for accuracy and that all dimensions, characteristics, ratings, operation, features, data, relation to existing conditions, and coordination with work and shop drawings of other trades were completely verified before submission. Approval of shop drawings by the engineer does not relieve the contractor of responsibilities to review shop drawings in detail, to comply with drawings and specifications, for errors contained in shop drawings, for coordination, and to provide equipment as listed.

16.5 Where any characteristics, ratings, operations, or features differ from the specified equipment (where not equivalent or superior to the characteristics, ratings, operations, and features of the specifications and specified equipment), circle, highlight, or otherwise clearly designate and identify the specific differences.

16.6 In the event that shop drawings are not acceptable to the engineer (including as provided below for conditional approval), submit acceptable shop drawings within seven (7) days of notification.

16.7 Approval of shop drawings, including approval of substitutions, is conditional that there is no cost change to the contract, unless specifically indicated on the shop drawings submittal and corresponding approval.

16.8 Approval of shop drawings is conditional upon the contractor fully and completely complying with all review comments by the owner, architect, and engineer. Where the contractor fails to or is unable to fully and completely comply with every review comment, then the shop drawings are *disapproved* (whether or not they are stamped or noted as "approved" in any manner in any review comment) and must be resubmitted as within seven (7) days (as indicated above). Immediately upon receipt of shop drawing review comments, the contractor is responsible for carefully reviewing all comments in detail and for complying with comments. Where unable to fully satisfy any comment or where the contractor takes exception to any comment, revise and resubmit acceptable shop drawings (or, where taking exception, notify the engineer in writing) within seven (7) days. Where the contractor fails to comply with these requirements (including resubmitting/notifying within the seven (7) day period specified), the contractor shall provide acceptable equipment meeting all specified requirements and all review comments (including removing unacceptable equipment [if installed] and replacing with acceptable equipment) at no cost to the owner.

16.9 Do not release equipment until shop drawings are approved. The electrical contractor is responsible for all changes where equipment is released before approval and/or where equipment does not comply with all approval conditions.

16.10 In addition to the quantity of shop drawings submitted for approval (see above), submit one (1) copy of *approved* shop drawings to the general contractor, the mechanical contractor, and each other contractor and trade for review and coordination. The electrical contractor is not required to submit copies direct to subcontractors or vendors to other contractors (this is the other contractors' responsibility). The electrical contractor is responsible for all changes and other costs where the electrical contractor fails to submit shop drawings to other parties for coordination.

16.11 Obtain copies of all shop drawings relating in any way to electrical work from all other contractors, subcontractors, and trades. Review shop drawings and coordinate with electrical work. Notify the architect and engineer immediately where discrepancies are found. The electrical contractor is responsible for all changes and other costs where the electrical contractor fails to obtain shop drawings or fails to coordinate shop drawing information. Approval of other trades submittals by the architect or engineers (or lack of review by the architect or engineers) does not relieve the electrical contractor of the responsibility to review other trades shop drawings in detail and for coordination.

16.12 No extra consideration, claims, charges, or compensation will be granted under any circumstance associated with any party's failure or delay in properly submitting, transmitting, obtaining, reviewing, and/or coordinating shop drawings.

17. SAMPLES

17.1 Submit (see the section of these specifications "Summary of Submissions") samples of materials and equipment for approval only where specifically requested by the owner, architect, or engineer. Submit samples along with complete catalog data, installation instructions, operating and maintenance (O&M) information, etc. specifically applying to the samples submitted, to facilitate proper evaluate the quality of the sample. Specifically designate and identify each sample as to the service and location where each sample is to be used on the project.

17.2 Submit samples within 30 days of the engineer's request, except where the sample is ancillary to a substitution. Where samples are ancillary to a substitution, submit samples within seven (7) days of the engineer's request.

18. AS-BUILT DRAWINGS, MANUALS, AND DEMONSTRATION

18.1 Prepare and submit (see the section of these specifications "Summary of Submissions") as-built record drawings showing conditions exactly as installed.

A. Indicate the exact locations and elevations of all equipment and devices and underground, concealed, and hidden work (including raceways, junction and pull boxes, etc.).

B. Indicate exact layout, connections, and conductor routing for all grounding.

C. Indicate all substitutions and changes, including updated lighting fixture/luminaire schedule, symbol list, list of alternates, etc..

D. For underground work, specifically indicate exact conditions accurately. Where underground wiring does not run straight and direct between visible and obvious equipment, objects, or markers (i.e. markers specifically placed to identify underground work [specifically note the presence and approximate location of all markers on as-built drawings]), clearly, accurately, and exactly *mark* and *dimension* exact underground work (including all bends) from visible permanent landmarks. Acceptable visible permanent landmarks include building walls, retaining walls, curbs, foundations, pole bases, etc.. Lines, joints, and markings on pavements are not considered permanent (since they would be covered by re-paving). Acceptable markers for placement to identify underground work include a 0.9 m (3'0") long piece of 102 mm (4") conduit installed vertically in the ground (top flush with grade) completely filled with concrete (or other similar means providing equivalent or superior visibility, durability, and permanence approved by the engineer). Where the contractor does not include this exact marking/ dimensions on as-built drawings or where marking/dimensions are inaccurate (allowing for a tolerance of not greater than 0.6 m (2'0") away from actual locations), the electrical contractor will be held responsible if underground facilities are damaged in the future (where due to lack of or inaccurate marking/ dimensioning).

18.2 During the progress of work, maintain accurate records of all deviations, variations, changes, and corrections from layouts shown on the drawings/specifications on a "record working" set of drawings and specifications kept at the job site for this purpose.

18.3 Upon completion of work, incorporate all information from the "record working" drawings/specifications onto a "marked-up as-built" set of drawings/specifications. Submit the "marked-up as-built" drawings/specifications to the engineer for review, comment, and approval.

18.4 Following approval of "marked-up as-built" drawings/specifications, prepare "final as-built" drawings (utilizing the latest version of Autocad (or compatible) software) and specifications (utilizing the latest version of Microsoft Word (or compatible) software). Submit one (1) set of "final as-built" drawing/specifications originals, sets of "final as-built" copies as directed in the general construction specifications (but in no case less than three (3) sets), and "final as-built" drawings/specifications in electronic Autocad (drawings), Word (specifications), and PDF (drawings and specifications) formats. Submit photocopies of all panel circuit directories with "final as-built" drawings.

18.5 Submit operating and maintenance (O&M) manuals for all new equipment furnished as part of this contract. Provide O&M manuals including installation, operating, and maintenance instructions for the equipment. Wherever "proof-of-purchase" is required as part of any manufacturer's warranty (whether manufacturer's warranty is specified or not), submit with O&M manuals. Where any proof-of-purchase is required but not submitted (or where insufficient information is submitted), the electrical contractor is fully responsible and liable for providing the warranty. Submit all O&M manuals bound together in a single three-ring binder (one binder per set of manuals) including a table of contents. Submit quantity of sets as directed in the general construction specifications, but in no case less than three (3) sets.

18.6 Explain and demonstrate the complete electrical system and all work installed by the electrical contractor to the owner's operating and maintenance personnel. Demonstration is to instruct owner's personnel in the operation and maintenance of systems as well as to prove to the owner correct and adequate operation of all parts of the electrical system. Provide a demonstration period of one (1) full working day for the general electrical installation (including, but not limited to, contactors, time clocks, generators, transfer switches, key interlocking schemes, and similar equipment, where applicable). Wherever demonstrations are indicated elsewhere in the specifications for equipment furnished by the electrical contractor (i.e. for fire alarm, dimming, sound/paging, security, CCTV, and similar systems, where applicable), provide the specified additional demonstrations during additional periods of time (above and beyond the period above for the general electrical demonstration). Conduct all demonstrations at the project site and after all systems are fully operational.

19. SUMMARY OF SUBMISSIONS

19.1 Submit items as indicated elsewhere in the specifications (applicable sections are shown for convenience) and as summarized as follows. Information below indicates relative schedule of submission.

19.2 Submit upon commencement of construction (as per general construction specifications); resubmit within seven (7) days of notification:

A. Permits, licenses, certificates (see 16100-9)
B. Schedule of work (see 16100-10)
C. Product list (see 16100-17)
D. Shop drawings (see 16100-17)

19.3 Submit within 30 days of request (within seven (7) days for substitutions):

A. Samples (see 16100-18)

19.4 Submit during the project as applicable (refer to respective specifications sections for conditions and schedule of submission):

A. Scope of work changes, w/ breakdowns (see 16100-11)
B. Test results, abnormal/failing only (16100-15)

19.5 Submit upon substantial completion of the project:

A. Approved inspection certificate(s) (see 16100-9)
B. Written manufacturers' warranties (see 16100-14)
C. Test results (see 16100-15)
D. As-built drawings (see 16100-19)
E. O&M manuals (see 16100-19)
F. Spare parts (where specified elsewhere)

20. SAFETY

20.1 Perform all work and work practices in strict accordance with all applicable local, state, and federal codes, standards, regulations, and requirements including OSHA (including the proper use and maintenance of personal protective equipment (PPE) and clothing), state labor and industry, the NEC, ASTM, the National Electrical Safety Code, NFPA, etc..

20.2 The term "live" means "energized or capable of being energized at any time for any reason, either intentionally or accidentally".

20.3 Suitably protect all live equipment against accidental contact at all times. Install and maintain covers on all live equipment. Where covers are not installed, provide suitable insulating barriers at all live parts. Suitable barriers include arc-resistant NEMA GPO-2 or GPO-3 and UL 94 V-0 electrical grade fiberglass reinforced epoxy compound sheets, rubber insulating blankets, suitable thermoplastic insulating materials, etc. as per OSHA, ASTM, and the NEC. Cardboard and similar materials are not acceptable. Provide listed OSHA approved signs reading "Danger: High Voltage" at locations of live parts and on doors/gates leading to rooms/fences/areas containing the equipment and keep doors/gates locked at all times.

20.4 When working on equipment or wiring, properly identify and use lockout devices and tags (in accordance with OSHA requirements) to prevent unauthorized or accidental energizing of equipment and wiring.

20.5 Perform all work in or associated with confined spaces (including manholes, hand holes, vaults, crawl spaces, etc.) in accordance with all safety codes referenced above. Obtain appropriate permits where required by the above codes and/or the owner.

20.6 Perform all excavation and work in and associated with excavation in accordance with all safety codes referenced above (include all required sloping, benching, shoring, bracing, supporting, shields, protective systems [fall protection, protection of personnel in excavation, protection of structures, etc.], ramps, access/egress, warning systems, rescue equipment, etc.). Provide suitable barricades and safety procedures to restrict pedestrian and vehicular access to areas where work is being performed (including open excavations, lay-down areas, clearance space around operating excavation equipment, etc.). Do not leave excavations open when not actually performing associated work (including at night, during week ends, or when working away from excavations). Leaving excavations open for short periods of time will be considered only when approved in writing by the owner and only where suitably protected. Any request for owner's approval must include a written plan on proposed protection and safety procedures. No extra consideration, claims, charges, or compensation will be granted under any circumstance for any multiple excavations and backfilling needed to satisfy safety requirements.

20.7 When working in, on, or near areas subject to vehicular traffic (including public and private roadways, driveways, parking lots, etc. and including loading and unloading equipment/materials in the vicinity of traffic), perform all work and provide appropriate work zone traffic control in accordance with all safety codes referenced above as well as state department of transportation regulations, requirements, and recommendations. Where requested by the owner, architect, or engineer, submit a traffic control plan detailing proposed work zone traffic control and associated safety procedures.

21. HAZARDOUS MATERIALS

21.1 The electrical contractor is not responsible for and is not required to remove equipment contaminated by hazardous materials, except as indicated below. For this specification section, the term "hazardous material(s)" applies to any materials classified by federal, state, or local authorities having jurisdiction as environmental or health hazards (including, but not limited to, polychlorinated biphenyls (PCB's), asbestos, mercury, radioactive materials, etc.). For this specification section, the term "contaminated" (in any form) means "contains or is contaminated by hazardous material(s)".

21.2 The electrical contractor (and all applicable subcontractors) shall be fully insured for performing all work related to, on, and around contaminated equipment and for all work specifically shown in this specifications section as by the electrical contractor. Submit proof of insurance to the owner as part of or along with other applicable insurance submittals (as per Division 1 General Conditions, Supplemental Conditions, and Special Contract Requirements).

21.3 Immediately notify the owner if any electrical equipment or wiring to be removed or modified as part of this project is contaminated or suspected as contaminated. Identify all areas where disruptive work is proposed (including, but not limited to, excavation, cutting, penetration, drilling, etc.) in advance of performing work so the owner can arrange to have any necessary abatement completed, include all costs and schedule time accordingly. No extra consideration, claims, charges, or compensation will be granted under any circumstance for any delays resulting from abatement of hazardous materials.

21.4 When performing work with, on, and around equipment contaminated or suspected as contaminated, assume that the equipment is contaminated until/unless proven otherwise by testing. Exercise care and suitably guard and protect equipment at all times from the start of work until the equipment is either proven by testing as not contaminated or is removed from the project site.

21.5 When removing existing luminaires containing ballasts (fluorescent, H.I.D., etc.), consider all ballasts as being contaminated by PCB's, unless ballast factory nameplate specifically indicates that the ballast does not contain PCB's. The electrical contractor shall completely disconnect, remove, and dispose of all ballasts not contaminated by PCB's. For ballasts considered as contaminated by PCB's, remove ballasts from luminaires, cut all ballast wiring leads within 51 mm (2") of the ballasts, and neatly place ballasts in owner furnished drum containers (i.e. 55-gallon). The owner shall dispose of PCB contaminated ballasts in drum containers. For luminaires (with ballasts considered as contaminated by PCB's) where there are signs of ballast rupture or leakage, carefully remove the entire luminaire and turn over to the owner (owner shall dispose of luminaires where PCB leakage is suspected).

END OF SECTION

SECTION 16200 - ELECTRICAL WORK PRACTICES

1. GENERAL PROVISIONS

1.1 The applicable requirements and conditions of specifications section "General Provisions" of specifications division 16100, General Electrical, are hereby made an integral part of this section.

1.2 The work governed by these specifications includes but is not limited to that as defined in specifications section "Scope of Work" of specifications division 16100, General Electrical.

2. INSTALLATION

2.1 Provide all equipment and materials in accordance with the recommendations and instructions of the respective manufacturers. This includes recommendations and instructions for equipment furnished by other trades or the owner and installed or connected by the electrical contractor.

2.2 Perform all work in an approved first class and workmanlike manner and conform to the best practices of the trade and to all requirements of the NEC.

2.3 Protect and preserve all existing, new and proposed raceways, wiring, materials, devices, luminaires, and equipment from corrosion, dirt, paint, building materials, acid, solvents, chemicals, water, ice, tools, overload, freezing, heat, combustion, theft, damage, abrasion, inadvertent removal, improper installation (including where installation has not been completely or properly coordinated), conflicts, interference, vandalism, etc. at all times. Repair or replace all equipment and materials lost or damaged as the result of inadequate protection. Cap and plug open ends of raceways and equipment during construction until wiring is ready to be installed.

2.4 Coordinate with and obtain approval of the owner and architect for all exact locations of all outlets, raceways, materials, and equipment. Where requested by the owner, architect, or engineer, submit sketches/drawings of proposed raceway routing, equipment locations, and any other details of installation specifically requested.

2.5 Completely coordinate installation and routing of all wiring, materials, and equipment in the field and with shop drawing information of all trades prior to rough in of wiring or releasing equipment. Completely inspect equipment and materials upon receiving in the field (including equipment received by other trades where installed or connected to by the electrical contractor) and verify exact installation requirements and details (compare to installation and routing as coordinated above) prior to installing, preparing installation, modifying, or handling in any manner which would restrict the ability to return material or equipment in the event of potential installation complications.

2.6 Cooperate and fully coordinate all work with the work of all other trades, contractors, subcontractors, and the owner, including work as part of other contracts and projects related to and/or in the vicinity of the specified work. Coordinate the locations of pipes, ducts, structure, reinforcement, foundation components, floor/wall/ceiling construction, raceways, branch and distribution panels, luminaires, devices, electrical outlets, air outlets, motor controls, and all other equipment in order to avoid conflicts, interference, or placing services at the wrong locations. Coordinate all demolition, disconnection, removals, relocations, extension, and re-feeding associated with existing equipment and wiring. Coordinate with shop drawings of all trades. Install all wiring and equipment in such a way to maintain clearance and clear access to all equipment requiring access by code or for operating, servicing, maintaining, replacing, examining, etc.. This includes access to electrical equipment and devices as well as mechanical, architectural, and other equipment including, but not limited to, valves, dampers, sensors, meters, gauges, clean-outs, access doors and panels, operating mechanisms, motors, pumps, fans, air handling and other mechanical equipment, etc.. This specifically includes coordinating wall mounted electrical devices and outlets with wall mounted HVAC equipment (including baseboard, radiation, cabinets, etc.).

2.7 Provide all work indicated on the electrical drawings and electrical specifications but involving disciplines of other trades performed by the electrical contractor (or applicable sub-contractors to the electrical contractor), unless specifically indicated otherwise. Perform work in complete accordance with all general construction specifications applicable to the work. This applies to all work including, but not limited to, cutting and patching, excavation, backfill, surface restoration (including paving), concrete, metal fabrication, fire stopping and sealing, painting, etc..

2.8 Properly isolate all materials and equipment against the transmission of vibration or noise to, from, or between any parts of the building.

2.9 The electrical contractor is fully responsible for determining and verifying all exact details of installation. Where installation details or similar information is shown on the drawings or is otherwise forwarded to the contractor (including during construction), the information represents the minimum criteria required and serves as a guide to the contractor but does not relieve the contractor of the responsibility for determining and verifying installation details.

3. GROUNDING

3.1 Completely ground and bond all equipment (specifically including all metallic raceways, cable armor, cladding, and shielding, supports, transformers, cabinets, cable trays, service equipment, and the neutral conductor) in strict and complete accordance with all applicable requirements of the NEC.

3.2 Provide insulated grounding conductors run with all wiring (not applicable to "BX" armored cable [type "AC"] where permitted elsewhere in this specification).

3.3 Install all metallic raceways in such a way to provide a continuous grounding path without the use of the insulated grounding conductor required above. Include all bonding jumpers and conductors (in addition to the insulated conductor required above) for flexible conduit, loosely jointed raceways, etc.. Provide suitable raceway/conduit fittings for a completely grounded raceway system, including the use of fittings approved and/or listed for grounding, grounding bushings, grounding lock nuts, etc.

3.4 Provide all grounding and bonding materials and connections as per specifications section "Grounding Materials" of specifications division 16300, Electrical Materials.

3.5 Wherever connections to grounding electrodes or electrode systems are required by code, connect and bond to and interconnect the following.

A. Provide new driven (made) grounding rod electrodes, for all services and where equipment is located on or below the second floor of a building.

B. Connect to the domestic cold water piping system and any other metal piping system where required by the NEC (excluding piping prohibited from bonding/grounding by the NEC).

C. Connect to the structural steel and/or metal building frame, where applicable.

D. Connect to all existing grounding electrode systems, where applicable.

3.6 Wherever the following is installed as part of this project (including where installed by other contractors), connect and bond to the grounding electrode system.

A. Ground new metal piping systems where required by the NEC.

B. Ground new structural steel and/or metal building framing.

C. Wherever any new foundation and/or footing is installed with continuous length of 3.0 m (10'0") or more or covering area of 3.3 m^2 (36 sq. ft.) or more, provide concrete-encased electrode(s) as per NEC Article 250.52(A)(3). Provide consisting of not less than 6.0 m (20'0") of #4 AWG bare copper conductor encased in not less than 50 mm (2") of the foundation/footing concrete, except that concrete reinforcement may be substituted for the copper conductor where the size, length, type, and installation of reinforcement complies with NEC Article 250.52(A)(3) for use as a grounding electrode.

3.7 Where driven (made) grounding rod electrodes are installed, provide grounding resistance not exceeding 1.0 ohm (maximum). Verify proper ground resistance by testing as per the section "Testing" of this specifications division 16100. Where the measured resistance exceeds the maximum value, install additional ground rod(s) at the location and/or set ground rods in suitable listed and NEC approved chemical ground enhancement material in order to obtain proper values, include all costs in bid.

3.8 Detail all grounding on as-built record documents.

4. WIRING METHODS

4.1 The wiring methods in this section apply to all systems (including power, lighting, emergency, over 600 V, control, telecommunications, data, fire alarm, sound, security, CCTV, and any other system), unless specifically indicated otherwise.

4.2 In finished areas, run all wiring hidden or concealed in/behind ceilings, walls, and floors, include all required cutting and patching. In unfinished areas, wiring may run exposed. Run exposed wiring following building lines.

4.3 Utilize steel rigid metal conduit (RMC) for all wiring unless indicated otherwise. Utilize only steel RMC for all exposed visible exterior raceways, for raceways in wet locations above ground, for exposed visible raceways in damp locations. Utilize only steel RMC (encase in a 76 mm (3") 20 MPa (3,000 p.s.i.) concrete envelope) for raceways in or below grade that are subject to vehicular traffic (except that reinforced concrete encased PVC RNC or concrete encased steel IMC may be utilized as indicated below). Utilize only steel RMC (with concrete encasement where required by code) where field conditions do not facilitate maintaining NEC required minimum cover for underground PVC RNC. For conduits 53 mm (2") and larger, where concrete encasement is not required above, embed all underground 45 degree or greater conduit bends (field fabricated or factory elbows) in a 155 mm (6") 20 MPa (3,000 p.s.i.) concrete envelope.

4.4 Steel intermediate metal conduit (IMC) may be utilized for all wiring except conditions indicated above as requiring only steel RMC. Steel IMC may be utilized in any condition where PVC RNC is permitted by these specifications. As an alternate to steel RMC, steel IMC (encase in a 76 mm (3") 20 MPa (3,000 p.s.i.) concrete envelope) is permitted under roadways, parking lots, and other areas subject to vehicular traffic. For conduits 53 mm (2") and larger, where concrete encasement is not required above, embed all underground 45 degree or greater conduit bends (field fabricated or factory elbows) in a 155 mm (6") 20 MPa (3,000 p.s.i.) concrete envelope.

4.5 Where permitted by code, schedule 40 or schedule 80 polyvinyl chloride rigid nonmetallic conduit (PVC RNC) may be used underground. Changing PVC RNC thickness (i.e. from schedule 40 to schedule 80 or vice versa) in the middle of any run of PVC RNC is not permitted. Encase all PVC RNC in a 76 mm (3") 20 MPa (3,000 p.s.i.) concrete envelope, unless indicated otherwise. As an alternate to steel RMC, PVC RNC encased in steel reinforced 76 mm (3") 20 MPa (3,000 p.s.i.) concrete envelope is permitted under roadways, parking lots, and other areas subject to vehicular traffic. Provide steel reinforcement consisting of a 12.7 mm (#4) reinforcing rod at each of four (4) "corners" around each conduit in cross section (where encasement includes more than one (1) conduit, rods located between conduits may be "shared"). Provide reinforcing rods continuous for the entire length of the reinforced encasement, join rods where required by overlapping not less than 155 mm (6") and wrapping with suitable reinforcing tie wire. In unpaved areas not subject to vehicular traffic, schedule 80 PVC RNC may be installed without concrete encasement. In unpaved areas not subject to vehicular traffic, schedule 40 PVC RNC 27 mm (1") and smaller may be installed without concrete encasement. For conduits 41 mm (1.5") and larger, where concrete encasement is not required by these specifications, embed all underground 45 degree or greater conduit bends (field fabricated or factory elbows) in a 155 mm (6") 20 MPa (3,000 p.s.i.) concrete envelope.

4.6 Where runs of PVC RNC protrude exposed and visible above grade or floors, in indoor or outdoor locations, utilize steel RMC for the portions above grade/floor to a minimum depth of 155 mm (6") below finished grade/floor. This requirement does not apply where protruding PVC RNC is completely concealed/hidden within equipment enclosures, walls, or ceilings. Where exposed visible runs of PVC RNC are installed by the contractor (without prior written approval) the contractor shall remove the PVC RNC and install new steel RMC (including cutting and patching to a minimum 155 mm (6") depth and including replacing or reinstalling conductors) at no cost to the owner.

4.7 Where permitted by code, electrical metallic tubing (EMT) may be used for interior feeder and branch wiring in locations not subject to abuse or injury. Utilize steel RMC for conditions indicated above as requiring only steel RMC.

4.8 Utilize flexible conduit for flexible connections to motors, equipment requiring flexibility, equipment subject to vibration (including transformers), and where required for adjustment, in lengths not to exceed 1.8 m (6'0"). Flexible conduit may be utilized for flexible connections to luminaires only where wiring is concealed or located above accessible ceilings (in lengths not to exceed 1.8 m (6'0")). Exposed visible flexible conduit is not permitted for luminaires, except adjustable luminaires. Flexible conduit may be used where existing walls are fished in lengths not to exceed the portion in the wall plus 0.9 m (3'0"). Utilize liquidtight flexible metal conduit (LFMC, "sealtite"), unless indicated otherwise. Utilize only LFMC in damp, wet, and outdoor locations, mechanical rooms, and for NEC hazardous (classified) locations (except as indicated below). Utilize flexible metal conduit (FMC, "greenfield") in dry locations only (except conditions indicated above as requiring only LFMC). Where flexible connections are required in NEC Class I, Division 1 hazardous (classified) locations, utilize only flexible unions listed as suitable for the application. Flexible conduit/fittings of any type are not permitted as a substitute for conduit bends or offsets under any circumstance.

4.9 Where permitted by Code and approved by local authorities having jurisdiction and the owner, metal clad cable (type "MC") may be used for interior branch wiring concealed in walls/ceilings and hidden above accessible ceilings in dry locations only. Where applicable, comply with NEC Article 518 "Assembly Occupancies". Utilize raceway for all feeder wiring (#4 AWG and larger). Type "MC" cables are not permitted in wet, damp, or exterior locations. Type "MC" cables are not permitted in exposed visible locations. Hide cables at panels in electrical rooms and electrical closets as per the section "Branch Panels" of specifications division 16300, Electrical Material. Contact local authorities for approval before submitting bid and include all costs in bid (no extra consideration, claims, charges, or compensation will be granted under any circumstance associated with wiring methods not approved by local authorities).

4.10 Provide surface raceway with integral wiring devices (including receptacles, power outlets, telephone/data outlets, switches, etc.) and/or surface raceway plug-in strips where specifically indicated on the drawings.

4.11 Surface raceway without integral wiring devices is permitted only where all of the following conditions are met or where specifically indicated on the drawings. Surface raceway without integral wiring devices is permitted where physically impossible to run wiring hidden or concealed, where impossible to hide or conceal wiring by cutting, patching, and painting, where approved by code, in dry locations only, and where specifically approved by the owner and architect in writing. Permission to use surface raceway without integral wiring devices is conditional upon there being no cost change to the contract, unless specifically indicated on the written approval.

4.12 Nonmetallic-sheathed cable (types "NM", "NMC", and "NMS", i.e. "romex") is not permitted under any circumstance. Electrical nonmetallic tubing (ENT), liquidtight flexible nonmetallic conduit (types LFNC-A and LFNC-B), high-density polyethylene (HDPE) conduit, type "A" nonmetallic conduit, and type "EB" nonmetallic conduit are not permitted under any circumstance.

4.13 Provide all wiring within air handling plenum spaces in complete accordance with the NEC. Provide wiring methods utilizing metal conduit raceways (as permitted by the specifications) only. Type "MC" cable, where otherwise permitted, may be utilized in plenum ceilings (but not other plenum spaces).

4.14 Provide all systems wiring (including only fire alarm, telecommunications, data, sound, security, and CCTV, where applicable) in complete accordance with all requirements of other sections of the electrical specifications, except as modified below. Where permitted by Code and approved by local authorities having jurisdiction and the owner, suitable code approved systems type cables (without conduit) may be used for interior systems wiring concealed in walls/ceilings and hidden above accessible ceilings in dry locations only. Contact local authorities for approval before submitting bid and include all costs in bid (no extra consideration, claims, charges, or compensation will be granted under any circumstance associated with wiring methods not approved by local authorities). Systems type cables without conduit are not permitted in wet, damp, or exterior locations. Systems type cables without conduit are not permitted in exposed visible locations. Run wiring in pathways as indicated on the drawings and specifications.

A. Provide wiring as directed, recommended, and approved by the respective system manufacturer/utility company and meeting all minimum requirements of the system manufacturer/utility (including where manufacturer/ utility requirements exceed the requirements of the specifications and the NEC).

B. Provide all cables as multi-conductor style having an overall jacket (of a color other than red; red is reserved for fire alarm) and utilize only cables approved by the NEC for use with the system.

C. Provide all wiring in plenum spaces in complete accordance with the NEC. In dry location plenum ceilings, utilize only plenum rated cables. For damp and wet location plenum ceilings and in all other duct and plenum spaces, run wiring (utilize a non-plenum type suitable for the damp/wet location) in metal conduit. Plenum rated cables may be utilized for other (i.e. non-plenum) applications, but only in dry locations. Plenum cables, even when installed in conduit, are prohibited in damp and wet locations.

D. In damp locations, utilize only cables specifically listed and identified for use in damp or wet locations. Provide all cables in wet locations (including underground and embedded in concrete slabs at or below grade, whether in conduit or direct buried) specifically designed for outdoor and submerged use and specifically listed and identified for use in wet locations.

4.15 Except as indicated otherwise on the drawings, 21 mm (3/4") raceways are the minimum permitted. No raceway smaller than 21 mm (3/4") is permitted under any circumstance (except where specifically approved in writing by the owner and engineer for the individual condition encountered). Where luminaires, devices, or equipment have factory knockouts or hubs smaller than 21 mm (3/4") size (or smaller than conduit sizes specified on the drawings), provide suitable reducing conduit fittings or provide field knockouts at equipment to match conduit size.

4.16 Except as indicated otherwise on the drawings, #12 AWG conductors are the minimum permitted for power and lighting and #14 AWG conductors are the minimum permitted for control and signal systems. #10 AWG conductors are the minimum permitted for outdoor wiring, night lighting circuit wiring, and emergency power and lighting wiring. #10 AWG conductors are the minimum permitted where circuits exceed 23 m (75'0") for 120/208/240 V circuits or exceed 46 m (150'0") for 277/480 V circuits, measured to the center of the load.

4.17 Provide a separate neutral conductor with each branch circuit where a neutral is required or indicated on the drawings. Multi-wire branch circuits with a shared common neutral are not permitted, unless specifically indicated otherwise on the drawings. Utilize multi-wire branch circuits with a shared common neutral conductor for lighting controlled by "dual switching" where the lighting is connected to two (2) circuits.

4.18 Multiple branch circuits may be installed in the same raceway (including surface raceways) where permitted by code and provided all of the following conditions (A through D below) are met.

A. Apply appropriate NEC de-rating factors and adjust conductor sizes accordingly. Wiring sizes indicated on the drawings are based on each circuit run in an individual raceway (and are not adjusted for de-rating factors), except where multiple branch circuits in a common raceway are specifically indicated on the drawings (wiring is adjusted for applicable de-rating factors in this case, but only for the specific wiring combination shown on the drawings).

B. Provide no conductor (after de-rating adjustment) exceeding #10 AWG, except grounding conductors as provided below (or as otherwise specifically approved in writing by the engineer).

C. Common equipment grounding conductors are permitted in lieu of individual equipment grounding conductors for each individual circuit. Provide minimum single equipment grounding conductor size two (2) standard wire sizes larger than the size as determined in accordance with the NEC. Provide isolated grounding conductors (where required) individually for each circuit and in addition to common equipment grounding conductors.

D. Provide raceway fill (after de-rating adjustment) not exceeding 30% (provide maximum number of conductors permitted not exceeding 75% of the maximum number permitted by Code [i.e. refer to NEC Chapter 9 and Annex C] to allow for future wiring). Adjust minimum conduit size to maintain 30% maximum fill.

4.19 Minimum raceway sizes indicated in the specifications and on the drawings are applicable to all conduit types specified, except schedule 80 PVC RNC (unless the drawings specifically indicate schedule 80 PVC RNC). Where schedule 80 PVC RNC is utilized and the specified conduit size is 63 mm (2.5") and smaller, increase conduit to the next higher trade size. Where schedule 80 PVC RNC is proposed and the specified conduit size is 78 mm (3") and larger, submit raceway fill calculations; where raceway fill with the specified conduit size exceeds 40%, increase conduit to the next higher trade size.

5. WIRING INSTALLATION

5.1 Securely support and fasten all raceways, cables, outlets, boxes, equipment, etc. in place as per the NEC. Support at intervals as per the NEC, but in no case exceeding 3.0 m (10'0"). Refer to the section of this specification "Fastenings, Supports, and Hangers" for information.

5.2 Where any run of wiring passes vertically through more than one (1) floor level (including where installed in open vertical chases), support at every floor level. For conduits 63 mm (2.5") and larger, utilize only suitable pipe riser clamps (B-Line #B3373 series or equivalent), suitable wall bracket offset pipe clamps (NPHC-National Pipe Hanger Corp. figure #430 series or equivalent), or engineer approved heavy duty steel brackets (fabricated of not less than 6.5 mm (1/4") thick steel and of type, design, and arrangement suitable for the specific application and weights involved) for these floor level supports. Conduit clamps and strut type supports are not acceptable for this application. Equipment as manufactured by B-Line, Erico, and NPHC (or equivalent) shall be considered.

5.3 Make all changes in direction of 27 mm (1") and larger conduits with standard elbows or case metal fittings. Fabricate field-made bends and offsets in conduit with suitable hickey/conduit-bending machine. Make conduit bends of the long radius type without kinks, flattening or crushing. Do not install crushed or deformed raceways. Avoid trapped raceways in damp and wet locations. Exercise care to prevent the accumulation of plaster, dirt, or trash in raceways, boxes, fittings and equipment during the course of construction. Entirely free clogged or obstructed raceways or replace raceways

5.4 Provide raceway ends cut squarely and reamed. Provide raceway installation (including pull boxes as applicable) so there is no more than a total of 360 degrees of bends in any run of raceway. Provide pull boxes at intervals not greater than every 30 m (100'0"), unless otherwise indicated on drawings.

5.5 Maintain a separation of not less than 155 mm (6") between all raceways and hot water lines, steam lines, and any other surface with temperature exceeding 104 degrees F (40 degrees C), whenever possible. When not possible to maintain the 155 mm (6") separation, provide insulation pipe covering on the electrical raceways.

5.6 Provide a suitable insulating or grounding type (as applicable) bushing on each conduit terminating in a pressed steel box and for each conduit stub. Bushing is not required where conduit terminates in a suitable conduit connector/termination fitting which includes an integral bushing or which provides smoothly rounded surface suitable and approved for use without a bushing.

5.7 Wherever raceways pass across structure expansion joints, provide suitable conduit expansion fittings. Where expansion fittings are not listed for grounding, provide external flexible copper grounding strap. Wherever expansion fittings are installed, provide a suitable junction box located not farther than 7.6 m (25'0") from the expansion fitting location. Coil suitable slack conductors in this junction box to allow functioning of expansion fittings. For continuous runs of PVC RNC exceeding 27 m (90'0"), provide expansion fittings at intervals not exceeding 15 m (50'0") to compensate for linear thermal expansion and contraction.

5.8 Where metal raceway is installed in contact with or entering earth or concrete in outdoor, wet, or damp locations, coat raceway with engineer approved coal tar or epoxy based corrosion resistant coating (3M, Benjamin Moore, Carboline, or equivalent).

5.9 Running threads are not permitted.

5.10 Do not run wiring horizontally across floors or the ground, to avoid tripping hazards and facilitate cleaning floors.

5.11 Horizontal runs of raceway at rooftops are not permitted (to facilitate future roofing repairs/replacement) except where specifically approved in writing by the architect and owner. Horizontal runs may not exceed 2.4 m (8'0") length. Do not install any wiring or electrical equipment of any type (specifically including disconnecting means and receptacles) within 4.5 m (15'0") of any edge of any roof under any circumstance, to avoid tripping and fall hazards. Equipment and wiring is only permitted within 4.5 m (15'0") of any edge of any roof where necessary to serve utilization equipment within the space and only where specifically approved in writing by the engineer and architect (where approved suitable protective means are included to prevent fall hazards). Support raceways at roofs in a manner to avoid harming, impacting, or compromising the roofing weatherproof integrity (fully coordinate requirement with roofing contractor/supplier [where present], architect, and owner). Where wiring is installed atop roofing material, utilize only pre-cast concrete paving units measuring not less than 12" x 12" x 2" (300 mm x 300 mm x 51 mm) laid on the roof and bonded to the roof using suitable roofing adhesive. Running rooftop wiring on wood blocks or bricks is not permitted under any circumstance.

5.12 Install wiring in such a manner to avoid infiltrating water into the wiring system (during or after construction). Install wiring in such a manner so any water which does infiltrate cannot become trapped or accumulate and cannot drain into electrical or other equipment.

5.13 Install exposed wiring (including visible wiring and wiring in accessible ceiling spaces or other accessible locations) parallel or perpendicular to walls, structural members, or intersections of vertical planes and floors or ceilings.

5.14 Install concealed wiring (except as provided above for wiring in accessible spaces) as straight and direct as possible. Detail routing of all concealed wiring on record (as-built) documents.

5.15 Provide all splices only in suitable code-sized junction or outlet boxes. Splices are not permitted in any type of conduit body under any circumstance.

5.16 Do not install any wires in raceways until all raceway work is completed and closed in such a manner as to prevent the possibility of water or other foreign matter entering raceways.

5.17 Wherever empty or spare raceways are installed, provide suitable pull wires with identification tags securely attached to each end. Where empty or spare raceways do not terminate in boxes or enclosures, provide suitable conduit caps. Utilize only conduit fitting type caps appropriate for the conduit involved. Rubber and plastic conduit plugs, duct sealing compounds, and tape are not acceptable.

6. FASTENERS, SUPPORTS, AND HANGERS

6.1 Provide all fastenings, supports, hangers, clamps, and anchors of the type made for the specific purpose for which they are used.

A. Utilize wood screws for fastening to wood.
B. Utilize toggle bolts or bolt fastenings for fastening to hollow tile, terra cotta, hollow masonry units, lath, and similar construction.
C. Utilize machine screws/bolts with nuts for fastening to structural steel.
D. Utilize metallic expansion shield anchors and machine screws/bolts for fastening to concrete, brick, and solid masonry. Wooden plugs with screws and plastic expansion shield anchors are not acceptable.
E. Threaded studs driven in by a powder charge and provided with washers and nuts may be used in lieu of expansion anchors, machine screws, and wood screws under the applications indicated above.
F. Utilize engineer approved adhesive fastening on roofing areas (mechanical fasteners are not be permitted to be driven into roofing surfaces).
G. Threaded C-clamps are not permitted.
H. Additional acceptable supports for a single 21 mm (3/4") EMT only include common nails for wood, spring-tension clamps for steel and nail-type nylon anchors for masonry.
I. Additional acceptable supports for not more than two (2) cables (where cable wiring methods are permitted elsewhere in this specification) only include nails for wood, spring-tension clamps for steel, and nail-type nylon anchors for masonry. A single cable only may be secured directly to wood with NEC approved cable staples.

6.2 To prevent swaying, vibrating and/or sagging, rigidly and firmly install raceway and cable (where cable wiring methods are permitted elsewhere in this specification).

A. Support with malleable or wrought steel clamps, hangers, or with fabricated strut type supports (steel only, aluminum is not acceptable unless specifically indicated on the drawings). Provide strut type supports as B-Line, Kindorf, Power-Strut, or Unistrut (or equivalent).

B. Stamped metal one-hole and two-hole straps are permitted to secure EMT and cable wiring methods permitted by the specifications in exposed and concealed dry indoor locations not subject to abuse or injury only.
C. Stamped metal wrap around "mineralax" type hangers are permitted to secure EMT and cable wiring methods permitted by the specifications in hidden and concealed dry indoor locations not subject to abuse or injury only. Stamped metal wrap around type hangers are not permitted for visible exposed wiring.
D. Additional manufactured fastening systems specifically designed for the purpose shall be considered to secure cable wiring methods permitted by the specifications, but only where submitted for review and approval before commencing work.
E. Do not weld raceways, clamps, hangers, or straps to steel structure.
F. Wire (including ceiling support wires), perforated pipe straps, plastic ties, "J" hooks, and bridle rings are not acceptable.

6.3 Provide all supports and fasteners of the following materials, unless indicated otherwise.

A. Utilize stainless steel for all applications, unless indicated otherwise. Utilize stainless steel only when underground or in contact with earth or floors in outdoor areas, mechanical rooms, kitchens, and other areas subject to the possible presence of water on the floor/ground.
B. Steel protected by hot-dip or mechanical galvanizing after fabrication may be utilized for all conditions except conditions indicated above as requiring only stainless steel. Clean areas where galvanizing is cut or damaged and touch-up with suitable zinc dust/zinc oxide paint.
C. Steel protected by pre-galvanizing before fabrication, epoxy coating, zinc electrolytic plating, or other engineer approved corrosion resistant coating may be utilized for interior locations not subject to abuse or injury.
D. Other materials providing equivalent or superior strength and corrosion resistance to the above shall be considered.
E. Supports and fasteners without corrosion protection, protected only by painting, or protected only by oil coating are not acceptable under any circumstances.
F. For electrical fasteners (at conductors and all current-carrying parts), utilize only materials and types approved by the NEC and listed for the application.

6.4 Provide all fastening, supports, wall brackets, ceiling trapeze, and hangers for the installation of all equipment and wiring. Install all fastenings, supports and hangers in such a way and at such intervals as per NEC or otherwise required to support the equipment. The electrical contractor is responsible for verifying that supports are adequate for the load supported, based upon weight, stresses which may be applied to the support (including when installing equipment, pulling wiring, physical impacts to equipment, and seismic/earthquake loads as per IBC Section 1613), vibration, etc. Submit calculations for any supports where requested by the engineer.

6.5 For all telephone and equipment backboards indicated on the drawings and wherever plywood backboards are installed to support and/or mount electrical equipment, utilize only fire resistant plywood.

6.6 Where the contractor installs fasteners or supports not meeting specified requirements (without prior written approval) the contractor shall remove the fasteners and supports and install new fasteners and supports as specified at no cost to the owner.

7. CHASES, RECESSES, AND OPENINGS

7.1 Provide, including all excavation, cutting, patching, fire stopping, sealing, backfill, surface restoration, and painting, all required openings, chases, and recesses in the construction for all work.

7.2 Where openings are required in new or modified structure, furnish the exact location, size, and other necessary information to the contractor installing or modifying the structure in ample time to have them incorporated during construction as approved by the architect and engineer. If the electrical contractor fails to comply with these information requirements, then the electrical contractor shall perform the necessary cutting and patching at his own expense under the direct supervision of the general contractor.

7.3 Where openings in masonry are required, make by coring only.

7.4 Locate and provide all openings (including openings for junction and outlet boxes and luminaires) in such a manner to maintain any required fire/smoke rating, waterproof, and sound transmission integrity in accordance with all applicable codes and standards (including, but not limited to IBC/BOCA, NFPA, and UL). Where boxes are located in opposite sides of fire/smoke/sound rated walls, maintain minimum spacing between boxes as per NEC. The general contractor shall provide fire/smoke rated enclosures around luminaires and boxes where required to comply with fire/smoke ratings.

8. CUTTING, PATCHING, FIRE STOPPING, AND PAINTING

8.1 Perform all required excavation, cutting, patching, fire stopping, sealing, backfill, surface restoration, and painting associated with the electrical installation. Perform in accordance with general construction specifications and as indicated elsewhere in this specification. Coordinate all requirements with the general contractor. This includes cutting and patching associated with suspended ceiling tiles and grid.

8.2 Completely restore (including painting where applicable) all surfaces to match existing condition as directed and approved by the owner, architect, and engineer.

8.3 Completely seal and fire stop all penetrations of all fire and/or smoke rated walls, floors, ceilings and any other construction (including all construction required to be rated by any code) to a rating matching or exceeding the fire rating of the construction. Refer to architectural drawings and specifications for information on fire ratings of building construction and include all costs in bid. Provide the complete installation (including fire stopping methods and materials) complying with all applicable fire rating codes and standards (including the NEC, NFPA, IBC/BOCA, and UL (including the UL "Fire Resistance Directory").

8.4 Completely seal and weatherproof all penetrations of exterior, at or below grade, and wet location walls and floors and roof penetrations.

8.5 Paint all exposed raceways, boxes, enclosures, etc. as directed by the owner and architect.

8.6 Provide baked enamel painted finish for all equipment and materials as directed by the owner and architect. Wherever finish colors are indicated on the drawings (including symbol list and luminaire schedule) as being selected by the architect ("as per architect", etc.), include costs in bid to utilize any of the available standard and/or optional colors listed in manufacturers' catalogs (excluding any colors identified in manufacturers' catalogs as "custom" or "premium").

8.7 Touch up damages to prime and/or finished paint coats on equipment. This includes touching-up stainless steel surfaces to avoid superficial surface rust (i.e. at cut surfaces and welds).

9. SLEEVES

9.1 Provide sleeves in all construction. Provide sleeves of minimum 0.85 mm (22 ga.) galvanized steel, sized for passing raceway/cable, and of the proper design for sealing and flashing around the sleeves where required. Locate and set sleeves extending approximately 51 mm (2") above floor in concealed locations, unfinished rooms, and mechanical spaces. Locate and set all sleeves flush with finished surfaces in finished areas unless otherwise directed by the owner and architect.

9.2 Seal the space between the raceway/cable and sleeve and between the sleeve and structure in an engineer and code approved manner. Seal and fire-stop all penetrations to a fire rating not less than the wall, ceiling, floor, or member penetrated. Completely seal and waterproof all penetrations of exterior walls, roofs, mechanical room floors, or any other area subject to weather or water.

10. FLASHING AND ACCESS PANELS

10.1 Where a general contractor is present, base flashing is by the general contractor, otherwise base flashing is by the electrical contractor. Counter flashing (provide of 0.47 mm (28 ga.) copper) is by the electrical contractor under all circumstances.

10.2 Provide access panels for all items requiring accessibility for operation and maintenance or where required by code. Provide access panels of not less than 1.6 mm (16 ga.) steel frame and not less than 1.9 mm (14 ga.) steel panel, with tamper-proof fasteners, and compatible with the type of construction in which they are installed. Where installed in fire rated walls or ceilings, provide access panels with fire rating matching or exceeding the fire rating of the wall/ceiling involved.

10.3 Where a general contractor is present, the electrical contractor shall furnish all access panels and the general contractor shall install access panels under the direction of the electrical contractor.

11. LOCATIONS AND MOUNTING HEIGHTS

11.1 The approximate locations of luminaires, pipes, switches, radiation, receptacles, outlets and other equipment and materials are indicated on the drawings. Provide actual locations and mounting heights as determined by, confirmed with, and approved by the owner and architect during field construction (prior to rough-in). Where equipment or devices are installed without prior approval/confirmation or without prior written notification (see below) and the location or mounting height is not acceptable to the owner and architect, relocate the equipment and all associated wiring as directed by the owner and architect at no cost to the owner.

11.2 Provide mounting heights complying with all applicable federal, state, and local disabled ("handicapped") access codes, standards, and requirements, including the Americans with Disabilities Act (ADA).

11.3 Provide mounting heights for all equipment as follows. Utilize standard mounting heights indicated below for all equipment, unless indicated otherwise on the drawings or otherwise directed by the owner and architect. Where installation conditions and/or obstructions make it impossible to install equipment at the standard height, the mounting height may be adjusted to suit conditions, provided the mounting height falls within the listed maximum and minimum heights. Notify the architect and engineer in writing of all conditions where deviating from standard mounting heights. Provide mounting heights not greater than the maximum mounting height and not less than the minimum mounting height under any circumstance, unless specifically approved in writing by the owner, architect, and engineer.

11.4 All mounting heights listed below are above finished floor, unless indicated otherwise. Mounting heights listed as "to bottom" are measured to the lowest operable part of the equipment or the lowest visual indicating device on the equipment. Mounting heights listed as "to top" are measured to the highest operable part of the equipment or the highest visual indicating device on the equipment.

	Mounting Heights		
	Standard	Minimum	Maximum
Control Devices			
Wall Switches & lighting controls	46" (1.17m) to ctr.	15" (0.38m) to bot.	48" (1.22m) to top
Thermostats & other controls	46" (1.17m) to ctr.	15" (0.38m) to bot.	48" (1.22m) to top
Receptacles and Outlets			
Receptacles, tele/data, & similar *	18" (0.46m) to ctr.	15" (0.38m) to bot.	48" (1.22m) to top
Wall mounted telephones	46" (1.17m) to top	27" (0.69m) to bot.	48" (1.22m) to top
Electrical Equipment			
Safety switches **	See max./min.	15" (0.38m) to bot.	48" (1.22m) to top
Enclosed circuit breakers **	See max./min.	15" (0.38m) to bot.	48" (1.22m) to top
Devices with fuses/breakers **	See max./min.	15" (0.38m) to bot.	48" (1.22m) to top
Contactors **	See max./min.	15" (0.38m) to bot.	48" (1.22m) to top
Transfer Switches **	See max./min.	15" (0.38m) to bot.	48" (1.22m) to top
Time clocks, individual **	See max./min.	15" (0.38m) to bot.	48" (1.22m) to top
Annunciators and displays	46" (1.17m) to ctr.	15" (0.38m) to bot.	48" (1.22m) to top
Equip. indicated with (**) where group mounted	15" (0.38m) to 48" (1.22m)	None	78" (1.98m) to top
Equip. indicated with (**) where too large to mount at above heights	15" (0.38m) to 48" (1.22m)	None	78" (1.98m) to top
Branch panels	15" (0.38m) to 48" (1.22m)	None	78" (1.98m) to top

Wall mounted distribution panels	15" (0.38m) to 48" (1.22m)	None	78" (1.98m) to top
Controllers & grouped controls	15" (0.38m) to 48" (1.22m)	None	78" (1.98m) to top
Fire Alarm Equipment			
Fire alarm controls	15" (0.38m) to 48" (1.22m)	None	78" (1.98m) to top
Pull stations	48" (1.22m) to top	42" (1.07m) to bot.	48" (1.22m) to top
Horns/speakers/strobes/bells ****	80" (2.03m) to bot.	80" (2.03m) to bot.	96" (2.43m) to bot.
All equipment mounted above counters	*****	15" (0.38m) to bot.	44" (1.17m) to top
Other Equipment			
Other equipment mounted on standard electrical outlet boxes	46" (1.17m) to ctr.	15" (0.38m) to bot.	48" (1.22m) to top

Contact the engineer for any equipment not listed or similar to equipment above.

* Specifically coordinate with any wall-mounted radiation, if present

** Applies where equipment is mounted individually, see below for group mounted equipment.

*** Provide metering equipment mounting heights conforming to utility company requirements, where applicable, regardless of mounting heights indicated above.

**** For ceilings lower than 90" (2.29m), mount fire alarm signaling devices 6" (0.15m) below the ceiling. Fire alarm signaling devices may be ceiling mounted if mounted on the lowest portion of the ceiling, if mounted not higher than 9.14 m (30'0") above the lowest floor level in the room and if located and spaced in accordance with NFPA requirements.

***** Standard mounting height for above counter equipment is 6" (0.16m) above back splash or 8" (0.20m) above counter where no back splash is present, but not higher than the maximum shown above.

11.5 Where any equipment or device protrudes more than 100 mm (4") from the finished wall surface, mount at height conforming with the ADA and in accordance with the following. Contact the engineer where maximum and minimum heights listed above conflict with mounting requirements summarized below.

A. Mount so the bottom of equipment/device is 0.68 m (2'3") AFF or less.

B. Mount so the bottom of equipment/device is 2.0 m (6'8") AFF or greater.

C. Projecting equipment/devices are permitted mounted with the bottom between 0.68 m (2'3") and 2.0 m (6'8") AFF where protected with a suitable warning barrier in accordance with ADA requirements.

D. Projecting equipment/devices are permitted mounted with the bottom between 0.68 m (2'3") and 2.0 m (6'8") AFF without warning barrier protection only where specifically approved in writing by the engineer.

12. UTILIZATION EQUIPMENT CONNECTIONS

12.1 Provide complete power wiring and final connections for utilization equipment as indicated on the drawings. This includes, but is not limited to, all mechanical, kitchen, manufacturing, computer, medical, office, copier, fixed, and portable equipment and apparatus. Coordinate all requirements with the contractor supplying the equipment (the

supplying contractor).

12.2 Provide connections complete and including power wiring from the electrical contractor provided local disconnecting means to each piece of equipment. If required, pass power wiring through supplying contractor furnished control equipment (including thermostats, relays, timers, integrated controllers, starters, contactors, VFD's, etc.). Provide a single point connection or multiple-point connections (by separating one larger circuit into smaller circuits at controller and/or equipment) as applicable (include all costs in bid). The electrical contractor is responsible for taking deliveries of all control equipment (which power wiring passes through) from the supplying contractor and for mounting and passing power wiring through this control equipment. Locate control equipment as indicated on mechanical or other trades documents or as otherwise coordinated with and approved by the owner, architect, mechanical engineer, and the supplying contractor.

12.3 All control wiring and associated raceway is by the supplying contractor (regardless of voltage), unless specifically indicated on the drawings. All central/common control panels are by the supplying contractor (power wiring is by the electrical contractor), unless specifically indicated on the drawings.

12.4 Provide safety switches as local disconnecting means at all equipment. Provide switches regardless of whether shown on the drawings or not. Provide switches regardless of whether or not the equipment includes integral unit switches or circuit breakers. Provide outdoor switches as NEMA-3R and indoor switches as NEMA-1.

12.5 For all equipment rated 120 V or 277 V and 20 A or less, provide either direct connection, including thermal overload switch where disconnecting means is required, or suitable receptacle where equipment is supplied with cord and plug (combination of plug and receptacle serves as disconnecting means), include all costs in bid.

12.6 Prior to rough in of raceway or purchasing any associated electrical equipment, obtain shop drawings from the supplying contractor and verify all requirements. The electrical contractor is fully responsible for contacting and obtaining copies of approved shop drawings from the supplying contractor. This includes fully coordinating the locations of all equipment and wiring in/serving elevator shafts, pits, and machine rooms.

12.7 Where equipment is served by variable frequency drives (VFD's), other solid-state controllers, or other special starters or controllers, wiring indicated on the drawings is as a guide to pricing only. Prior to rough in of raceway or purchasing associated electrical equipment, verify all requirements in writing with the supplying contractor. Provide exact circuit breaker trip amperes (or fuse amperes, where applicable) for circuits feeding this equipment as coordinated with and directed and approved by the manufacturer, include all costs in bid. Where the required circuit breaker/fuse amperes exceed the ampacity of the specified wiring, notify the engineer in writing. Provide all safety switches connected on the load side of VFD's with auxiliary contacts and interconnect (including providing all required wiring in separate 21 mm (3/4") raceway from power wiring) with VFD controls (to prevent and stop operating VFD with load disconnected). Provide all power wiring on the load side of any VFD as a dedicated circuit (from individual VFD to motor served) with no other circuit or wiring (of any kind) in the same raceway.

12.8 Where heat trace, control power transformers and control power supplies (rated 500 VA and less), electric alarm bells, plug-in condensate pumps, ultraviolet germicidal lamps in HVAC equipment, electrically operated security devices, door hardware, dampers (including smoke and fire dampers), and valves (including sinks/toilets/urinals), switchgear/switchboard strip/space heaters, etc. are specified on mechanical, plumbing, fire protection, electrical, or architectural drawings or specifications, provide appropriate wiring and power connections (whether shown on electrical drawings or not). Verify and coordinate voltage and wattage/amperes in field and provide wiring accordingly. Obtain power from a suitable nearby branch circuit. Include all disconnecting means switches, junction boxes, receptacles, and other equipment as per code or manufacturer recommendations. Provide ground fault protection (utilizing protective devices complying with the NEC) for all heat tracing.

12.9 For ductless split ("mini") style HVAC equipment the electrical contractor shall coordinate in detail with the supplying mechanical contractor before submitting bid to ensure that the equipment is compatible with power wiring shown on the electrical drawings. The supplying contractor shall furnish only equipment which is capable of separate and independent power supply to indoor and outdoor ductless split units (powering indoor unit from outdoor unit is not acceptable, unless specifically indicated on the electrical drawings). The supplying contractor shall furnish only equipment which is arranged so the incoming power wiring is energized all of the time and so the incoming power wiring is not used to control any of the equipment involved. All control wiring between indoor and outdoor units (and branch controllers, where applicable) is by the supplying contractor (see specifications section 13.3 above). Where ductless split equipment is supplied which is normally arranged to control one unit from another by directly switching power wiring, the supplying contractor shall include any necessary suitable relays (and associated wiring and modifications) to accommodate independent power supply. The electrical contractor is responsible for ensuring that this is coordinated in advance and that the ductless split style HVAC equipment, control wiring, and relaying is furnished by the supplying contractor accordingly. No extra consideration, claims, charges, or compensation will be granted under any circumstance associated with coordination of interconnection of ductless split style HVAC equipment.

13. DEMOLITION, REMOVAL, RELOCATION, AND RE-FEEDING

13.1 Disconnect, remove, relocate, and/or re-feed existing wiring and electrical equipment as indicated on the drawings (including, but not limited to, as indicated in electrical notes on the drawings) and otherwise provided in contract documents. Assume that all demolition and new construction requires disconnecting, removing, relocating, and re-feeding unless verified otherwise in the field. No consideration, claims, charges, or compensation will be granted for any alleged misunderstanding of the scope of disconnecting, removing, relocating, and re-feeding or as a result of failure to verify existing conditions.

13.2 Fully verify all requirements associated in any way with demolition, removals, relocations, and re-feeding and include all costs in bid. Visit site prior to submitting bid and investigate and verify all existing conditions (including verifying conditions above all accessible "drop" ceilings and in accessible chases). Completely remove from the site and properly dispose of all equipment and materials removed.

13.3 Prior to commencing any removals, completely verify all conditions and exact requirements related to re-feeding, maintaining, or affecting service to existing electrical equipment, devices, and wiring and mechanical, architectural, and other equipment and system in the field during construction. Where equipment or wiring is removed which is required to re-feed equipment, maintain service, or effects systems to remain, replace or reinstall the equipment and wiring. No extra consideration, claims, charges, or compensation will be granted to re-feed, reinstall, replace, reconfigure, etc. wiring and equipment where removed without first verifying all conditions.

13.4 Wherever electrical equipment and wiring is removed from visible finished surfaces, patch and restore the surface to the original condition matching existing adjacent surfaces. This includes all required painting, filling all openings (including channels and filling holes left from supports), etc.

13.5 Where existing ceilings are removed and reinstalled (either partly or entirely), remove all existing electrical equipment (including lighting fixtures, fire alarm devices [including, but not limited to, smoke and heat detectors, signaling devices, indicators, etc.], security/CCTV cameras, motion detectors, speakers, and all other electrical devices, equipment, and apparatus) from the ceiling grid and ceiling tiles. Leave in place at the ceiling and temporarily support (in a code approved and local authorities having jurisdiction approved manner) to facilitate ceiling removal. Once ceiling is reinstalled, permanently reinstall all electrical equipment in the ceiling. Where new equipment is shown on the drawings, completely disconnect and remove existing equipment (being replaced) and all associated wiring and provide all new equipment and associated wiring as shown on the drawings. Ceilings may be left open for a long period of time (i.e. there may be several months or more between the time of removal and the time of reinstalling ceilings). When ceilings are not in place, maintain (as operational) all fire alarm devices and equipment and normal and emergency lighting (temporarily install fire alarm devices, supported from structure and provide temporary lighting or temporarily support existing lighting from structure as applicable). When ceilings are not in place, safely secure everything which is exposed by the absence of ceilings (new and existing) and keep all areas clean when occupied. This ceiling work is not shown on electrical plans (see architectural drawings and ceiling plans and other trades drawings for information). This ceiling work applies regardless of the party removing the ceiling and regardless of whether or not ceiling removal is shown on drawings. Coordinate with all contractors and trades to confirm the extent of ceiling work and include all costs in bid. This ceiling work also applies where any contractor chooses to install new ceiling in lieu of reinstalling the existing ceiling.

14. EXCAVATION, BACK-FILLING, AND RESTORATION

14.1 Perform all required excavation, cutting, patching, backfill, surface restoration, and painting associated with the electrical installation, perform in accordance with general construction specifications. Coordinate all requirements with the general contractor. Refer to the section of this specification "Cutting, Patching, Fire-Stopping, and Painting" for additional information.

14.2 Install all underground wiring to maintain a minimum cover of 0.8 m (2'7") to top of raceways. Where field obstructions do not facilitate the above minimum cover, minimum cover as indicated in NEC Article 300.5 is permitted.

14.3 Perform all excavation and work in and associated with excavation in accordance with all applicable safety codes, standards, regulations, and requirements (refer to specifications section "Safety" of specifications division 16100, General Electrical).

14.4 Completely restore all surfaces to a condition matching or exceeding the original condition to the satisfaction of the owner, architect, and engineer. Backfilling and restoration below does not supersede or serve as a substitute for concrete encasement of raceways specified elsewhere.

A. Earth (and other unpaved surfaces) excavation: Backfill with suitable on-site material, preferably utilizing excavated material, and compact during backfill. Provide additional material to provide a flush surface after compacting or settlement. Provide seeding (as directed by the owner and architect) to restore grass surfaces.

B. Sidewalk (and other paved surfaces not subject to vehicular traffic) excavation: Where pavement construction joints are spaced not greater than 1.8m (6'0") apart, remove complete blocks of paving to the construction joints to facilitate excavation. Where construction joint spacing exceeds 1.8 m (6'0"), either saw cut pavement at a convenient location or remove to construction joints to facilitate excavation. Backfill with suitable on-site material, preferably utilizing excavated material and compact during backfill. Replace pavement sub-base with new materials to match existing sub-base materials. Replace pavement with new materials to match existing pavement.

C. Roadway and parking lot (and other surfaces subject to vehicular traffic) excavation: Saw cut pavement 76 mm (3") deep prior to excavation. Remove pavement 300 mm (1'0") beyond the edges of below grade excavation ("cut-back" pavement 300 mm (1'0") on both sides of trench). Backfill with suitable on-site material, preferably utilizing excavated material and compact during backfill. Replace pavement sub-base with new materials to match existing sub-base materials. Replace pavement with new materials to match existing pavement, filling the entire width of the excavation with "cut-backs".

D. Optional roadway and parking lot (and other surfaces subject to vehicular traffic) excavation: The following may be substituted for the methods indicated in item "C" above at the contractor's option. Saw cut pavement 76 mm (3") deep prior to excavation. Remove pavement to the same width as the edges of below grade excavation (without any "cut-back"). Back fill with concrete only to the bottom of the sub-base. Replace pavement sub-base with new materials to match existing sub-base materials. Replace pavement with new materials to match existing pavement.

14.5 Completely remove and properly dispose of any material excavated and not utilized for backfill, include all costs in bid.

15. HOUSEKEEPING AND EQUIPMENT PADS

15.1 Mount all fully or partially freestanding electrical equipment on pads as follows. Where equipment is installed without pad (without prior written approval) the contractor shall remove the equipment, provide a suitable approved pad, and reinstall the equipment

(including providing temporary power [including the use and cost of a generator if required] to maintain service) at no cost to the owner.

15.2 Provide all floor/roof mounted equipment on 100 mm (4") concrete housekeeping pad.

15.3 Provide all outdoor ground mounted equipment on a suitable pad. Level grade around pad. Provide top of pad 155 mm (6") nominal above finished grade (100 mm (4") minimum at any point).

15.4 Provide all housekeeping and equipment pads in complete accordance with equipment manufacturer's requirements and recommendations. This includes, but is not limited to anchor bolts, reinforcement, minimum thickness, pad openings/cutouts, raceway stubs, overall dimensions/shape, steel leveling channels, concrete characteristics, grounding (including grounding grids and loops), and structural details.

END OF SECTION

SECTION 16300 - ELECTRICAL MATERIALS

1. GENERAL PROVISIONS

1.1 The applicable requirements and conditions of specifications section "General Provisions" of specifications division 16100, General Electrical, are hereby made an integral part of this section.

1.2 The work governed by these specifications includes but is not limited to that as defined in specifications section "Scope of Work" of specifications division 16100, General Electrical.

1.3 Provide all materials and equipment (products) as new, the best in grade and quality, and manufactured in the United States of America with standards and ratings as specified herein. No substitution or deviation from the materials and equipment specified is permitted except by written permission from the engineer. Provide all materials and equipment as listed and/or labeled where applicable.

1.4 Replace or repair, to the satisfaction of the owner, any materials and equipment damaged before or after installation.

1.5 Materials and equipment manufacturers and catalog numbers specified constitute the type and quality of design, material, workmanship, ruggedness of construction, resistance to vandalism, exact operating and performance characteristics, features, configuration, dimensions, etc.. Where multiple manufacturers are shown in the drawings and/or specifications, not all manufacturers shown may be capable of providing materials and equipment meeting the specifications, field conditions, etc.. Manufacturers not specifically shown on the drawings or specifications shall be considered, provided the products are equivalent or superior to the requirements of the drawings and specifications (including equivalent or superior to products and/or manufacturers specifically shown on drawings and specifications). Manufacturers, whether shown on the drawings or specifications or not, are acceptable only if they can meet the specifications, conditions, and requirements specific to this project. The terms "equivalent", "equal", "equaling", and "approved equal" mean "equivalent or superior to the item/process specified when approved by the engineer", unless otherwise noted.

2. RACEWAYS

2.1 Steel Rigid Metal Conduit (RMC) and Steel Intermediate Metal Conduit (IMC)

A. Provide steel RMC as full weight, heavy wall, mild steel pipe, galvanized inside and outside.

B. Provide steel IMC as standard wall steel pipe; otherwise the same as steel RMC.

C. Provide fittings for steel RMC and steel IMC of high grade steel, having rust resistant finish, providing ample wiring space, having smooth round edges, and having full threaded hubs.

D. Utilize only fully threaded screw-on fittings with steel RMC and steel IMC (coat field-cut threads as per NEC Article 300.6(A)). Compression, set screw, bolt on, or other thread-less fittings are not permitted.

2.2 Electrical Metallic Tubing (EMT)

A. Provide EMT of high grade steel and galvanized inside and outside. Enamel coating only is not acceptable.

B. Provide fittings for EMT of high-grade steel, having rust resistant finish, providing ample wiring space, and having smooth round edges. For EMT in damp locations (i.e. concealed), utilize only fittings of the thread-less compression type without set screws. For EMT in dry locations only, thread-less set screw steel type fittings are permitted. Die cast, set screw, and indenter fittings are not permitted.

2.3 Flexible Metal Conduit (FMC) and Liquidtight Flexible Metal Conduit (LFMC)

A. Provide FMC ("greenfield") of high-grade steel, galvanized inside and outside, having a smooth interior, and providing a continuously effective ground. Provide fittings for FMC of high grade steel, having rust resistant finish, providing ample wiring space, having smooth round edges, of the two (2) screw type, listed and NEC approved for grounding.

B. Provide LFMC ("sealtite") with an overall PVC sheath; otherwise the same as FMC. Provide fittings for LFMC of high grade steel, having rust resistant finish, providing ample wiring space, having smooth round edges, listed and NEC approved for grounding, and of the sealing compression gland type.

C. Where applicable, provide FMC and LFMC manufactured to comply with NEC Article "Places of Public Assembly".

2.4 Polyvinyl Chloride Rigid Nonmetallic Conduit (PVC RNC)

A. Provide PVC RNC of virgin PVC (or material reground from the manufacturer's own products), heavy wall, schedule 40 or schedule 80.

B. Provide fittings for PVC RNC of schedule 40 virgin PVC, providing ample wiring space, and having smooth round edges. Make all interfaces between PVC RNC and raceways, enclosures, boxes, other conduit types, etc., utilizing adapter fittings designed for the purpose.

C. Make all joints utilizing solvent welding method, installed to be completely watertight and pressure-tight to 172 kPa (25 p.s.i.).

D. High density polyethylene (HDPE) conduit and type "EB" encased burial and type "A" PVC conduits are not permitted under any circumstance.

2.5 Surface Raceway

A. Surface raceway with integral wiring devices: Provide steel or aluminum type as indicated on the drawings. Utilize one (1), two (2), or three (3) compartment types (with dividers as applicable) as indicated on the drawings.

B. Provide all steel surface raceways in factory ivory finish. Provide final painting (over the ivory factory finish) as directed by the owner and architect in the field. Provide all aluminum surface raceways in natural brushed aluminum finish.

C. Nonmetallic surface raceways are not permitted, unless specifically indicated otherwise on the drawings.

D. Provide all installations of surface raceways complete including all required fittings, accessories, details of installation, etc.. Include costs in bid for installing surface raceways around all obstructions encountered.

E. Provide fittings for surface raceways manufactured by the surface raceway manufacturer and specifically designed to be used with and compatible with the surface raceway and the actual installation conditions encountered. Provide fittings for surface raceways having rust resistant finish, providing ample wiring space, and having smooth round edges. Provide device box type fittings as per the section of this specification "Outlet, Switch, and Junction Boxes".

F. Perform all cutting, bending, and offsetting of surface raceways and components utilizing tools specifically designed and manufactured for the purpose by the surface raceway manufacturer. Cutting with hacksaws and bending/offsetting with standard conduit benders is not acceptable. Where the manufacturer does not manufacture or supply tools to perform work required (as indicated in manufacturer's standard catalogs), use only tools specifically recommended and approved for the purpose by the manufacturer.

G. Fasten and secure all surface raceways utilizing hardware concealed by the surface raceway. Visible securing and fastening hardware is not acceptable except that Wiremold #V5703 (or approved equal) supporting "back clip" type fasteners are permitted with #V700 style surface raceway without integral wiring devices only. One (1) or two (2) hole straps over the raceway are not acceptable.

H. Specifications are based on equipment as manufactured by Wiremold. Equipment as manufactured by Hubbell and Mono-Systems (or equivalent) shall be considered.

3. OUTLET, SWITCH, PULL, AND JUNCTION BOXES

3.1 Provide boxes of proper types and sizes to facilitate installation and as per code at all outlets and junctions indicated on the drawings and as otherwise required.

3.2 In unfinished areas, mount boxes flush or exposed. In finished areas, mount boxes flush in ceilings, walls, and floors, include all required cutting and patching. Where impossible to mount flush in finished areas or where surface wiring is required to serve equipment in finished areas, finished style (Wiremold #V5730 to #V5760, equipment as manufactured by Hubbell or Thomas & Betts (or equivalent) shall be considered) surface boxes are permitted. Standard style pressed steel boxes are not permitted in finished areas. Where the contractor installs improper boxes in finished locations (without prior written approval), the contractor shall remove the boxes and install new boxes flush mounted (including cutting and patching to flush mount boxes and wiring and including replacing or reinstalling wiring) at no cost to the owner.

3.3 Utilize boxes of either unit or ganged construction and sized for devices and wiring installed and not smaller than the minimum sizes as per the drawings and specifications (and in no case smaller than the minimum size permitted by the NEC). Provide boxes as galvanized pressed steel (unless indicated otherwise), not less than 4" square, and with the proper size knockouts to facilitate wiring.

3.4 For flush mounted boxes, provide box shape permitting surfacing materials to be on straight lines and to fit closely around the box. Provide boxes in plastered, drywall (GWB), and similar walls, partitions, and ceilings with suitable plastering rings.

3.5 Utilize cast and/or malleable rust-resisting steel boxes for wiring in exterior, wet, or damp locations and for exposed visible steel RMC and IMC runs. Utilize aluminum or alloy boxes only where aluminum conduit is permitted by the specifications and used.

3.6 For all boxes in floors, utilize only boxes specifically designed, NEC approved, and listed for floor installation (including maintaining fire rating of the floor).

3.7 Provide all boxes for lighting outlets with studs of a size suitable for the weight of the luminaire supported (in no case less than 10 mm (3/8")). Provide the stud of integral construction with the box or of the type inserted from the back of the box. Studs held to the box with bolts to support luminaire weight are not permitted.

3.8 100 mm (4") diameter "octagon" boxes are not acceptable, except under the following conditions. Octagon boxes are permitted in conjunction with luminaire mounting studs where studs are required above. Octagon boxes are permitted where required to mount equipment where equipment is not compatible with square or ganged type boxes (including the use of adapter rings on square boxes).

3.9 Secure boxes firmly in place and set true, square, and flat or flush (as applicable) with finished surfaces. Keep all unused knockouts closed or close with suitable threaded plugs (for threaded knockouts or hubs) or knockout seals (for unthreaded knockouts). Install flush mounted boxes so the covers are flush with the finished surface.

3.10 Provide all boxes with cover plates as specified below.

4. COVER PLATES

4.1 Provide cover plates for switches, receptacles, outlet and junction boxes, and other devices of 1.0 mm (0.04") thick metal with paint finish or of stainless steel (as directed by the owner and architect, include costs in bid for painted or non-magnetic stainless steel), unless indicated otherwise.

4.2 Utilize suitable pressed galvanized steel code gauge raised covers for exposed wiring methods in unfinished areas and accessible hidden locations. Flat pressed galvanized steel code gauge covers may be utilized on junction boxes (where devices are not installed) or for ganged devices (three (3) gang or greater only). Tile and/or plastering rings style covers are not permitted for exposed wiring methods under any circumstance.

4.3 Utilize cast rust-resisting steel or #302 stainless steel covers with gaskets for boxes in wet, damp, or exterior locations or other locations where cast steel boxes are utilized.

4.4 Provide suitable blank covers on all unused boxes and boxes for future use (including boxes where devices are not installed at the time that electrical work is completed; specifically including telephone/data outlets where jacks and covers are not installed).

5. CONDUCTORS AND CABLE (600 V)

5.1 Provide all wiring (for all systems) utilizing multiple single conductors in raceway, unless indicated otherwise. Conductor sizes indicated in the specifications and on the drawings are the minimum that will be accepted (conductor sizes are identified based on the NEC, as either American Wire Gauge [AWG] or thousands of circular mils [MCM or kcmil]). Where the contractor installs conductors smaller than the minimum size, the contractor shall remove conductors and install new conductors of the specified size at no cost to the owner.

5.2 Provide all conductors (including conductors in cables, where permitted) as 600 V, having flame retardant, heat resistant, and moisture resistant insulation, and listed and marked in accordance with industry standards and the NEC. Unless indicated otherwise, provide all conductors identified both as type "THHN" and as type "THWN" ("THHN/THWN"), rated 90 degrees C for dry and damp locations and rated 75 degrees C for wet locations. Conductors identified as type "XHHW" (in lieu of type "THHN/THWN") are permitted only where conductors are of the compact stranded type (type "XHHW" is not permitted for solid conductors or for standard concentric or compressed stranded conductors). Provide all conductors for all systems of a type suitable for installing in dry, damp and wet locations. Conductors suitable for dry locations only and conductors suitable for dry and damp locations only are not acceptable (except as specifically otherwise provided for plenum rated systems cables).

5.3 Provide all conductors of soft drawn copper (Cu, CU) wire of 98% conductivity. Aluminum (Al, AL) conductors are not acceptable, unless specifically indicated otherwise on the drawings.

5.4 Where permitted elsewhere in this specification, provide metal clad cable (type "MC") having interlocked steel or aluminum cladding and having conductors as specified above, including an insulated grounding conductor. Provide conductors #10 AWG and smaller as solid and conductors #6 A.W.G and larger as stranded. Conductors #8 AWG may be solid or stranded. Provide type "MC" cable listed and NEC approved to provide an acceptable grounding path. Provide fittings for type "MC" cable of suitable pressure pad/clamp type, high grade steel, having rust resistant finish, providing ample wiring space, having smooth round edges, and having full threaded hubs. Fittings utilizing set screws are not acceptable. "Snap-in" fittings of any kind (including, but not limited to, fittings designed to fasten in knockouts or hold cable with spring tension, fittings without treaded hubs, and fittings designed to be installed without the use of tools) are not acceptable. Provide type "MC" cable as listed and install in complete accordance with NEC Article 330. Where permitted by the NEC (including Article 604), listed manufactured wiring systems consisting of cables identified as type "MC" may be utilized wherever specifications allow the use of type "MC" cables. Where permitted by the NEC (including Articles 725 and 770), listed type "MC" cables containing Class 2 and Class 3 cable and/or optical fiber members in addition to power conductors may be utilized wherever specifications allow the use of type "MC" cables.

6. SPLICES, TAPS, AND CONNECTIONS

6.1 Make all splices, taps, and connections at locations indoor and above ground only. Splices, taps, and connections are not permitted below grade (including below any floor level where the floor is in direct contact with earth, i.e. basement slabs, slabs on grade, etc.), or where subject to being submerged (except as specifically provided as follows). Route raceways and wiring accordingly and include all costs in bid. Where physically impossible to install wiring to make splices/taps above grade, splices/taps below grade shall be considered where specifically requested in writing in advance (prior to installing conductors) by the contractor and where approved in writing by the engineer. Specifically and individually identify each and every case involved for below grade splices/taps in the request(s) and submit shop drawings for splices/taps (as indicated below). Where below grade splices/taps are installed by the contractor (without prior written approval) the contractor shall remove the raceways, wiring, splices, and taps and install new raceways and wiring in such a manner to completely avoid below grade splices/taps at no cost to the owner.

6.2 Perform all splices/taps in suitable code sized outlet and junction boxes only, not in raceways, conduit bodies, or equipment cabinets. Clean each strand of conductors carefully before connecting.

6.3 Insulation piercing type splices, taps, and connections of any kind are not permitted under any circumstance (including where applied after removing insulation).

6.4 Provide connections at equipment, apparatus, and devices for a complete installation and as follows. Coordinate all requirements with equipment to connect.

A. Where equipment includes factory "pig tails" for connections, make connections as specified above for splices and taps.

B. For stranded wiring #10 AWG and smaller, utilize suitable crimp-on "stacon" type terminals. Where equipment terminals include pressure pads, wiring may terminate directly at equipment without crimp-on terminals. Connecting stranded wiring directly at wire binding screw terminals (i.e. wrapped around screw) is not permitted under any circumstance.

C. For solid wiring #8 AWG and smaller, provide wiring connecting directly at terminals.

D. For wiring #6 AWG and larger and #8 AWG stranded wiring, utilize suitable crimp-on compression lugs. Where equipment is provided with factory-installed lugs, wiring may connect directly at factory lugs.

6.5 Provide splices and taps at indoor locations and outdoor locations above ground (excluding exposed outdoor splices/taps) as follows.

A. For stranded wiring #10 AWG and smaller and solid wiring #8 AWG and smaller, make splices/taps by twisting conductors together and utilizing suitable pressure type "wire nut" connectors. Tightly over-wrap with vinyl insulating tape. Utilize listed wire nuts with internal coiled square metal binding spring ("all plastic" and porcelain wire nuts are not acceptable under any circumstance). For splices/taps in wet locations, utilize only "self-sealing" wire nuts with integral water repellent non-hardening sealant (Ideal #60 "DB Plus" or equivalent).

B. For wiring #6 AWG and larger and for #8 AWG stranded wiring, make splices/taps utilizing suitable crimp-on compression connectors. Bolted type connectors are not permitted, except where available crimp-on compression connector configurations do not correspond to combinations and arrangement of conductors to be connected. Wrap with rubber insulating tape or vinyl mastic of type, thickness, and insulation level equaling or exceeding the original insulation then tightly over wrap the entire assembly with vinyl insulating tape covering all rubber tape/mastic without gaps or voids.

6.6 Provide all splices and taps underground, below grade, and subject to being submerged (where specifically approved in writing by the engineer) as follows. Provide splices/taps of direct buried and open aerial wiring (where specified elsewhere) as follows. Submit shop drawings for all proposed splice/tap products and methods. Where any splice/tap is installed in any underground, below grade, submerged, or exposed wet or outdoor location for which shop drawings are not previously submitted, the contractor shall disconnect and remove the installed splices/taps and provide new acceptable splices/taps (as directed by the engineer) at no cost to the owner.

A. Utilize manufactured or pre-engineered splices/taps specifically designed and listed for the application, including being suitable for installation underground, direct buried, submerged, and in wet locations. Provide outdoor exposed splices/taps also as sunlight resistant. Pre-molded, heat-shrink, and cold-shrink manufactured kits and engineer approved pre-engineered hand-wrapped tape kits shall be considered.

B. For underground splices/taps of stranded wiring #10 AWG and smaller and solid wiring #8 AWG and smaller only, splices/taps may be made as follows. Permanently electrically connect conductors by either of the following options:

1) Twist conductors together then solder conductors. Utilize suitable pressure type wire nut connectors with integral water repellent non-hardening sealant (Ideal #60 "DB Plus" or equivalent) to mechanically bind the soldered splice/tap and tightly over wrap with vinyl insulating tape.

2) Splice/tap conductors with suitable insulated crimp-on connectors and tightly over wrap with vinyl insulating tape.

Once electrically connected, embed splices/taps in sealant compound. Utilize only engineer approved hardening flexible sealant (i.e. "bondo" traffic detector loop style sealant; contact the engineer for information and submit shop drawings for approval). Place sealant (uncured liquid) in a suitable container, immerse splices/taps in sealant in the container, and rigidly support splices, taps, and conductors in place until sealant has set.

C. Self-sealing wire nuts (used alone and/or when over wrapped with vinyl insulating tape) are not an acceptable substitute for splices/taps as specified in items "A" and "B" above.

6.7 Splices, taps, and connections (and associated materials) as manufactured by Burndy, Elastimold, G&W, Homac, Ideal, Ilsco, Mac Products, O-Z/Gedney, Plymouth, Raychem, Skotch/3M, and Thomas and Betts/Blackburn (or equivalent) shall be considered.

7. GROUNDING MATERIALS

7.1 Provide all material used for grounding of non-ferrous copper. Aluminum is not acceptable, unless specifically indicated on the drawings.

7.2 Provide all driven (made) grounding rod electrodes of copper or copper clad steel, minimum 19 mm (3/4") diameter by 3.0 m (10'0") long.

7.3 Provide all grounding conductors in accordance with the section of this specification "Conductors and Cable (600 V)", except as follows. Grounding conductors may be insulated or bare, except as follows. Wherever grounding conductors #6 AWG and smaller are insulated, provide insulation colored green. Provide "isolated" grounding conductors as insulated only (green with yellow tracer). Provide grounding conductors run in raceway/cable with wiring as insulated only (bare conductors are not permitted for grounding conductors run with wiring, except cable wiring methods permitted elsewhere in the specifications where insulated grounding conductors are not available).

7.4 Provide all grounding connections as per the section of this specification "Splices and Taps", except as modified below. Grounding connections do not require insulation.

7.5 For wiring #4 AWG and larger, provide all grounding connections utilizing exothermic weld process (Erico/Cadweld, Thermoweld, Thomas & Betts, or equivalent). Crimp-on compression type connectors may be used only where available exothermic weld process connection configurations do not correspond to combinations and arrangement of conductors to be connected. Bolted type connectors are not permitted, except where available exothermic weld process and crimp-on compression connector configurations do not correspond to combinations and arrangement of conductors to be connected. Where equipment is provided with factory installed lugs, #4 AWG and larger wiring may terminate directly at factory lugs.

7.6 Utilize only exothermic weld process connections for all concealed grounding connections (compression, mechanical, and other grounding connections are not permitted concealed). Where available exothermic weld process connection configurations do not correspond to combinations and arrangement of conductors to be connected in concealed locations, utilize combinations and arrangement of conductors necessary to facilitate exothermic weld process connections and extend from the concealed connection location to an accessible location where crimp-on compression or bolted type connections may be utilized (as permitted above).

7.7 Accessible connections of wiring #6 AWG and smaller to piping and similar materials/equipment may utilize multiple-bolt type ground clamps. Accessible connections of wiring #6 AWG and smaller to driven (made) grounding rod electrodes may utilize one-piece, single bolt "acorn" type ground clamps.

7.8 Provide conduit grounding bushings of galvanized malleable iron with integral screw pressure connector or provisions to accept factory or field installed lug where required.

8. IDENTIFICATION, NAMEPLATES, AND TAGS

8.1 Provide all new electrical equipment with engraved three (3) layer laminated plastic nameplates describing the equipment, load/device served, ratings, circuit(s) feeding the equipment, etc. as indicated below. Provide engraved plastic nameplates for existing electrical equipment where modified or connected to as part of this project or where specifically indicated on the drawings. Provide these engraved plastic nameplates in addition to any code required or manufacturers' standard nameplates.

8.2 Provide engraved plastic nameplates for all electrical equipment, including, but not limited to, safety switches, enclosed circuit breakers, branch panels, distribution panels (including branch circuit breakers and circuit breaker spaces), transformers, any equipment containing fuses, power outlets, thermal overload switches, contactors, time clocks, photocells, meter sockets, modular meter centers, fire alarm equipment and devices, lighting controllers, dimming cabinets, capacitors, snow melting equipment, generators, motor control centers, motor controls (starters, variable frequency drive [VFD] units, etc.) where furnished by the electrical contractor, high voltage equipment, etc. (where applicable). Provide engraved plastic nameplates for all receptacles and switches where dedicated to serving specific equipment. Provide engraved plastic nameplates for convenience receptacles (only where indicated on the drawings).

8.3 Secure engraved plastic nameplates with suitable screws or rivets, self-adhesive nameplates are not acceptable. Provide engraved plastic nameplates with white letters on black background, unless indicated otherwise. Provide engraved plastic nameplates with 6.5 mm (1/4") minimum lettering, unless indicated otherwise. Provide engraved plastic nameplates on the front and/or cover of the equipment plainly visible when the cover (where applicable) is closed, unless indicated otherwise.

8.4 Submit shop drawings showing proposed sizes (overall and lettering sizes) and exact proposed wording (including exact arrangement of wording) of all engraved plastic nameplates for review and approval.

8.5 Provide all engraved plastic nameplates in accordance with the following example. Equipment names are the alphanumeric designation for equipment indicated on the drawings (i.e. "MDP", "PP1", "EF-1", etc.). Equipment descriptions identify the equipment in "plain English" (see example). Indicate the operating voltage of the equipment, including phase and wires (see example). Where equipment includes overcurrent devices (i.e. main breaker panels, fused switches, enclosed circuit breakers, etc.) show the appropriate amperes on the engraved plastic nameplate. Where equipment does not include overcurrent devices (i.e. main lug panels, unfused switches, contactors, transformers, etc.) show the amperes of the overcurrent device protecting the circuit serving the equipment.

Remarks include information as described below.

EXAMPLE ENGRAVED PLASTIC NAMEPLATE WORDING

Equipment Name (use 10 mm (3/8") lettering):	PP1
Equipment Description:	POWER PANEL
Equipment Voltage, Phase, Amperes:	120/208V-3PH-4W, 100A
Remarks:	FED FROM MDP - CCT. 4

A. Branch Panel: Provide engraved plastic nameplate showing panel name and use (description) as indicated on the single line diagram and/or respective panel schedule. Remarks indicate the panel and circuit number or transformer feeding the panel.

B. Safety Switch/Enclosed Circuit Breaker: Provide engraved plastic nameplate with the name and description of equipment/load fed. Remarks indicate the panel and circuit number or transformer feeding the switch/breaker. Ampere rating may be omitted if the proper rating is clearly indicated on the switch/breaker and is visible with the cover closed. Where fusible switches are used, show the fuse ampere rating. Where adjustable trip circuit breakers are used, show the proper ampere setting.

C. Fusible Device: On the inside cover of each fused device, provide an engraved plastic sign indicating the proper fuse size (as indicated on the drawings or otherwise required). Provide nameplate reading, "USE ___A FUSE ONLY" (fill in the proper fuse rating).

D. Transformer: Provide engraved plastic nameplate with the name and description of equipment/load fed. Show both the primary and secondary voltages and phase as well as the transformer kVA rating. Ampere ratings are not required. Remarks indicate the panel and circuit number feeding the transformer.

8.6 Provide engraved plastic nameplates for power outlets, thermal overload switches, and for receptacles and switches where dedicated to serving specific equipment. Show the equipment served, the voltage and ampere rating, and the circuit feeding the equipment. Utilize 3.2 mm (1/8") high minimum lettering. Provide as per the following example:

Equipment Name and Description:	MO-1 MICROWAVE OVEN
Equipment Voltage and Amperes:	120V, 20A - PP1-12

8.7 Where specifically indicated on the drawings only, provide engraved plastic nameplates for convenience receptacles showing the voltage and ampere rating and the circuit feeding the receptacle. Utilize 3.2 mm (1/8") high minimum lettering. Provide as per the following example:

Equipment Voltage and Amperes:	120V, 20A
Equipment Circuit:	PP1-14

8.8 Provide engineer approved wrap-around adhesive or tube type wire tags or markers for all conductors, except conductors in feeders tagged as indicated below. Provide tags/markers indicating the panel or device where the wiring originates and the conductor circuit number (or other identifying number/letter/designation unique to the conductor). Tag/mark neutral and grounding conductors with the respective circuit number(s) of the corresponding phase conductor(s).

8.9 Provide engineer approved tags for all panel feeders (regardless of ampere rating) and other circuits (600 V and less) rated 100 A and larger, at both ends and at all intermediate junction and pull boxes. Provide tags indicating the circuit designation or equipment served, panel name and circuit number (or other source of feeder), and stating the voltage, phase, and amperes of the circuit. Provide tag wording and layout similar to engraved plastic nameplates as indicated above.

8.10 Where any conductor size differs from the conductor size normally expected for the respective overcurrent device (for any reason, whether specified or not, including voltage drop, NEC "tap rule" application, ampacity de-rating, etc.), provide engineer approved tags at the point where the wiring terminates at the overcurrent device reading, "WIRING IS ADJUSTED FOR VOLTAGE DROP/TAP RULE/DE-RATING, USE MAXIMUM ___A FUSE/CB" (indicate the proper reason for the adjustment and fill in the proper overcurrent device ampere rating). For feeders, this information may be included on the tags specified above.

8.11 Provide engineer approved plastic tags for all primary feeders (over 600 V) identifying the feeder number/designation and service voltage. Provide feeder numbers and exact tag configuration and information as designated by the owner and/or engineer during construction. Apply tags after applying cable fire protection tape, where applicable.

8.12 Provide all new and existing branch panels (where connected to or modified as part of this project) with accurate and descriptive typewritten circuit directories. For existing panels, provide directories including all modifications as part of this project as well as all previous "penciled in" changes and information. Actual tracing and identifying of existing circuits is not required, unless specifically indicated on the drawings. Submit photocopies of circuit directories as part of as-built record documents.

8.13 Provide all new electrical equipment with all caution, danger, and warning signs or indications required by any applicable regulation, code, standard, or manufacturer's recommendation (provide as listed where applicable and refer to specifications section "Regulations and Codes" of specifications division 16100, General Electrical). This includes, but is not limited to NEC Articles 100, 110, 200, 230, 250, 450, 490, 504, 513, 516, 550-552, 585, 620, 647, 665, 669, 690, 692, 700, 705, etc., as applicable.

8.14 Identify conductors in complete accordance with the NEC and as indicated below (including identifying "high-leg", grounding, and grounded (i.e. neutral) conductors, where applicable). For conductors #6 and smaller, identify by natural insulation color. For conductors #4 and larger (and for cable wiring methods where applicable colors are not readily available from cable manufacturers), identify by natural insulation color or by a 155 mm (6") long (minimum) band of colored vinyl electrical tape on conductors at all terminations and in all boxes and enclosures. Where "tracers" are required, identify by natural insulation color including narrow stripes of the tracer color. Where conductors

including tracer stripes are not readily available, provide a 25 mm (1") band of tape (apply over and in the center of the 55 mm (6") band of tape, where applicable) of the tracer color at all terminations and in all boxes and enclosures.

8.15 Identify phases of all conductors where more than one phase conductor is present (in raceways, cables, boxes, enclosures, etc.) with methods as indicated above. Utilize standard color-coding throughout the project as follows:

120/208 V SYSTEM

A-phase	Black
B-phase	Red
C-phase	Blue
Neutral	White
Ground	Green

277/480 V SYSTEM

A-phase	Brown
B-phase	Orange
C-phase	Yellow
Neutral	White with brown tracer(s)
Ground	Green

8.16 The electrical contractor shall provide new OSHA approved "DANGER - HIGH VOLTAGE" signs on all doors which directly enter any room containing exposed live parts or containing new or existing equipment operating at over 600 V (where connected to or modified as part of this project). Provide new signs even if existing signs are present (except that new signs are not required where existing signs are OSHA approved type complying with *current* OSHA standards).

9. LOCKS AND KEYS

9.1 Provide all locks for lighting and power panels, fire alarm and signaling cabinets and all other electrical systems or locked apparatus with keys which are alike.

10. RECEPTACLES AND SWITCHES

10.1 Provide all receptacles and switches as industrial and specification grade, totally enclosed in non-flammable and heat resistant heavy-duty thermoset or thermoplastic case, with terminal screws on the side of the case. Pigtail conductor connections are not permitted (except for specialty devices where side terminal screws are not available options in the manufacturer's catalog), unless specifically indicated otherwise. Provide color as selected and approved by the owner and architect.

10.2 Provide receptacles as duplex, parallel blade, side wired, three (3) wire, grounding type, 20 A, 120 V, and listed as "tamper-resistant", unless specifically indicated otherwise on the drawings. Listed combination receptacle and separable snap-in wiring terminal assemblies (Hubbell "SNAPConnect" style, Pass & Seymour "PlugTail" style, or equivalent) may be used and may utilize pigtail connections on the wiring terminal assemblies.

10.3 Provide weatherproof receptacles listed as weather-resistant type and mounted in a weatherproof box with gasket and single spring-hinged weatherproof-while-in-use cover over both receptacle positions.

10.4 Provide receptacles at accessory buildings (at or below grade), bathrooms (including rooms containing bathtubs or showers), boat hoists, boathouses, crawl spaces, dishwashers, garages, janitor closets, kitchens, kitchenette counters, laundry areas, outdoors, rooftops, unfinished basements, wet locations, within 6'0" of any sink, and as indicated on the drawings or required by the NEC with integral ground fault circuit interrupter (GFCI) protection for personnel with trip characteristics as per the NEC and UL standards. Utilize only weather-resistant type receptacle mounted in a weatherproof outlet box with single spring-latched weatherproof-while-in-use cover for boat hoists and in all outdoor, rooftop, and wet locations. Feed-through protection of standard type receptacles from other GFCI receptacles is not acceptable (unless specifically indicated otherwise on the drawings). Protection of standard type receptacles in readily accessible locations from GFCI circuit breakers is not acceptable (see below for inaccessible receptacles). For inaccessible receptacles (locations which are not readily accessible as per the NEC, for example where located behind equipment, appliances, or obstacles) the use of GFCI type receptacles is prohibited and protection of standard type receptacles from GFCI circuit breaker must be used (identify receptacles as protected as per the NEC). Provide compliant GFCI protection wherever required by the NEC whether indicated on the drawings or not.

10.5 Provide wall switches as single pole, three-way, or four-way as applicable, heavy duty flux tumbler type, UL "T" rated, specification grade, and rated 20 A, 277 V and 120 V.

10.6 Provide horsepower rated single-pole thermal overload switches (manual motor starters, O/L switches, etc.) with thermal overload heater element coordinated with equipment served. Where overload protection is not required (where the switch acts only as disconnecting means) provide overload heater element rated in excess of the branch circuit breaker amperes.

10.7 For all switches where locking provisions are required by Code or indicated on the drawings and for all thermal overload switches, provide a suitable handle locking guard capable of visibly padlocking in the open or closed position (with switch handle position visible when locked).

10.8 Provide dimmer switches of thin profile slide type ("off" when slider is in the lowest position), Lutron #NT series (or equivalent by Hubbell or Leviton), unless indicated otherwise. Dimmer switches of the rotary type, with raised profile (with raised cooling fins), and/or with on/off toggle separate from slider are not acceptable. Provide with full wattage rating as indicated on the drawings, do not "de-rate" by removing cooling fins or heat sink sections (unless specifically indicated on the drawings). Where multiple dimmer switches or dimmer switch(es) along with standard type switches (single pole, three-way, and four-way) are shown grouped together on the drawings, gang switches together with a single overall cover plate (conform with NEC Article 404.8(B) "Voltage Between Adjacent Switches", where applicable). Utilize special cover plates based on the combination of switches involved. Where ganged with dimmer switches, utilize single pole, three-way, and four-way switches of the slide type with appearance and manufacturer matching dimmer switches.

11. SAFETY SWITCHES

11.1 Provide all safety switches (disconnect switches) of the quick-make and quick-break type, with contacts not marked or shielded, designed to function if the operating spring fails or is removed, with mechanical interlock so operation is impossible when the cover is open (provide means to manually bypass/defeat the interlock), with provisions for padlocking in both the open and closed positions, and of the heavy duty type. Provide switches with voltage ratings equaling or exceeding the operating voltage. Provide indoor switches with NEMA-1 enclosures. Provide outdoor switches with NEMA-3R enclosures. Where NEMA-4X enclosures are specifically indicated on the drawings only, provide of the stainless steel type only.

11.2 Provide fuse clips in fusible switches to facilitate fuses as per the section of this specification "Fuses". Provide suitable "rejection" type clips to prevent replacing fuses with short circuit ratings lower than specified.

11.3 Provide safety switches with ground busses. Where neutral conductor is present, provide safety switches with separate neutral busses (with provisions for bonding, bond where required by the NEC).

11.4 For all safety switches on the load side of variable frequency drive (VFD) units, provide safety switches with integral "electrical interlock" auxiliary contacts (one (1) N.O. and one (1) N.C., minimum) which "break" before safety switch opens. Provide two (2) #14 AWG interlock conductors run (in raceway with line side power conductors) from auxiliary contact to VFD unit. The VFD supplying contractor shall connect interlock wiring at VFD unit to shut down VFD unit if safety switch is opened to prevent operating VFD without load connected.

11.5 Equipment as manufactured by Eaton, General Electric, Siemens, and Square-D (or equivalent) shall be considered.

12. FUSES

12.1 Provide an NEC cartridge fuse for each fuse-gap in the work. Furnish three (3) spare fuses of the rating installed to the owner for each fused device. Specifications are based on equipment as manufactured by Cooper/Bussman. Equipment as manufactured by Ferraz Shawmut and Littlefuse (or equivalent) shall be considered.

12.2 Provide fuses of the dual element time delay, current limiting, and non-renewable type with voltage rating not less than the operating voltage and coordinated with the respective fuse clips and with short circuit rating of 200,000 A. Provide fuses as class "RK1" (600 A and less, Cooper/Bussman #LPN/S-RK series) or class "L" (over 600 A, Cooper/Bussman #KRP-C series). Class "CC" fast acting (Cooper/Bussman #LP-CC series) or time delay (Cooper/Bussman #KTK-R series) fuses, as recommended by manufacturer, are permitted for control applications.

13. CIRCUIT BREAKERS

13.1 This section applies to all circuit breakers installed within or in conjunction with branch and distribution panels, enclosed circuit breakers, contactors, starters, and any other electrical equipment, unless indicated otherwise.

13.2 Provide all circuit breakers of the molded case type unless specifically indicated otherwise. Provide readily removable from the front of panels and equipment without disturbing adjacent units, having quick-make and quick-break toggle mechanisms and non-fusible contacts, having inverse time and short circuit characteristics, which trip free on overload or short circuit so that they cannot be held closed on overload, clearly indicating whether they are in the open, tripped, or closed position. Provide automatic release obtained through the medium of a bimetallic thermal type element (ambient compensated) engaged in the releasing latch of the breaker or mechanism.

13.3 Provide circuit breakers in branch and distribution panels with short circuit ratings as indicated in the respective equipment specifications. Provide circuit breakers as part of enclosed circuit breakers, contactors, starters, and any other electrical equipment with short circuit ratings not less than the short circuit rating of the first overcurrent device on the line side of the breaker, unless indicated otherwise on the drawings.

13.4 Provide field-installed handle locking devices for all circuit breakers not requiring switch control, for all circuit breakers feeding emergency lighting equipment (including battery equipment) and fire alarm controls, and for all circuit breakers fed from an emergency generator system (where applicable).

13.5 Provide 15 A and 20 A circuit breakers "SWD" and "HID" rated. Provide branch panel (250 V and less) circuit breakers rated 70 A and less as "HACR" rated. Provide enclosed circuit breakers and circuit breakers in distribution panels rated 250 A and less as "HACR" rated.

14. ENCLOSED CIRCUIT BREAKERS

14.1 Provide each enclosed circuit breakers consisting of a molded case circuit breaker, with a trip rating as indicated on the drawings, with provisions for padlocking in both the open and closed positions, within a listed enclosure manufactured for the purpose of housing a circuit breaker. Provide indoor breakers with NEMA-1 enclosures. Provide outdoor breakers with NEMA-3R enclosures.

14.2 Provide circuit breakers (including short circuit ratings) as specified elsewhere in this specification. Provide circuit breakers of the bolt-on type.

14.3 Provide enclosed circuit breakers with ground busses. Where neutral conductor is present, provide safety switches with separate neutral busses. Provide neutral bus with provisions for bonding and bond where required by the NEC.

14.4 Equipment as manufactured by Eaton, General Electric, Siemens, and Square-D (or equivalent) shall be considered.

15. BRANCH PANELS

15.1 Provide branch panels (panel boards) of dead front completely enclosed safety type construction, listed (with all components bearing labels), of a type suitable for use as service entrance, and containing thermal-magnetic "bolt-on" type circuit breaker branches as per the respective schedules on the drawings.

15.2 Provide circuit breakers as specified elsewhere in this specification.

15.3 Provide cabinets consisting of code gauge galvanized sheet steel boxes of sufficient depth, width, and length to mount the panels as indicated on the drawings and to facilitate wiring, with suitable lugs for mounting panel interiors, and with wiring gutters at top, bottom, and sides of sufficient size to adequately accommodate the raceways, conductors, and cables entering and leaving (provide all gutters at least 100 mm (4")).

15.4 Provide panel faces with adjustable indicating type clamps and of door-in-door construction, with inner door opening over the circuit breaker section and outer door over wiring space (both secured with locks and pulls as per specifications section "Locks and Keys"), hung with heavy hinges, and with faces and doors not less than 2.7 mm (12 ga.) thick.

15.5 Provide metal frame circuit directory holders welded to the inside of the cabinet doors with transparent covers. Place typewritten directories in these holders.

15.6 Provide bus bars with ampacity as indicated on the drawings (or corresponding to main breaker, where applicable) and with all current carrying parts sized per UL 67 heat rise testing.

15.7 Provide panels with copper or aluminum bus bars.

15.8 Provide panels with separate ground and neutral busses. Provide neutral bus with provisions for bonding and bond where required by the NEC.

15.9 Provide panels with 10,000 A short circuit rating (A.I.C., I_{sc}), unless indicated otherwise on the drawings. Provide panels fully short circuit rated, series short circuit rating of panels are not acceptable (unless specifically indicated otherwise).

15.10 Equipment as manufactured by Eaton, General Electric, Siemens, and Square-D (or equivalent) shall be considered.

15.11 Where indicated on the drawings or required by code, provide with integral factory installed transient voltage surge suppression (TVSS). Provide for all emergency panels whether shown on not on drawings.

15.12 Where branch wiring fed from the panel utilizes cable wiring methods (i.e. types "AC" or "MC" cables, where permitted elsewhere by the specifications) avoid visible exposed cables in electrical closets and electrical rooms by either of the following options:

A. Provide suitable sheet metal panel "skirt" enclosure(s) above and/or below the panel to completely enclose cable wiring methods so not more than a 300 mm (12") total length of each cable is visible. Provide skirt enclosures fabricated of galvanized sheet steel not less than 0.55 mm (26 ga.) thick.

B. Provide a nearby junction box for branch wiring as indicated below.

15.13 Where panels are flush mounted, provide an adjacent junction box for branch wiring as indicated below.

16. JUNCTION BOXES FOR BRANCH PANELS

16.1 Provide suitable junction boxes (and/or wiring troughs) for branch wiring at branch panels as follows. The electrical contractor must provide junction boxes for all flush mounted panels. The electrical contractor may utilize junction boxes (as an option to metal panel skirts) to avoid exposed visible cables in electrical closets and electrical rooms. The electrical contractor may utilize junction boxes at other locations and applications if desired, but the boxes and raceways (wherever used) must comply with all of the following requirements.

16.2 Locate each junction box above an accessible drop ceiling (or an access panel if ceiling is inaccessible) directly above or as close as practical to the panel. Where junction box is installed to satisfy requirements to hide cable wiring methods, locate outside of the electrical closet/room or inside the closet/room at a perimeter wall so there are no visible cables in the closet/room (except that not more than 300 mm (12") total visible length of each cable is permitted leaving the junction box).

16.3 Provide junction boxes and raceways between boxes and panel as indicated below.

Panel Size (Branch Cct. Poles)	Junction Box Min. Dimensions	Quantity and Size of Conduits
43-Poles & Over (All Double panels)	48"W x 8"H x 8"D (1.2m x 205mm x 205mm) *	(8) 53 mm (2")
31-to 42-Poles	24"W x 8"H x 8"D (0.6m x 205mm x 205mm)	(4) 53 mm (2")
19-to 30-Poles	24"W x 6"H x 6"D (0.6m x 155mm x 155mm)	(3) 53 mm (2")
18-Poles and less	18"W x 6"H x 6"D (460mm x 155mm x 155mm)	(2) 53 mm (2")

* Two (2) 24"W x 8"H x 8"D (0.6 m x 205 mm x 205 mm) junction boxes may be substituted. Provide (2) 78 mm (3") conduit nipples between the junction boxes.

16.4 Adjust wiring sizes between each junction box and panel in accordance with NEC de-rating factors. Utilize #8 AWG wiring for branch circuits rated 25 A or 30 A. Utilize #6 AWG wiring for branch circuits rated over 30 A but less than 60 A. Coordinate routing of wiring between junction box and panel with the engineer during construction for all circuits rated over 30 A. Where wiring sizes change due to de-rating considerations, splice wiring in the junction box.

16.5 Do not pass the incoming panel feeder and any branch circuits rated 60 A and larger through junction boxes, run this wiring directly into panels. Do not terminate any branch wiring conductors (including grounding conductors associated with each branch circuit) in junction boxes. Terminate conductors only at circuit breakers, ground bus, and neutral bus in panels. Do not splice conductors in junction boxes, except straight-through splicing of two (2) conductors as provided above for de-rating.

16.6 Bond each junction box to the panel enclosure with a grounding conductor run in one of the raceways between the panel and junction box. Provide bonding conductor not smaller than the grounding conductor for the panel feeder.

17. DRY TYPE TRANSFORMERS

17.1 Provide dry type transformers (indicated "AA" on the drawings) with primary and secondary voltages, connections (i.e. single phase, three-phase wye, three-phase delta, etc.), and kVA rating as indicated on the drawings.

17.2 Provide with 150 degrees C temperature rise above 40 degrees C ambient. Provide all insulating materials in accordance with NEMA St20-1972 standards for a 220 degree C listed component recognized insulation system and provide transformers listed for the specified temperature rise. The maximum temperature of the top of the enclosure may not exceed 50 degrees C rise above 40 degrees C ambient.

17.3 Provide with primary full capacity taps, a minimum of two (2) 2.5% taps above and two (2) 2.5% taps below rated voltage.

17.4 Provide coils of continuous wound construction impregnated with non-hydroscopic, thermosetting varnish. Provide copper or aluminum coil windings.

17.5 Provide core constructed of high grade, grain oriented, non-aging silicon steel laminations with high magnetic permeability, featuring low hysteresis losses and low eddy current losses, and constructed to maintain magnetic flux densities well below the saturation point. Provide core laminations clamped together with structural steel angles. Provide the core and coil fastened to the enclosure base utilizing an appropriate engineered permanent fastening and vibration isolating/absorbing system (i.e. including rubber mounts). Metal-to-metal contact of any kind between the core and coil and the enclosure is not acceptable. Isolating systems requiring the complete removal of all fastening devices are not acceptable. Provide core and all ferrous parts suitably protected to resist corrosion by painting or plating.

17.6 Provide core visibly grounded to the enclosure by means of a flexible grounding conductor sized in accordance with applicable NEMA, IEEE, and ANSI standards.

17.7 Provide transformers mounted in heavy gauge, sheet steel, ventilated enclosures designed for floor mounting or designed for both floor and wall mounting (wall mounting only is not acceptable, unless specifically indicated on the drawings). Provide ventilating openings to prevent access to live parts in accordance with UL, NEMA, and NEC standards (specifically including NEC Articles 110.27 and 450.8 [and 110.31(B)(1) if over 600 V]) for ventilated enclosures in locations accessible to unqualified persons (whether installed in such locations or not), including the use of an enclosure bottom plate (open bottom is not acceptable under any circumstance). Include custom/special enclosures or enclosure modifications to satisfy this requirement (where enclosures are installed which not meeting this requirement [without prior written approval], the contractor shall remove the enclosure and provide a new acceptable enclosure at no cost to the owner).

17.8 Provide the entire enclosure degreased, cleaned, phosphatized, primed, and finished with gray baked enamel.

17.9 Provide manufacturer guaranteed sound levels not exceeding 45 dB.

17.10 For transformer coils rated 600 V and less, provide basic impulse level (B.I.L.) rating as per applicable industry standards. For transformer coils rated over 600 V, provide 95 kV B.I.L. rating.

17.11 Provide all transformers rated 15 kVA and larger as energy efficient NEMA TP1 rated. Provide all transformers rated 480V-3PH-3W to 120/208V-3PH-4W and 500 kVA and less with UL K-13 rating, minimum, unless specifically indicated otherwise.

17.12 Equipment as manufactured by Eaton, General Electric, Hevi-Duty, Siemens, and Square-D (or equivalent) shall be considered.

18. OUTDOOR LIGHTING CONTROLS

18.1 PHOTOCELLS: Provide photocells of the utility-grade twist-lock type with integral time delay feature (nominal 3-5 s), with molded sealed infrared (IR) silicon electronic sensor and 360 J integral utility grade metal oxide varistor (M.O.V.) over-voltage surge protection, arranged to "fail-on", listed, and rated 120-305 V (suitable for 120 V, 208 V, 240 V, and 277 V operation), 1,000 W tungsten, 1,800 VA ballast, and 1,000 W LED, unless indicated otherwise. Provide a suitable twist-lock photocell receptacle and mount atop a suitable weatherproof box. Utilize Tork #5237M photocells and Tork #2223/4 photocell twist-lock receptacles (or equivalent). Provide an engraved laminated plastic nameplate at photocell twist-lock receptacles (refer to the section of this specification "Identification, Nameplates, and Tags") describing the device(s) controlled by the photocell and the circuit feeding the photocell ("SEE LIGHTING CONTROLLER IN ELECTRICAL ROOM - 120V, 5A - PP1, CCT. 4"). Nameplate may utilize 3.2 mm (1/8") letters. Specifications are based on equipment as manufactured by Tork. Equipment as manufactured by Intermatic and Paragon (or equivalent) shall be considered.

19. HAND HOLES

19.1 Provide hand holes of minimum sizes as required by the NEC to facilitate wiring, except where sizes are indicated on the drawings. "Hand holes" include underground boxes with all inside dimension (length, width, and depth) less than 1.2 m (4'0").

19.2 Provide all hand holes of the pre-cast type, unless indicated otherwise. Provide all hand holes of only the pre-cast type where located in roadways, parking lots, areas subject to vehicular traffic, and for wiring over 600 V. Hand holes of the composite type are permitted for wiring 600 V and less in paved and unpaved areas not subject to vehicular traffic (except locations indicated above as requiring only the pre-cast type). Hand holes of the composite type are permitted in parking lots (and other locations indicated on the drawings or designated in writing by the engineer as limited to occasional non-deliberate traffic) only where one (1) or more of the following applies:

A. The center of the hand hole is located within 0.6 m (2'0") of a concrete lighting pole foundation, wall, or similar structure 0.6 m (2'0") or higher (i.e. excluding curbs).
B. Protective bollards installed for the purpose of protecting other equipment or apparatus protect the hand hole (installing bollards for the sole purpose of protecting a hand hole is not permitted).
C. The engineer approved the specific installation in writing.

19.4 Provide all pre-cast hand holes as follows. Provide of reinforced pre-cast concrete cast with integral sump pit (slope floor towards pit), ground rod hole, recessed "break-out" wall sections to facilitate raceways, and pulling irons. Provide with at least one (1) pulling iron for each wall (locate at the bottom of the wall), unless indicated otherwise. Provide with the following:

A. Provide with round 0.75 m (2'6") diameter (minimum inside clear opening), vented (to facilitate escape of pressurized gasses), and heavy-duty AASHTO H20 full traffic loading rated frame and cover (cover weighing 46 kg (100 lb.) or more). In paved areas, set nominally flush with finished grade (set in such a manner to avoid damaging snow plows and other snow removal equipment). In unpaved areas, set 25 to 76 mm (1" to 3") below finished grade to facilitate lawn mowing and to allow for settling. Slope the frame and cover (provide floor as level) if necessary to match grade. Where necessary to facilitate finished grade, provide suitable grade extension ring (of either the pre-cast concrete type or field fabricated utilizing bricks and mortar) between top and cover frame.

B. Provide 19 mm (3/4") x 3.0 m (10'0") ground rod driven through floor. Bond all metallic objects, grounding conductors, cable shields, etc. to ground rod utilizing #6 AWG (minimum) copper ground conductors.

C. Where the distance from grade level to the floor exceeds 1.8 m (6'0"), provide one (1) sign inside of each cover, plainly visible from grade with the cover removed. Provide warning sign as OSHA approved, conforming with CFR1926.21, with the wording "DANGER: Confined Space...", and with additional wording as directed by the owner (include costs for custom wording). Provide signs as 255 mm x 180 mm (10" x 7") minimum, semi-rigid plastic type.

F. Install and set on a smooth, compacted, and level base of not less than 155 mm (6") of sand or crushed stone according to manufacturer's recommendations. Install so all parts of the concrete top (excluding frame, cover, and grade extension ring) are at least 100 mm (4") below final finished grade. Any corner projecting above or within 100 mm (4") below grade is not acceptable.

19.5 Provide all composite hand holes as follows. Provide of composite fiberglass reinforced polymer concrete construction, heavy-duty open bottom type, capable of being stacked to form an overall deeper box, Hubbell/Quazite #PC* or #PG* series (or equivalent). Fiberglass reinforced polymer and structural plastic construction shall be considered where technical characteristics and structural ratings meet or exceed the specified construction. Provide rectangular (dimensions to match box) locking cover secured with "penta-head" bolts. Provide heavy-duty ANSI/SCTE 77 "Tier 22" loading rated hand hole and cover. Specifications are based on equipment as manufactured by Hubbell/Quazite. Equipment as manufactured by Nordic Fiberglass, PenCell, and Synertech (or equivalent) shall be considered.

A. Install in complete accordance with manufacturer's recommendations, including gravel/crushed stone under box (for drainage, as per manufacturer but not less than 155 mm (6") deep below box) for all locations plus concrete encasement ring (as per manufacturer but not less than 255 mm (10") wide and 255 mm (10") deep around box) where located in areas subject to vehicular traffic.

B. Install and set on a smooth, compacted, and level base of not less than 155 mm (6") of crushed stone (for leveling and drainage) according to manufacturer's recommendations. In paved areas, set nominally flush with finished grade (set in such a manner to avoid damaging snow plows and other snow removal equipment). In unpaved areas, set 25 to 76 mm (1" to 3") below finished grade to facilitate lawn mowing and to allow for settling. Slope hand hole if necessary to match grade.

C. Provide all raceways entering the open bottom of the box (locate as required to comply with the NEC), unless indicated otherwise. Where the quantity of bends in a raceway run does not facilitate entering the bottom of the box, raceway may enter the side of the box only where in accordance with NEC Article 314.28.

D. Where a ground rod is indicated on the drawings or otherwise installed, bond all metallic objects, grounding conductors, cable shields, etc. to ground rod utilizing copper ground conductors sized as per the NEC.

19.6 Provide all raceways with suitable bushings or bell fittings. Completely seal around all raceway openings (except raceways entering the open bottom of composite hand holes).

19.7 Utilize steel RMC only for all raceways entering pre-cast hand holes within 1.5 m (5'0"), except as follows. Where PVC RNC is permitted elsewhere, PVC RNC may directly enter provided the PVC RNC is encased in a steel reinforced concrete envelope within 1.5 m (5'0") and the duct bank reinforcement is tied and interconnected to the pre-cast hand hole reinforcement.

19.8 Provide all covers with prominent and permanent factory cast marking describing the system use. Coordinate exact wording with the engineer based on the system involved (i.e. "ELECTRIC", "CATV", "COMMUNICATIONS", "CONTROLS", FIBER OPTIC", "HIGH VOLTAGE", "LIGHTING", "STREET LIGHTING", "TELEPHONE", "TRAFFIC", "TRAFFIC SIGNAL", etc.).

19.9 Avoid splices and connections in hand holes as much as practical. Where splices and connections are necessary (including grounding connections), utilize only methods approved, identified, and listed as suitable for direct burial, underground, and submerged use. Submit shop drawings for all splicing, connecting, and terminating methods and materials to the engineer for review and approval. Where any splices or connections are made utilizing methods or materials which are not approved (in advance) in writing by the engineer, the contractor shall remove splices/ connections and install new splices/ connections as directed by the engineer (including replacing and/or reinstalling any wiring which is damaged, corroded, must be extended, or does not facilitate the directed splices/connections) at no cost to the owner.

END OF SECTION

SECTION 16400 - LIGHTING SYSTEM

1. GENERAL PROVISIONS

1.1 The applicable requirements and conditions of specifications section "General Provisions" of specifications divisions 16100, General Electrical, and 16300, Electrical Materials, are hereby made an integral part of this section.

1.2 Provide lighting systems consisting of all components necessary for a complete installation. Refer to the lighting fixture schedule on the drawings for additional information.

1.3 Lighting fixtures including, but not limited to, those manufactured by the following shall be considered: Abolite, Cooper, Columbia, Contech, Emergilite, General Electric, Hubbell, Kenall, Kim, Light Guard, Lightolier, Lithonia, LSI, Prescolite, Sterner, Stonco(or equivalent).

2. DRIVER WIRING

2.1 Completely coordinate exact lamp types (including configuration, dimensions, etc.), drivers, lighting fixture construction and arrangement (as related to facilitating lamps and related equipment), and all applicable ancillary equipment and provide a complete and compatible installation.

2.2 Submit shop drawings of all drivers proposed for use (multiple manufacturers and series are permitted, provided all drivers conform to the specifications). Where lighting fixtures are installed by the contractor which include drivers that do not meet the specifications (without prior written approval) the contractor shall remove drivers and provide new drivers meeting the specified criteria at no cost to the owner.

2.3 Provide all drivers of the high power factor solid-state electronic energy saving type, unless indicated otherwise on the drawings.

2.4 For lighting shown with 0-10 V dimming, provide with drivers to facilitate dimming. For all light emitting diode (LED) and fluorescent lighting fixtures shown or specified with 0-10 V dimmable drivers (wherever 0-10 V dimming is indicated on the drawings [including lighting fixture schedule] or specifications), provide both power wiring and 0-10 V control wiring to all lighting fixtures. Run control wiring from all lights with 0-10 V dimmable drivers to the respective dimmer or switch controlling the lighting. Where dimmers are shown on the drawings (including combination sensors/dimmers), interconnect control wiring with dimmers as per manufacturer. Where dimmers are not shown on the drawings, install control wiring to the switch (non-dimmed) location and safely insulate and cap off control wiring (to facilitate future replacement of non-dimmed switch with dimmer).

3. LAMPS (LIGHT ENGINES)

3.1 Provide all lamps (the term "lamp" includes all light engines of any type which directly emit illumination) as follows. Completely coordinate exact lamp types (including configuration, dimensions, etc.), drivers, lighting fixture construction and arrangement (as related to facilitating lamps and related equipment), and all applicable ancillary equipment and provide a complete and compatible installation.

3.2 Provide lamps for lighting fixtures as indicated on the drawings. Provide all lighting fixtures with lamps (even if lamp types and/or quantities are not shown on drawings) to provide a complete installation.

3.3 Maintain compatibility and consistency of lamp types and manufacturers (as well as lamp colors, except where different lamp colors are indicated on the drawings) throughout the project as much as possible.

4. LIGHTING FIXTURES

4.1 Provide lighting fixture types and manufacturers as indicated on the drawings. Where a lighting fixture type designation (i.e. letter) is not shown at a lighting fixture symbol, include costs in bid to provide any applicable type of lighting fixture used for the same symbol anywhere else on the drawings.

4.2 Support all lighting fixtures (including outlet boxes and/or conduits used to support lighting fixtures, where permitted) in complete accordance with all applicable requirements of the NEC (including, but not limited to, code requirements for mounting and support of lighting fixtures, outlet and other boxes, conduits, raceways, and devices). Provide all required mounting hardware, including pendant kits, fasteners, hangers, wall mounted brackets, concrete foundations, conduits, supplementary supports, grounding, etc., for a complete installation. Support all lighting fixtures completely independent of suspended ceilings and direct from the structure (suspended ceilings are permitted to provide supplemental lateral support to lighting fixtures which are vertically supported direct from the structure. Supporting lighting fixtures with or from conduits or raceways is not permitted, except that lighting fixtures specifically designed for conduit support may be supported utilizing only rigid steel conduit (supporting with any other type conduit or raceway, including IMC, EMT, PVC, surface raceway, and flexible conduit, is not permitted under any circumstance). Supporting lighting fixtures from screw shells of lamp holders is not permitted under any circumstance. Supporting lighting fixtures or wiring from trees or vegetation is not permitted under any circumstance.

4.3 Refer to architectural drawings, reflected ceiling plans, and details for exact locations of all lighting fixtures. Verify final location of all lighting fixtures with the owner, architect, and lighting designer (where applicable) prior to rough-in.

4.4 Perform field measurements, verify proper clearances, and verify all exact mounting and installation conditions and requirements prior to ordering lighting fixtures.

4.5 Provide integral thermal protection for all recessed lighting fixture housings.

4.6 Perform aiming of all adjustable interior lighting fixtures. Include all costs to aim to the satisfaction of the owner, architect, and engineer. This aiming may be performed during normal working hours.

4.7 For surface mounted lighting fixtures wired utilizing surface mounted wiring methods, provide wiring entering the side of lighting fixtures. Where fixtures do not facilitate side

entry of wiring, provide fixture with manufacturer's back mounting adapter (so wiring enters side of adapter and then enters rear of fixture by passing through adapter). Installing the fixture on surface outlet boxes (in such a way that there is a significant "gap" between the fixture and the wall/ceiling surface) is not acceptable.

4.8 Wherever finish colors are indicated on the drawings (including symbol list and lighting fixture schedule) as being selected by the architect ("as per architect", etc.), include costs in bid to utilize any of the available standard and/or optional colors listed in manufacturers' catalogs (excluding any colors identified in manufacturers' catalogs as "custom" or "premium").

4.9 Where lighting fixtures are specified or furnished by the contractor with tamper resistant hardware (including, but not limited to, torx, spanner, allen/torx with center reject pin, etc.) which must be removed in order to access lamps or drivers for replacing or servicing, furnish and turn over to the owner not less than two (2) tamper resistant screw drivers of each type required.

5. EXTERIOR LIGHTING

5.1 All provisions of the section of this specification "General Lighting" apply to exterior lighting as modified herein.

5.2 Perform night aiming of all adjustable exterior lighting fixtures. Include all costs in bid (including overtime costs for work at night) to aim to the satisfaction of the owner, architect, and engineer.

6. EMERGENCY AND EXIT LIGHTING

6.1 Provide all emergency and exit lighting as indicated on the drawings.

6.2 Verify exact mounting, quantity of faces, and directional arrows of all exit signs prior to ordering.

6.3 Install all exit signs at general locations as shown on the drawings. Coordinate and obtain approval for exact locations with the architect and local authorities having jurisdiction before installation. Install exit signs to ensure they are completely and clearly visible from the entire covered areas and egress paths.

6.4 Perform aiming of all adjustable emergency lighting fixtures. Include all costs to aim to the satisfaction of the owner, architect, engineer, and local authorities having jurisdiction. This aiming may be performed during normal working hours.

6.5 Wherever any battery units or battery packs are installed (including batteries integral to lighting fixtures), connect power to the battery units/packs on the line side of all lighting and other control switches so it is impossible to de-energize by turning any switch off.

END OF SECTION

SECTION 16510 - FIRE ALARM SYSTEM MODIFICATIONS

1. GENERAL PROVISIONS

1.1 The applicable requirements and conditions of specifications section "General Provisions" of specifications divisions 16100, General Electrical, and 16300, Electrical Materials, are hereby made an integral part of this section.

1.2 Extent of fire alarm and detection system work is indicated on the drawings and schedules. Fire alarm work includes modifying the existing fire alarm system to facilitate new fire alarm devices as indicated on the drawings. Types of fire alarm and detection equipment includes the following:

A. FACU panel modifications
B. Audio/visual speaker/strobes and visual strobes
C. Manual pull stations
D. Smoke, heat, and other automatic fire detectors

1.3 Provide the fire alarm system (including operation, equipment, devices, wiring, installation, and manufacturer's representative services [programming, testing, adjustment, equipment start-up, as-built documentation, and operation and maintenance documentation and instructions]) in complete accordance with all applicable federal, state, and local codes and standards (including National Electrical Code (NEC), Institute of Electrical and Electronic Engineers (IEEE), National Fire Protection Association (NFPA), Underwriter's Laboratories (UL), Factory Mutual (FM), American National Standards Institute (ANSI), National Electrical Contractors' Association (NECA) "Standard of Installation", Americans with Disabilities Act (ADA), United States Department of Labor Occupational Safety and Health Administration (OSHA), all local authorities having jurisdiction, etc.). Provide fire alarm system controls and all new and existing system components (including devices, equipment, modules, interfaces, etc.) listed to operate together. Provide all signaling devices of an ADA approved type providing ADA approved audible and visual coverage throughout all areas of the project.

1.4 Specifications are based on equipment indicated on the Electrical Symbol List on the drawings. Only equipment matching and fully compatible with (including maintaining NFPA, UL, FM, and other applicable listings and approvals) the existing fire alarm controls will be considered. The electrical contractor is fully responsible for verifying all compatibility requirements and all exact existing devices in the field before submitting shop drawings and shall provide the system accordingly. Include all costs in bid. Manufacturer and catalog numbers of equipment indicate the type and quality of the equipment required.

1.5 Submit a list of local approved service vendors with shop drawings. Perform manufacturer's representative services (specifically including programming, testing, adjustment, equipment start-up, as-built documentation, and operation and maintenance documentation and instructions) throughout the entire duration of the project, up through final testing and acceptance of the system by the owner and local authorities having jurisdiction, include all costs in bid. *No extra consideration, claims, charges, or compensation will be granted under any circumstance for manufacturer's representative services (including programming, testing, adjustment, equipment start-up, as-built documentation, and operation and maintenance documentation and instructions) during the project (specifically including where associated with changes to the scope of work,*

alternates, unit prices, allowances, etc.) performed before final testing and acceptance of the system. Extra claims and/or compensation shall only be considered for changes which are initiated after final testing and acceptance of the system.

2. SUBMITTALS

2.1 Submit shop drawings including, but not limited to, shop drawings on equipment and devices (specifically showing manufacturers, model numbers, and listing information), rough in diagrams, detailed project-specific riser and wiring diagrams (specifically showing conductor/cable types and sizes), installation layout drawings (specifically showing locations of all equipment and devices on floor plans [drawn to scale], equipment, and wiring and information on ceiling height and construction [on architectural background plans which shall be made available to the contractor for this purpose], information showing ADA compliant signaling device audible and visual coverage (specifically show all audible device decibel (dB) and visual device candela (cd) settings), , installation instructions, written warranty, detailed zone or addressable device lists (showing each system point identifiable from the control panel and the associated numbered address and detailed description), sequence of operation, power supply wiring information, and power consumption/supply/battery sizing and voltage drop calculations. Submit quantity as indicated elsewhere in the specifications to the engineer for review and approval. In addition to submitting to the engineer, submit additional sets (quantity as per local authorities) to the local authorities having jurisdiction for review, approval, and permits.

2.2 Include all costs in bid associated with preparing and submitting shop drawing information. This includes sealing (by a registered professional engineer) diagrams if required by the local authorities having jurisdiction.

2.3 Upon project completion, submit operation and maintenance (O&M) manuals (include with other project O&M manuals). Submit at least three (3) original copies of all fire alarm system software.

2.4 Upon project completion, submit certification of the entire system to the owner and local authorities having jurisdiction.

3. FIRE ALARM AND DETECTION SYSTEMS

3.1 Provide all components of the system matching and maintaining current operation, functioning, and system arrangement for a complete installation.

3.2 Perform all modifications to maintain current fire alarm system operation and operation as per code.

3.3 The fire alarm riser diagram on the drawings is approximate as a general guide to system architecture and functioning. Provide exact quantities as specified (based on floor plan drawings, etc.).

3.4 Provide the following sequence of operation and functions for new initiating and signaling devices.

A. Fire Alarm Activation: Actuation of any initiating device (including manual pull stations, automatic smoke, heat, and other fire detectors initiates a "fire alarm" and activates all fire alarm signaling, output, and notification devices (including, but not limited to, horns and strobes, elevator interfaces, HVAC equipment shut-downs, door releases, and central station and fire department alarm notification).

B. Trouble Alarm Activation: Any trouble conditions in the fire alarm system initiates a "trouble alarm" and activates central station (and fire department where required) trouble notification and an audio and visual signal at the control panel and remote annunciator (where applicable). "Trouble alarms" do not activate alarm signaling devices or output devices.

4. MATERIALS, EQUIPMENT, AND DEVICES

4.1 CONTROL PANEL MODIFICATIONS: Modify the existing FACU to facilitate all new devices specified. Visit the site and verify exact existing control system conditions and requirements in field before submitting bid and include all costs for modifications in bid. No extra consideration, claims, charges, or compensation will be granted under any circumstance associated with fire alarm control panel modifications or resulting from the failure to fully verify all control system conditions and requirements before submitting bid.

A. Existing system components may be reused as much as practical where they support new devices
B. Where necessary to facilitate new signaling devices, provide supervised signal circuit modules (complete and including modules to synchronize all new visual indicating devices)
C. Where necessary to facilitate new output functions provide relaying
D. Modify, upgrade, and/or replace the power supply and control panel main circuitry where necessary to facilitate new devices
E. Modify, upgrade, and/or replace batteries and related components to provide battery backup to operate the system under "normal", "trouble", and "alarm" conditions as per code, but not less than a minimum of 24 hours and then operate the system in "alarm" condition for a minimum of 15 minutes at the end of the 24 hour period.
F. Where necessary to facilitate new initiating devices, provide suitable device termination, zone, and/or loop modules as applicable
G. Where necessary (i.e. due to limitations of existing controls for expansion), provide a slave sub-panel interconnected with the existing control panel.
H. As an alternative to modifying the existing fire alarm control panel, a new fire alarm control panel may be installed to replace the existing control panel (and may re-feed existing peripheral devices), provided there is no additional cost to the project. No extra consideration, claims, charges, or compensation will be granted under any circumstance associated with the contractor's election to utilize this alternative (include all costs in bid, where this alternative is desired).
I. Where not existing, provide smoke detector(s) located to provide protection/ coverage (in accordance with NFPA-72 requirements) for the main FACU all sub- or slave- control panels, all power supplies, all remote indicating controllers, and related equipment, whether shown on the drawings or not.

J. Provide power to (obtain from power circuit for main control panel) and smoke detector(s) located to provide protection/coverage (in accordance with NFPA-72 requirements) for the main fire alarm control panel, all sub- or slave- control panels, all power supplies, all remote indicating controllers, and related equipment, whether shown on the drawings or not.

4.2 COMBINATION HORN AND STROBE ASSEMBLIES: Provide combination horn and flashing strobe audible and visual notification appliances with code approved wording "FIRE". Provide listed, flush mounted (mount on flush outlet box), ADA approved type wired using Class "B" supervised circuits. Provide listed for wall or ceiling mounting as applicable. Only appliance types featuring both listed wall mounting models and listed ceiling mounting models or models listed for both wall and ceiling mounting shall be considered. For all dwelling units and for sleeping areas in other occupancies, utilize only NFPA compliant low-frequency (nominal 520 Hz) devices. Provide audibly and visually synchronized (utilizing synchronized type appliances in conjunction with suitable synchronizing control modules in signaling circuits) to prevent photosensitive reactions and ensure distinct audible patterns. Provide with adjustable output settings (90, 95, and 99 dBA audible and 15, 30, 75, and 95 or 110 cd visual). Base pricing and wiring and power supply sizing on maximum settings. Lower output settings shall be considered only where they provide audible and visual coverage meeting or exceeding ADA and code requirements (throughout all areas of the project where coverage is required or otherwise shown on the drawings) and where the manufacturer submits calculations/criteria showing compliant coverage. Include costs in bid to provide additional signaling appliances where necessary to provide compliant coverage.

4.3 STROBE ONLY ASSEMBLIES: Provide flashing strobe visual notification appliances with code approved wording "FIRE". Provide listed, flush mounted (mount on flush outlet box), ADA approved type wired using Class "B" supervised circuits. Provide visually synchronized (utilizing synchronized type appliances in conjunction with suitable synchronizing control modules in signaling circuits) to prevent photosensitive reactions. Provide with adjustable output settings (15, 30, 75, and 95 or 110 cd). Base pricing and wiring and power supply sizing on maximum settings. Lower output settings shall be considered only where they provide audible and visual coverage meeting or exceeding ADA and code requirements (throughout all areas of the project where coverage is required or otherwise shown on the drawings) and where the manufacturer submits calculations/criteria showing compliant coverage. Include costs in bid to provide additional signaling appliances where necessary to provide compliant coverage.

4.4 MANUAL PULL STATIONS: Provide station semi-flush mounted (mount on flush outlet box), of the non-coded double-action type with key reset switch. For addressable systems, provide including suitable addressable monitor module.

4.5 SMOKE DETECTORS: Provide detector of the dual chamber, solid-state photoelectric type arranged for two-wire, non-polarized installation. Provide detector of low profile design, white in color, and with twist-lock base for mounting on standard flush outlet box. For addressable and addressable/analog systems, provide detectors of the addressable and addressable/analog types, respectively.

4.6 HEAT DETECTORS: Provide detector functioning on both fixed temperature (rating as indicated on the drawing, unless otherwise required as noted below) and rate-of-rise principals of operation. Provide arranged for two-wire, non-polarized installation, of low profile design, white color finish, and with twist-lock base for mounting on standard flush outlet box. For areas where ambient temperatures may normally exceed 38 degrees C (100 degrees F), such as unconditioned attic spaces or spaces which are not insulated, utilize detectors with temperature ratings as recommended by the detector manufacturer for the application (detectors rated 80 degrees C (175 degrees F) or greater may utilize fixed temperature sensing only [rate-of-rise sensing is not required for these detectors]). Verify all requirements associated with temperature ratings with manufacturer in detail before purchasing detectors or rough-in (no extra consideration, claims, charges, or compensation will be granted under any circumstance associated with temperature ratings of heat detectors).

4.7 SUPERVISORY AND OTHER ACTUATION DEVICES: Interconnect and monitor every fire actuation device part of or installed along with architectural or mechanical equipment and apparatus (including smoke and/or fire dampers [including those in ducts, at shafts, and for ceiling radiation], smoke and/or fire doors, gates, grills, and shutters, fan control, and other similar equipment/apparatus) to the fire alarm system. Provide all wiring for complete connections between each monitored device and the fire alarm system. Connect supervisory and actuation devices whether shown on the electrical drawings or not. Review mechanical, and architectural drawings and coordinate with mechanical, and general contractors before submitting bid and include all costs in bid. For addressable systems, provide including suitable addressable monitor module.

4.8 SUPERVISORY AND CONTROL DEVICES: Interconnect each supervisory and control device specifically indicated on the drawings to the fire alarm system. For addressable systems, provide including suitable addressable monitor module.

4.9 RELAY INTERFACES: Provide a suitable output relays for control relay interconnection to the fire alarm system. Provide all wiring for complete connections to the respective controlled device.

5. LOCKS AND KEYS

5.1 Refer also to the section of this specification "Locks and Keys" of specifications section 16300 "Electrical Materials".

5.2 Provide all fire alarm system equipment enclosures and keyed and/or key operated devices (including pull stations) utilizing keys which are alike and which match existing fire alarm system keys.

6. INSTALLATION

6.1 Provide fire alarm wiring in complete accordance with all requirements of other sections of the electrical specifications, except as modified below. Utilize wiring methods in accordance with specifications section 16200 "Electrical Work Practices".

6.2 Provide all fire alarm system wiring as directed, recommended, and approved by the system manufacturer and meeting all system manufacturer minimum requirements (including where manufacturer's requirements exceed the requirements of the specifications and the NEC). #14 AWG conductors are the minimum permitted. Provide all wiring utilizing solid conductors. Stranded conductors are permitted only where in accordance with NEC Article 760. The fire alarm system may utilize individual conductors wiring in conduit and/or multi-conductor cables (in conduit where otherwise required by the specifications).

6.3 Provide multi-conductor cables (where utilized) as follows. Provide insulation rated not less than 300 V. Utilize only cables having an overall red jacket and approved by the NEC and NFPA for use with fire alarm systems. Plenum rated cables may be utilized, but only in dry locations (plenum cables, even when installed in conduit, are prohibited in damp and wet locations). In damp locations, utilize only cables specifically listed and identified for use in damp or wet locations. Provide all cables in wet locations (including underground and embedded in concrete slabs at or below grade) specifically designed for outdoor and submerged use and specifically listed and identified for use in wet locations.

6.4 Provide raceways for the fire alarm system dedicated to fire alarm wiring. Fire alarm raceways may not contain wiring of any other system (including power, lighting, controls, telecommunications, etc.). Where fire alarm wiring is recommended or required by the manufacturer to be separated from other fire alarm wiring due to noise, interference, or other concerns, install wiring in separate raceways (or physically separate wiring as per manufacturer recommendations where wiring is permitted elsewhere to run without raceway). Paint outlet, junction, device, and other boxes, conduit bodies, and covers associated with the fire alarm system red. Paint exposed fire alarm raceways red.

6.5 Identify all new (and existing equipment as specifically indicated below of as specifically indicated on the drawings) fire alarm equipment, devices (as listed below), and wiring as indicated in specifications section "Identification, Nameplates, and Tags" of specifications division 16300, Electrical Materials.

A. Provide an engraved laminated plastic nameplate on the front cover of the existing fire alarm control panel reading, "FIRE ALARM CONTROL PANEL - 120V, 20A - PP1, CCT. 4"). Indicate the exact panel and circuit number feeding the control panel (trace existing circuit in field if required to determine proper circuit). Provide similar nameplates at all power supply units, auxiliary power supplies, and signaling circuit power extender modules.

B. Provide red engraved laminated plastic nameplates with 6.5 mm (1/4") high (minimum) white letters at each new pull station reading "IN CASE OF FIRE: SOUND ALARM AND CALL 911" (or "IN CASE OF FIRE: SOUND ALARM AND CALL THE FIRE DEPARTMENT" where the building telephone system does not facilitate directly dialing 911), "FIRE ALARM DOES NOT CALL FIRE DEPARTMENT", or with other wording as directed by the local authorities having jurisdiction.

C. For addressable systems, suitably label (in an engineer and owner approved method) all new addressable fire alarm devices (manual pull stations, smoke detectors, heat detectors, supervised output relay modules, identification modules, etc.) with the respective system address. Labeling annunciator(s) is not required. Labeling

signaling devices and magnetic door holders is not required, except that labeling is required for any associated addressable relays.

7. QUALITY ASSURANCE

7.1 Completely test the entire system as per "Testing" in specifications section 16100 "General Electrical". Perform the following additional testing.

7.2 Completely test the entire system to demonstrate proper operation, functioning, capability, and compliance with all code and specification requirements. Inspect equipment, devices, relays, signals, etc. for malfunctioning. Correct malfunctions and retest to demonstrate satisfying the above requirements. Perform all testing in complete accordance with all applicable NFPA-72 standards and testing procedures.

7.3 The electrical contractor and manufacturer's representative shall fully certify (in writing) the entire system and system operation, including documenting successful testing of the system. Submit copies of certification to the owner and local authorities having jurisdiction.

7.4 Provide manufacturer's representative services performed by specially trained personnel employed by the fire alarm system manufacturer's representative. Perform manufacturer's representative services (specifically including programming, testing, adjustment, equipment start-up, as-built documentation, and operation and maintenance documentation and instructions) throughout the entire duration of the project, up through final testing and acceptance of the system by the owner and local authorities having jurisdiction, include all costs in bid. *No extra consideration, claims, charges, or compensation will be granted under any circumstance for manufacturer's representative services (including programming, testing, adjustment, equipment start-up, as-built documentation, and operation and maintenance documentation and instructions) during the project (specifically including where associated with changes to the scope of work, alternates, unit prices, allowances, etc.) performed before final testing and acceptance of the system.* Extra claims and/or compensation shall only be considered for changes which are initiated after final testing and acceptance of the system.

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END OF SECTION

SECTION 16600 – EXISTING EMERGENCY GENERATOR

1. GENERAL PROVISIONS

1.1 The applicable requirements and conditions of specifications section "General Provisions" of specifications divisions 16100, General Electrical, and 16300, Electrical Materials, are hereby made an integral part of this section.

1.2 Reconnect existing generator set with controller, transfer switch, generator annunciator, all ancillary and accessory equipment to new building service.

1.3 Existing generator is as manufactured by Kohler Model 100 RZ or equivalent.

2. INSTALLATION

2.1 Relocate existing automatic transfer switch and charger as shown on the drawings.

2.2 Coordinate exact equipment layout and locations with the architect, owner, and all other trades (including mechanical contractor) for a complete installation.

2.3 Mount the generator controller, battery rack, battery cables, battery heater, batteries, and battery charger integral to generator outdoor enclosure only where possible.

2.4 The mechanical contractor shall provide the complete fuel system serving the generator (including appropriately sized piping and suitable gas regulator serving the generator; fully coordinate fuel system with the mechanical engineer and mechanical contractor) The gas regulator (where applicable) must be dedicated to serving the generator only and must be located at the generator (only). Generator must be supplied directly from the natural gas utility service without any intermediate regulators.

2.5 Provide new engraved laminated plastic nameplates at all generator system equipment and equipment fed from the generator system as per specifications section "Identification, Nameplates, and Tags" of specifications division 16300, Electrical Materials, except utilize red nameplates with white letters. This includes nameplates at the generator set, transfer switch, emergency branch/distribution panels, remote mounted generator accessories, switches serving generator set accessories, and related equipment.

A. Provide generator nameplate with wording similar to the following example (fill in the proper ratings):

Name (10 mm (3/8") lettering):	STANDBY GENERATOR
Voltage and Phase:	277/480V-3PH-4W
Ratings and circuit breaker amperes:	100 KW
Fuel Source:	NATURAL GAS

B. Provide nameplates for transfer switch similar to nameplates for safety switches and enclosed circuit breakers, except with remarks indicating the panel and circuit number or generator feeding both the normal and emergency sources (provide description describing load fed from the transfer switch).

C. Provide nameplates for electrical accessories (block/coolant, generator strip, and battery heaters and battery charger) similar to nameplates for safety switches and enclosed circuit breakers.

D. Provide red engraved laminated plastic nameplates at each of the generator annunciator and the building service disconnect reading, "NATURAL GAS EMERGENCY GENERATOR LOCATED OUTDOORS AT...", and describe the generator location.

E. The electrical contractor shall provide tags (of an engineer and code approved type) at all fuel line shutoff valves and fuel supply equipment serving the generator reading, "EMERGENCY POWER SUPPLY - NOT TO BE SHUT OFF DURING AN EMERGENCY" or similar wording as directed by local authorities having jurisdiction. Coordinate locations and requirements with mechanical contractor and mechanical engineer.

2.6 Provide complete interconnection, control, and intercommunication wiring between all generator system components for a complete installation. This includes wiring between any and all of the equipment and components as follows, where applicable: generator set (including engine, generator, controller and indicating panel, and all accessories), transfer switch, remote generator annunciator, fuel supply equipment, etc. Provide all control wiring in complete accordance with the NEC.

END OF SECTION