

PROJECT MANUAL / SPECIFICATIONS FOR

BETHUNE LEARNING CENTER ALTERATIONS

**1 Echo Hill Drive, Building # 36
Dobbs Ferry, NY 12601**

SED No: 66-04-11-02-0-003-002

GREENBURGH ELEVEN UNION FREE SCHOOL DISTRICT

**1 Echo Hill Drive, Building # 36
Dobbs Ferry, NY 12601**

ARCHITECT:

**KAEYER, GARMENT + DAVIDSON
ARCHITECTS, PC**
285 Main Street
Mount Kisco, NY 10549

SYSTEMS ENGINEER:

BARILE GALLAGHER & ASSOCIATES
39 Marble Avenue
Pleasantville, NY 10570

STRUCTURAL ENGINEER :

THE DISALVO ENGINEERING GROUP
83 Wooster Heights Road, Suite 200
Danbury, CT 06810

CONSTRUCTION CONSULTANT/ SPECIFIER:

SUE MCCLYMONDS ARCHITECT
200 Robb Road
Amsterdam, NY 12010

CONSTRUCTION DOCUMENTS:

6 NOVEMBER 2020

THE UNDERSIGNED CERTIFIES THAT TO THE BEST OF HIS KNOWLEDGE, INFORMATION AND BELIEF, THE PLANS AND SPECIFICATIONS ARE IN ACCORDANCE WITH APPLICABLE REQUIREMENTS OF THE NEW YORK STATE UNIFORM FIRE PREVENTION AND BUILDING CODE, THE STATE ENERGY CONSERVATION CONSTRUCTION CODE, AND BUILDING STANDARDS OF THE EDUCATION DEPARTMENT, AND THAT THE PLANS AND SPECIFICATIONS REQUIRE THAT NO ASBESTOS CONTAINING MATERIAL SHALL BE USED.

Russell A. Davidson, FAIA

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ADVERTISEMENT FOR BIDS

Greenburgh Eleven UFSD will receive individual sealed proposals before **2:00 PM on January 28, 2021** for:

**Bethune Learning Center Alterations
1 Echo Hill Drive Bldg. # 36
Dobbs Ferry, NY 10522**

The Owner will receive the proposals at the Business Office, 1 Echo Hill Drive Bldg. # 36, Dobbs Ferry, NY 10522 and at that time and place any and all such proposals that have been received in accordance with the terms hereof will be publicly opened and read aloud.

The Owner invites bidders to bid on the work described in the Bid Documents that falls within the following bid package:

<u>Contract No.</u>	<u>Trade</u>
1	General Construction Work
2	Plumbing Work
3	HVAC Work
4	Electrical Work

See the Bid Documents for a further description of the scope of work.

Bidders must use the Bid Proposal Forms included with the Bid Documents in order to make their proposals, and each proposal must be made in accordance with those Forms.

Bidders may obtain the Bid Documents **after 10:00 AM on December 22, 2020** from REV, 330 Route 17A, Goshen, New York 10924 Tel: 1-877-272-0216. Complete digital sets of Bidding Documents, drawings and specifications, may be obtained online as a download at the following website: www.usinglesspaper.com under 'public projects.' Complete hard copy sets of the Bidding Documents, drawings and specifications, may be obtained from REV upon depositing the sum of \$50 for each combined set of documents. Check or money orders shall be made payable to Greenburgh Eleven UFSD. The deposit of \$50 per set for the first set is refundable as per NYS General Municipal Law Article 5A section 102. Deposit, for initial sets, will be refunded to all qualified bidders returning plans and specifications in good condition within 45 days following the award of the Contract or rejection of that bidder's Bid.

Additional copies of the documents will be available from the designated printer and at the non-refundable cost of reproduction. Any bidder requiring Bid Documents to be shipped shall make arrangements with the printer and pay for all packaging and shipping costs.

Please note Rev (www.usinglesspaper.com) is the designated location and means for distributing and obtaining all bid package information. All bidders are urged to register to

ensure receipt of all necessary information, including bid addenda.

There will be a pre-bid site meeting on **January 15, 2021 at 3:00 PM**, commencing at the Main Entrance of the Bethune Learning Center. **Bidders are urged to attend the site meeting. Knowledge of the field conditions is crucial to understanding the Work.**

All Requests for Information must be sent in writing using the RFI Form in the Construction Documents to the Architect via email (Ryan Carper, rcarper@kqdarchitects.com) by **5:00 PM, January 18, 2021**.

Each proposal must be accompanied by a certified check payable to Greenburgh Eleven UFSD or by a Bid Bond for a sum equal to five percent (5%) of the Bid Sum, conditioned as set forth in the Instructions to Bidders. All bid security, except those of the three low bidders will be returned after formal analysis and evaluation of the Bids received. The bid security provided by the three low bidders will be returned after the execution of the Trade Contract.

The Owner may require the successful bidder to provide separate Performance and Labor & Materials Payment Bonds in the amount of the contract price and in the form specified in the Bid Documents.

All laborers, workers and mechanics working on the site of this project must be certified as having successfully completed the OSHA 10-hour construction safety and health course.

To the fullest extent allowed by law, the Owner reserves the right to reject bids that contain omissions, exceptions or modifications, or in their sole discretion to waive such irregularities, or to reject any or all bids or to accept any bid which is in the best interest of the District.

All proposals shall be sealed and in an opaque envelope distinctly marked on the outside as follows:

**Greenburgh Eleven UFSD
Bethune Learning Center Alterations
Bid Opening Date: January 28, 2021, 2:00 PM
Name of Bidder
Marked "SEALED BID"**

Such proposals must be delivered to the Business Office, 1 Echo Hill Drive Bldg. # 36 Dobbs Ferry, NY 10522. The Owner will not open or consider any proposal unless it is received at that location by no later than the bid opening date and time. Bidders are solely responsible for the arrival of each bid proposal at the place of bid opening by the appointed time, regardless of the means of delivery.

END OF ADVERTISEMENT

INSTRUCTIONS TO BIDDERS

To be considered, Bids must be made in accordance with these Instructions to Bidders.

1. PROJECT DESCRIPTION

The Project consists of performing Alterations at the Bethune Learning Center, Greenburgh Eleven UFSD as shown on the Contract Drawings and described in the Specifications.

1. The Work consists of renovations to the existing Mary McLeod Bethune Building to provide new classroom spaces, replace finishes, casework and miscellaneous specialties, replace doors and hardware, replace roofing, provide masonry repairs and miscellaneous exterior work, improve site drainage, replace paving and walkways, and provide a new entrance canopy.
2. The Work will be performed at the Bethune Learning Center located at 1 Echo Hill Drive, Building #36, Dobbs Ferry, NY 10522.

2. TIME SCHEDULE

It is the intent of the Owner to award the Contracts for the Work on or about two weeks after receipt of bids. Immediately upon receipt of Notice of Award of Contract from Owner, Contractors shall begin preparing required bonds, insurance certificates and other required submittals. Work may be performed at the building and site only upon receipt of written authorization (Notice to Proceed) from Owner and after the approval of the required submissions.

The Work shall be Substantially Complete on or before the date(s) indicated in the Milestone Schedule attached to Section 011000. It is extremely important that the Owner resume its full use of the building and site on the completion date(s) specified.

3. QUALIFICATIONS OF BIDDERS

The Owner may make such investigation as it deems necessary to determine the responsibility of any bidder or to determine the ability of any bidder to perform the Work. The Owner reserves the right to disqualify any prospective bidder or to reject any bid.

4. DOCUMENTS

Bidders may obtain electronic or hard copies of the Bid Documents after 10:00 AM on December 22, 2020 from REV, 330 Route 17A, Goshen, New York 10924 Tel: 1-877-272-0216. Complete digital sets of Bidding Documents, drawings and specifications, may be obtained online as a download at the following website: www.usinglesspaper.com under 'public projects.'

Complete hard copy sets of Bidding Documents, drawings and specifications, may be obtained upon depositing the sum of \$50.00 for each combined set of documents. Checks or money orders shall be made payable to Greenburgh Eleven UFSD. The deposit of

\$50.00 per set for the first set is refundable as per NYS General Municipal Law Article 5A section 102. Deposit, for initial sets, will be refunded to all qualified bidders returning plans and specifications in good condition within 45 days following the award of the Contract or rejection of that bidder's Bid.

Additional copies of the documents will be available from the designated printer and at the non-refundable cost of reproduction.

Any bidder requiring documents to be shipped shall make arrangements with the printer and pay for all packaging and shipping costs

Please note Rev (www.usinglesspaper.com) is the designated location and means for distributing and obtaining all bid package information. All bidders are urged to register to ensure receipt of all necessary information, including bid addenda

5. EXAMINATION

Bidders shall carefully examine the Bid Documents and the existing building and site to obtain first-hand knowledge of existing conditions and to verify conditions under which work will be performed. Failure to do so will not relieve a successful bidder of the obligation to furnish all material and labor necessary to carry out the provisions of the Contract Documents and to complete the contemplated work for the construction set forth in his bid. Submission of a Bid will be considered conclusive evidence that a bidder has visited the building and site and is conversant with local facilities and difficulties, the requirements of the Contract Documents, applicable laws and codes, the state of labor and material markets, and has made due allowance in his bid for all contingencies that may arise, whether or not stated.

6. QUESTIONS

Should a bidder find discrepancies in, or omissions from the drawings or any Contract Documents, or should he be in doubt, as to their meaning, or should he find provisions of any law or applicable code conflicting with provisions of the Contract Documents, he shall at once notify the Architect in writing, who will endeavor to issue the necessary clarifications or revisions to prospective bidders by means of an Addendum. Such Addendum, as part of the Contract Documents, shall be binding on all bidders. It shall be the duty of each bidder to make certain that he has received or provided himself with copies of all Addenda. Bids will be conclusively presumed to be based upon all Addenda issued up to the time of the opening of Bids, regardless of whether or not a copy of each Addendum is actually in the possession of the bidder.

Prospective bidders may request clarifications of the Bid Documents from the Architect by contacting Ryan Carper at Kaeyer, Garment & Davidson Architects, PC, via e-mail to rcarper@kgdarchitects.com. All questions must be submitted in writing, no phone calls will be accepted. All correspondence must be addressed to subject line "Alterations at the Bethune Learning Center". All Requests for Information must be sent in writing using the RFI Form in the Construction Documents.

Inquiries received over the phone will not be answered. All information will be relayed to bidders by written addenda. Neither the Owner nor the Architect will be responsible for any oral instruction or clarification to any persons whatsoever. Questions received after 5:00 PM, January 18, 2021 cannot be answered.

If a bidder, prior to submitting a Bid, fails to give notification to the Architect of the existence of any such discrepancies, omissions, ambiguities, errors, or conflicts, he shall comply with the interpretations or directions given by the Architect in resolving same, without claiming extra costs.

7. INTERPRETATION OF BID DOCUMENTS

If, in the interpretation of Bid Documents, requirements within the Drawings and Specifications conflict, or it appears that the Drawings and Specifications are not in agreement, the Contractor shall base his bid on (1) the greater quantity, where there is a discrepancy in quantity; and (2) the superior quality, where there is a discrepancy in quality.

8. PRE-BID MEETING

A pre-bid meeting will be held on January 15, 2021 at 3:00 PM at the Main Entrance of the Bethune Learning Center located at 1 Echo Hill Drive, Building #36, Dobbs Ferry, NY 10522. Attendance at the prebid meeting is not mandatory for submitting a bid but is strongly encouraged. No one may visit the building or site without an appointment.

9. PREPARATION OF BIDS

Each Bid must be completed in duplicate on the applicable Bid Form(s) provided herein. All blank spaces must be filled in with ink in both words and figures. Erasures or other changes in a proposal must be explained or noted over the signature of the bidder. The Bid shall be signed by person or persons legally authorized to bind Bidder to Contract.

A Bid Security and Certificate of Compliance with the Iran Divestment Act shall be a part of each bid submitted and is required to be submitted with the Bid Form. The Statement of Bidder's Qualifications shall be considered part of the bid and is required to be submitted with each Bid. All blank spaces on both documents must be filled in with ink in both words and figures.

Any Bid submitted contrary to requirements above or specified, or containing omissions, conditions, or irregularities of any kind may be rejected by the Owner.

10. CERTIFICATE OF COMPLIANCE WITH THE IRAN DIVESTMENT ACT

In accordance with the requirements of General Municipal Law §103-g, the bidder is required to include with its bid either (1) the "Certification of Compliance with the Iran Divestment Act" or, in the case where the bidder is unable to make such certification, (2) the form titled "Declaration of Bidder's Inability to Provide Certification of Compliance with the Iran Divestment Act". This form is included in the Bid Documents.

11. BID SECURITY

Each bid must be accompanied by a Bid Security made payable to Greenburgh Eleven UFSD in the amount of five percent (5%) of the Bid Sum (the sum of the Base Bid plus all Add Alternates). The Bid Security shall be either a certified bank check or a Bid Bond issued by a surety company licensed to conduct business in the State of New York on the form included herein (AIA Document A310). The Bid Bond must be issued by a surety which meets the requirements set forth in Article 11 of the General Conditions. The successful bidder's security will be retained until he has signed the Agreement and furnished required Performance and Payment Bonds. The Owner reserves the right to retain the security of the three lowest bidders for each contract until the successful bidder enters into the contract and executes the Project Labor Agreement, or until 45 days after the bid opening, whichever is longer. All other bid security will be returned within 4 days after the bid opening. Attorneys-in-fact who sign bid bonds or contract bonds must file with each bond a certified and effectively dated copy of their power of attorney.

12. CONTRACTOR'S QUALIFICATION STATEMENT

Submit a properly executed Contractor's Qualification Statement on the form included herein (AIA Document A305) with the Contractor's bid. The Contractor's Qualification Statement must be signed and notarized. All items must be answered and the data given must be clear and comprehensive. Failure to answer these questions in a complete and satisfactory manner may result in the rejection of the bid. Failure to submit a properly executed Contractor's Qualification Statement with the Bid may result in the rejection of the bid. If necessary, questions may be answered on separate attached sheets. Additional information may be submitted by bidder, if desired.

Enclose the Contractor's Qualification Statement in a separate, sealed envelope with Bid.

If, after evaluating the Contractor's Qualification Statement, the Owner has any doubt that a Bidder has the proper qualifications, it may require from that Bidder within 3 working days and prior to a Contract award, further written evidence of financial data, previous experience, personnel resumes, or other information. If after evaluating supplied data and investigating the evidence, the Owner has any reasonable doubt that a Bidder has the experience, available personnel, reliability, or availability of financial resources to complete the project in a timely manner and in full compliance with the requirements of the Contract, the Owner may reject the Bid and award to the next lowest qualified Bidder

13. PERFORMANCE AND LABOR AND MATERIAL BOND

The successful bidder shall provide a Performance Bond and Payment Bond made payable to Greenburgh Eleven UFSD, each in an amount at least equal to one hundred percent (100%) of the Contract Price as security for the faithful performance of his Contract and for payment of all persons performing labor and furnishing materials in connection with the project. The value of each bond shall be adjusted during the Project construction period to reflect changes in the Contract Sum. All Bonds must meet or exceed the requirements set forth in Article 11 of the General Conditions of the Contract for Construction. Provide such bonds simultaneously with the execution of the Contract. Bonding company and bond

must be approved by the Owner. Only sureties licensed to do business in the State of New York may be used.

14. SUBMITTAL

Submit each Bid in an opaque, sealed envelope. Identify the envelope with: (1) project name, (2) name of bidder, (3) Contract name (e.g. Contract No. 1 - General Construction Work) and (4) proposal opening date. Submit Bids in accordance with the Advertisement for Bids and with these Instructions to Bidders. If forwarded by mail, the Bid must be enclosed in another envelope and forwarded to the Owner by certified mail at the address indicated in the Advertisement for Bids. The bidder assumes the risk of any delay in the mail or in handling of the bid by the Owner. The bidder assumes full responsibility for having his bid deposited on time and to the location and person indicated in the Advertisement for Bids, regardless of the method of delivery.

15. MODIFICATION AND WITHDRAWAL

No oral, facsimile, or telephonic proposals or modifications of Bids will be considered. Bids may be modified at any time prior to bid opening by submitting to the Owner a written modification, enclosed in a sealed opaque envelope, signed by the bidder, or an officer thereof if the bidder is a corporation, clearly setting forth in what respects the Bid is to be modified. Bids may be withdrawn on written or telegraphic request received from bidders prior to the time fixed for bid opening. Except as otherwise provided by law, negligence on the part of the bidder in preparing his Bid confers no right for the withdrawal of the Bid after it has been opened. No bidder may withdraw his Bid for forty-five (45) days after the opening thereof, except as otherwise provided by law.

16. REJECTION OF BIDS

The Owner reserves the right to reject any and all Bids. The Owner reserves the right to reject any Bid for reasons including, but not limited to, the following:

- a. The bidder fails to furnish any portion of the information required pursuant to the Instructions to Bidders.
- b. The bidder mis-states or conceals any material fact.
- c. The Bid does not strictly conform to law or to requirements of the Contract Documents.
- d. The Bid is conditional.
- e. The Bid is incomplete (by reason of, for example, failure to fill in an alternate price or failure to submit required documentation described herein).
- f. The Bidder is deemed unqualified to undertake the work.

The Owner reserves the right, however, to waive any informalities in the Bids received when such waiver is deemed to be in its interest.

17. OPENING AND AWARD

Bids will be opened as stated in the Advertisement for Bids. The Owner will award the Contracts, if at all, on or about two weeks after receipt of bids.

The Owner reserves the right to accept Alternates in any order or combination and to determine the low bidder on the basis of the sum of the Base Bid and Alternates accepted.

18. EXECUTION OF CONTRACT

After the Owner has ascertained the successful bidder, it shall send a Notice of Award of Contract to bidder to whom a Contract has been awarded.

The Contract used for this project shall be the Standard Form of Agreement Between Owner and Contractor - AIA Document A101, 2019 Edition published by the American Institute of Architects as modified herein.

In case of failure or refusal of an accepted Bidder to enter into a Contract within ten (10) days after the issue date of the Notice of Award, or to provide the Performance and Payment Bonds simultaneously with the execution of such Contract, the bidder will be considered as having abandoned the Contract. In such event, the bidder shall be liable for and agrees to pay to the Owner, on demand, damages for such failure or refusal. Such damages shall be the difference between the price bid by him and the price for which such contract shall subsequently be relet, plus the cost of such reletting, plus any other consequential expenses and damages.

The amount of such bidder's Bid Security shall be retained by the Owner and shall be applied toward payment of such damages. If any amount remains in excess of such damages, such remaining amount shall be returned to the bidder.

19. SUBCONTRACTORS

All Subcontractors must be acceptable to the Architect and/or Owner. When requested by the Architect and/or Owner, the Bidder shall submit the names of the Subcontractors proposed for use on the Project and all other information concerning his Subcontractors as requested by the Architect and/or Owner within the time frame stipulated. If the Architect and/or Owner disapproves any proposed Subcontractor the contractor shall submit the name of an alternate Subcontractor to whom the Architect and/or Owner has no objection in the same manner as the original submittal.

The Owner reserves the right to reject any bid if the names of the proposed Subcontractors are not submitted as required.

20. SALES AND COMPENSATING USE TAXES

The Owner is exempt from paying sales and compensating use taxes of the State of New York and of cities, counties, and other subdivisions of the State on all materials sold to it pursuant to the provisions of this Contract. These taxes are not to be included in bids. This exemption shall apply to supplies and materials which are incorporated in such project. This exemption does not, however, apply to equipment rentals, small tools, and supplies

for equipment such as supplies of gasoline used in operating trucks. The term "materials" as used in this article shall include supplies incorporated in this project. A Tax Exemption Certificate will be furnished to the Contractor by the Owner upon request.

21. LAWS AND REGULATIONS

All applicable State Laws, municipal ordinances, and the rules, regulations and ordinances of all authorities having jurisdiction over construction of the project shall apply to the Contract throughout, and they will be deemed to be included in the Contract the same as though herein written out in full.

22. AFFIRMATIVE ACTION PROVISION

During the performance of this Contract, each Contractor agrees that he will not discriminate against any employee or applicant for employment because of race, color, religion, sex, national origin, age or disability. Such action shall include, but not be limited to the following: employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoffs or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. Each Contractor agrees to include, or require the inclusion of the above provision in any subcontract made pursuant to its contract with the Owner.

23. EQUIVALENCY CLAUSE

Whenever a material, article, device, piece of equipment or type of construction is identified on the Drawings or in the Specifications by reference to manufacturers' or vendors' names, trade names, catalog numbers, or similar specific information, it is so identified for the purpose of establishing a standard of quality, and such identification shall not be construed as limiting competition. Any material, article, device, piece of equipment or type of construction of other manufacturers or vendors that will perform adequately the duties imposed by the general design will be considered equally acceptable provided the material, article, device, piece of equipment or type of construction so proposed is completely described in submittals to the Architect and is, in the opinion of the Architect, of equal substance, appearance, and function. If the contractor desires to use any kind, type, brand, or manufacturer or material other than those named in the specifications, they shall indicate in writing, when requested, and prior to award of contract, what kind, type, brand, or manufacturer is included in the base bid for the specified item, following procedures specified in Section 016000. Refer to Division 01 General Requirements (Section 016000) and General Conditions of the Contract for Construction.

24. TYPE OF CONTRACT

The Work of this Project will be let in four (4) separate contracts divided according to the work of the separate Prime Contractors for the following:

Contract No. 1 - General Construction Work
Contract No. 2 - Plumbing Work
Contract No. 3 - HVAC Work

Contract No. 4 - Electrical Work

Responsibilities assigned to each separate Prime Contractor and the scope of the Work included in each contract is clearly identified in the Specifications

25. POST BID PROCEDURES

- A. The responsibility of bidders and of their proposed subcontractors will be considered in making the award. The Owner through the Architect may make such investigation as the Owner deems necessary to determine the responsibility of any bidder or to determine the ability of any bidder to perform the Work.
- B. When requested by the Architect, bidders shall furnish all information and data required by the Owner, including financial data, within the time and in the form and manner required by the Owner. Upon notification from the Architect, the three apparent low bidders for each contract shall furnish within three (3) working days after the bid opening four (4) copies of the following information in writing:
 - 1. A signed and notarized bidder qualification statement;
 - 2. The names, addresses and phone numbers of the subcontractors and suppliers that the bidder proposes to use on the project;
 - 3. The bidder's proposed site safety plan;
 - 4. A bar chart schedule showing the bidders' proposed plan and schedule to complete the bidder's work in accordance with the phasing milestones outlined in Section 011000;
 - 5. The insurance certificates required by the Bid Documents;
 - 6. A proposed schedule of values for the bidder's work;
 - 7. A proposed list of submittals and a proposed schedule for making them, all keyed to the bar chart.
 - 8. A list of proposed substitutions in accordance with Paragraph 24 above.
- C. After receipt of the above information, the Architect will designate a time and place for a meeting between the Owner, the Architect and the apparent low bidder. The apparent low bidder's principal, project manager and site superintendent will attend that meeting, at which time the parties will discuss the bidder's responsiveness, responsibility and qualifications.
- D. The Owner reserves the right to disapprove the use of any proposed Subcontractor and in such event the bidder shall submit the name of another Subcontractor in a similar manner within the time specified by the Architect.
- E. To the fullest extent allowed by law, the Owner reserves the right to reject any bid if the evidence required by the Owner is not submitted or fails to satisfy the Owner that the bidder is responsible, able and qualified to carry out the obligations of the Contract or to complete the Work as contemplated. The Owner will consider the information received under paragraphs A through D above in determining whether or not to accept a proposal.
- F. Acceptance of a proposal will be a notice in writing signed by a duly authorized representative of the Owner.
- G. Any bidder whose proposal is accepted will be required to sign the Trade Contract within ten (10) days after receiving notice of acceptance.

- H. In the event that the Owner should reject the proposal of a bidder as provided above or otherwise, at the Owner's option, the Owner may elect to meet with the next lowest bidder and to consider the information as provided in paragraphs A through D above. In the event that the proposal of the next lowest bidder is rejected as provided above or otherwise, at the Owner's option, the Owner may elect to meet with the third lowest bidder and repeat the above process. At all times the Owner retains the right to reject all bids.

END OF INSTRUCTIONS TO BIDDERS

INFORMATION AVAILABLE TO BIDDERS

1.1 GENERAL

- A. Hazardous Material Information: Data in hazardous material investigation reports included herein are provided to the Contractor for information only. Conditions are not intended as representations or warranties of accuracy or continuity between sampling locations. The Owner will not be responsible for interpretations or conclusions drawn from this data by Contractor.

REPORT OF ENVIRONMENTAL SERVICES

Performed at:

**BETHUNE LEARNING COMMUNITY HIGH SCHOOL
1 ECHO DRIVE – BUILDING 38
DOBBS FERRY, NY 10522**

Prepared for:



**Greenburgh Eleven Union Free School District
1 Echo Drive – Building 36
Dobbs Ferry, New York 10522**

Prepared by:



Louis Berger A WSP Company

**565 Taxter Road, 5th Floor
Elmsford, New York 10523**

Tel. (914) 798-3710

Fax (914) 592-1734

**Project No. 2043479.35
Submission Date: December 26, 2019**



Louis Berger A WSP Company

565 Taxter Road, 5th Floor, Elmsford, NY 10523
Tel 914 798 3710 Fax 914 592 1734

www.louisberger.com

December 26, 2019

Mr. Emmanuel Glasu
Greenburgh Eleven Union Free School District
1 Echo Drive – Building 36
Dobbs Ferry, New York 10522

**Subject: Report of Environmental Services
Bethune Learning Community High School
1 Echo Drive – Building 38
Dobbs Ferry, New York 10522**

Dear Mr. Glasu:

Louis Berger (LB) A WSP Company has completed a material inspection at the Bethune Learning Community High School located at 1 Echo Drive - Building 38, Dobbs Ferry, NY 10522. The inspection included visual observation, material sampling, and laboratory sample analysis of suspect Asbestos-Containing Materials (ACM) and Polychlorinated Biphenyls (PCBs) based on the demolition drawings dated December 12, 2019 submitted by KG&D Architects for the proposed “Alterations Project” at the Bethune Learning Community High School.

The attached report presents descriptions and results of the material sampling procedures and visual analysis. Relevant general project information is provided, followed by our findings, assessments and recommendations. Laboratory analysis data and certifications are provided in the Appendices.

If you have any questions concerning this report or if we may be of further assistance to you, please contact us.

Sincerely,

LOUIS BERGER (LB) A WSP COMPANY

A handwritten signature in blue ink, appearing to read 'CN' or similar initials, followed by a horizontal line.

Craig Napolitano, CHMM
Vice President, Emergency Management & IH Services



Report for Environmental Inspection Services

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Appendices

Appendix A: Asbestos Sample Analysis Results in Tabular Form

Appendix B: Asbestos Bulk Sample Field Data Sheets with Chain of Custody & Laboratory Results

Appendix C: Asbestos Bulk Sample Location Drawings

Appendix D: Asbestos Containing Materials Location Drawings

Appendix E: PCB Bulk Sample Field Data Sheets with Chain of Custody & Laboratory Results

Appendix F: Company License, Personnel Certifications and Laboratory Accreditations



Report for Environmental Inspection Services

1.0 EXECUTIVE SUMMARY

Louis Berger (LB) A WSP Company has performed a material inspection for the presence or absence of Asbestos-Containing Materials (ACM) and Polychlorinated Biphenyls (PCBs) at the Bethune Learning Community High School located at 1 Echo Drive - Building 38, Dobbs Ferry, NY 10522. The intent of this inspection was to screen for Asbestos-Containing Materials (ACM) and Polychlorinated Biphenyls (PCBs) that may be impacted during the proposed “Alterations Project” at the Bethune Learning Community High School based on the demolition drawings dated December 12, 2019 submitted by KG&D Architects.

Marvin Luccioni, Tyler Prine & Luis Nevarez of LB performed the inspection on December 17 & 18, 2019. Mr. Luccioni (Cert# 03-11021) is certified as a New York State Department of Labor (NYSDOL) Asbestos Inspector. Mr. Prine (Cert# 19-02666) is certified as a New York State Department of Labor (NYSDOL) Asbestos Inspector. Mr. Nevarez (Cert# 12-12740) is certified as a New York State Department of Labor (NYSDOL) Asbestos Inspector.

The results of the visual inspection and bulk sample analysis determined that the following suspect ACM and PCB materials may be impacted by the proposed alterations project:

A. ASBESTOS-CONTAINING MATERIAL

Analytical results of the bulk samples collected by LB on 12/17 & 18/19 indicate that the following materials **contain asbestos** (greater than 1-percent).

- **None**

Analytical results of bulk samples collected by LB on 12/17 & 18/19 indicate the following materials **do not contain** asbestos (less than 1-percent);

- Interior Brick Mortar, Gray
- Ceramic Wall Tile Grout, Brown
- Ceramic Wall Tile Grout, Gray
- Interior Cinderblock Mortar, Gray
- Glazed Block Wall Mortar, Gray
- Sink Undercoating, Gray
- Counter Caulking, White
- 2’x4’ Fissure Ceiling Tiles, White
- 2’x4’ Split Fissure Ceiling Tiles, White
- Glue to Chalk Board, Brown
- 4” Black Cove Base Mastic, Beige
- 4” Brown Cove Base Mastic, Yellow
- 4” Blue Cove Base Mastic, Yellow
- Joint Compound, White with Gypsum Board, Gray



Report for Environmental Inspection Services

- Insulation below Leveling Compound, Brown
- Leveling Compound, White
- Leveling Compound, Dark Gray
- Leveling Compound, Light Gray
- 12"x12" Gray Floor Tiles with Mastic, Beige
- 12"x12" Beige Floor Tiles with Mastic, Brown
- 12"x12" Blue Floor Tiles with Mastic, Beige
- Carpet Mastic, Yellow
- Carpet Mastic, Brown/Gray
- Ceramic Wall Tile Backing, Tan
- Ceramic Wall Tile Grout, White
- Ceramic Wall Floor Tile Mortar, Gray
- Spray on Fireproofing, Brown
- Exterior Brick Mortar, Gray
- Exterior Door Frame Caulking, Brown/Gray
- Exterior Door Frame Caulking, White
- Sealant to Vent Pipe, Black
- Pitch Pocket Tar, Black

B. PCB-CONTAINING MATERIAL

Analytical results of the bulk samples collected indicate that the following materials **contain PCB** (greater than 50 PPM).

- **TBD**

Analytical results of the bulk samples collected indicate that the following materials **did not contain PCB** (less than 50 PPM);

- Counter Caulking, White
- Exterior Door Frame Caulking, Brown/Gray
- Exterior Door Frame Caulking, White



Report for Environmental Inspection Services

2.0 FIELD INSPECTION PROCEDURES AND SAMPLE ANALYSIS METHODS

ASBESTOS-CONTAINING MATERIAL

Guidelines used for the inspection were established by the Environmental Protection Agency (EPA) in the Guidance for Controlling Asbestos Containing Materials in Buildings, Office of Pesticides and Toxic Substances, Doc 560/5-85-024, and 40 CFR Part 763, Asbestos Hazard Emergency Response Act (AHERA).

Field information was organized in accordance with the AHERA methodology of homogenous area (HA). During the Inspection, reasonable effort was made to identify all locations and types of ACM materials associated with the scope of work. Sampling has included multiple samples of the same materials chosen at random. However, due to inconsistencies of a manufacturer's processes and the contractor's installation methods, materials of similar construction may contain various amounts of asbestos. Furthermore, some materials that were not originally specified to contain asbestos may in fact contain this mineral. For example, cementitious pipe insulation and plaster were frequently mixed with asbestos at the construction site for ease of application. Locating all asbestos materials can only be definitively achieved by conducting exploratory demolition and sampling every section of pipe insulation, fitting or valve covering, fireproofing, and other suspect ACM.

Bulk samples of suspect ACM are analyzed using polarized light microscopy (PLM) coupled with dispersion staining, as described in 40 CFR Part 763 and the National Emissions Standard for Hazardous Air Pollutants (NESHAPS). NESHAPS is the standard industry protocol for the determination of asbestos in building materials. A suspect material is immersed in a solution of known refractive index and subjected to illumination by polarized light. The color displays that result are compared to a standardized atlas whereby the specific variety of asbestos is determined. It should also be recognized that PLM is primarily a qualitative identification method whereby asbestos percentage, if any, is estimated. While EPA, New York State, and New York City regulations governing ACM consider materials containing greater than 1-percent as asbestos, accurately quantifying asbestos content below 5-percent has been shown to be unreliable.

The New York State Department of Health has recently revised the PLM Stratified Point Counting Method. The March 25th, 2011 method, "Polarized Light Microscopy Methods for Identifying and Quantifying Asbestos in Bulk Samples" can be found as Item 198.1 in the Environmental Laboratory Approval program (ELAP) Certification manual. Whereas the procedure of analysis for bulk samples that fall into the category of "Non-friable Organically Bound" (NOB) can be found in the March 25th 2011 method "Polarized-Light Microscope Method for Identifying and Quantifying Asbestos in Non-Friable Organically Bound Bulk Samples", Item 198.6 in the ELAP Certification Manual. This category includes any sample in a flexible to rigid asphalt or vinyl matrix (floor tiles, mastic, roofing shingles, roofing felt, etc.). These samples must be "ashed" in a muffle furnace at 480-degrees Celsius (to remove organic matrix), treated with acid (to remove any mineral carbonate), and filtered through a 0.4-micron polycarbonate filter before being analyzed by PLM. The sample must be weighted between each of these steps to track the percent loss of organic matrix.



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ELAP has determined that analysis of NOB materials is not reliably performed by PLM. Therefore, if PLM analysis yields results of 1-percent asbestos or less, the result must be confirmed by TEM. For bulk samples that undergo TEM analysis, the March 25th, 2011 method "Transmission Electron Microscope Method for Identifying and Quantitating Asbestos in Non-Friable organically Bound Bulk Samples" must be used and can be found as Item 198.4 in the ELAP Certification Manual. ELAP certified laboratories must include the following statement with their PLM analysis results for each "negative" (1-percent or less asbestos) NOB sample: "Polarized-light microscopy is not consistently reliable in detecting asbestos in floor coverings and similar non-friable organically bound materials. Before this material can be considered or treated as non-ACM, confirmation must be made by quantitative transmission electron microscopy".

All samples are initially analyzed by Polarized Light Microscopy in accordance with Item 198.1 and 198.6 of the ELAP Certification Manual. Samples which yield a negative PLM result and which are classified as a "non-friable" material, are then re-analyzed utilizing TEM methodology in accordance with Item 198.4 of the ELAP Certification Manual. The laboratory performing both these analysis procedures is EMSL located at 528 Mineola Ave., Carle Place NY 11514. The laboratory has received accreditation from the following agencies:

- National Voluntary Laboratory Accreditation Program (Lab Code 101048-10)
- New York State Environmental Laboratory Approval Program (Lab No. 11469)
- American Industrial Hygiene Association Accredited Laboratory (Lab No. 102344)

POLYCHLORINATED BIPHENYLS (PCBs)

PCBs belong to a broad family of man-made organic chemicals known as chlorinated hydrocarbons. PCBs were domestically manufactured from 1929 until their manufacture was banned in 1979. They have a range of toxicity and vary in consistency from thin, light-colored liquids to yellow or black waxy solids. Due to their non-flammability, chemical stability, high boiling point, and electrical insulating properties, PCBs were used in hundreds of industrial and commercial applications including electrical, heat transfer, and hydraulic equipment; as plasticizers in paints, plastics, and rubber products; in pigments, dyes, and carbonless copy paper; and many other industrial applications.

Although no longer commercially produced in the United States, PCBs may be present in products and materials produced before the 1979 PCB ban. Products that may contain PCBs include: Transformers and capacitors, Oil used in motors and hydraulic systems, Fluorescent light ballasts, Adhesives and tapes, Caulking, Plastics, etc.

The PCBs used in these products were chemical mixtures made up of a variety of individual chlorinated biphenyl components, known as congeners. Most commercial PCB mixtures are known in the United States by their industrial trade names. The most common trade name is aroclor.



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Polychlorinated biphenyls (PCBs) are regulated pursuant to the United States Environmental Protection Agency Code of Federal Regulations (40 CFR Part 761), the Toxic Substances Control Act (TSCA – 15 U.S.C. 2605), New York State Department of Environmental Conservation 6NYCRR 370-376 and federal Occupational Safety and Health Administration (OSHA) 29CFR 1926 & 1910. These regulations require certain testing and reporting requirements to determine management, recycling and disposal options for PCBs.



Report for Environmental Inspection Services

3.0 INSPECTION SCOPE AND MATERIAL ASSESSMENT

The areas inspected for ACM and PCB materials that may be impacted by the proposed exterior renovations at the Bethune Learning Community High School. Locations surveyed include:

- Throughout Interior Lower Level, 1st & 2nd Floors
- Exterior Facade
- Roof

A. ASBESTOS-CONTAINING MATERIAL

Materials examined during the Berger inspection included:

- Interior Brick Mortar, Gray
- Ceramic Wall Tile Grout, Brown
- Ceramic Wall Tile Grout, Gray
- Interior Cinderblock Mortar, Gray
- Glazed Block Wall Mortar, Gray
- Sink Undercoating, Gray
- Counter Caulking, White
- 2'x4' Fissure Ceiling Tiles, White
- 2'x4' Split Fissure Ceiling Tiles, White
- Glue to Chalk Board, Brown
- 4" Black Cove Base Mastic, Beige
- 4" Brown Cove Base Mastic, Yellow
- 4" Blue Cove Base Mastic, Yellow
- Joint Compound, White with Gypsum Board, Gray
- Insulation below Leveling Compound, Brown
- Leveling Compound, White
- Leveling Compound, Dark Gray
- Leveling Compound, Light Gray
- 12"x12" Gray Floor Tiles with Mastic, Beige
- 12"x12" Beige Floor Tiles with Mastic, Brown
- 12"x12" Blue Floor Tiles with Mastic, Beige
- Carpet Mastic, Yellow
- Carpet Mastic, Brown/Gray
- Ceramic Wall Tile Backing, Tan
- Ceramic Wall Tile Grout, White
- Ceramic Wall Floor Tile Mortar, Gray
- Spray on Fireproofing, Brown
- Exterior Brick Mortar, Gray



Report for Environmental Inspection Services

- Exterior Door Frame Caulking, Brown/Gray
- Exterior Door Frame Caulking, White
- Sealant to Vent Pipe, Black
- Pitch Pocket Tar, Black

A. ASBESTOS-CONTAINING MATERIAL

Analytical results of the bulk samples collected by LB on 12/17 & 18/19 indicate that the following materials **contain asbestos** (greater than 1-percent).

- **None**

Analytical results of bulk samples collected by LB on 12/17 & 18/19 indicate the following materials **do not contain** asbestos (less than 1-percent);

- Interior Brick Mortar, Gray
- Ceramic Wall Tile Grout, Brown
- Ceramic Wall Tile Grout, Gray
- Interior Cinderblock Mortar, Gray
- Glazed Block Wall Mortar, Gray
- Sink Undercoating, Gray
- Counter Caulking, White
- 2'x4' Fissure Ceiling Tiles, White
- 2'x4' Split Fissure Ceiling Tiles, White
- Glue to Chalk Board, Brown
- 4" Black Cove Base Mastic, Beige
- 4" Brown Cove Base Mastic, Yellow
- 4" Blue Cove Base Mastic, Yellow
- Joint Compound, White with Gypsum Board, Gray
- Insulation below Leveling Compound, Brown
- Leveling Compound, White
- Leveling Compound, Dark Gray
- Leveling Compound, Light Gray
- 12"x12" Gray Floor Tiles with Mastic, Beige
- 12"x12" Beige Floor Tiles with Mastic, Brown
- 12"x12" Blue Floor Tiles with Mastic, Beige
- Carpet Mastic, Yellow
- Carpet Mastic, Brown/Gray
- Ceramic Wall Tile Backing, Tan
- Ceramic Wall Tile Grout, White
- Ceramic Wall Floor Tile Mortar, Gray



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- Spray on Fireproofing, Brown
- Exterior Brick Mortar, Gray
- Exterior Door Frame Caulking, Brown/Gray
- Exterior Door Frame Caulking, White
- Sealant to Vent Pipe, Black
- Pitch Pocket Tar, Black

B. PCB-CONTAINING MATERIAL

Analytical results of the bulk samples collected indicate that the following materials **contain PCB** (greater than 50 PPM).

- **TBD**

Analytical results of the bulk samples collected indicate that the following materials **did not contain PCB** (less than 50 PPM);

- Counter Caulking, White
- Exterior Door Frame Caulking, Brown/Gray
- Exterior Door Frame Caulking, White



Report for Environmental Inspection Services

4.0 INSPECTION RESULTS

A. ASBESTOS-CONTAINING MATERIAL

The asbestos inspection involved a thorough visual examination of all areas that may be impacted by the proposed alterations project at the Bethune Learning Community High School. The following suspect materials were sampled and analyzed for asbestos content by Berger:

4.1 Table 4.1 – Suspect Materials Inspected

HOMOGENOUS MATERIAL	LOCATION	MATERIAL	ASBESTOS CONTENT
01	Throughout Interior	Interior Brick Mortar, Gray	NAD
02	Throughout Interior	Ceramic Wall Tile Grout, Brown	NAD
03	Throughout Interior	Ceramic Wall Tile Grout, Gray	NAD
04	Throughout Interior	Interior Cinderblock Mortar, Gray	NAD
05	Throughout Interior	Glazed Block Wall Mortar, Gray	NAD
06	Throughout Interior	Sink Undercoating, Gray	NAD
07	Throughout Interior	Counter Caulking, White	NAD
08	Throughout Interior	2'x4' Fissure Ceiling Tiles, White	NAD
09	Throughout Interior	2'x4' Split Fissure Ceiling Tiles, White	NAD
10	Throughout Interior	Glue to Chalk Board, Brown	NAD
11	Throughout Interior	4" Black Cove Base Mastic, Beige	NAD
12	Throughout Interior	4" Gray Cove Base Mastic, Tan	<1% Anthophyllite
13	Throughout Interior	4" Brown Cove Base Mastic, Yellow	NAD
14	Throughout Interior	4" Blue Cove Base Mastic, Yellow	NAD
15	Throughout Interior	Joint Compound, White	NAD
16	Throughout Interior	Gypsum Board, Gray	NAD
17	Throughout Interior	Insulation below Leveling Compound, Brown	NAD
18	Throughout Interior	Leveling Compound, White	NAD
19	Throughout Interior	Leveling Compound, Dark Gray	NAD
20	Throughout Interior	Leveling Compound, Light Gray	NAD
21	Throughout Interior	Mastic associated with 12"x12" Gray Floor Tiles, Beige	NAD
22	Throughout Interior	12"x12" Gray Floor Tiles	NAD
23	Throughout Interior	Mastic associated with 12"x12" Beige Floor Tiles, Brown	NAD
24	Throughout Interior	12"x12" Beige Floor Tiles	NAD
25	Throughout Interior	Mastic associated with 12"x12" Blue Floor Tiles, Beige	NAD
26	Throughout Interior	12"x12" Blue Floor Tiles	NAD
27	Throughout Interior	Carpet Mastic, Yellow	NAD



Report for Environmental Inspection Services

HOMOGENOUS MATERIAL	LOCATION	MATERIAL	ASBESTOS CONTENT
28	Throughout Interior	Carpet Mastic, Gray/Brown	NAD
29	Throughout Interior	Ceramic Wall Tile Backing, Tan	NAD
30	Throughout Interior	Ceramic Wall Tile Grout, White	NAD
31	Throughout Interior	Ceramic Floor Tile Mortar, Gray	NAD
32	Throughout Interior	Spray on Fire Proofing, Brown	NAD
33	Exterior Facade	Exterior Brick Mortar, Gray	NAD
34	Exterior Facade	Exterior Door Frame Caulking, Brown/Gray	NAD
35	Roof	Exterior Door Frame Caulking, White	NAD
36	Roof	Sealant to Vent Pipe, Black	NAD
37	Roof	Pitch Pocket Tar, Black	NAD

Bold = Positive for ACM NAD = No Asbestos Detected

4.2 CONDITION AND FRIABILITY ASSESSMENT TABLE

For each inspection conducted, the inspector classifies ACM or Assumed ACM materials by friability and condition. This helps to determine the extent of damage in certain areas as well as the potential for further damage and Asbestos release due to disturbance of the material.

Table 4.2 – Condition and Friability Assessment

Location	Material	Quantity	Friability	Condition
NO ASBESTOS CONTAINING MATERIALS WERE FOUND DURING THIS INSPECTION.				

Condition Definitions:

Good: None/Minimal apparent damage to ACM

Fair: Up to 10% localized damage or up to 25% of the entire ACM is damaged

Poor: Over 10% localized damage or over 25% of the entire ACM is damaged

4.3 SAMPLE ANALYSIS TABLE

Laboratory analysis results, in tabular form, are included in Appendix A.

5.0 AREAS NOT ACCESSIBLE

During the inspection the following areas were not accessible:

Spaces within Walls/Floors/Ceilings: No destructive sampling was performed on concealed spaces in walls to access plenum, chases etc. It should be assumed that asbestos containing materials may exist in these spaces. Any suspect materials encountered during work should be sampled for analysis before work continues.

Building Envelope: No destructive sampling was performed on the building envelope. It should



Report for Environmental Inspection Services

be assumed that asbestos containing materials may exist in these spaces. Any suspect materials encountered during work should be sampled for analysis before work continues.

6.0 CONCLUSIONS AND RECOMMENDATIONS

No asbestos containing materials have been identified in this inspection that may be impacted as part of the alterations project at the Bethune Learning Community High School.

The ACM and PCB inspection was conducted at the request of the Greenburgh Eleven Union Free School District based on the demolition drawings dated December 12, 2019 submitted by KG&D Architects for the proposed "Alterations Project" at the Bethune Learning Community High School. Any change in the scope of work will require further investigation to accurately classify any additional ACM and PCB resulting from the modified or updated scope of work.

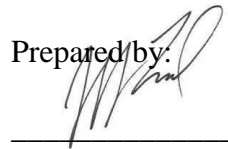
7.0 REPORT CERTIFICATIONS

This report, and the supporting data, findings, conclusions, opinions, and recommendations it contains represent the result of LB's efforts for the environmental inspection work for the Bethune Learning Community High School.

Opinions and recommendations presented in this report apply to site conditions and features as they existed at the time of LB's site visits, and those reasonably foreseeable. They cannot necessarily apply to conditions and features of which LB is unaware and has not had the opportunity to evaluate.

The conclusions presented in this report are professional opinions solely upon LB's visual observations of accessible areas, laboratory test data, and current regulatory requirements. These conclusions are intended exclusively for the purpose stated herein and the site indicated for the project indicated.

Prepared by:


Marvin Luccioni
NYS DOL Inspector

Reviewed by:


Craig Napolitano, CHMM
Vice President, Emergency Management & IH Services



Report of Environmental Inspection Services

APPENDIX A: ASBESTOS SAMPLE ANALYSIS RESULTS IN TABULAR FORM



Survey Report for Environmental Inspection Services

APPENDIX A
SAMPLE ANALYSIS RESULTS IN TABULAR FORM
BETHUNE SCHOOL
1 ECHO DRIVE
DOBBS FERRY, NY

Homogeneous Area No.	Sample No.	Location	Material	PLM Result	TEM Result
01	01	1 st Floor Lobby	Interior Brick Mortar, Gray	NAD	--
01	02	1 st Floor Lobby	Interior Brick Mortar, Gray	NAD	--
02	03	1 st Floor Lobby	Ceramic Wall Tile Grout, Brown	NAD	--
02	04	1 st Floor Lobby	Ceramic Wall Tile Grout, Brown	NAD	--
03	05	Multi-Purpose Room	Ceramic Wall Tile Grout, Gray	NAD	--
03	06	Multi-Purpose Room	Ceramic Wall Tile Grout, Gray	NAD	--
04	07	Multi-Purpose Room	Interior Cinderblock Mortar, Gray	NAD	--
04	08	Room LL 07	Interior Cinderblock Mortar, Gray	NAD	--
05	09	1 st Floor Hallway	Glazed Block Wall Mortar, Gray	NAD	--
05	10	2 nd Floor Hallway	Glazed Block Wall Mortar, Gray	NAD	--
06	11	Room LL 07	Sink Undercoating, Gray	NAD	NAD
06	12	Room 226	Sink Undercoating, Gray	NAD	NAD
07	13	Room LL 07	Counter Caulking, White	NAD	NAD
07	14	Room 226	Counter Caulking, White	NAD	NAD
08	15	Room LL 07	2'x4' Fissure Ceiling Tiles, White	NAD	NAD
08	16	Room 226	2'x4' Fissure Ceiling Tiles, White	NAD	NAD
09	17	1 st Floor Hallway	2'x4' Split Fissure Ceiling Tiles, White	NAD	NAD

Bold = Positive for ACM
NAD = No Asbestos Detected

N/A = Not Applicable
NA/PS = Not analyzed/ positive sample



Survey Report for Environmental Inspection Services

Homogeneous Area No.	Sample No.	Location	Material	PLM Result	TEM Result
09	18	2 nd Floor Hallway	2'x4' Split Fissure Ceiling Tiles, White	NAD	NAD
10	19	Room LL 07	Glue to Chalk Board, Brown	NAD	NAD
10	20	Room 226	Glue to Chalk Board, Brown	NAD	NAD
11	21	Multi-Purpose Room	4" Black Cove Base Mastic, Beige	NAD	NAD
11	22	Multi-Purpose Room	4" Black Cove Base Mastic, Beige	NAD	NAD
12	23	Room LL 07	4" Gray Cove Base Mastic, Tan	NAD	NAD
12	24	Room 226	4" Gray Cove Base Mastic, Tan	NAD	<1% Anthophyllite
13	25	Room LL 34	4" Brown Cove Base Mastic, Yellow	NAD	NAD
13	26	Room LL 34	4" Brown Cove Base Mastic, Yellow	NAD	NAD
14	27	LL Entryway	4" Blue Cove Base Mastic, Yellow	NAD	NAD
14	28	LL Entryway	4" Blue Cove Base Mastic, Yellow	NAD	NAD
15	29	Room LL 34	Joint Compound, White	NAD	--
15	30	Room 127	Joint Compound, White	NAD	--
15	31	Multi-Purpose Room	Joint Compound, White	NAD	--
16	32	Room LL 34	Gypsum Board, Gray	NAD	--
16	33	Room 127	Gypsum Board, Gray	NAD	--
16	34	Multi-Purpose Room	Gypsum Board, Gray	NAD	--
17	35	LL Hallway o/s Room 34	Insulation below Leveling Compound, Brown	NAD	--
17	36	LL Hallway o/s Room 34	Insulation below Leveling Compound, Brown	NAD	--
18	37	LL Hallway o/s Room 34	Leveling Compound, White	NAD	--

Bold = Positive for ACM
NAD = No Asbestos Detected

N/A = Not Applicable
NA/PS = Not analyzed/ positive sample



Survey Report for Environmental Inspection Services

Homogeneous Area No.	Sample No.	Location	Material	PLM Result	TEM Result
18	38	LL Hallway o/s Room 34	Leveling Compound, White	NAD	--
19	39	LL Hallway	Leveling Compound, Dark Gray	NAD	--
19	40	LL Hallway	Leveling Compound, Dark Gray	NAD	--
20	41	Room 222	Leveling Compound, Light Gray	NAD	--
20	42	Room 221	Leveling Compound, Light Gray	NAD	--
21	43	Room LL 07	Mastic associated with 12"x12" Gray Floor Tiles, Beige	NAD	NAD
21	44	Room 109	Mastic associated with 12"x12" Gray Floor Tiles, Beige	NAD	NAD
22	45	Room LL 07	12"x12" Gray Floor Tiles	NAD	NAD
22	46	Room 109	12"x12" Gray Floor Tiles	NAD	NAD
23	47	Room LL 34	Mastic associated with 12"x12" Beige Floor Tiles, Brown	NAD	NAD
23	48	Room LL 34	Mastic associated with 12"x12" Beige Floor Tiles, Brown	NAD	NAD
24	49	Room LL 34	12"x12" Beige Floor Tiles	NAD	NAD
24	50	Room LL 34	12"x12" Beige Floor Tiles	NAD	NAD
25	51	LL Entryway	Mastic associated with 12"x12" Blue Floor Tiles, Beige	NAD	NAD
25	52	LL Entryway	Mastic associated with 12"x12" Blue Floor Tiles, Beige	NAD	NAD
26	53	LL Entryway	12"x12" Blue Floor Tiles	NAD	NAD
26	54	LL Entryway	12"x12" Blue Floor Tiles	NAD	NAD
27	55	Room 221	Carpet Mastic, Yellow	NAD	NAD
27	56	Room 222	Carpet Mastic, Yellow	NAD	NAD
28	57	1 st Floor Lobby	Carpet Mastic, Gray/Brown	NAD	NAD
28	58	1 st Floor Lobby	Carpet Mastic, Gray/Brown	NAD	NAD
29	59	1 st Floor Boys Restroom	Ceramic Wall Tile Backing, Tan	NAD	NAD
29	60	2 nd Floor Restroom	Ceramic Wall Tile Backing, Tan	NAD	NAD

Bold = Positive for ACM
NAD = No Asbestos Detected

N/A = Not Applicable
NA/PS = Not analyzed/ positive sample



Survey Report for Environmental Inspection Services

Homogeneous Area No.	Sample No.	Location	Material	PLM Result	TEM Result
30	61	1 st Floor Boys Restroom	Ceramic Wall Tile Grout, White	NAD	--
30	62	2 nd Floor Restroom	Ceramic Wall Tile Grout, White	NAD	--
31	63	1 st Floor Boys Restroom	Ceramic Floor Tile Mortar, Gray	NAD	--
31	64	2 nd Floor Restroom	Ceramic Floor Tile Mortar, Gray	NAD	--
32	65	Room 221	Spray on Fire Proofing, Brown	NAD	--
32	66	LL Entryway	Spray on Fire Proofing, Brown	NAD	--
32	67	1 st Floor Boys Restroom	Spray on Fire Proofing, Brown	NAD	--
33	68	Exterior Facade	Exterior Brick Mortar, Gray	NAD	--
33	69	Exterior Facade	Exterior Brick Mortar, Gray	NAD	--
34	70	Exterior Facade	Exterior Door Frame Caulking, Brown/Gray	NAD	NAD
34	71	Exterior Facade	Exterior Door Frame Caulking, Brown/Gray	NAD	NAD
35	72	South East Corner of Roof	Exterior Door Frame Caulking, White	NAD	NAD
35	73	South East Corner of Roof	Exterior Door Frame Caulking, White	NAD	NAD
36	74	North End Corner of Roof	Sealant to Vent Pipe, Black	NAD	NAD
36	75	North End Corner of Roof	Sealant to Vent Pipe, Black	NAD	NAD
37	76	South West Corner of Roof	Pitch Pocket Tar, Black	NAD	NAD
37	77	South West Corner of Roof	Pitch Pocket Tar, Black	NAD	NAD

Bold = Positive for ACM
NAD = No Asbestos Detected

N/A = Not Applicable
NA/PS = Not analyzed/ positive sample



Report of Environmental Inspection Services

APPENDIX B: ASBESTOS BULK SAMPLE FIELD DATA SHEETS WITH CHAIN OF CUSTODY AND LABORATORY RESULTS



EMSL Analytical, Inc.

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<http://www.EMSL.com / carleplacelab@emsl.com>

EMSL Order: 061927603
Customer ID: LBAP78
Customer PO: 2043479.35
Project ID:

Attention: Marvin Luccioni
 Louis Berger U.S., Inc
 96 Morton Street
 8th floor
 New York, NY 10014

Phone: (718) 730-2741

Fax:

Received Date: 12/18/2019 8:17 AM

Analysis Date: 12/18/2019 - 12/19/2019

Collected Date: 12/17/2019

Project: Greenburgh 11 UFSD, LB PROJ: 2043479.35, Bethune School, 1 Echo Drive, Dobbs Perry, NY. Alterations - Throughout.

Test Report:Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		Asbestos
			Fibrous	Non-Fibrous	
Sample ID 1-1 061927603-0001		Description	1st Fl. - Lobby - Interior Brick Mortar, Gray		
		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable	12/18/2019	Gray		30.00% Ca Carbonate 14.00% Non-fibrous (other) 56.00% Quartz	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 1-2 061927603-0002		Description	1st Fl. - Lobby - Interior Brick Mortar, Gray		
		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable	12/18/2019	Gray		37.00% Ca Carbonate 13.00% Non-fibrous (other) 50.00% Quartz	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 2-3 061927603-0003		Description	1st Fl. - Lobby - Ceramic Wall Tile Grout, Brown		
		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable	12/18/2019	Gray	2.00% Cellulose	60.00% Ca Carbonate 8.00% Non-fibrous (other) 30.00% Quartz	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 2-4 061927603-0004		Description	1st Fl. - Lobby - Ceramic Wall Tile Grout, Brown		
		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable	12/18/2019	Gray	2.00% Cellulose	62.00% Ca Carbonate 3.00% Non-fibrous (other) 33.00% Quartz	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed

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EMSL Order: 061927603

Customer ID: LBAP78

Customer PO: 2043479.35

Project ID:

Test Report: Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		Asbestos
			Fibrous	Non-Fibrous	
Sample ID 3-5 061927603-0005			Description Multi-Purpose Room - Ceramic Wall Tile Grout, Gray Homogeneity Homogeneous		
PLM NYS 198.1 Friable	12/18/2019	Gray	2.00% Cellulose	63.00% Ca Carbonate 3.00% Non-fibrous (other) 32.00% Quartz	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 3-6 061927603-0006			Description Multi-Purpose Room - Ceramic Wall Tile Grout, Gray Homogeneity Homogeneous		
PLM NYS 198.1 Friable	12/18/2019	Gray	2.00% Cellulose	40.00% Ca Carbonate 6.00% Non-fibrous (other) 52.00% Quartz	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 4-7 061927603-0007			Description Multi-Purpose Room - Interior Cinderblock Mortar, Gray Homogeneity Homogeneous		
PLM NYS 198.1 Friable	12/18/2019	Gray	1.00% Cellulose	37.00% Ca Carbonate 9.00% Non-fibrous (other) 53.00% Quartz	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 4-8 061927603-0008			Description Room LL07 - Interior Cinderblock Mortar, Gray Homogeneity Homogeneous		
PLM NYS 198.1 Friable	12/18/2019	Gray	2.00% Cellulose	34.00% Ca Carbonate 2.00% Mica 2.00% Non-fibrous (other) 60.00% Quartz	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 5-9 061927603-0009			Description 1st Fl. - Hallway - Glazed Block Wall Mortar, Gray Homogeneity Homogeneous		
PLM NYS 198.1 Friable	12/18/2019	Brown	2.00% Cellulose	31.00% Ca Carbonate 5.00% Non-fibrous (other) 62.00% Quartz	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed

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EMSL Order: 061927603

Customer ID: LBAP78

Customer PO: 2043479.35

Project ID:

Test Report: Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		Asbestos
			Fibrous	Non-Fibrous	
Sample ID 5-10 061927603-0010		Description Homogeneity	2nd Fl. - Hallway - Glazed Block Wall Mortar, Gray Homogeneous		
PLM NYS 198.1 Friable	12/18/2019	Brown	2.00% Cellulose	29.00% Ca Carbonate 6.00% Non-fibrous (other) 63.00% Quartz	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 6-11 061927603-0011		Description Homogeneity	Room LL07 - Sink Undercoating, Gray Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	12/18/2019	Gray		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	12/19/2019	Gray		100.00% Other	None Detected
Sample ID 6-12 061927603-0012		Description Homogeneity	Room 226 - Sink Undercoating, Gray Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	12/18/2019	Gray		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	12/19/2019	Gray		100.00% Other	None Detected
Sample ID 7-13 061927603-0013		Description Homogeneity	Room LL07 - Counter Caulking, White Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	12/18/2019	White		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	12/19/2019	White		100.00% Other	None Detected
Sample ID 7-14 061927603-0014		Description Homogeneity	Room 226 - Counter Caulking, White Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	12/18/2019	White		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	12/19/2019	White		100.00% Other	None Detected
Sample ID 8-15 061927603-0015		Description Homogeneity	Room LL07 - 2'x4' Fissure Ceiling Tile, Gray Heterogeneous/Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	12/18/2019	Gray/ White	35.00% Min. Wool	65.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	12/19/2019	Gray/ White		100.00% Other	None Detected

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EMSL Order: 061927603

Customer ID: LBAP78

Customer PO: 2043479.35

Project ID:

Test Report: Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		Asbestos
			Fibrous	Non-Fibrous	
Sample ID 8-16 061927603-0016		Description Homogeneity	Room 226 - 2'x4' Fissure Ceiling Tile, Gray Heterogeneous/Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	12/18/2019	Gray/ White	30.00% Min. Wool	70.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	12/19/2019	Gray/ White		100.00% Other	None Detected
Sample ID 9-17 061927603-0017		Description Homogeneity	1st Fl. - Hallway - 2'x4' Split Fissure Ceiling Tile, Gray Heterogeneous/Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	12/18/2019	Gray/ White	23.00% Min. Wool	77.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	12/19/2019	Gray/ White		100.00% Other	None Detected
Sample ID 9-18 061927603-0018		Description Homogeneity	2nd Fl. - Hallway - 2'x4' Split Fissure Ceiling Tile, Gray Heterogeneous/Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	12/18/2019	Gray/ White	33.00% Min. Wool	67.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	12/19/2019	Gray/ White		100.00% Other	None Detected
Sample ID 10-19 061927603-0019		Description Homogeneity	Room LL07 - Glue to Chalk Boards, Brown Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	12/18/2019	Brown		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	12/19/2019	Brown		100.00% Other	None Detected
Sample ID 10-20 061927603-0020		Description Homogeneity	Room 226 - Glue to Chalk Boards, Brown Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	12/18/2019	Brown		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	12/19/2019	Brown		100.00% Other	None Detected
Sample ID 11-21 061927603-0021A		Description Homogeneity	Multi-Purpose Room - 4" Black Cove Base Mastic, Beige Heterogeneous/Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	12/18/2019	Brown/ Tan		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	12/19/2019	Brown/ Tan		100.00% Other	None Detected

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EMSL Order: 061927603

Customer ID: LBAP78

Customer PO: 2043479.35

Project ID:

Test Report:Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		Asbestos
			Fibrous	Non-Fibrous	
Sample ID 11-22 061927603-0022A		Description Homogeneity	Multi-Purpose Room - 4" Black Cove Base Mastic, Beige Heterogeneous/Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	12/18/2019	Brown/ Tan		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	12/19/2019	Brown/ Tan		100.00% Other	None Detected
Sample ID 12-23 061927603-0023A		Description Homogeneity	Room LL07 - 4" Gray Cove Base Mastic, Tan Heterogeneous/Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	12/18/2019	White/ Yellow		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	12/19/2019	White/ Yellow		100.00% Other	None Detected
Sample ID 12-24 061927603-0024A		Description Homogeneity	Room 226 - 4" Gray Cove Base Mastic, Tan Heterogeneous/Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	12/18/2019	White/ Yellow	<1.00% Wollastonite	100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	12/19/2019	White/ Yellow	None	100.00% Other	<1% Anthophyllite
Sample ID 13-25 061927603-0025A		Description Homogeneity	Room LL34 - 4" Brown Covebase Mastic, Yellow Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	12/18/2019	Gray/ White		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	12/19/2019	Gray/ White		100.00% Other	None Detected
Sample ID 13-26 061927603-0026A		Description Homogeneity	Room LL34 - 4" Brown Covebase Mastic, Yellow Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	12/18/2019	White		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	12/19/2019	White		100.00% Other	None Detected
Sample ID 14-27 061927603-0027A		Description Homogeneity	LL Entry Way - 4" Blue Covebase Mastic, Yellow Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	12/18/2019	White		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	12/19/2019	White		100.00% Other	None Detected

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EMSL Order: 061927603

Customer ID: LBAP78

Customer PO: 2043479.35

Project ID:

Test Report: Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		Asbestos
			Fibrous	Non-Fibrous	
Sample ID 14-28 061927603-0028A		Description Homogeneity	LL Entry Way - 4" Blue Covebase Mastic, Yellow Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	12/18/2019	White		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	12/19/2019	White		100.00% Other	None Detected
Sample ID 15-29 061927603-0029		Description Homogeneity	Room LL34 - Joint Compound, White Homogeneous		
PLM NYS 198.1 Friable	12/18/2019	White	2.00% Cellulose	83.00% Ca Carbonate 10.00% Mica 5.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 15-30 061927603-0030		Description Homogeneity	Room 127 - Joint Compound, White Homogeneous		
PLM NYS 198.1 Friable	12/18/2019	White	2.00% Cellulose	84.00% Ca Carbonate 13.00% Mica 1.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 15-31 061927603-0031		Description Homogeneity	Multi-Purpose Room - Joint Compound, White Homogeneous		
PLM NYS 198.1 Friable	12/18/2019	White		74.00% Ca Carbonate 10.00% Mica 16.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 16-32 061927603-0032		Description Homogeneity	Room LL34 - Gypsum Board, Gray Homogeneous		
PLM NYS 198.1 Friable	12/18/2019	White	5.00% Cellulose 3.00% Glass	29.00% Ca Carbonate 60.00% Gypsum 3.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 16-33 061927603-0033		Description Homogeneity	Room 127 - Gypsum Board, Gray Homogeneous		
PLM NYS 198.1 Friable	12/18/2019	White	6.00% Cellulose 2.00% Glass	27.00% Ca Carbonate 65.00% Gypsum	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed

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EMSL Order: 061927603
Customer ID: LBAP78
Customer PO: 2043479.35
Project ID:

Test Report: Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		Asbestos
			Fibrous	Non-Fibrous	
Sample ID 16-34 061927603-0034		Description	Multi-Purpose Room - Gypsum Board, Gray		
		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable	12/18/2019	White	7.00% Cellulose 2.00% Glass	30.00% Ca Carbonate 61.00% Gypsum	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 17-35 061927603-0035		Description	LL - Hallway O/S Room 34 - Insulation Below Leveling Compound, Brown		
		Homogeneity	Heterogeneous		
PLM NYS 198.1 Friable	12/18/2019	Brown/ Black	90.00% Cellulose	10.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 17-36 061927603-0036		Description	LL - Hallway O/S Room 34 - Insulation Below Leveling Compound, Brown		
		Homogeneity	Heterogeneous		
PLM NYS 198.1 Friable	12/18/2019	Brown/ Black	95.00% Cellulose	5.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 18-37 061927603-0037		Description	LL - Hallway O/S Room 34 - Leveling Compound, White		
		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable	12/18/2019	White		40.00% Ca Carbonate 50.00% Gypsum 10.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 18-38 061927603-0038		Description	LL - Hallway O/S Room 34 - Leveling Compound, White		
		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable	12/18/2019	White		50.00% Ca Carbonate 43.00% Gypsum 7.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 19-39 061927603-0039		Description	LL - Entry Way - Leveling Compound, Dk. Gray		
		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable	12/18/2019	Gray		50.00% Ca Carbonate 20.00% Gypsum 30.00% Quartz	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed

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EMSL Order: 061927603
Customer ID: LBAP78
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Project ID:

Test Report:Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		Asbestos
			Fibrous	Non-Fibrous	
Sample ID 19-40 061927603-0040		Description	LL - Entry Way - Leveling Compound, Dk. Gray		
		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable	12/18/2019	Gray		60.00% Ca Carbonate 15.00% Gypsum 5.00% Non-fibrous (other) 20.00% Quartz	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 20-41 061927603-0041		Description	Room 222 - Leveling Compound, Lt. Gray		
		Homogeneity	Heterogeneous		
PLM NYS 198.1 Friable	12/18/2019	Gray		60.00% Ca Carbonate 20.00% Non-fibrous (other) 20.00% Quartz	None Detected
Associated mastic not included in analysis.					
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 20-42 061927603-0042		Description	Room 221 - Leveling Compound, Lt. Gray		
		Homogeneity	Heterogeneous		
PLM NYS 198.1 Friable	12/18/2019	Gray/ Yellow	2.00% Cellulose	55.00% Ca Carbonate 13.00% Non-fibrous (other) 30.00% Quartz	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 21-43 061927603-0043		Description	Room LL07 - Mastic assoc. w./ 12"x12" Gray FT, Beige		
		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	12/18/2019	Black		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	12/19/2019	Black		100.00% Other	None Detected
Sample ID 21-44 061927603-0044		Description	Room 109 - Mastic assoc. w./12"x12" Gray FT, Beige		
		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	12/18/2019	Black		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	12/19/2019	Black		100.00% Other	None Detected
Sample ID 22-45 061927603-0045		Description	Room LL07 - 12"x12" Gray Floor Tiles		
		Homogeneity	Heterogeneous/Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	12/18/2019	Gray/ Black		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	12/19/2019	Gray/ Black		100.00% Other	None Detected

Initial report from: 12/19/2019 01:42:17



EMSL Analytical, Inc.

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<http://www.EMSL.com> / carleplacelab@emsl.com

EMSL Order: 061927603

Customer ID: LBAP78

Customer PO: 2043479.35

Project ID:

Test Report: Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		Asbestos
			Fibrous	Non-Fibrous	
Sample ID 22-46 061927603-0046		Description Homogeneity	Room 109 - 12"x12" Gray Floor Tiles Heterogeneous/Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	12/18/2019	Gray/ Black		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	12/19/2019	Gray/ Black		100.00% Other	None Detected
Sample ID 23-47 061927603-0047		Description Homogeneity	Room LL34 - Mastic assoc. w./ 12"x12" Beige FT, Brown Heterogeneous/Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	12/18/2019	Brown/ Gray	<1.00% Wollastonite	100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	12/19/2019	Brown/ Gray		100.00% Other	None Detected
Sample ID 23-48 061927603-0048		Description Homogeneity	Room LL34 - Mastic assoc. w./ 12"x12" Beige FT, Brown Heterogeneous/Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	12/18/2019	Brown/ Gray	<1.00% Wollastonite	100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	12/19/2019	Brown/ Gray		100.00% Other	None Detected
Sample ID 24-49 061927603-0049		Description Homogeneity	Room LL34 - 12"x12" Beige Floor Tiles Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	12/18/2019	Brown/ Gray/ Beige		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	12/19/2019	Brown/ Gray/ Beige		100.00% Other	None Detected
Sample ID 24-50 061927603-0050		Description Homogeneity	Room LL34 - 12"x12" Beige Floor Tiles Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	12/18/2019	Brown/ Gray/ Beige		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	12/19/2019	Brown/ Gray/ Beige		100.00% Other	None Detected
Sample ID 25-51 061927603-0051		Description Homogeneity	LL - Entry Way - Mastic assoc. w./ 12"x12" Blue FT, Beige Heterogeneous/Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	12/18/2019	Brown/ Tan/ Black		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	12/19/2019	Brown/ Tan/ Black		100.00% Other	None Detected

Initial report from: 12/19/2019 01:42:17



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528 Mineola Avenue Carle Place, NY 11514

Tel/Fax: (516) 997-7251 / (516) 997-7528

<http://www.EMSL.com> / carleplacelab@emsl.com

EMSL Order: 061927603

Customer ID: LBAP78

Customer PO: 2043479.35

Project ID:

Test Report: Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		Asbestos
			Fibrous	Non-Fibrous	
Sample ID 25-52 061927603-0052		Description Homogeneity	LL - Entry Way - Mastic assoc. w./ 12"x12" Blue FT, Beige Heterogeneous/Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	12/18/2019	Brown/ Tan/ Black		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	12/19/2019	Brown/ Tan/ Black		100.00% Other	None Detected
Sample ID 26-53 061927603-0053		Description Homogeneity	LL - Entry Way - 12"x12" Blue Floor Tiles Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	12/18/2019	Blue		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	12/19/2019	Blue		100.00% Other	None Detected
Sample ID 26-54 061927603-0054		Description Homogeneity	LL - Entry Way - 12"x12" Blue Floor Tiles Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	12/18/2019	Blue		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	12/19/2019	Blue		100.00% Other	None Detected
Sample ID 27-55 061927603-0055		Description Homogeneity	Room 221 - Carpet Mastic, Yellow Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	12/18/2019	Yellow		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	12/19/2019	Yellow		100.00% Other	None Detected
Sample ID 27-56 061927603-0056		Description Homogeneity	Room 222 - Carpet Mastic, Yellow Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	12/18/2019	Yellow		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	12/19/2019	Yellow		100.00% Other	None Detected
Sample ID 28-57 061927603-0057		Description Homogeneity	1st Fl. - Lobby - Carpet Mastic, Brown/Gray Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	12/18/2019	Gray		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	12/19/2019	Gray		100.00% Other	None Detected

Initial report from: 12/19/2019 01:42:17



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<http://www.EMSL.com> / carleplacelab@emsl.com

EMSL Order: 061927603
Customer ID: LBAP78
Customer PO: 2043479.35
Project ID:

Test Report: Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		Asbestos
			Fibrous	Non-Fibrous	
Sample ID 28-58 061927603-0058		Description Homogeneity	1st Fl. - Lobby - Carpet Mastic, Brown/Gray Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	12/18/2019	Gray		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	12/19/2019	Gray		100.00% Other	None Detected
Sample ID 29-59 061927603-0059		Description Homogeneity	1st Fl. - Boys Restroom - Ceramic Wall Tile Backing, Tan Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB Material is adhesive.	12/18/2019	Gray/ Tan		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	12/19/2019	Gray/ Tan		100.00% Other	None Detected
Sample ID 29-60 061927603-0060		Description Homogeneity	2nd Fl. - Boys Restroom - Ceramic Wall Tile Backing, Tan Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB Material is adhesive.	12/18/2019	Gray/ Tan		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	12/19/2019	Gray/ Tan		100.00% Other	None Detected
Sample ID 30-61 061927603-0061		Description Homogeneity	1st Fl. - Boys Restroom - Ceramic Wall Tile Grout, White Homogeneous		
PLM NYS 198.1 Friable	12/18/2019	White		80.00% Ca Carbonate 20.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 30-62 061927603-0062		Description Homogeneity	2nd Fl. - Boys Restroom - Ceramic Wall Tile Grout, White Homogeneous		
PLM NYS 198.1 Friable	12/18/2019	White		88.00% Ca Carbonate 12.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 31-63 061927603-0063		Description Homogeneity	1st Fl. - Boys Restroom - Ceramic Floor Tile Mortar, Gray Homogeneous		
PLM NYS 198.1 Friable	12/18/2019	Gray	2.00% Cellulose	48.00% Ca Carbonate 10.00% Non-fibrous (other) 40.00% Quartz	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed

Initial report from: 12/19/2019 01:42:17



EMSL Analytical, Inc.

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EMSL Order: 061927603
Customer ID: LBAP78
Customer PO: 2043479.35
Project ID:

Test Report: Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		Asbestos
			Fibrous	Non-Fibrous	
Sample ID 31-64 061927603-0064		Description	2nd Fl. - Boys Restroom - Ceramic Floor Tile Mortar, Gray		
		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable	12/18/2019	Gray		50.00% Ca Carbonate 8.00% Non-fibrous (other) 42.00% Quartz	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 32-65 061927603-0065		Description	Room 221 - Spray-On Fireproofing, Brown		
		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable	12/18/2019	Gray	50.00% Min. Wool	40.00% Ca Carbonate 10.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 32-66 061927603-0066		Description	LL - Entry Way - Spray-On Fireproofing, Brown		
		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable	12/18/2019	Gray	55.00% Min. Wool	38.00% Ca Carbonate 7.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 32-67 061927603-0067		Description	1st Fl. - Boys Restroom - Spray-On Fireproofing, Brown		
		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable	12/18/2019	Gray	60.00% Min. Wool	35.00% Ca Carbonate 5.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 33-68 061927603-0068		Description	Exterior Façade - Exterior Brick Mortar, Gray		
		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable	12/18/2019	Gray		52.00% Ca Carbonate 3.00% Non-fibrous (other) 45.00% Quartz	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 33-69 061927603-0069		Description	Exterior Façade - Exterior Brick Mortar, Gray		
		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable	12/18/2019	Gray		43.00% Ca Carbonate 1.00% Non-fibrous (other) 56.00% Quartz	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed

Initial report from: 12/19/2019 01:42:17



EMSL Analytical, Inc.

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EMSL Order: 061927603

Customer ID: LBAP78

Customer PO: 2043479.35

Project ID:

Test Report:Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		Asbestos
			Fibrous	Non-Fibrous	
Sample ID 34-70 061927603-0070		Description Homogeneity	Exterior Façade - Exterior Door Frame Caulking, Black/Gray Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	12/18/2019	Black		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	12/19/2019	Black		100.00% Other	None Detected
Sample ID 34-71 061927603-0071		Description Homogeneity	Exterior Façade - Exterior Door Frame Caulking, Black/Gray Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	12/18/2019	Black		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	12/19/2019	Black		100.00% Other	None Detected

Initial report from: 12/19/2019 01:42:17



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EMSL Order: 061927603

Customer ID: LBAP78

Customer PO: 2043479.35

Project ID:

Test Report: Asbestos Analysis of Bulk Material

The samples in this report were submitted to EMSL for analysis by Asbestos Analysis of Bulk Materials via NYS ELAP Approved Methods. The reference number for these samples is the EMSL Order ID above. Please use this reference number when calling about these samples.

Report Comments:

Sample Receipt Date: 12/18/2019

Sample Receipt Time: 8:17 AM

Analysis Completed Date: 12/18/2019

Analysis Completed Time: 12:04 PM

Analyst(s):

Omatie Ramrattan-Scarallo PLM NYS 198.1 Friable (33)

Steve Juszczuk PLM NYS 198.6 NOB (38)

Keith McWilliams TEM NYS 198.4 NOB (38)

Samples reviewed and approved by:

Daniel Clarke, Asbestos Laboratory Manager
or Other Approved Signatory

NOB = Non Friable Organically Bound N/A = Not Applicable VCM = Vermiculite Containing Material

-In New York State, TEM is currently the only method that can be used to determine if NOB materials can be considered or treated as non-asbestos containing.

All samples examined for the presence of vermiculite when analyzed via NYS 198.1.

-NYS Guidelines for Vermiculite containing samples are available at http://www.wadsworth.org/labcert/elapcert/forms/VermiculiteInterimGuidance_Rev070913.pdf EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples were received in good condition unless otherwise noted.

This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government. This report may contain data that is not covered by the NVLAP accreditation.

Samples analyzed by EMSL Analytical, Inc. Carle Place, NY NYS ELAP 11469

Initial report from: 12/19/2019 01:42:17



LOUIS BERGER

ASBESTOS SURVEY DATA SHEET/ CHAIN OF CUSTODY

PAGE 1 OF 6

LB PROJ 2043479.35
 CLIENT: GREENBURGH H.U.F.S.D.

LOCATION(S) SURVEYED: THROUGHOUTPROPOSED PROJECT: ALTERATIONS

PROJECT SITE: BETHUNE SCHOOL @ ECHODRINE, DOBBS PERRY NY
 Project Manager: M. MUCCIONI

DATE(S) OF INSPECTION: 12/17/19Inspector(s) M. MUCCIONI, L. NEVAREZ & T. PRINE

LOUIS BERGER
 TELEPHONE NO.: (212) 612-7900 FAX NO.: (212) 363-4341
 ADDRESS: 98 Morton Street, 8 Floor, New York, NY 10014

RESULTS TO:
MUCCIONI@LOUISBERGER.COM

TURNAROUND TIME:

☐ 4 HR. ☒ 24 HRS. ☐ 48 HRS. ☐ 72 HRS.

HA	SAMPLE NO.	MATERIAL DESCRIPTION	SAMPLE LOCATION	APPROX. QUANTITY (LF/SF)	FIELD NOTES
01	01	INTERIOR BRICK MORTAR, GRAY	1 ST FL. LOBBY		
↓	02	↓	↓		
02	03	CERAMIC WALL TILE GROUT, BROWN			
↓	04	↓	↓		
03	05	CERAMIC WALL TILE GROUT, GRAY	MULTI-PURPOSE Room		
↓	06	↓	↓		
04	07	INTERIOR CINDER BLOCK MORTAR, GRAY			
↓	08	↓	↓		
05	09	GLAZED BLOCK WALL MORTAR, GRAY	Room LL07		
↓	10	↓	↓		
06	11	SINK UNDER CABSINS, GRAY	1 ST FL. HALLWAY 2 ND FL. HALLWAY		
↓	12	↓	↓		
			Room LL07		
			Room 226		

CHAIN OF CUSTODY

Relinquished by: (print) <u>M. MUCCIONI</u>	(Sign) <u>[Signature]</u>	12/18/19	AM/PM	Relinquished by: (print)	(Sign)			AM/PM
Received by: (print) <u>S. GARD</u>	(Sign) <u>[Signature]</u>	12/18/19	3:47 PM	Received by: (print)	(Sign)			AM/PM

GENERAL NOTES: All inconclusive NOBs to be analyzed by TEM. Please stop at 1st positive in any homogeneous group.


[Signature] 12/19/19

[Signature] 12/18/19



OrderID: 061927603

Page 1 Of 6

061927603

 LOUIS BERGER		ASBESTOS SURVEY DATA SHEET/ CHAIN OF CUSTODY				PAGE <u>2</u> OF <u>6</u>	
LB PROJ: <u>2043479.35</u>		LOCATION(S) SURVEYED: <u>THROUGHOUT</u>					
CLIENT: <u>GREENBURGH II U.F.S.D.</u>		PROPOSED PROJECT: <u>ALTERATIONS</u>					
PROJECT SITE: <u>BETHUNE SCHOOL @ ECHODRINE, DOBBS PERKY NY</u>		DATE(S) OF INSPECTION: <u>12/17/19</u>					
Project Manager: <u>M. MUCCIONI</u>		Inspector(s): <u>M. MUCCIONI, L. NEVAREZ & T. PRINE</u>					
LOUIS BERGER TELEPHONE NO.: (212) 612-7900 FAX NO.: (212) 363-4341 ADDRESS: 98 Morton Street, 8 Floor, New York, NY 10014		RESULTS TO: <u>MUCCIONI@LOUISBERGER.COM</u>			TURNAROUND TIME: <input type="checkbox"/> 4 HR. <input checked="" type="checkbox"/> 24 HRS. <input type="checkbox"/> 48 HRS. <input type="checkbox"/> 72 HRS.		
HA	SAMPLE NO.	MATERIAL DESCRIPTION	SAMPLE LOCATION	APPROX. QUANTITY (LF/SF)	FIELD NOTES		
07	13	COUNTER CAULKINGS, WHITE	Room LL07				
↓	14	↓	Room 226				
08	15	2x4 FISSURE CEILING TILES, GRAY	Room LL07				
↓	16	↓	Room 226				
09	17	2x4 3/4" FISSURE CEILING TILES, GRAY	1 st FLOOR HALLWAY				
↓	18	↓	2nd FLOOR HALLWAY				
10	19	GLUE TO CHALK BOARD, BROWN	Room LL07				
↓	20	↓	Room 226				
11	21	4" BLACK COVE BASE, BEIGE	MULTI PURPOSE ROOM				
↓	22	↓	↓				
12	23	4" GRAY COVE BASE MASTIC, TAN	Room LL07				
↓	24	↓	Room 226				

CHAIN OF CUSTODY

Relinquished by: <u>M. MUCCIONI</u>	(Sign) 	12/17/19	AM/PM	Relinquished by: (print)	(Sign)	/ /	AM/PM	Relinquished by: (print)	(Sign)	/ /	AM/PM
Received by: <u>S. Gaudel</u>	(Sign) 	12/18/19	8:17 AM/PM	Received by: (print)	(Sign)	/ /	AM/PM	Received by: (print)	(Sign)	/ /	AM/PM

GENERAL NOTES: All inconclusive NOBs to be analyzed by TEM. Please stop at 1st positive in any homogeneous group.

061927603



LOUIS BERGER

ASBESTOS SURVEY DATA SHEET/ CHAIN OF CUSTODY

PAGE 3 OF 6

LB PROJ 2043479.35

CLIENT: GREENBURGH II U.F.S.D.

PROJECT SITE: BETHUNE SCHOOL @ ECHODRNE, DOBBS PERRY NY

Project Manager: M. Muccioni

LOCATION(S) SURVEYED: THROUGHOUT

PROPOSED PROJECT: ALTERATIONS

DATE(S) OF INSPECTION: 12/17/19

Inspector(s) M. Muccioni, L. NEVAREZ & T. PRINE

LOUIS BERGER

TELEPHONE NO.: (212) 612-7900 FAX NO.: (212) 363-4341

ADDRESS: 98 Morton Street, 8 Floor, New York, NY 10014

RESULTS TO:

Muccioni@LOUISBERGER.COM

TURNAROUND TIME:

☐ 4 HR. ☒ 24 HRS. ☐ 48 HRS. ☐ 72 HRS.

HA	SAMPLE NO.	MATERIAL DESCRIPTION	SAMPLE LOCATION	APPROX. QUANTITY (LF/SF)	FIELD NOTES
13	25	4" BROWN COVE BASE MASTIC, YELLOW	Room LL 34		
↓	26	↓	↓		
14	27	4" BLUE COVE BASE MASTIC, YELLOW	LL ENTRY WAY		
↓	28	↓	↓		
15	29	JOINT COMPOUND, WHITE	Room LL 34		
↓	30	↓	Room 127		
↓	31	↓	MULTI-PURPOSE Room		
16	32	Gypsum Board GRAY	Room LL 34		
↓	33	↓	Room 127		
↓	34	↓	MULTI-PURPOSE Room		
17	35	INSULATION BROWN LEAKING COMPOUND, BROWN	LL HALLWAY o/c Room 34		
↓	36	↓	↓		

 19 DEC 18 AM 8:17
 CASTLE PLACE, NY
 ANALYTICAL, INC.

CHAIN OF CUSTODY

Relinquished by: M. Muccioni	(Sign) 	12/18/19	AM/PM	Relinquished by: (print)	(Sign)	/ /	AM/PM	Relinquished by: (print)	(Sign)	/ /	AM/PM
Received by: S. Gaud	(Sign) 	12/18/19	8:17 AM/PM	Received by: (print)	(Sign)	/ /	AM/PM	Received by: (print)	(Sign)	/ /	AM/PM

GENERAL NOTES: All inconclusive NOBs to be analyzed by TEM. Please stop at 1st positive in any homogeneous group.

OrderID: 061927603

☐ 4 HR. ☒ 24 HRS. ☐ 48 HRS. ☐ 72 HRS.

3000 MEDICAL, INC.
CARL PLAZA, IN.
19 DEC 18 AM 8:17

GENERAL NOTES: All inconclusive NOBs to be analyzed by TEM. Please stop at 1st positive in any homogeneous group.



LOUIS BERGER

ASBESTOS SURVEY DATA SHEET/ CHAIN OF CUSTODY

PAGE 5 OF 6

LB PROJ 2043479.35CLIENT: GREENBURGH H.U.F.S.D.LOCATION(S) SURVEYED: THROUGHOUTPROPOSED PROJECT: ALTERATIONSPROJECT SITE: BETHUNE SCHOOL @ ECHODRNE, DOBBS PERRY NYDATE(S) OF INSPECTION: 12/17/19Project Manager: M. MuccioniInspector(s) M. Muccioni, L. NEVAREZ & T. PRINE

LOUIS BERGER

TELEPHONE NO.: (212) 612-7900 FAX NO.: (212) 363-4341

ADDRESS: 98 Morton Street, 8 Floor, New York, NY 10014

RESULTS TO:

MUCCIONI@LOUISBERGER.COM

TURNAROUND TIME:

☐ 4 HR. ☒ 24 HRS. ☐ 48 HRS. ☐ 72 HRS.

HA	SAMPLE NO.	MATERIAL DESCRIPTION	SAMPLE LOCATION	APPROX. QUANTITY (LF/SF)	FIELD NOTES
24	49	12x12 BEIGE FLOOR TILES	Room LL34		
↓	50	↓	↓		
25	51	MASTIC ASSOC w/ 12x12 BLUE FT., BEIGE	LL ENTRY WAY		
↓	52	↓	↓		
26	53	12x12 BLUE FLOOR TILES			
↓	54	↓	↓		
27	55	CARPET MASTIC, YELLOW	Room 221		
↓	56	↓	Room 222		
28	57	CARPET MASTIC, BROWN/GRAY	1st FL. LOBBY		
↓	58	↓	↓		
29	59	CERAMIC WALL TILE BACKING, TAN	1st FL. BOYS RESTROOM		
↓	60	↓	2nd FL. BOYS RESTROOM		

19 DEC 18 AM 8:18
CARLE PLACE, NY
TODAL, INC.


CHAIN OF CUSTODY

Relinquished by: <u>M. Muccioni</u>	(Sign) <u>[Signature]</u>	12/18/19	AM/PM	Relinquished by: (print)	(Sign)	/ /	AM/PM
Received by: <u>S. Gould</u>	(Sign) <u>[Signature]</u>	12/18/19	8:27 AM/PM	Received by: (print)	(Sign)	/ /	AM/PM

GENERAL NOTES: All inconclusive NOBs to be analyzed by TEM. Please stop at 1st positive in any homogeneous group.

OrderID: 061927603

061927603

		LOUIS BERGER	ASBESTOS SURVEY DATA SHEET/ CHAIN OF CUSTODY		PAGE <u>6</u> OF <u>6</u>	
LB PROJ <u>2043479.35</u> CLIENT: <u>GREENBURGH II U.F.S.D.</u>			LOCATION(S) SURVEYED: <u>THROUGHOUT</u> PROPOSED PROJECT: <u>ALTERATIONS</u>			
PROJECT SITE: <u>BETHUNE SCHOOL @ ECHODRINE, DOBBS PERRY NY</u> Project Manager: <u>M. MUCCIONI</u>			DATE(S) OF INSPECTION: <u>12/17/19</u> Inspector(s) <u>M. MUCCIONI, L. NEVAREZ & T. PRINE</u>			
LOUIS BERGER TELEPHONE NO.: (212) 612-7900 FAX NO.: (212) 363-4341 ADDRESS: 98 Morton Street, 8 Floor, New York, NY 10014			RESULTS TO: <u>MUCCIONI@LOUISBERGER.COM</u>		TURNAROUND TIME: <input type="checkbox"/> 4 HR. <input checked="" type="checkbox"/> 24 HRS. <input type="checkbox"/> 48 HRS. <input type="checkbox"/> 72 HRS.	
HA	SAMPLE NO.	MATERIAL DESCRIPTION	SAMPLE LOCATION	APPROX. QUANTITY (LF/SF)	FIELD NOTES	
30	61	CERAMIC WALL TILE GROUT WHITE	1 ST FL. BOYS RESTROOM			
↓	62	↓	2 ND FL. BOYS RESTROOM			
31	63	CERAMIC FLOOR TILE MORTAR, GRAY	1 ST FL. BOYS RESTROOM			
↓	64	↓	2 ND FL. BOYS RESTROOM			
32	65	SPRAY ON FIRE PROOFING BROWN	Room 221			
↓	66	↓	LL ENTRY WAY			
↓	67	↓	1 ST FL. BOYS RESTROOM			
33	68	EXTERIOR BRICK MORTAR, RED/GRAY	EXTERIOR PORCH			
↓	69	↓				
34	70	EXTERIOR DOOR FRAME CAULKING, BLACK/GRAY				
↓	71	↓				
	72					

19 DEC 18 AM 8:18
CARLE PLACE NY

CHAIN OF CUSTODY

Relinquished by: <u>M. MUCCIONI</u> (Sign)	(Sign)	12/17/19	AM/PM	Relinquished by: (print)	(Sign)	1	1	AM/PM	Relinquished by: (print)	(Sign)	1	1	AM/PM
Received by: <u>S. Gault</u> (Sign)	(Sign)	12/18/19	8:17 AM/PM	Received by: (print)	(Sign)	1	1	AM/PM	Received by: (print)	(Sign)	1	1	AM/PM

GENERAL NOTES: All inconclusive NOBs to be analyzed by TEM. Please stop at 1st positive in any homogeneous group.

1/16/20 12/18/19 12/18/19

OrderID: 061927603



EMSL Analytical, Inc.

528 Mineola Avenue Carle Place, NY 11514
 Tel/Fax: (516) 997-7251 / (516) 997-7528
<http://www.EMSL.com / carleplacelab@emsl.com>

EMSL Order: 061927682
Customer ID: LBAP78
Customer PO: 2043479.035
Project ID:

Attention: Marvin Luccioni
 Louis Berger U.S., Inc
 96 Morton Street
 8th floor
 New York, NY 10014

Phone: (718) 730-2741

Fax:

Received Date: 12/19/2019 9:08 AM

Analysis Date: 12/19/2019 - 12/20/2019

Collected Date: 12/18/2019

Project: #204379.035, Greensburg II, Buthane, Roof

Test Report:Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		Asbestos
			Fibrous	Non-Fibrous	
Sample ID 35-72 061927682-0001		Description Homogeneity	South East Corner at Roof - Door Frame Caulking, White Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	12/19/2019	White		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	12/20/2019	White		100.00% Other	None Detected
Sample ID 35-73 061927682-0002		Description Homogeneity	South East Corner at Roof - Door Frame Caulking, White Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	12/19/2019	White		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	12/20/2019	White		100.00% Other	None Detected
Sample ID 36-74 061927682-0003		Description Homogeneity	North End by Middle of Roof - Sealant to Vent Pipe, Black Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	12/19/2019	Black		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	12/20/2019	Black		100.00% Other	None Detected
Sample ID 36-75 061927682-0004		Description Homogeneity	North End by Middle of Roof - Sealant to Vent Pipe, Black Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	12/19/2019	Black		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	12/20/2019	Black		100.00% Other	None Detected
Sample ID 37-76 061927682-0005		Description Homogeneity	South West Corner of Roof - Pitch Pocket Tar, Black Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	12/19/2019	Black		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	12/20/2019	Black		100.00% Other	None Detected

Initial report from: 12/20/2019 01:58:44



EMSL Analytical, Inc.

528 Mineola Avenue Carle Place, NY 11514

Tel/Fax: (516) 997-7251 / (516) 997-7528

<http://www.EMSL.com> / carleplacelab@emsl.com

EMSL Order: 061927682

Customer ID: LBAP78

Customer PO: 2043479.035

Project ID:

Test Report: Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		Asbestos
			Fibrous	Non-Fibrous	
Sample ID 37-77 061927682-0006		Description Homogeneity	South West Corner of Roof - Pitch Pocket Tar, Black Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	12/19/2019	Black		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	12/20/2019	Black		100.00% Other	None Detected

Initial report from: 12/20/2019 01:58:44



EMSL Analytical, Inc.

528 Mineola Avenue Carle Place, NY 11514

Tel/Fax: (516) 997-7251 / (516) 997-7528

<http://www.EMSL.com> / carleplacelab@emsl.com

EMSL Order: 061927682

Customer ID: LBAP78

Customer PO: 2043479.035

Project ID:

Test Report: Asbestos Analysis of Bulk Material

The samples in this report were submitted to EMSL for analysis by Asbestos Analysis of Bulk Materials via NYS ELAP Approved Methods. The reference number for these samples is the EMSL Order ID above. Please use this reference number when calling about these samples.

Report Comments:

Sample Receipt Date: 12/19/2019

Sample Receipt Time: 9:08 AM

Analysis Completed Date: 12/19/2019

Analysis Completed Time: 11:18 PM

Analyst(s):

Steve Juscuk PLM NYS 198.6 NOB (6)

Keith McWilliams TEM NYS 198.4 NOB (6)

Samples reviewed and approved by:

Daniel Clarke, Asbestos Laboratory Manager
or Other Approved Signatory

NOB = Non Friable Organically Bound N/A = Not Applicable VCM = Vermiculite Containing Material

-In New York State, TEM is currently the only method that can be used to determine if NOB materials can be considered or treated as non-asbestos containing.

All samples examined for the presence of vermiculite when analyzed via NYS 198.1.

-NYS Guidelines for Vermiculite containing samples are available at http://www.wadsworth.org/labcert/elapcert/forms/VermiculiteInterimGuidance_Rev070913.pdf EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples were received in good condition unless otherwise noted.

This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government. This report may contain data that is not covered by the NVLAP accreditation.

Samples analyzed by EMSL Analytical, Inc. Carle Place, NY NYS ELAP 11469

Initial report from: 12/20/2019 01:58:44



LOUIS BERGER

ASBESTOS SURVEY DATA SHEET/ CHAIN OF CUSTODY

PAGE 7 OF 10

LB PROJ 2643479.035

CLIENT: Greensburg 11

PROJECT SITE: Buthane

Project Manager: M. Luccioni

LOUIS BERGER

TELEPHONE NO.: (212) 612-7900 FAX NO.: (212) 363-4341

ADDRESS: 98 Morton Street, 8 Floor, New York, NY 10014

LOCATION(S) SURVEYED: Key

PROPOSED PROJECT :

DATE(S) OF INSPECTION: 12/18

Inspector(s) T. Price

RESULTS TO: M.Luccioni@louisberger.com

TURNAROUND TIME:	
------------------	--

☐ 4 HR. ☒ 24 HRS. ☐ 48 HRS. ☐ 72 HRS.[illegible]

CHAIN OF CUSTODY

Relinquished by: (print) <i>M. W. Carson</i>	(Sign) <i>[Signature]</i>	12/15/19	AM/PM	Relinquished by: (print)	(Sign)	1 1	AM/PM	Relinquished by: (print)	(Sign)	1 1	AM/PM
Received by: (print) <i>[Signature]</i>	(Sign) <i>[Signature]</i>	12/19/19	AM/PM	Received by: (print)	(Sign)	1 1	AM/PM	Received by: (print)	(Sign)	1 1	AM/PM

GENERAL NOTES: All inconclusive NOBs to be analyzed by TEM. Please stop at 1st positive in any homogeneous group.



Report of Environmental Inspection Services

APPENDIX C: ASBESTOS BULK SAMPLE LOCATION DRAWINGS

BETHUNE
LEARNING
CENTER

Alterations
GREENBURGH ELEVEN
UFSD
1 Echo Hill Drive - Building #38
Dobbs Ferry, NY 10522

P: 914.666.5900 KGDARCHITECTS.COM

ENVIRONMENTAL CONSULTANT



565 Taxter Road, 5th Floor - Elmsford, New York, 10523
TEL: 914.798.3710 FAX: 914.592.1734 WWW.WSP.COM

Key Plan



Professional Seal

No. Date Issue

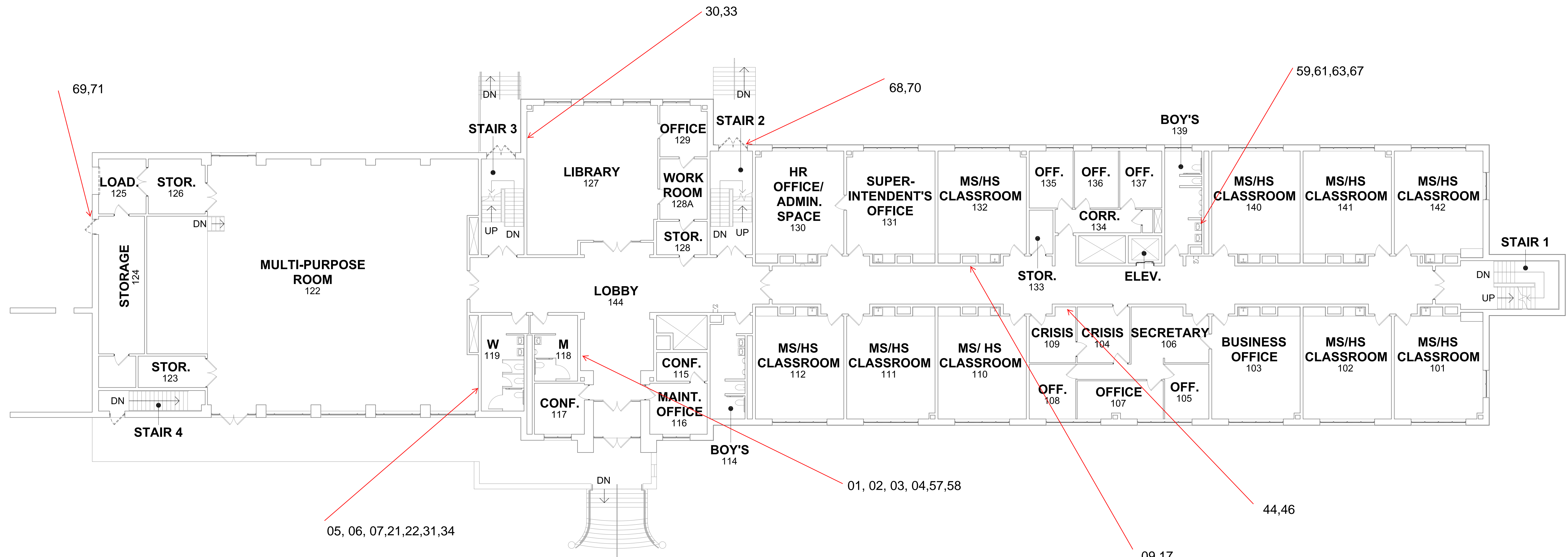
Sheet Title

BULK SAMPLE LOCATIONS
LOWER AND FIRST FLOOR
PLAN

Job No.	Date
2043479.35	12/20/2019
Scale	Drawn / Checked
AS NOTED	JP ML

Sheet Number

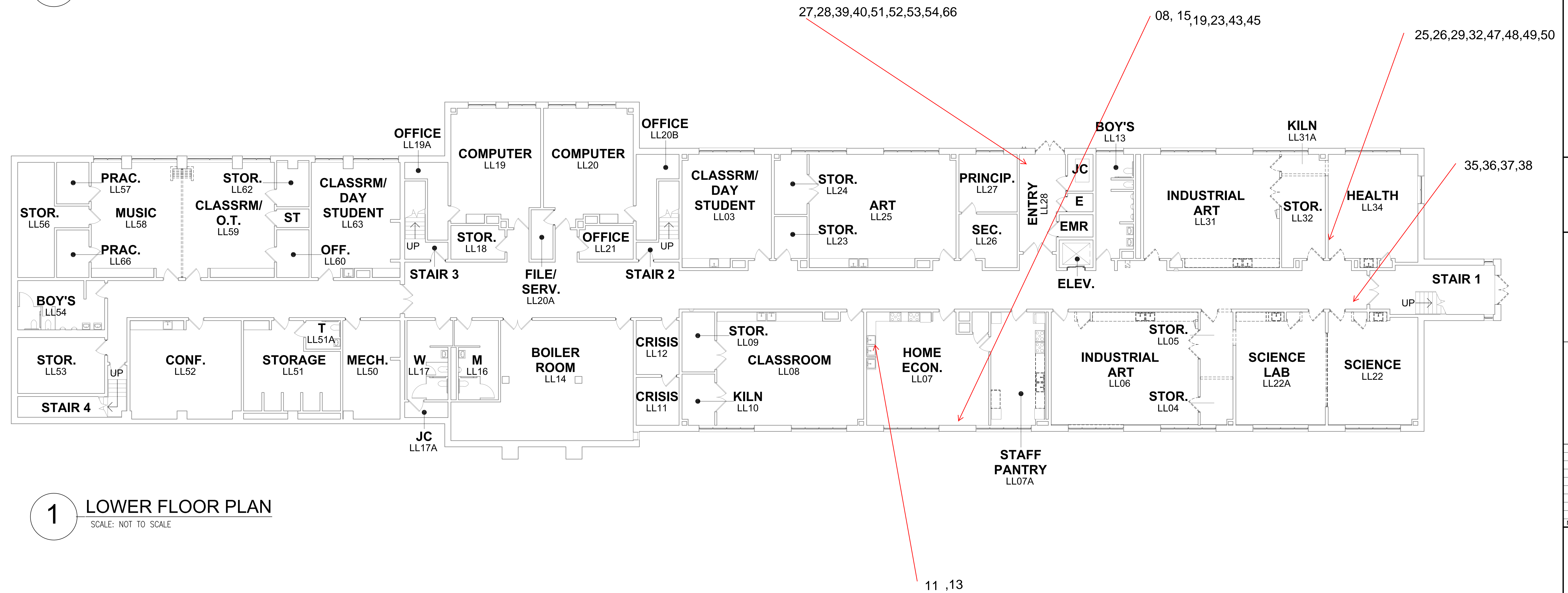
BSL001



2

FIRST FLOOR PLAN

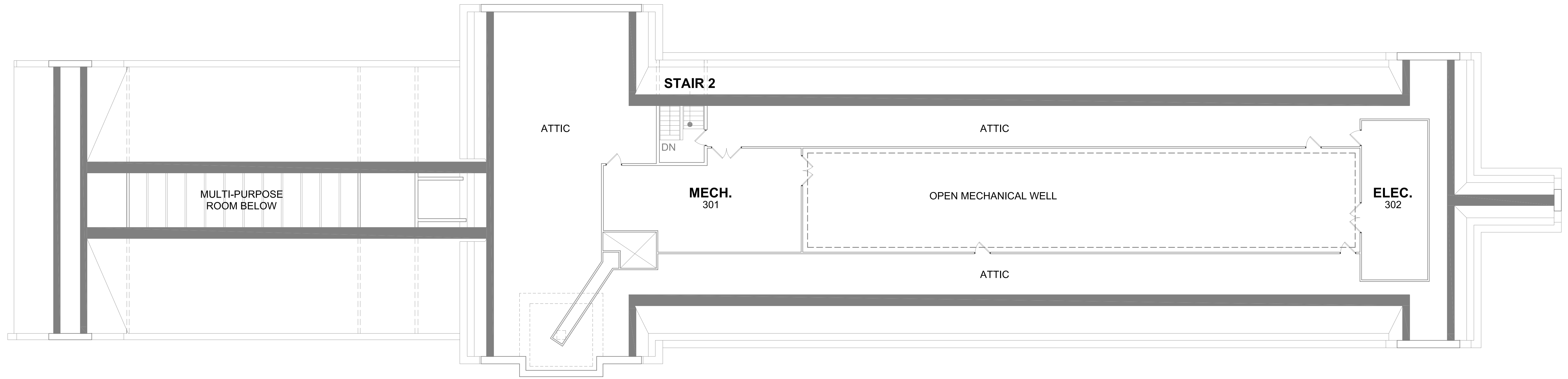
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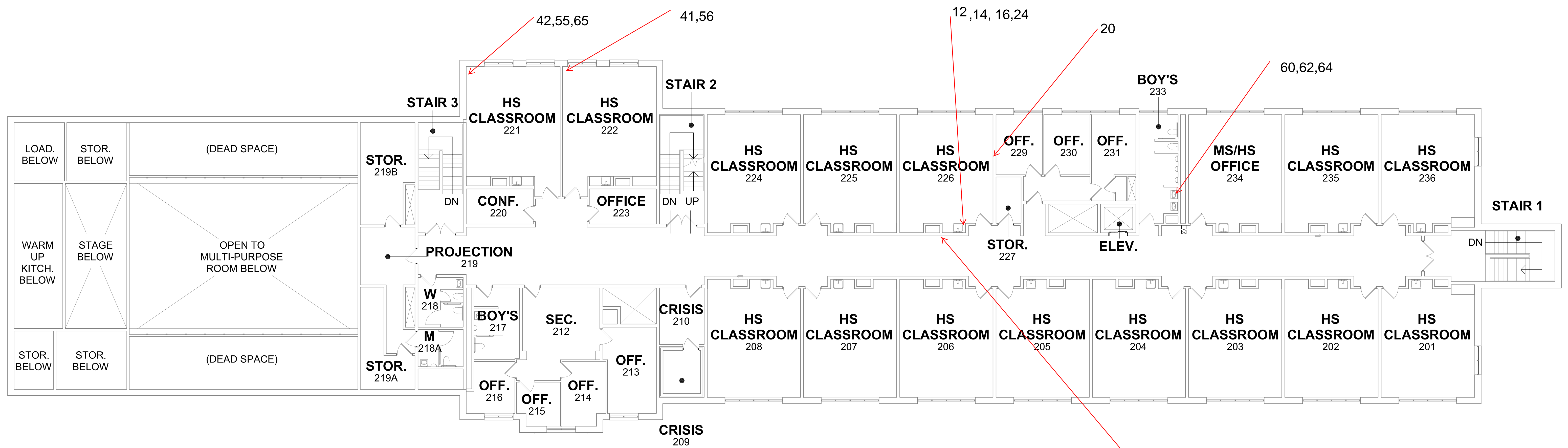
1

LOWER FLOOR PLAN

SCALE: NOT TO SCALE



2 ATTIC PLAN
SCALE: NOT TO SCALE



1 SECOND FLOOR PLAN
SCALE: NOT TO SCALE

BETHUNE
LEARNING
CENTER

Alterations
GREENBURGH ELEVEN
UFSD
1 Echo Hill Drive - Building #38
Dobbs Ferry, NY 10522

P: 914.666.5900 KGDARCHITECTS.COM

ENVIRONMENTAL CONSULTANT



565 Taxter Road, 5th Floor - Elmsford, New York, 10523
TEL: 914.798.3710 FAX: 914.592.1734 WWW.WSP.COM



Professional Seal

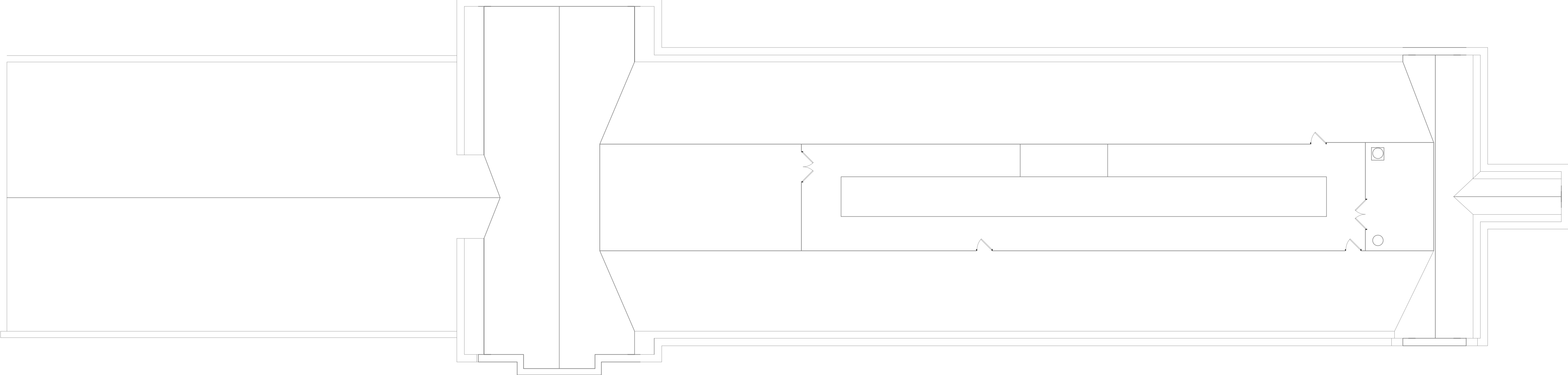
No. Date Issue
Sheet Title

BULK SAMPLE LOCATIONS
SECOND FLOOR AND ATTIC
PLAN

Job No. 2043479.35	Date 12/20/2019
Scale AS NOTED	Drawn / Checked JP ML

Sheet Number

BSL002



1 ROOF PLAN
SCALE: NOT TO SCALE

**BETHUNE
LEARNING
CENTER**

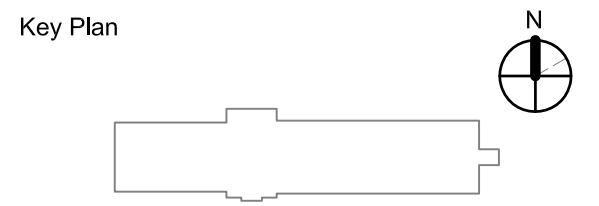
Alterations
**GREENBURGH ELEVEN
UFSD**
1 Echo Hill Drive - Building #38
Dobbs Ferry, NY 10522

P: 914.666.5900 KGDARCHITECTS.COM

ENVIRONMENTAL CONSULTANT

WSP

565 Taxter Road, 5th Floor - Elmsford, New York, 10523
TEL: 914.798.3710 FAX: 914.592.1734 WWW.WSP.COM



Professional Seal

No.	Date	Issue

Sheet Title		
BULK SAMPLE LOCATIONS ROOF PLAN		
Job No. 2043479.35	Date 12/20/2019	
Scale AS NOTED	Drawn / Checked JP ML	
Sheet Number BSL003		



Report of Environmental Inspection Services

APPENDIX D: ASBESTOS CONTAINING MATERIALS LOCATION DRAWINGS



Report of Environmental Inspection Services

APPENDIX E: PCB BULK SAMPLE FIELD DATA SHEETS WITH CHAIN OF CUSTODY & LABORATORY RESULTS



Report of Environmental Inspection Services

APPENDIX F: COMPANY LICENSE, PERSONNEL CERTIFICATIONS AND LABORATORY ACCREDITATIONS

New York State – Department of Labor

Division of Safety and Health
License and Certificate Unit
State Campus, Building 12
Albany, NY 12240

ASBESTOS HANDLING LICENSE

Louis Berger, U.S., Inc.
8th Floor
96 Morton Street
New York, NY 10014

FILE NUMBER: 19-132876
LICENSE NUMBER: 132876
LICENSE CLASS: RESTRICTED
DATE OF ISSUE: 02/14/2019
EXPIRATION DATE: 02/29/2020

Duly Authorized Representative – Craig Napolitano:

This license has been issued in accordance with applicable provisions of Article 30 of the Labor Law of New York State and of the New York State Codes, Rules and Regulations (12 NYCRR Part 56). It is subject to suspension or revocation for a (1) serious violation of state, federal or local laws with regard to the conduct of an asbestos project, or (2) demonstrated lack of responsibility in the conduct of any job involving asbestos or asbestos material.

This license is valid only for the contractor named above and this license or a photocopy must be prominently displayed at the asbestos project worksite. This license verifies that all persons employed by the licensee on an asbestos project in New York State have been issued an Asbestos Certificate, appropriate for the type of work they perform, by the New York State Department of Labor.



Eileen M. Franko, Director
For the Commissioner of Labor

STATE OF NEW YORK - DEPARTMENT OF LABOR
ASBESTOS CERTIFICATE

N.Y.S.



MARVIN LUCCIONI
CLASS(EXPIRES)
C ATEC(02/20) D INSP(02/20)
H PM (02/20) I PD (02/20)

CERT# 03-11021
DMV# 992503906

MUST BE CARRIED ON ASBESTOS PROJECTS

STANDARD SECURITY NUMBER 0000000000000000



**Department
of Labor**

LUIS A NEVAREZ

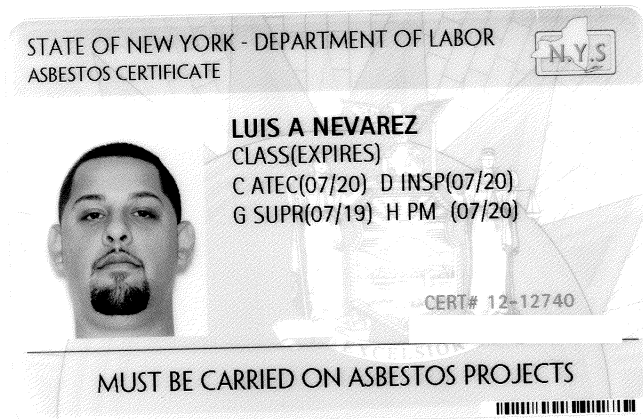
C/O LOUIS BERGER, 96 MORTON ST APT 8FL
NEW YORK NY 10014

Enclosed is your new card.

NYS Department of Labor

The Department of Labor is happy to provide this improved card. We welcome your comments:
nysdol@labor.ny.gov or call (518) 457-2735

YOUR NEW CARD





TYLER PRINE

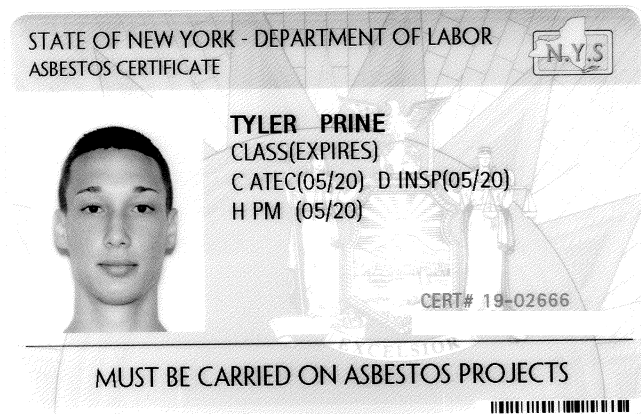
C/O LOUIS BERGER, 96 MORTON ST, 8TH FLOOR
NEW YORK NY 10014

Enclosed is your new card.

NYS Department of Labor

The Department of Labor is happy to provide this improved card. We welcome your comments:
nysdol@labor.ny.gov or call (518) 457-2735

YOUR NEW CARD





TYLER PRINE

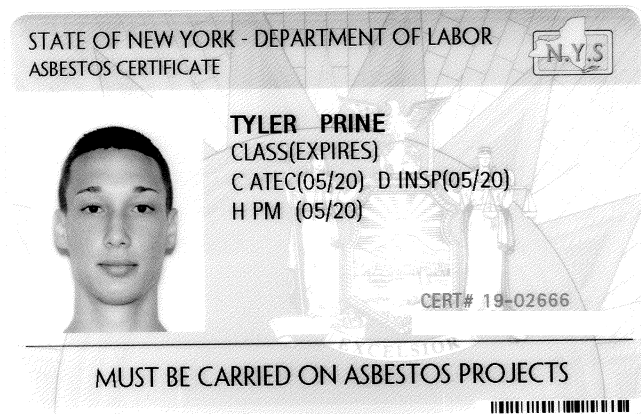
C/O LOUIS BERGER, 96 MORTON ST, 8TH FLOOR
NEW YORK NY 10014

Enclosed is your new card.

NYS Department of Labor

The Department of Labor is happy to provide this improved card. We welcome your comments:
nysdol@labor.ny.gov or call (518) 457-2735

YOUR NEW CARD



BID FORM
FOR
BETHUNE LEARNING CENTER ALTERATIONS
CONTRACT NO. 1 - GENERAL CONSTRUCTION WORK

Greenburgh Eleven UFSD
1 Echo Hill Drive, Building #36
Dobbs Ferry, NY 10522
Attention: Anthony Gyetua-Danquah, Superintendent of Schools

1. The Undersigned hereby declares that it has carefully examined all Bidding and Contract Documents and has inspected the actual location of Work, together with the local sources of supply, and has satisfied itself as to all quantities and conditions, and understands that in signing this Proposal, it waives all rights to plead any misunderstanding regarding the same.
2. The Undersigned further understands and agrees that it is to do, perform and complete all the Work in accordance with the Contract Documents and Contract and to accept in full compensation therefor, the amount of the Base Bid, modified by such additive or deductive alternatives, if any, as are accepted by the Owner.
3. In submitting this Bid, the Undersigned agrees:
 - a. To hold the Bid open for forty-five (45) days after Bid Opening.
 - b. To accept the provisions of the Instructions to Bidders.
 - c. To enter into and execute a Contract within ten (10) days of the Notice of Award issue date, and to simultaneously furnish Performance and Labor and Material Bonds.
 - d. To commence the Work immediately upon receipt of Notice of Award.
4. The Undersigned agrees that the Work proposed herein will be Substantially Complete the dates indicated in specification Section 011000 - "Summary" and in the Project Milestone Schedule following Section 011000.
5. By submission of this Bid, each Bidder and each person signing on behalf of any Bidder certifies, and in the case of a joint Bid, each party thereto certifies as to its own organization, under penalty of perjury, that to the best of the party's knowledge and belief:
 - a. the prices in this Bid have been arrived at independently without collusion, consultation, communication or agreement, for the purpose of restricting competition, as to any matter relating to such prices, with any other Bidder or with any competitor,
 - b. unless otherwise required by law, the prices that have been quoted in this Bid have not been knowingly disclosed by the Bidder, and will not knowingly be disclosed by

(Name of Bidder)

- the Bidder prior to opening, directly or indirectly, to any other Bidder or to any competitor; and
- c. no attempt has been made or will be made by the Bidder to induce any other person, partnership or corporation to submit or not to submit a Bid for the purpose of restricting competition.

A Bid shall not be considered for award, nor shall any award be made where a., b., and c. above have not been complied with, provided however, that if in any case the Bidder cannot make the foregoing certification, the Bidder shall so state and shall furnish, with the Bid, a signed statement which sets forth in detail the reasons therefor. Where a., b., and c. above have not been complied with, the Bid shall not be considered for award, nor shall any award be made unless the head of the purchasing unit of the political subdivision, public department, agency or official thereof to which the Bid is made, or his designee, determines that such disclosure was not made for the purpose of restricting competition.

The fact that a Bidder (a) has published price lists, rates or tariffs covering items being procured, (b) has informed prospective customers of proposed or pending publication of new or revised price lists for such items, or (c) has sold the same items to other customers at the same prices being Bid, does not constitute, without more, a disclosure within the meaning of this Section.

6. The Undersigned understands that the Owner reserves the right to accept or reject any or all Bids and to waive any informalities in the bidding.
7. The Undersigned acknowledges the receipt of the following addenda, but agrees that it is bound by all addenda whether or not listed herein:

Addendum Number

Date of Addendum

8. **BASE BID**

All labor, material, services and equipment necessary for completion of the Work shown on the Drawings and the Technical Specifications for General Construction Work:

\$ _____ (In numbers)

_____ Dollars
(in words)

9. **ALTERNATES**

(Name of Bidder)

The Undersigned agrees to provide all work in accordance with the requirements of the Specifications and the Drawings and includes all costs of related coordination, modification, or adjustment for the following:

ALTERNATE NO. 1: RENOVATION OF TOILET ROOMS LL16, LL17, LL51A, 218 AND 218A

ADD _____ Dollars (\$ _____)

ALTERNATE NO. 2: not applicable

ALTERNATE NO. 3: PROVIDE NEW CANOPY ADDITION AT NORTH ELEVATION

ADD _____ Dollars (\$ _____)

10. **UNIT PRICES**

The Undersigned agrees to perform all work as drawn and specified for the following items at the unit prices given:

Unit Price No. 1 - Repointing Brickwork for the unit price per SF of:

_____ Dollars (\$ _____)

Unit Price No. 2- Brick Replacement for the unit price per SF of:

_____ Dollars (\$ _____)

11. **ALLOWANCES** - none

12. The Undersigned has attached the following documents to this Bid:

- a. Certificate of Compliance with the Iran Divestment Act
- b. Bid Bond/Certified Check.
- c. Statement of Bidder's Qualifications AIA Document A305.

Legal name of person, partnership, joint venture or corporation (please type)

(If corporation, affix
corporate seal)

(Name of Bidder)

Address (please type)

Federal ID No. or Social Security No. (please type)

Phone No. (please type)

FAX No. (please type)

Name and title of signer (please type)

Signature _____ Date

If a Corporation
Name

Address

_____, PRESIDENT _____

_____, SECRETARY _____

_____, TREASURER _____

If a Partnership
Name of Partners

Address

If a Joint Venture

Name of Members

Address

If an Individual
Name of Individual

Address

BID FORM
FOR
BETHUNE LEARNING CENTER ALTERATIONS
CONTRACT NO. 2 - PLUMBING WORK

Greenburgh Eleven UFSD
1 Echo Hill Drive, Building #36
Dobbs Ferry, NY 10522
Attention: Anthony Gyetua-Danquah, Superintendent of Schools

1. The Undersigned hereby declares that it has carefully examined all Bidding and Contract Documents and has inspected the actual location of Work, together with the local sources of supply, and has satisfied itself as to all quantities and conditions, and understands that in signing this Proposal, it waives all rights to plead any misunderstanding regarding the same.
2. The Undersigned further understands and agrees that it is to do, perform and complete all the Work in accordance with the Contract Documents and Contract and to accept in full compensation therefor, the amount of the Base Bid, modified by such additive or deductive alternatives, if any, as are accepted by the Owner.
3. In submitting this Bid, the Undersigned agrees:
 - a. To hold the Bid open for forty-five (45) days after Bid Opening.
 - b. To accept the provisions of the Instructions to Bidders.
 - c. To enter into and execute a Contract within ten (10) days of the Notice of Award issue date, and to simultaneously furnish Performance and Labor and Material Bonds.
 - d. To commence the Work immediately upon receipt of Notice of Award.
4. The Undersigned agrees that the Work proposed herein will be Substantially Complete the dates indicated in specification Section 011000 - "Summary" and in the Project Milestone Schedule following Section 011000.
5. By submission of this Bid, each Bidder and each person signing on behalf of any Bidder certifies, and in the case of a joint Bid, each party thereto certifies as to its own organization, under penalty of perjury, that to the best of the party's knowledge and belief:
 - a. the prices in this Bid have been arrived at independently without collusion, consultation, communication or agreement, for the purpose of restricting competition, as to any matter relating to such prices, with any other Bidder or with any competitor,
 - b. unless otherwise required by law, the prices that have been quoted in this Bid have not been knowingly disclosed by the Bidder, and will not knowingly be disclosed by

(Name of Bidder)

- the Bidder prior to opening, directly or indirectly, to any other Bidder or to any competitor; and
- c. no attempt has been made or will be made by the Bidder to induce any other person, partnership or corporation to submit or not to submit a Bid for the purpose of restricting competition.

A Bid shall not be considered for award, nor shall any award be made where a., b., and c. above have not been complied with, provided however, that if in any case the Bidder cannot make the foregoing certification, the Bidder shall so state and shall furnish, with the Bid, a signed statement which sets forth in detail the reasons therefor. Where a., b., and c. above have not been complied with, the Bid shall not be considered for award, nor shall any award be made unless the head of the purchasing unit of the political subdivision, public department, agency or official thereof to which the Bid is made, or his designee, determines that such disclosure was not made for the purpose of restricting competition.

The fact that a Bidder (a) has published price lists, rates or tariffs covering items being procured, (b) has informed prospective customers of proposed or pending publication of new or revised price lists for such items, or (c) has sold the same items to other customers at the same prices being Bid, does not constitute, without more, a disclosure within the meaning of this Section.

6. The Undersigned understands that the Owner reserves the right to accept or reject any or all Bids and to waive any informalities in the bidding.
7. The Undersigned acknowledges the receipt of the following addenda, but agrees that it is bound by all addenda whether or not listed herein:

Addendum Number

Date of Addendum

8. **BASE BID**

All labor, material, services and equipment necessary for completion of the Work shown on the Drawings and the Technical Specifications for Plumbing Work:

\$ _____ (In numbers)

_____ Dollars
(in words)

9. **ALTERNATES**

(Name of Bidder)

The Undersigned agrees to provide all work in accordance with the requirements of the Specifications and the Drawings and includes all costs of related coordination, modification, or adjustment for the following:

ALTERNATE NO. 1: RENOVATION OF TOILET ROOMS LL16, LL17, LL51A, 218 AND 218A

ADD _____ Dollars (\$ _____)

ALTERNATE NO. 2: PROVIDE DOMESTIC WATER METER / RPZ ASSEMBLY AND FIRE SERVICE BACKFLOW PREVENTER (DCV)

ADD _____ Dollars (\$ _____)

ALTERNATE NO. 3: not applicable

10. **UNIT PRICES** - none

11. **ALLOWANCES** - none

12. The Undersigned has attached the following documents to this Bid:

- a. Certificate of Compliance with the Iran Divestment Act
- b. Bid Bond/Certified Check.
- c. Statement of Bidder's Qualifications AIA Document A305.

Legal name of person, partnership, joint venture or corporation (please type)

(If corporation, affix
corporate seal)

Address (please type)

Federal ID No. or Social Security No. (please type)

Phone No. (please type)

FAX No. (please type)

Name and title of signer (please type)

(Name of Bidder)

Signature _____ Date _____

If a Corporation
Name _____ Address _____
_____, PRESIDENT _____
_____, SECRETARY _____
_____, TREASURER _____

If a Partnership
Name of Partners _____ Address _____

If a Joint Venture
Name of Members _____ Address _____

If an Individual
Name of Individual _____ Address _____

**BID FORM
FOR
BETHUNE LEARNING CENTER ALTERATIONS
CONTRACT NO. 3 - HVAC WORK**

Greenburgh Eleven UFSD
1 Echo Hill Drive, Building #36
Dobbs Ferry, NY 10522
Attention: Anthony Gyetua-Danquah, Superintendent of Schools

1. The Undersigned hereby declares that it has carefully examined all Bidding and Contract Documents and has inspected the actual location of Work, together with the local sources of supply, and has satisfied itself as to all quantities and conditions, and understands that in signing this Proposal, it waives all rights to plead any misunderstanding regarding the same.
2. The Undersigned further understands and agrees that it is to do, perform and complete all the Work in accordance with the Contract Documents and Contract and to accept in full compensation therefor, the amount of the Base Bid, modified by such additive or deductive alternatives, if any, as are accepted by the Owner.
3. In submitting this Bid, the Undersigned agrees:
 - a. To hold the Bid open for forty-five (45) days after Bid Opening.
 - b. To accept the provisions of the Instructions to Bidders.
 - c. To enter into and execute a Contract within ten (10) days of the Notice of Award issue date, and to simultaneously furnish Performance and Labor and Material Bonds.
 - d. To commence the Work immediately upon receipt of Notice of Award.
4. The Undersigned agrees that the Work proposed herein will be Substantially Complete the dates indicated in specification Section 011000 - "Summary" and in the Project Milestone Schedule following Section 011000.
5. By submission of this Bid, each Bidder and each person signing on behalf of any Bidder certifies, and in the case of a joint Bid, each party thereto certifies as to its own organization, under penalty of perjury, that to the best of the party's knowledge and belief:
 - a. the prices in this Bid have been arrived at independently without collusion, consultation, communication or agreement, for the purpose of restricting competition, as to any matter relating to such prices, with any other Bidder or with any competitor,
 - b. unless otherwise required by law, the prices that have been quoted in this Bid have not been knowingly disclosed by the Bidder, and will not knowingly be disclosed by

(Name of Bidder)

- the Bidder prior to opening, directly or indirectly, to any other Bidder or to any competitor; and
- c. no attempt has been made or will be made by the Bidder to induce any other person, partnership or corporation to submit or not to submit a Bid for the purpose of restricting competition.

A Bid shall not be considered for award, nor shall any award be made where a., b., and c. above have not been complied with, provided however, that if in any case the Bidder cannot make the foregoing certification, the Bidder shall so state and shall furnish, with the Bid, a signed statement which sets forth in detail the reasons therefor. Where a., b., and c. above have not been complied with, the Bid shall not be considered for award, nor shall any award be made unless the head of the purchasing unit of the political subdivision, public department, agency or official thereof to which the Bid is made, or his designee, determines that such disclosure was not made for the purpose of restricting competition.

The fact that a Bidder (a) has published price lists, rates or tariffs covering items being procured, (b) has informed prospective customers of proposed or pending publication of new or revised price lists for such items, or (c) has sold the same items to other customers at the same prices being Bid, does not constitute, without more, a disclosure within the meaning of this Section.

6. The Undersigned understands that the Owner reserves the right to accept or reject any or all Bids and to waive any informalities in the bidding.
7. The Undersigned acknowledges the receipt of the following addenda, but agrees that it is bound by all addenda whether or not listed herein:

Addendum Number

Date of Addendum

8. **BASE BID**

All labor, material, services and equipment necessary for completion of the Work shown on the Drawings and the Technical Specifications for HVAC Work:

\$ _____ (In numbers)

_____ Dollars
(in words)

9. **ALTERNATES**

(Name of Bidder)

The Undersigned agrees to provide all work in accordance with the requirements of the Specifications and the Drawings and includes all costs of related coordination, modification, or adjustment for the following:

ALTERNATE NO. 1: RENOVATION OF TOILET ROOMS LL16, LL17, LL51A, 218 AND 218A

ADD _____ Dollars (\$ _____)

ALTERNATE NO. 2: not applicable

ALTERNATE NO. 3: not applicable

10. **UNIT PRICES** - none

11. **ALLOWANCES** - none

12. The Undersigned has attached the following documents to this Bid:

- a. Certificate of Compliance with the Iran Divestment Act
- b. Bid Bond/Certified Check.
- c. Statement of Bidder's Qualifications AIA Document A305.

Legal name of person, partnership, joint venture or corporation (please type)

(If corporation, affix
corporate seal)

Address (please type)

Federal ID No. or Social Security No. (please type)

Phone No. (please type)

FAX No. (please type)

Name and title of signer (please type)

Signature

Date

If a Corporation
Name

Address

(Name of Bidder)

_____, PRESIDENT _____
_____, SECRETARY _____
_____, TREASURER _____

If a Partnership
Name of Partners

Address

If a Joint Venture

Name of Members

Address

If an Individual
Name of Individual

Address

BID FORM
FOR
BETHUNE LEARNING CENTER ALTERATIONS
CONTRACT NO. 4 - ELECTRICAL WORK

Greenburgh Eleven UFSD
1 Echo Hill Drive, Building #36
Dobbs Ferry, NY 10522
Attention: Anthony Gyetua-Danquah, Superintendent of Schools

1. The Undersigned hereby declares that it has carefully examined all Bidding and Contract Documents and has inspected the actual location of Work, together with the local sources of supply, and has satisfied itself as to all quantities and conditions, and understands that in signing this Proposal, it waives all rights to plead any misunderstanding regarding the same.
2. The Undersigned further understands and agrees that it is to do, perform and complete all the Work in accordance with the Contract Documents and Contract and to accept in full compensation therefor, the amount of the Base Bid, modified by such additive or deductive alternatives, if any, as are accepted by the Owner.
3. In submitting this Bid, the Undersigned agrees:
 - a. To hold the Bid open for forty-five (45) days after Bid Opening.
 - b. To accept the provisions of the Instructions to Bidders.
 - c. To enter into and execute a Contract within ten (10) days of the Notice of Award issue date, and to simultaneously furnish Performance and Labor and Material Bonds.
 - d. To commence the Work immediately upon receipt of Notice of Award.
4. The Undersigned agrees that the Work proposed herein will be Substantially Complete the dates indicated in specification Section 011000 - "Summary" and in the Project Milestone Schedule following Section 011000.
5. By submission of this Bid, each Bidder and each person signing on behalf of any Bidder certifies, and in the case of a joint Bid, each party thereto certifies as to its own organization, under penalty of perjury, that to the best of the party's knowledge and belief:
 - a. the prices in this Bid have been arrived at independently without collusion, consultation, communication or agreement, for the purpose of restricting competition, as to any matter relating to such prices, with any other Bidder or with any competitor,
 - b. unless otherwise required by law, the prices that have been quoted in this Bid have not been knowingly disclosed by the Bidder, and will not knowingly be disclosed by

(Name of Bidder)

- the Bidder prior to opening, directly or indirectly, to any other Bidder or to any competitor; and
- c. no attempt has been made or will be made by the Bidder to induce any other person, partnership or corporation to submit or not to submit a Bid for the purpose of restricting competition.

A Bid shall not be considered for award, nor shall any award be made where a., b., and c. above have not been complied with, provided however, that if in any case the Bidder cannot make the foregoing certification, the Bidder shall so state and shall furnish, with the Bid, a signed statement which sets forth in detail the reasons therefor. Where a., b., and c. above have not been complied with, the Bid shall not be considered for award, nor shall any award be made unless the head of the purchasing unit of the political subdivision, public department, agency or official thereof to which the Bid is made, or his designee, determines that such disclosure was not made for the purpose of restricting competition.

The fact that a Bidder (a) has published price lists, rates or tariffs covering items being procured, (b) has informed prospective customers of proposed or pending publication of new or revised price lists for such items, or (c) has sold the same items to other customers at the same prices being Bid, does not constitute, without more, a disclosure within the meaning of this Section.

6. The Undersigned understands that the Owner reserves the right to accept or reject any or all Bids and to waive any informalities in the bidding.
7. The Undersigned acknowledges the receipt of the following addenda, but agrees that it is bound by all addenda whether or not listed herein:

Addendum Number

Date of Addendum

8. **BASE BID**

All labor, material, services and equipment necessary for completion of the Work shown on the Drawings and the Technical Specifications for Electrical Work:

\$ _____ (In numbers)

_____ Dollars
(in words)

9. **ALTERNATES**

(Name of Bidder)

The Undersigned agrees to provide all work in accordance with the requirements of the Specifications and the Drawings and includes all costs of related coordination, modification, or adjustment for the following:

ALTERNATE NO. 1: RENOVATION OF TOILET ROOMS LL16, LL17, LL51A, 218 AND 218A

ADD _____ Dollars (\$ _____)

ALTERNATE NO. 2: not applicable

ALTERNATE NO. 3: PROVIDE NEW CANOPY ADDITION AT NORTH ELEVATION

ADD _____ Dollars (\$ _____)

10. **UNIT PRICES** - none

11. **ALLOWANCES** - none

12. The Undersigned has attached the following documents to this Bid:

- a. Certificate of Compliance with the Iran Divestment Act
- b. Bid Bond/Certified Check.
- c. Statement of Bidder's Qualifications AIA Document A305.

Legal name of person, partnership, joint venture or corporation (please type)

(If corporation, affix
corporate seal)

Address (please type)

Federal ID No. or Social Security No. (please type)

Phone No. (please type)

FAX No. (please type)

Name and title of signer (please type)

Signature

Date

(Name of Bidder)

If a Corporation
Name

Address

_____, PRESIDENT _____
_____, SECRETARY _____
_____, TREASURER _____

If a Partnership
Name of Partners

Address

If a Joint Venture
Name of Members

Address

If an Individual
Name of Individual

Address

CERTIFICATION OF COMPLIANCE WITH THE IRAN DIVESTMENT ACT

As a result of the Iran Divestment Act of 2012 (the "Act"), Chapter 1 of the 2012 Laws of New York, a new provision has been added to State Finance Law (SFL) § 165-a and New York General Municipal Law § 103-g, both effective April 12, 2012. Under the Act, the Commissioner of the Office of General Services (OGS) will be developing a list of "persons" who are engaged in "investment activities in Iran" (both are defined terms in the law) (the "Prohibited Entities List"). Pursuant to SFL § 165-a(3)(b), the initial list is expected to be issued no later than 120 days after the Act's effective date at which time it will be posted on the OGS website.

By submitting a bid in response to this solicitation or by assuming the responsibility of a Contract awarded hereunder, each Bidder/Contractor, any person signing on behalf of any Bidder/Contractor and any assignee or subcontractor and, in the case of a joint bid, each party thereto, certifies, under penalty of perjury, that once the Prohibited Entities List is posted on the OGS website, that to the best of its knowledge and belief, that each Bidder/Contractor and any subcontractor or assignee is not identified on the Prohibited Entities List created pursuant to SFL § 165-a(3)(b).

Additionally, Bidder/Contractor is advised that once the Prohibited Entities List is posted on the OGS Website, any Bidder/Contractor seeking to renew or extend a Contract or assume the responsibility of a Contract awarded in response to this solicitation must certify at the time the Contract is renewed, extended or assigned that it is not included on the Prohibited Entities List.

During the term of the Contract, should the School District receive information that a Bidder/Contractor is in violation of the above-referenced certification, the School District will offer the person or entity an opportunity to respond. If the person or entity fails to demonstrate that he/she/it has ceased engagement in the investment which is in violation of the Act within 90 days after the determination of such violation, then the School District shall take such action as may be appropriate including, but not limited to, imposing sanctions, seeking compliance, recovering damages or declaring the Bidder/Contractor in default. The School District reserves the right to reject any bid or request for assignment for a Bidder/Contractor that appears on the Prohibited Entities List prior to the award of a contract and to pursue a responsibility review with respect to any Bidder/Contractor that is awarded a contract and subsequently appears on the Prohibited Entities List.

I, _____, being duly sworn, deposes and says that
he/she is the _____ of the _____ Corporation
and that neither the Bidder/ Contractor nor any proposed subcontractor is identified on the Prohibited Entities List.

SIGNED: _____

SWORN to before me this _____ day of _____, 201_____

Notary Public: _____

OR

DECLARATION OF BIDDER'S INABILITY TO PROVIDE CERTIFICATION OF COMPLIANCE
WITH THE IRAN DIVESTMENT ACT

Bidders shall complete this form if they cannot certify that the bidder /contractor or any proposed subcontractor is not identified on the Prohibited Entities List. The District reserves the right to undertake any investigation into the information provided herein or to request additional information from the bidder.

Name of the Bidder: _____

Address of Bidder _____

Has bidder been involved in investment activities in Iran? _____

Describe the type of activities including but not limited to the amounts and the nature of the investments (e.g. banking, energy, real estate): _____

If so, when did the first investment activity occur? _____

Have the investment activities ended? _____

If so, what was the date of the last investment activity? _____

If not, have the investment activities increased or expanded since April 12, 2012? _____

Has the bidder adopted, publicized, or implemented a formal plan to cease the investment activities in Iran and to refrain from engaging in any new investments in Iran? _____

If so, provide the date of the adoption of the plan by the bidder and proof of the adopted resolution, if any and a copy of the formal plan. _____

In detail, state the reasons why the bidder cannot provide the Certification of Compliance with the Iran Divestment Act below (additional pages may be attached): _____

I, _____ being duly sworn, deposes and says that he/she is the

_____ of the _____ Corporation and

the foregoing is true and accurate.

SIGNED

SWORN to before me this _____ day of _____ 201_____

Notary Public: _____



AIA[®] Document A310[™] – 2010

Bid Bond

CONTRACTOR:

(Name, legal status and address)

SURETY:

(Name, legal status and principal place of business)

OWNER:

(Name, legal status and address)

Greenburgh Eleven UFSD
1 Echo Hill Drive, Bldg #36
Dobbs Ferry, NY 10522

BOND AMOUNT: \$**PROJECT:**

(Name, location or address, and Project number, if any)

Greenburgh Eleven UFSD Bethune Bldg A+A
1 Echo Hill Drive, Bldg #36
Dobbs Ferry, NY 10522
SED #66-04-11-02-0-003-002

The Contractor and Surety are bound to the Owner in the amount set forth above, for the payment of which the Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, as provided herein. The conditions of this Bond are such that if the Owner accepts the bid of the Contractor within the time specified in the bid documents, or within such time period as may be agreed to by the Owner and Contractor, and the Contractor either (1) enters into a contract with the Owner in accordance with the terms of such bid, and gives such bond or bonds as may be specified in the bidding or Contract Documents, with a surety admitted in the jurisdiction of the Project and otherwise acceptable to the Owner, for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof; or (2) pays to the Owner the difference, not to exceed the amount of this Bond, between the amount specified in said bid and such larger amount for which the Owner may in good faith contract with another party to perform the work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect. The Surety hereby waives any notice of an agreement between the Owner and Contractor to extend the time in which the Owner may accept the bid. Waiver of notice by the Surety shall not apply to any extension exceeding sixty (60) days in the aggregate beyond the time for acceptance of bids specified in the bid documents, and the Owner and Contractor shall obtain the Surety's consent for an extension beyond sixty (60) days.

If this Bond is issued in connection with a subcontractor's bid to a Contractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

When this Bond has been furnished to comply with a statutory or other legal requirement in the location of the Project, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so

ADDITIONS AND DELETIONS:

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

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

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

furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

Signed and sealed this day of ,

(Witness)

(Witness)

(Contractor as Principal)

(Seal)

(Title)

(Surety)

(Seal)

(Title)

Init.

/



AIA[®] Document A305[™] – 1986

Contractor's Qualification Statement

The Undersigned certifies under oath that the information provided herein is true and sufficiently complete so as not to be misleading.

SUBMITTED TO:

ADDRESS:

SUBMITTED BY:

NAME:

ADDRESS:

PRINCIPAL OFFICE:

- ☐ Corporation
- ☐ Partnership
- ☐ Individual
- ☐ Joint Venture
- ☐ Other

NAME OF PROJECT: *(if applicable)* Greenburgh Eleven UFSD Bethune Bldg A+A

TYPE OF WORK: *(file separate form for each Classification of Work)*

- ☐ General Construction
- ☐ HVAC
- ☐ Electrical
- ☐ Plumbing
- ☐ Other: *(Specify)*

§ 1 ORGANIZATION

§ 1.1 How many years has your organization been in business as a Contractor?

§ 1.2 How many years has your organization been in business under its present business name?

§ 1.2.1 Under what other or former names has your organization operated?

§ 1.3 If your organization is a corporation, answer the following:

§ 1.3.1 Date of incorporation:

§ 1.3.2 State of incorporation:

ADDITIONS AND DELETIONS:

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

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

This form is approved and recommended by the American Institute of Architects (AIA) and The Associated General Contractors of America (AGC) for use in evaluating the qualifications of contractors. No endorsement of the submitting party or verification of the information is made by AIA or AGC.

§ 1.3.3 President's name:

§ 1.3.4 Vice-president's name(s)

§ 1.3.5 Secretary's name:

§ 1.3.6 Treasurer's name:

§ 1.4 If your organization is a partnership, answer the following:

§ 1.4.1 Date of organization:

§ 1.4.2 Type of partnership (if applicable):

§ 1.4.3 Name(s) of general partner(s)

§ 1.5 If your organization is individually owned, answer the following:

§ 1.5.1 Date of organization:

§ 1.5.2 Name of owner:

§ 1.6 If the form of your organization is other than those listed above, describe it and name the principals:

§ 2 LICENSING

§ 2.1 List jurisdictions and trade categories in which your organization is legally qualified to do business, and indicate registration or license numbers, if applicable.

§ 2.2 List jurisdictions in which your organization's partnership or trade name is filed.

§ 3 EXPERIENCE

§ 3.1 List the categories of work that your organization normally performs with its own forces.

§ 3.2 Claims and Suits. (If the answer to any of the questions below is yes, please attach details.)

§ 3.2.1 Has your organization ever failed to complete any work awarded to it?

§ 3.2.2 Are there any judgments, claims, arbitration proceedings or suits pending or outstanding against your organization or its officers?

§ 3.2.3 Has your organization filed any law suits or requested arbitration with regard to construction contracts within the last five years?

§ 3.3 Within the last five years, has any officer or principal of your organization ever been an officer or principal of another organization when it failed to complete a construction contract? (If the answer is yes, please attach details.)

§ 3.4 On a separate sheet, list major construction projects your organization has in progress, giving the name of project, owner, architect, contract amount, percent complete and scheduled completion date.

§ 3.4.1 State total worth of work in progress and under contract:

§ 3.5 On a separate sheet, list the major projects your organization has completed in the past five years, giving the name of project, owner, architect, contract amount, date of completion and percentage of the cost of the work performed with your own forces.

§ 3.5.1 State average annual amount of construction work performed during the past five years:

§ 3.6 On a separate sheet, list the construction experience and present commitments of the key individuals of your organization.

§ 4 REFERENCES

§ 4.1 Trade References:

§ 4.2 Bank References:

§ 4.3 Surety:

§ 4.3.1 Name of bonding company:

§ 4.3.2 Name and address of agent:

§ 5 FINANCING

§ 5.1 Financial Statement.

§ 5.1.1 Attach a financial statement, preferably audited, including your organization's latest balance sheet and income statement showing the following items:

Current Assets (e.g., cash, joint venture accounts, accounts receivable, notes receivable, accrued income, deposits, materials inventory and prepaid expenses);

Net Fixed Assets;

Other Assets;

Current Liabilities (e.g., accounts payable, notes payable, accrued expenses, provision for income taxes, advances, accrued salaries and accrued payroll taxes);

Other Liabilities (e.g., capital, capital stock, authorized and outstanding shares par values, earned surplus and retained earnings).

§ 5.1.2 Name and address of firm preparing attached financial statement, and date thereof:

§ 5.1.3 Is the attached financial statement for the identical organization named on page one?

§ 5.1.4 If not, explain the relationship and financial responsibility of the organization whose financial statement is provided (e.g., parent-subsidiary).

§ 5.2 Will the organization whose financial statement is attached act as guarantor of the contract for construction?

§ 6 SIGNATURE

§ 6.1 Dated at this day of

Name of Organization:

By:

Title:

§ 6.2

M being duly sworn deposes and says that the information provided herein is true and sufficiently complete so as not to be misleading.

Subscribed and sworn before me this day of

Notary Public:

My Commission Expires:



AIA® Document A101® – 2017

Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum

AGREEMENT made as of the day of in the year 2021
(In words, indicate day, month and year.)

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

Greenburgh Eleven UFSD
1 Echo Hill Drive, Bldg. #36
Dobbs Ferry, NY 10522
914.693.8500

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

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

Greenburgh Eleven UFSD Bethune Bldg. A+A
1 Echo Hill Drive, Building #36
Dobbs Ferry, NY 10522
SED # 66-04-11-02-0-003-002

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

KG+D Architects, PC
285 Main Street
Mount Kisco, NY 10549
914.666.5900

The Owner and Contractor agree as follows.

ADDITIONS AND DELETIONS:

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

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

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

TABLE OF ARTICLES

1	THE CONTRACT DOCUMENTS
2	THE WORK OF THIS CONTRACT
3	DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION
4	CONTRACT SUM
5	PAYMENTS
6	DISPUTE RESOLUTION
7	TERMINATION OR SUSPENSION
8	MISCELLANEOUS PROVISIONS
9	ENUMERATION OF CONTRACT DOCUMENTS

EXHIBIT A INSURANCE AND BONDS

ARTICLE 1 THE CONTRACT DOCUMENTS

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

ARTICLE 2 THE WORK OF THIS CONTRACT

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

ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be:

(Check one of the following boxes.)

- ☐ The date of this Agreement.
- ☐ A date set forth in a notice to proceed issued by the Owner.
- ☐ Established as follows:
(Insert a date or a means to determine the date of commencement of the Work.)

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

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

§ 3.3 Substantial Completion

§ 3.3.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall achieve Substantial Completion of the entire Work:

(Check one of the following boxes and complete the necessary information.)

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

[] By the following date:

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

Portion of Work

Substantial Completion Date

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

ARTICLE 4 CONTRACT SUM

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

§ 4.2 Alternates

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

Item

Price

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

Item

Price

Conditions for Acceptance

§ 4.3 Allowances, if any, included in the Contract Sum:
(Identify each allowance.)

Item

Price

§ 4.4 Unit prices, if any:

(Identify the item and state the unit price and quantity limitations, if any, to which the unit price will be applicable.)

Item

Units and Limitations

Price per Unit (\$0.00)

§ 4.5 Liquidated damages, if any:

(Insert terms and conditions for liquidated damages, if any.)

§ 4.6 Other:

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

ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments

§ 5.1.1 Based upon Applications for Payment submitted to the Architect by the Contractor and Certificates for Payment issued by the Architect, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided below and elsewhere in the Contract Documents.

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

§ 5.1.3 Provided that an Application for Payment is received by the Architect not later than the 15th day of a month, the Owner shall make payment of the amount certified to the Contractor not later than the 15th day of the following month. If an Application for Payment is received by the Architect after the application date fixed above, payment of the amount certified shall be made by the Owner not later than 45 (forty-five) days after the Architect receives the Application for Payment.

(Federal, state or local laws may require payment within a certain period of time.)

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

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

§ 5.1.6 In accordance with AIA Document A201™–2017, General Conditions of the Contract for Construction, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

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

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

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

- .1 The aggregate of any amounts previously paid by the Owner;
- .2 The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A201–2017;
- .3 Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;
- .4 For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A201–2017; and
- .5 Retainage withheld pursuant to Section 5.1.7.

§ 5.1.7 Retainage

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

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

5%

Init.

§ 5.1.7.1.1 The following items are not subject to retainage:
(Insert any items not subject to the withholding of retainage, such as general conditions, insurance, etc.)

N/A

§ 5.1.7.2 Reduction or limitation of retainage, if any, shall be as follows:
(If the retainage established in Section 5.1.7.1 is to be modified prior to Substantial Completion of the entire Work, including modifications for Substantial Completion of portions of the Work as provided in Section 3.3.2, insert provisions for such modifications.)

§ 5.1.7.3 Except as set forth in this Section 5.1.7.3, upon Substantial Completion of the Work, the Contractor may submit an Application for Payment that includes the retainage withheld from prior Applications for Payment pursuant to this Section 5.1.7. The Application for Payment submitted at Substantial Completion shall not include retainage as follows:
(Insert any other conditions for release of retainage upon Substantial Completion.)

§ 5.1.8 If final completion of the Work is materially delayed through no fault of the Contractor, the Owner shall pay the Contractor any additional amounts in accordance with Article 9 of AIA Document A201–2017.

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

§ 5.2 Final Payment

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

- .1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Article 12 of AIA Document A201–2017, and to satisfy other requirements, if any, which extend beyond final payment; and
- .2 a final Certificate for Payment has been issued by the Architect.

§ 5.2.2 The Owner's final payment to the Contractor shall be made no later than 30 days after the issuance of the Architect's final Certificate for Payment, or as follows:

§ 5.3 Interest

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

%

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Initial Decision Maker

The Architect will serve as the Initial Decision Maker pursuant to Article 15 of AIA Document A201–2017, unless the parties appoint below another individual, not a party to this Agreement, to serve as the Initial Decision Maker.
(If the parties mutually agree, insert the name, address and other contact information of the Initial Decision Maker, if other than the Architect.)

§ 6.2 Binding Dispute Resolution

For any Claim subject to, but not resolved by, mediation pursuant to Article 15 of AIA Document A201–2017, the method of binding dispute resolution shall be as follows:

(Check the appropriate box.)

- ☐ Arbitration pursuant to Section 15.4 of AIA Document A201–2017
- ☒ Litigation in a court of competent jurisdiction in the County of Westchester
- ☐ Other *(Specify)*

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

ARTICLE 7 TERMINATION OR SUSPENSION

§ 7.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A201–2017.

§ 7.1.1 If the Contract is terminated for the Owner's convenience in accordance with Article 14 of AIA Document A201–2017, then the Owner shall pay the Contractor a termination fee as follows:

(Insert the amount of, or method for determining, the fee, if any, payable to the Contractor following a termination for the Owner's convenience.)

§ 7.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A201–2017.

ARTICLE 8 MISCELLANEOUS PROVISIONS

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

§ 8.2 The Owner's representative:

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

§ 8.3 The Contractor's representative:

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

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

§ 8.5 Insurance and Bonds

§ 8.5.1 The Owner and the Contractor shall purchase and maintain insurance as set forth in AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum, Exhibit A, Insurance and Bonds, and elsewhere in the Contract Documents.

§ 8.5.2 The Contractor shall provide bonds as set forth in AIA Document A101™–2017 Exhibit A, and elsewhere in the Contract Documents.

§ 8.6 Notice in electronic format, pursuant to Article 1 of AIA Document A201–2017, may be given in accordance with AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, if completed, or as otherwise set forth below:

(If other than in accordance with AIA Document E203–2013, insert requirements for delivering notice in electronic format such as name, title, and email address of the recipient and whether and how the system will be required to generate a read receipt for the transmission.)

§ 8.7 Other provisions:

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

- .1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor
- .2 AIA Document A101™–2017, Exhibit A, Insurance and Bonds
- .3 AIA Document A201™–2017, General Conditions of the Contract for Construction

(Insert the date of the E203-2013 incorporated into this Agreement.)

- .5 Drawings

Number	Title	Date
--------	-------	------

- .6 Specifications

Section	Title	Date	Pages
---------	-------	------	-------

- .7 Addenda, if any:

Number	Date	Pages
--------	------	-------

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

- .8 Other Exhibits:

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

[] AIA Document E204™–2017, Sustainable Projects Exhibit, dated as indicated below:

Init.

(Insert the date of the E204-2017 incorporated into this Agreement.)

[] The Sustainability Plan:

Title	Date	Pages
-------	------	-------

[] Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages
----------	-------	------	-------

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

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

OWNER (Signature)

, President, Board of Education
(Printed name and title)

CONTRACTOR (Signature)

(Printed name and title)

Init.



AIA® Document A312™ – 2010

Performance Bond

CONTRACTOR:

(Name, legal status and address)

SURETY:

(Name, legal status and principal place of business)

OWNER:

(Name, legal status and address)

Greenburgh Eleven UFSD
1 Echo Hill Drive, Bldg #36
Dobbs Ferry, NY 10522

CONSTRUCTION CONTRACT

Date:

Amount: \$ 0.00

Description:

(Name and location)

Greenburgh Eleven UFSD Bethune Bldg A+A
1 Echo Hill Drive, Bldg #36
Dobbs Ferry, NY 10522
SED # 66-04-11-02-0-003-002

BOND

Date:

(Not earlier than Construction Contract Date)

Amount: \$

Modifications to this Bond: ☐ None ☐ See Section 16

CONTRACTOR AS PRINCIPAL

Company: (Corporate Seal)

Signature: _____

Name and

Title:

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

SURETY

Company: (Corporate Seal)

Signature: _____

Name and

Title:

(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or BROKER:

OWNER'S REPRESENTATIVE:

(Architect, Engineer or other party:)

ADDITIONS AND DELETIONS:

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

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

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

Init.

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User Notes:

(1145988933)

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

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

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

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

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

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

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

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

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

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

- .1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or
- .2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.

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

§ 7 If the Surety elects to act under Section 5.1, 5.2 or 5.3, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the

Surety shall not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication, for

- .1 the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;
- .2 additional legal, design professional and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Section 5; and
- .3 liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.

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

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

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

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

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

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

§ 14 Definitions

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

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

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

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

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

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

§ 16 Modifications to this bond are as follows:

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

CONTRACTOR AS PRINCIPAL

Company: _____
(Corporate Seal)

Signature: _____
Name and Title: _____
Address: _____

SURETY

Company: _____
(Corporate Seal)

Signature: _____
Name and Title: _____
Address: _____

Init.

/



AIA® Document A312™ – 2010

Payment Bond

CONTRACTOR:

(Name, legal status and address)

SURETY:

(Name, legal status and principal place of business)

OWNER:

(Name, legal status and address)

Greenburgh Eleven UFSD
1 Echo Hill Drive, Bldg #36
Dobbs Ferry, NY 10522

CONSTRUCTION CONTRACT

Date:

Amount: \$ 0.00

Description:

(Name and location)

Greenburgh Eleven UFSD Bethune Bldg A+A
1 Echo Hill Drive, Bldg #36
Dobbs Ferry, NY 10522
SED # 66-04-11-02-0-003-002

BOND

Date:

(Not earlier than Construction Contract Date)

Amount: \$

Modifications to this Bond: ☐ None ☐ See Section 18

CONTRACTOR AS PRINCIPAL

Company: (Corporate Seal)

SURETY

Company: (Corporate Seal)

Signature: _____

Name and

Title:

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

Signature: _____

Name and

Title:

(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or BROKER:

OWNER'S REPRESENTATIVE:

(Architect, Engineer or other party:)

ADDITIONS AND DELETIONS:

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

§ 16 Definitions

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

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

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

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

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

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

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

§ 18 Modifications to this bond are as follows:

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

CONTRACTOR AS PRINCIPAL

Company: _____ (Corporate Seal)

Signature: _____
Name and Title: _____
Address: _____

SURETY

Company: _____ (Corporate Seal)

Signature: _____
Name and Title: _____
Address: _____

AIA® Document A201® – 2017

General Conditions of the Contract for Construction

for the following PROJECT:

(Name and location or address)

Greenburgh Eleven UFSD Bethune Bldg. A+A
1 Echo Hill Drive, Bldg. #36
Dobbs Ferry, NY 10522

THE OWNER:

(Name, legal status and address)

Greenburgh Eleven UFSD
1 Echo Hill Drive, Bldg. #36
PO Box 501
Dobbs Ferry, NY 10522

THE ARCHITECT:

(Name, legal status and address)

KG+D Architects, PC
285 Main Street
Mount Kisco, NY 10549

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ADDITIONS AND DELETIONS:

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

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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Init.

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ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

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

§ 1.1.2 The Contract

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

§ 1.1.3 The Work

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

§ 1.1.4 The Project

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

§ 1.1.5 The Drawings

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

§ 1.1.6 The Specifications

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

§ 1.1.7 Instruments of Service

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

§ 1.1.8 Initial Decision Maker

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

§ 1.2 Correlation and Intent of the Contract Documents

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

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

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

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

§ 1.3 Capitalization

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

§ 1.4 Interpretation

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

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

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

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

§ 1.6 Notice

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

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

§ 1.7 Digital Data Use and Transmission

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

§ 1.8 Building Information Models Use and Reliance

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

G202™–2013, Project Building Information Modeling Protocol Form, shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

ARTICLE 2 OWNER

§ 2.1 General

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

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

§ 2.2 Evidence of the Owner's Financial Arrangements

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

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

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

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

§ 2.3 Information and Services Required of the Owner

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

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

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

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

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

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

§ 2.4 Owner's Right to Stop the Work

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

§ 2.5 Owner's Right to Carry Out the Work

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

ARTICLE 3 CONTRACTOR

§ 3.1 General

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

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

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

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

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

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

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

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

§ 3.3 Supervision and Construction Procedures

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

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

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

§ 3.4 Labor and Materials

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

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

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

§ 3.5 Warranty

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

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

§ 3.6 Taxes

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

§ 3.7 Permits, Fees, Notices and Compliance with Laws

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

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

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

§ 3.7.4 Concealed or Unknown Conditions

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

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

§ 3.8 Allowances

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

§ 3.8.2 Unless otherwise provided in the Contract Documents,

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

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

§ 3.9 Superintendent

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

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

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

§ 3.10 Contractor's Construction and Submittal Schedules

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

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

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

§ 3.11 Documents and Samples at the Site

The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Architect and Owner, and

delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.12 Shop Drawings, Product Data and Samples

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

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

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

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

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

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

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

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

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

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

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

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

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

§ 3.13 Use of Site

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

§ 3.14 Cutting and Patching

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

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

§ 3.15 Cleaning Up

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

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

§ 3.16 Access to Work

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

§ 3.17 Royalties, Patents and Copyrights

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

§ 3.18 Indemnification

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

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

ARTICLE 4 ARCHITECT

§ 4.1 General

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

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

§ 4.2 Administration of the Contract

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

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

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

§ 4.2.4 Communications

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

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

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

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

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

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

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

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

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

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

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

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

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

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

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

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

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

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

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

§ 5.3 Subcontractual Relations

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

§ 5.4 Contingent Assignment of Subcontracts

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

- .1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and
- .2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

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

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

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

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

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

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

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

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

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

§ 6.2 Mutual Responsibility

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

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

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

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

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

§ 6.3 Owner's Right to Clean Up

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

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

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

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

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

§ 7.2 Change Orders

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

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

§ 7.3 Construction Change Directives

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

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

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

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

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

- .1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect;
- .2 Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;
- .3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;
- .4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and
- .5 Costs of supervision and field office personnel directly attributable to the change.

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

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

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

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

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

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

§ 7.4 Minor Changes in the Work

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

ARTICLE 8 TIME

§ 8.1 Definitions

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

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

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

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

§ 8.2 Progress and Completion

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

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

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

§ 8.3 Delays and Extensions of Time

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

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

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

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

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

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

§ 9.2 Schedule of Values

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

§ 9.3 Applications for Payment

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

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

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

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

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

§ 9.4 Certificates for Payment

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

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

§ 9.5 Decisions to Withhold Certification

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

- .1 defective Work not remedied;
- .2 third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;
- .3 failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;

- .4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- .5 damage to the Owner or a Separate Contractor;
- .6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
- .7 repeated failure to carry out the Work in accordance with the Contract Documents.

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

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

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

§ 9.6 Progress Payments

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

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

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

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

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

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

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

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

§ 9.7 Failure of Payment

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

§ 9.8 Substantial Completion

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

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

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

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

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

§ 9.9 Partial Occupancy or Use

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

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

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

§ 9.10 Final Completion and Final Payment

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

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

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

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

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

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

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

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

§ 10.2 Safety of Persons and Property

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

- .1 employees on the Work and other persons who may be affected thereby;
- .2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor; and
- .3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

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

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

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

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

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

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

§ 10.2.8 Injury or Damage to Person or Property

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

§ 10.3 Hazardous Materials and Substances

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

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor and the Architect will

promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

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

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

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

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

§ 10.4 Emergencies

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

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

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

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

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

§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or

expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance

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

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

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

§ 11.3 Waivers of Subrogation

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

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

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

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

§11.5 Adjustment and Settlement of Insured Loss

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

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

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

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

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

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

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

§ 12.2.2 After Substantial Completion

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

that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.5.

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

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

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

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

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

§ 12.3 Acceptance of Nonconforming Work

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

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

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

§ 13.2 Successors and Assigns

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

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

§ 13.3 Rights and Remedies

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

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

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

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

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

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

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

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

§ 13.5 Interest

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

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

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

- .1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;
- .2 An act of government, such as a declaration of national emergency, that requires all Work to be stopped;
- .3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or
- .4 The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2.

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

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

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

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

- .1 repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
- .2 fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;
- .3 repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or
- .4 otherwise is guilty of substantial breach of a provision of the Contract Documents.

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

- .1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- .2 Accept assignment of subcontracts pursuant to Section 5.4; and
- .3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

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

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

§ 14.3 Suspension by the Owner for Convenience

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

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

- .1 that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or
- .2 that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 Termination by the Owner for Convenience

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

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

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

- .2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and
- .3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

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

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

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

§ 15.1.2 Time Limits on Claims

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

§ 15.1.3 Notice of Claims

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

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

§ 15.1.4 Continuing Contract Performance

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

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

§ 15.1.5 Claims for Additional Cost

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

§ 15.1.6 Claims for Additional Time

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

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

§ 15.1.7 Waiver of Claims for Consequential Damages

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

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

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

§ 15.2 Initial Decision

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

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

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

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

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

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

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

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

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

§ 15.3 Mediation

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

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

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

§ 15.3.4 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

§ 15.4 Arbitration

§ 15.4.1 If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. The Arbitration shall be conducted in the place where the Project is located, unless another location is mutually agreed upon. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

§ 15.4.1.1 A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.

§ 15.4.2 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement, shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

§ 15.4.4 Consolidation or Joinder

§ 15.4.4.1 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).

§ 15.4.4.2 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.

§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as those of the Owner and Contractor under this Agreement.

NEW YORK STATE WAGE RATE SCHEDULES

1.1 GENERAL

- A. The following minimum prevailing rate of wages, health and welfare and pension fund contributions are as determined by the Industrial Commissioner of the State of New York in accordance with the provisions of Section 220 of the Labor Law of New York State.
- B. It shall be the sole responsibility of each Contractor to pay wages at least equal to current and future Wage Rate Schedules which are applicable to this project throughout the entire duration of the Contract without claiming extra costs.
- C. Current Wage Rate Schedules are included herein. The Owner and the Architect do not warrant the accuracy or pertinency of the wage rates stated. The Contractor shall be solely responsible for verifying the accuracy of the attached Prevailing Wage Schedule.

SECTION 008701- WAGE AND HOUR RATES

1.1 GENERAL

- A. The following minimum wage rates, health and welfare and pension fund contributions are as determined by the Industrial Commissioner of the State of New York in accordance with the provisions of Section 220 of the Labor Law.
- B. All contractors will be bound and obligated by the Laws of New York State to insure payment to all workers involved with the construction of the Project.

1.2 MINIMUM WAGE RATES

- A. The current wage and benefit rates are as set forth in the attached wage schedules.

The "Request for Wage and Supplement Information" (PW 39) you have submitted has been accepted, and a Prevailing Rate Case Number (PRC# 2020001093 - Bethune Learning Center) has been assigned to the project.

To access the PDF file of your schedule, click on <http://apps.labor.ny.gov/wpp/publicViewProject.do?method=showIt&id=1492902> or copy and paste into your browser.

New York State Department of Labor
Prevailing Wage[Unemployment
Benefits](#)[Career
Services](#)[Business
Services](#)[Worker
Protection](#)[Forms and
Publications](#)[Home](#)[Wage Schedule](#) · [Submit Notice Of Award](#) · [Submit Notice Of Project Completion](#)

PRC#: 2020001093

Type of Contracting Agency: Local School District

Acceptance Status: Accepted Article 8

Contracting Agency

Greenburgh Eleven UFSD
Anthony Danqua
Superintendent of Schools
1 Echo Hills
Bethune Building #36
Dobbs Ferry NY 10522

(914) 693-8500
adanquah@greenburgheleven.org

Send Reply To

Teresa Jarrard
Assistant Project Manager
KG+D Architects, PC
285 Main Street
Mount Kisco NY 10549

(914) 666 -5900
tjarrard@kgdarchitects.com

Project Information

Project Title Bethune Learning Center

Description of Work Addition of a canopy and renovations to existing toilet rooms, classrooms, finishes and site work

Contract Id No. 2012-1087

Project Location(s) 1 Echo Hills Bldg # 36

Route No / Street Address

Village / City Dobbs Ferry

Town

State / Zip NY 10522

Nature of Project Addition to Existing Structure

Approximate Bid Date 05/01/2020

Checked Occupation(s) Construction (Building, Heavy & Highway, Sewer, Water, Tunnel)

Applicable Counties

Westchester

SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Work covered by Contract Documents.
2. Type of the Contract.
3. Work not included
4. Owner Furnished, Contractor Installed products and equipment.
5. Work schedule and phasing.
6. Coordination
7. Use of premises.
8. Owner's occupancy requirements.
9. Work restrictions.
10. Regulations of the Commissioner of Education - 8 NYCRR 155.5 - Uniform Safety Standards for School Construction and Maintenance Projects
11. Payrolls and payroll records

B. Related Sections include the following:

1. Division 01 Section "Project Management and Coordination" for specific coordination requirements.
2. Division 01 Section "Temporary Facilities and Controls" for specific requirements for temporary facilities and controls.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Identification: Project consists of all labor, materials, equipment, appliances, services, and incidentals necessary for layout, installing, and performing Alterations at the Bethune Learning Center, Greenburgh Eleven UFSD as shown on the Contract Drawings and described in the Specifications.

1. The Work consists of renovations to the existing Mary McLeod Bethune Building to provide new classroom spaces, replace finishes, casework and miscellaneous specialties, replace doors and hardware, replace roofing, provide masonry repairs and miscellaneous exterior work, improve site drainage, replace paving and walkways, and provide a new entrance canopy.
2. The Work will be performed at the Bethune Learning Center located at 1 Echo Hill Drive, Building #36, Dobbs Ferry, NY 10522.

B. Architect Identification: The Contract Documents were prepared for Project by Kaeyer, Garment & Davidson Architects, PC.

1.3 TYPE OF CONTRACT

- A. The Work of the project will be let in four (4) separate contracts; separate contracts will be awarded for the following scopes of work:

Contract No. 1 - General Construction Work
Contract No. 2 - Plumbing Work
Contract No. 3 - HVAC Work
Contract No. 4 - Electrical Work

- B. Responsibilities assigned to each separate Prime Contractor and the scope of the Work included in each contract is clearly identified in the Specifications and Drawings.
- C. One set of Documents is issued covering all contracts. Each Prime Contractor shall review all drawings and specifications for complete understanding and knowledge of the Work.

1.4 SCOPE OF WORK - SEPARATE PRIME CONTRACTS

- A. Each Prime Contractor is responsible for all of Bidding and Contract Requirements (Division 00), General Requirements (Division 01), Code Compliance Drawings (CC Series), and all work specifically indicated as Work included in their Contract throughout the contract documents, including the following:
1. General Construction Work: Structural Drawings (S Series), Architectural Drawings (A Series), and Civil Drawings (C series), and Specifications Divisions 02 through 14 and 31 through 33, except where specifically noted by others, and as specifically required to complete the work of the general construction.
 2. HVAC Work: Mechanical Drawings (H Series), and Specifications Division 23, and such work types, such as cutting and patching, firesafing, and access doors, as specifically required to complete the work of the HVAC installations.
 3. Plumbing Work: Plumbing Drawings (P series), Fire protection Drawings (SP Series), and Specifications Divisions 21 and 22, and such work types, such as cutting and patching and firesafing and access doors, as specifically required to complete the work of the plumbing installations.
 4. Electrical Work: Electrical Drawings (E series) and Specifications Divisions 26, 27 and 28, and such work types, such as cutting and patching and firesafing / firestopping and access doors, as specifically required to complete the work of the electrical (and telecommunications) installations.
- B. All Prime Contractors are responsible to provide a complete installation of their work with the exception of such work that is specifically indicated to be by another Contractor. Exceptions or clarifications are as follows:
1. Cutting and patching in the existing building generally will be by the trade needing that work. When mechanical or electrical work is above a ceiling, not being replaced by the GC, the Prime doing that work will be responsible for providing their own access and restoration. When the plumber is making sanitary connections below grade at the existing, they will be responsible for accessing the existing pipe and restoration (subject to exceptions).

2. Exceptions for cutting and patching at the existing building will be:
 - a. The GC will be responsible for penetrations through the existing façade and roof.
 - b. The GC will provide restoration of Floor Finish after PC has restored floor for below grade sanitary.
3. All trades shall coordinate, schedule, and sequence work so no cutting and patching is required in any new slabs (or the trade failing to comply would be responsible).
4. Excavation for any sub grade mechanical / plumbing (within 5'-0" of the building) would be by the trade requiring same. (Outside of 5'-0", including any structures would be by the General Contractor, who would provide their own excavation.)
5. Fire-safing / fire-stopping will be by the trade needing / installing that work.
6. All trades to provide access doors as required by their work, to be installed by the GC.

1.5 WORK NOT INCLUDED

- A. The following items are not included in the Work covered by the Contract:
 1. Items marked N.I.C.

1.6 OWNER-FURNISHED, CONTRACTOR INSTALLED PRODUCTS AND EQUIPMENT

- A. Owner will furnish products indicated. The Work includes receiving, unloading, handling, storing, protecting, and installing Owner-furnished products and making building services connections.
- B. Owner-Furnished, Contractor Installed Materials and Equipment Includes:
 1. Toilet accessories.

1.7 WORK SCHEDULE AND PHASING

- A. The Work shall be Substantially Complete on or before the date(s) indicated in the Milestone Schedule attached to this Section. It is extremely important that the Owner resume its full use of the buildings and sites on the completion date(s) specified.
- B. The Work shall be conducted in accordance with the phasing drawings and the milestone schedule included in the contract documents.

1.8 COORDINATION

- A. Project Coordinator shall be responsible for coordination between the separate prime contracts.
 1. Architect will act as Project Coordinator.

1.9 USE OF PREMISES

A. Use of Buildings and Sites:

1. Limits: Confine constructions operations to areas within contract limits indicated. Do not disturb portions of the site beyond the areas in which the Work is indicated. All areas of the site with the exception of the project area where the Work is being performed are off limits to Contractor and his employees.
2. Access to Building: Contractors' employees shall use a single means of access and egress, except in the case of emergency, to be designated by the Owner.
3. Owner Occupancy: Allow for Owner occupancy of adjacent buildings and sites and use by the public. Conduct the Work to provide the least possible interference to the activities of the Owner's personnel and use of the buildings and sites by the public
4. Driveways and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, the public, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
 - a. Schedule deliveries to minimize use of driveways and entrances.
 - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
 - c. Coordinate staging, parking and storage areas with the Architect.
5. Damages: Promptly repair damages caused to adjacent facilities by work of the Contract to a good-as-new condition acceptable to the Owner.
6. Existing Facilities: The following facilities are specifically noted as **not** to be used by Contractor or his employees:
 - a. Toilet facilities.
 - b. Food service facilities, including kitchen and dining areas.
 - c. Parking lots.
 - d. Telephones.

B. Work Hours: During the school session contract work may be performed weekdays from 3:30 pm to 11:00 pm. Work hours on Saturdays and on school holidays are from 7:30 am to 4:00 pm. Summer hours are from 7:30 am to 4:00 pm. All areas affected by Work need to be in perfect condition by 6:00 am the day school opens. All asbestos abatement must be performed on weekends or school holidays. Contractors may work Saturday if additional work hours are required to meet the schedule (Saturday work will be required if necessary to meet deadline) with prior approval from the Owner and Architect and after Contractor has verified allowable working hours by town ordinance.

C. Deliveries: Deliveries to any area of the project will only be allowed between 4:00 pm and 6:00 pm on school days. On Saturdays, school holidays and summer work periods, deliveries are permitted during work hours.

D. Utility Shutdowns: Coordinate all utility shut downs and cross overs with the Owner, schedule during off hours and non-occupied times only.

E. Security Provisions:

1. Comply with all security protocols established by the school.

2. As a minimum, Contractors' employees shall wear, at all times on the job site, a photo ID displayed in a conspicuous location, bearing the name of the individual and the Contractor for whom working. An up-to-date list of all I.D. badges, indicating the name along with a copy of the photograph for each employee, shall be furnished to the Owner.

1.10 OWNER OCCUPANCY REQUIREMENTS

- A. Full Owner Occupancy: Owner will occupy adjacent site and existing buildings during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's operations.
 1. Occupancy level will be reduced during summer months when school is not in session. Coordinate with Owner and Architect for schedule of working hours and work restrictions during period when school is in session.
- B. Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied before Owner occupancy.
 1. Obtain a Certificate of Occupancy from authorities having jurisdiction before Owner occupancy.
 2. Before partial Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will provide, operate, and maintain mechanical and electrical systems serving occupied portions of building.
 3. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of building.
- C. Comply with standards for construction projects as follows:
 1. Interaction with students, employees and visitors is strictly forbidden.
 2. Use of offensive or inappropriate language is strictly forbidden .
 3. The use of radios, tape and CD players is prohibited on the site and in the buildings.
 4. Smoking is prohibited on the site and in the buildings.

1.11 REGULATIONS OF THE COMMISSIONER OF EDUCATION - 8 NYCRR 155.5 - UNIFORM SAFETY STANDARDS FOR SCHOOL CONSTRUCTION AND MAINTENANCE PROJECTS

- A. This Article indicates requirements for school construction and maintenance projects required under New York Codes Rules and Regulations, Regulations of the Commissioner of Education, Part 155, Section 155.5, and are binding on all Contracts of this Project.
- B. The occupied portion of the school building shall always comply with the minimum requirements necessary to maintain a certificate of occupancy.
- C. Comply with general safety and security standards for construction projects as follows:

1. Store all construction materials in a safe and secure manner.
 2. Provide and maintain fences around construction supplies or debris.
 3. Maintain all gates locked at all times when school is in session, unless a worker is in attendance to prevent unauthorized entry.
 4. Provide overhead protection during exterior renovation work, for any sidewalks or areas immediately beneath the work site, or fence off such areas and provide with warning signs to prevent entry.
 5. Provide all workers with photo-identification badges that are required to be worn at all times for identification and security purposes while working at the project site.
- D. Separation of Construction Areas from Occupied Spaces: Separate construction areas which are under the control of a contractor and therefore not occupied by district staff or students from occupied areas. Provide dust proof partitions to prevent dust and contaminants into occupied parts of the building. Provide periodic inspection and repairs of the containment barriers to prevent exposure to dust or contaminants. Gypsum board must be used in exit ways or other areas that require fire rated separation. Heavy duty plastic sheeting may be used only for a vapor, fine dust or air infiltration barrier, and shall not be used to separate occupied spaces from construction areas.
1. Workers may not use corridors, stairs or elevators designated for students or school staff.
 2. Large amounts of debris must be removed by using enclosed chutes or a similar sealed system. No movement of debris through halls of occupied spaces of the building is permitted. No material shall be dropped or thrown outside the walls of the building.
 3. Clean all occupied parts of the building affected by renovation activity at the close of each workday. Maintain required health, safety and educational capabilities at all times for school buildings occupied during a construction project when classes are in session.
- E. Exiting: Maintain all building exits during construction. Comply with exiting plans incorporated in the Construction Documents. If exiting is modified other than as shown on the Contract Documents, provide a plan for Architect's review detailing how exiting required by the applicable building code will be maintained during construction. The plan shall indicate temporary construction required to isolate construction equipment, materials, people, dust, fumes, odors, and noise during the construction period. Temporary construction details shall meet code-required fire ratings for separation and corridor enclosure. At a minimum, required exits, temporary stairs, ramps, exit signs, and door hardware shall be provided at all times.
- F. Ventilation: Comply with the ventilation plan incorporated in the Construction Documents. The plan shall indicate ductwork which must be rerouted, disconnected, or capped in order to prevent contaminants from the construction area from entering the occupied areas of the building. The plan shall also indicate how required ventilation to occupied spaces affected by construction will be maintained during the project.
- G. Fire and Hazard Prevention: Areas of buildings under construction that are to remain occupied shall maintain a certificate of occupancy. In addition, the following shall be strictly enforced:

1. No smoking is allowed on public school property, including construction areas.
 2. During construction daily inspections of district occupied areas shall be conducted by the Contractor's personnel to assure that construction materials, equipment or debris do not block fire exits or emergency egress windows.
 3. Proper operation of fire extinguishers, fire alarm, and smoke/fire detection systems shall be maintained throughout the project.
- H. Noise Abatement During Construction Activities: Contain noise from construction operations so as to not produce noise in excess of 60 dba in occupied spaces when school is in session, or schedule work for times when the building or affected building spaces are not occupied (school is not in session), or provide acoustical abatement measures to reduce noise to acceptable levels.
1. Noise level measurements (dba) shall be taken with a type 2 sound level meter in the occupied space in a location closest to the source of the noise.
- I. Control of Chemical Fumes, Gases, and Other Contaminants during Construction and Maintenance Projects: Control exhaust fumes from welding, gasoline engines, roofing, paving, painting, VOC fumes, or other fumes to assure they do not enter occupied portions of the building or fresh air intakes.
1. Schedule, cure or ventilate materials and activities to allow for "off-gassing" of volatile organic compounds introduced during construction before occupancy of school. Specific attention is warranted for materials and activities including, but not limited to, glues, paint, furniture, carpeting, wall coverings, and drapery.
 - a. Air out building materials or furnishings which "off-gas" chemical fumes, gases, or other contaminants in one of the following manners:
 - 1) Air out in a well-ventilated heated warehouse before they are brought to the project for installation.
 - 2) Air out installed products in accordance with the manufacturer's recommended "off-gassing" periods by allowing this period of time to elapse prior to Substantial Completion date.
 - b. If the work will generate toxic gases that cannot be contained in an isolated area, the work must be done when school classes and programs are not in session. The building must be properly ventilated and the material must be given proper time to cure or "off-gas" before re-occupancy.
 2. Manufacturer's Material Safety Data Sheets (MSDS) shall be maintained at the site for all products used in the project. MSDS must be provided to anyone who requests them.
- J. Large and small asbestos abatement projects as defined by 12NYCRR56 shall not be performed while the building is occupied. Note, It is The State Education Department's interpretation that the term "building", as referenced in this Paragraph, means a wing or major section of a building that can be completely isolated from the rest of the building

with sealed non combustible construction. The isolated portion of the building must contain exits that do not pass through the occupied portion and ventilation systems must be physically separated and sealed at the isolation barrier.

1. Exterior work such as roofing, flashing, siding, or soffit work may be performed on occupied buildings provided proper variances are in place as required, and complete isolation of ventilation systems and at windows is provided. Care must be taken to schedule work so that classes are not disrupted by noise or visual distraction.

- K. Lead-Based Paint Sampling and Analysis Notification: Surfaces containing lead will not be disturbed during construction.

1.12 PAYROLLS AND PAYROLL RECORDS

- A. In accordance with Article 8, Section 220 of the New York State Labor Law, every contractor and subcontractor must keep original payrolls or transcripts subscribed and affirmed as true under penalty of perjury. Payrolls must be maintained for at least three years from the project's date of completion. At a minimum, payrolls must show the following information for each person employed on a public work project:

1. Name
2. Classification(s) in which the worker was employed
3. Hourly wage rate(s) paid
4. Supplements paid or provided
5. Daily and weekly number of hours worked in each classification.

- B. Every contractor and subcontractor shall submit, within thirty (30) days after issuance of it's first payroll and every thirty (30) days thereafter, a transcript of the original payrolls, subscribed and affirmed as true under penalty of perjury.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

Attachment: Project Milestone Schedule

SECTION 011001

PROJECT MILESTONE SCHEDULE

PROJECT MILESTONE DATES:

Construction Period:

Time is of the essence for completion of all project locations and construction must take place simultaneously where required to meet the schedule. The milestones apply regardless of the alternates selected.

Bethune Learning Center

Start Date: February 15, 2021

Summer Construction start date: June 26, 2021

Substantial Completion Date: August 28, 2021

Final Completion Date: October 24, 2021

Last day of 2020-2021 school year: June 25, 2021

END OF SECTION 000000

SECTION 012200 - UNIT PRICES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for unit prices.

1.2 DEFINITIONS

- A. Unit price is a price per unit of measurement for materials, equipment, or services, or a portion of the Work, added to or deducted from the Contract Sum by appropriate modification, if the scope of Work or estimated quantities of Work required by the Contract Documents are increased or decreased.

1.3 PROCEDURES

- A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.
- B. Measurement and Payment: See individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.
- C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.
- D. List of Unit Prices: A schedule of unit prices is included in Part 3. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF UNIT PRICES – GENERAL CONSTRUCTION CONTRACT ONLY

- A. Unit Price No 1: Repointing Brickwork
 - 1. Description: Repoint exterior brickwork in accordance with Section 049110.
 - 2. Unit of Measurement: Per square foot of brickwork repointed, measured in place.
 - 3. Base Bid includes the SF amount of brick repointing work indicated on the Drawings.
- B. Unit Price No 2: Brick Replacement

1. Description: Replace exterior brickwork in accordance with Section 042120.
2. Unit of Measurement: Per square foot of brickwork replaced, measured in place.
3. Base Bid includes the SF amount of brick replacement work indicated on the Drawings.

END OF SECTION 012200

SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for alternates.

1.2 DEFINITIONS

- A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
 - 1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
 - 2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.3 PROCEDURES

- A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
 - 1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
- B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated revisions to alternates.
- C. Execute accepted alternates under the same conditions as other work of the Contract.
- D. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

- A. Add Alternate No. 1: RENOVATION OF TOILET ROOMS LL16, LL17, LL51A, 218 AND 218A
 - 1. Description of Alternate: Provide renovations indicated on the Drawings at the toilet rooms LL16, LL17, LL51A, 218 AND 218A.
 - 2. Base Bid Work: Existing conditions to remain.
 - 3. Contracts Involved in this Alternate:
 - a. Contract No. 1 – General Construction Work
 - b. Contract No. 2 – Plumbing Work
 - c. Contract No. 3 – HVAC Work
 - d. Contract No. 4 – Electrical Work
- B. Add Alternate No 2: PROVIDE DOMESTIC WATER METER / RPZ ASSEMBLY AND FIRE SERVICE BACKFLOW PREVENTER (DCV)
 - 1. Description of Alternate: Provide Domestic Water Meter / RPZ Assembly and Fire Service Backflow Preventer (DCV).
 - 2. Base Bid Work: Existing conditions to remain.
 - 3. Contracts Involved in this Alternate:
 - a. Contract No. 3 – Plumbing Work
- C. Add Alternate No 3: PROVIDE NEW CANOPY ADDITION AT NORTH ELEVATION
 - 1. Description of Alternate: Provide new canopy addition at North Elevation as indicated on Drawing A302 and other Drawings.
 - 2. Base Bid Work: Existing conditions to remain.
 - 3. Contracts Involved in this Alternate:
 - a. Contract No. 1 – General Construction Work
 - b. Contract No. 4 – Electrical Work

END OF SECTION 012300

SECTION 012500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions.
- B. Related Requirements:
 - 1. Section 012300 "Alternates" for products selected under an alternate.
 - 2. Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.2 DEFINITIONS

- A. Substitutions: Changes in products, materials, equipment, and assemblies which deviate from the requirements of the Contract Documents and proposed by Contractor which the Contractor deems will perform the same function and have equal capabilities, service life, economy of operations, and suitability for the intended purpose.
 - 1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
 - 2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.3 ACTION SUBMITTALS

- A. Substitution Requests: Submit requests for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Substitution Request Form: Use the electronic version of form included as an attachment to this Section; submit in portable document format (.pdf).
 - 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
 - b. Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.

- c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
 - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures in .pdf format.
 - e. Samples, where applicable or requested.
 - f. Certificates and qualification data, where applicable or requested.
 - g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
 - h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 - i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES
 - j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
 - k. Cost information, including a proposal of change, if any, in the Contract Sum.
 - l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
 - m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
- a. Forms of Acceptance: Change Order.

1.4 QUALITY ASSURANCE

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

1.5 PROCEDURES

- A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 30 days prior to time required for preparation and review of related submittals.
1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
- a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - b. Requested substitution does not require revisions to the Contract Documents.
 - c. Requested substitution provides sustainable design characteristics that specified product provided for achieving LEED prerequisites and credits.
 - d. Substitution request is fully documented and properly submitted.
 - e. Requested substitution will not adversely affect Contractor's construction schedule.
 - f. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - g. Requested substitution is compatible with other portions of the Work.
 - h. Requested substitution has been coordinated with other portions of the Work.
 - i. Requested substitution provides specified or superior warranty.
 - j. Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule; or if requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
 - k. Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
 - l. Maintenance service and source of replacement parts, as applicable, is available similar to the specified product.
 - m. Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
 - n. Proposed substitution does not affect dimensions and functional clearances.
 - o. Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.
- B. Substitutions for Convenience: Architect will consider requests for substitution if received within 120 days after the Notice of Award. Requests received after that time may be considered or rejected at discretion of Architect.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
 - a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
 - b. Requested substitution does not require revisions to the Contract Documents or, if revisions are required, the Contractor acknowledges that the cost of the Architect's redesign fee will be deducted from the Contract Price.
 - c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - d. Requested substitution provides sustainable design characteristics that specified product provided for achieving LEED prerequisites and credits.
 - e. Substitution request is fully documented and properly submitted.
 - f. Requested substitution will not adversely affect Contractor's construction schedule.
 - g. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - h. Requested substitution is compatible with other portions of the Work.
 - i. Requested substitution has been coordinated with other portions of the Work.
 - j. Requested substitution provides specified or superior warranty.
 - k. Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule; or if requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
 - l. Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
 - m. Maintenance service and source of replacement parts, as applicable, is available similar to the specified product.
 - n. Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
 - o. Proposed substitution does not affect dimensions and functional clearances.
 - p. Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

November 6, 2020
Construction Documents
SED 66-04-11-02-0-003-002

Greenburgh Eleven UFSD
Bethune Learning Center
Alterations

ATTACHMENT: SUBSTITUTION REQUEST FORM

SUBSTITUTION REQUEST FORM

To:

Project:

Section	Page	Paragraph	Specified Item

THE UNDERSIGNED REQUESTS CONSIDERATION OF THE FOLLOWING SUBSTITUTION:

Attached data shall include, in a tabular format to provide a line by line comparison - product description, specifications, drawings, photographs, performance and laboratory tests and the like with applicable portions of said data clearly identified.

FURTHER, The Proposed Substitution WILL (OR WILL NOT) Affect:

Dimensions indicated on the drawings? _____
Wiring, piping, ductwork, or other building services indicated on the drawings? _____
Other trades and abutting or interconnection work? _____
Manufacturer's guarantees and warranties? _____
The construction schedule? _____
Maintenance and service parts locally available? _____

(NOTE - If Substitution WILL affect any item above, explain in detail.)

In addition to the above, the undersigned agrees to pay for -

- Any and all changes to the building design, including structural, civil or electro/mechanical systems engineering (if any), detailing; and
- Any and all additional construction costs caused by the requested substitution.

The undersigned further states that the function, appearance and quality of the Proposed Substitution are equivalent or superior to the Specified Item.

SUBMITTED:		DESIGN PROFESSIONAL'S COMMENTS	
By:		Accepted	Accepted as Noted
Firm: _____		Not Accepted	Received Too Late
Address:			
			By:
Date:			Date:
Telephone/Fax:			Remarks:
Approved For Subcontractor Submittal:			
By:		Contractor:	Date:

SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.2 DEFINITIONS

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

1.3 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.

- 1. Submit the Schedule of Values to Architect at pre-construction conference.

- B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.

- 1. Identification: Include the following Project identification on the Schedule of Values:
 - a. Project name and location.
 - b. Name of Architect.
 - c. Architect's project number.
 - d. SED number.
 - e. Contractor's name and address.
 - f. Date of submittal.
 - 2. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:
 - a. Related Specification Section or Division.
 - b. Description of the Work.
 - c. Name of subcontractor.
 - d. Name of manufacturer or fabricator.
 - e. Name of supplier.
 - f. Change Orders (numbers) that affect value.
 - g. Dollar value.
 - 1) Percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.

3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate. No line item should exceed 10% of the contract sum.
4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
5. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
 - a. Differentiate between items stored on-site and items stored off-site. Include evidence of insurance or bonded warehousing if required.
6. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
7. Allowances: Provide a separate line item in the Schedule of Values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
8. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
 - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.

1.4 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
 1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Failure to proceed with coordination drawings or complete and submit HVAC balancing reports will delay payment applications.
- C. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.
- D. Payment Application Forms: Use AIA Document G702 and AIA Document G703 Continuation Sheets as form for Applications for Payment.
- E. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.

1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
 2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
 3. Payrolls and Payroll Records:
 - a. In accordance with Article 8, Section 220 of the New York State Labor Law, every contractor and subcontractor must keep original payrolls or transcripts subscribed and affirmed as true under penalty of perjury. Payrolls must be maintained for at least three years from the project's date of completion. At a minimum, payrolls must show the following information for each person employed on a public work project:
 - 1) Name
 - 2) Classification(s) in which the worker was employed
 - 3) Hourly wage rate(s) paid
 - 4) Supplements paid or provided
 - 5) Daily and weekly number of hours worked in each classification.
 - b. Every contractor and subcontractor shall submit, within thirty (30) days after issuance of it's first payroll and every thirty (30) days thereafter, a transcript of the original payrolls, subscribed and affirmed as true under penalty of perjury.
 4. Attachments to Applications for Payment: In addition to other requirements stated in the Contract Documents, include with each Application for Payment fully executed Partial Release and Waiver of Liens on the form included at the end of this Section. In addition provide a current copy of the approved Contractor's Construction Schedule, signed by all Prime Contractors, indicating agreement to the schedule.
- F. Transmittal: Submit 3 signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and all other required attachments.
1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's liens from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.
1. Submit partial waivers on each item for amount requested, before deduction for retainage, on each item.
 2. When an application shows completion of an item, submit final or full waivers.

3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
 4. Waiver Delays: Submit each Application for Payment with Contractor's waiver of mechanic's lien for construction period covered by the application.
 - a. Submit final Application for Payment with or preceded by final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
 5. Waiver Forms: Submit partial waivers of lien on form included at the end of this Section, executed in a manner acceptable to Owner.
- H. Initial Application for Payment: Administrative actions and submittals (that have been previously approved) that must precede or coincide with submittal of first Application for Payment include the following:
1. List of Subcontractors.
 2. Schedule of Values.
 3. Contractor's Construction Schedule.
 4. Products list.
 5. Submittals Schedule.
 6. List of Contractor's staff assignments.
 7. List of Contractor's principal consultants.
 8. Copies of building permits.
 9. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 10. Initial progress report.
 11. Report of preconstruction conference.
 12. Certificates of insurance and insurance policies.
 13. Performance and payment bonds.
 14. Data needed to acquire Owner's insurance.
 15. Initial settlement survey and damage report if required.
- I. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum. Submit the following prior to Application for Payment:
 - a. All Project Record Documents (record drawings, etc,) as indicated in Division 01 Section "Closeout Procedures."
 - b. Balance reports for mechanical and electrical systems.

2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- J. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 3. Updated final statement, accounting for final changes to the Contract Sum.
 4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
 5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
 6. AIA Document G707, "Consent of Surety to Final Payment."
 7. Evidence that claims have been settled.
 8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

Attachment: Partial Waiver of Liens Form

REQUISITION FOR PARTIAL PAYMENT - WAIVER OF LIENS

PROJECT	OWNER
GENERAL CONTRACTOR	SUBCONTRACTOR/VENDOR
CONTRACT	WORK COMPLETE
PROJECT:	CONTRACT - \$
TRADE:	CHANGE ORDERS - \$
CONTRACT - \$	TOTAL COMPLETE - \$
CHANGE ORDERS - \$	RETAINAGE (___%) - \$
TOTAL CONTRACT - \$	LESS PRE. REQ. - \$
	THIS REQUISITION - \$

Waiver of Lien

The undersigned, upon receipt of the above requisition payment hereby releases and discharges the Owner of and from any liability or obligation in any way related to or arising out of this project up to and including the date of this document.

The undersigned further covenants and agrees that it shall not in any way claim or file a mechanic's or other lien against the premises of the above designated project, or any part thereof, or against any fund applicable thereto for any of the work, labor, materials heretofore furnished by it in connection with the improvement of said premises.

The undersigned further warrants that, in order to induce the Owner to release this partial payment, they have paid all claims for labor, material, insurance, taxes, equipment, etc., employed in the prosecution of the work above, to date of this requisition.

The undersigned hereby releases and agrees to hold the Owner harmless from any and all claims in connection with the furnishing of such labor and materials, etc., for the construction of the aforementioned project.

The undersigned further guarantees that all portions of the work furnished and/or provided by them are in accordance with the contract and that the terms of the contract with respect to these guarantees will hold for the period specified in said contract.

IN WITNESS WHEREOF, we have executed under seal this release on the date below and to be legally bound hereby:

WITNESS: _____ FIRM: _____

BY: _____ DATE: _____

CORPORATE ACKNOWLEDGEMENT

State of

)SS.
)

County of

On the _____ day of _____, before me came _____ to me known and who by me being duly sworn did depose and say that he resides at _____; that he is the officer of the said corporation executing the foregoing instrument, that he knows the seal of said corporation, that the seal affixed to said instrument is such corporate seal, that it was so affixed by order of the Board of Directors of said corporation and that he signed his name thereto by like order.

Notary Public

INDIVIDUAL ACKNOWLEDGEMENT

State of

)SS.
)

County of

On the _____ day of _____, before me came _____ to me known and who by me being duly sworn did depose and say that he resides at _____ that he is the individual who executed the foregoing instrument.

Notary Public

PARTNERSHIP ACKNOWLEDGEMENT

State of

)SS.
)

County of

On the _____ day of _____, before me came _____ to me known and who by me being duly sworn did depose and say that he resides at _____; that he is the partner in the firm of _____ doing business under the name of _____ and that he executed the foregoing instrument on behalf of said partnership.

Notary Public

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. General project coordination procedures.
 - 2. Conservation.
 - 3. Administrative and supervisory personnel.
 - 4. Project meetings.
 - 5. RFI's.

1.2 COORDINATION

- A. Coordination: Each contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its operations with operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
 - 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. If necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
 - 1. Prepare similar memoranda for Architect, Owner and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
 - 1. Preparation of Contractor's Construction Schedule.
 - 2. Preparation of the Schedule of Values.
 - 3. Installation and removal of temporary facilities and controls.
 - 4. Delivery and processing of submittals.
 - 5. Progress meetings.
 - 6. Preinstallation conferences.

7. Project closeout activities.

- D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work.

- E. Use of the Site: The Architect will administer allocation of available space equitably among separate Prime Contractors and other entities needing access and space, so as to produce the best overall efficiency in performance of the total work of the project. Each contractor shall schedule deliveries so as to minimize space and time requirements for storage of materials and equipment on site.

1.3 SUBMITTALS

- A. Staff Names: Within 5 days of Notice to Proceed, Contractor shall submit a list of principal staff assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.

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

- B. Company Safety Plan: Submit safety program including MSDS Management Plan for the Work of this Project.

1.4 REQUESTS FOR INFORMATION (RFI's)

- A. General: All requests for information or clarification shall be forwarded to the Architect. Contractor shall maintain a log of the status of each request shall be prepared to discuss outstanding items at each progress meeting.

- B. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI in the form specified.

1. RFIs shall originate with Contractor. RFIs submitted by entities other than Contractor will be returned with no response.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

- C. Content of the RFI: Include a detailed, legible description of item needing interpretation and the following:

1. Project name.
2. Date.

3. Name of Contractor.
 4. Name of Architect.
 5. Names of Trade/Specialty Contractors affected and coordinated with.
 6. RFI number, numbered sequentially.
 7. Specification Section number and title and related paragraphs, as appropriate.
 8. Drawing number and detail references, as appropriate.
 9. Field dimensions and conditions, as appropriate.
 10. Contractor's suggested solution(s). If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 11. Contractor's signature.
 12. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.
 - a. Supplementary drawings prepared by Contractor shall include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments.
- D. Hard-Copy RFIs; Prepare on the RFI Submittal Form included at the end of this Section.
1. Identify each page of attachments with the RFI number and sequential page number.
- E. Software-Generated RFIs: Software-generated form with substantially the same content as indicated above.
1. Attachments shall be electronic files in Adobe Acrobat PDF format.
- F. Architect's Action: Architect will review each RFI, determine action required, and return it. Allow five working days minimum for Architect's response for each RFI. RFIs received after 1:00 p.m. will be considered as received the following working day.
1. The following RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for coordination information already indicated in the Contract Documents.
 - d. Requests for adjustments in the Contract Time or the Contract Sum.
 - e. Requests for interpretation of Architect's actions on submittals.
 - f. Incomplete RFIs or RFIs with numerous errors.
 2. Architect's action may include a request for additional information, in which case Architect's time for response will start again.
 3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be processed under "Changes to the Work" provisions in the General Conditions.
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response, unless otherwise established in the General Conditions.

- G. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.
- H. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log bi-weekly. Include the following:
 - 1. Project name.
 - 2. Name and address of Contractor.
 - 3. Name and address of Architect.
 - 4. RFI number including RFIs that were dropped and not submitted.
 - 5. RFI description.
 - 6. Date the RFI was submitted.
 - 7. Date Architect's response was received.
 - 8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

1.5 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

- A. General: In addition to Project superintendent, Contractor shall provide other administrative and supervisory personnel as required for proper performance of the Work
 - 1. Administrative and/or supervisory personnel shall always be present on the job site when work is being performed; this person shall be familiar with Project and authorized to conclude matters relating to progress.
 - 2. Include special personnel required for coordination of operations with other contractors.

1.6 PROJECT MEETINGS

- A. General: Architect will schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
 - 1. Attendees: Architect will inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Architect will notify Owner of scheduled meeting dates and times.
 - 2. Agenda: Architect will prepare the meeting agenda and distribute the agenda to all invited attendees.
 - 3. Minutes: Architect will record significant discussions and agreements achieved at all other meetings and will distribute the meeting minutes to everyone concerned, including Owner, within 3 days of the meeting.
- B. Preconstruction Conference: Architect will schedule a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement. Conference will be held at Project site or another convenient location. Architect will conduct the meeting to review responsibilities and personnel assignments.

1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; manufacturers; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Tentative construction schedule.
 - b. Phasing.
 - c. Critical work sequencing.
 - d. Designation of responsible personnel.
 - e. Procedures for processing field decisions and Change Orders.
 - f. Procedures for processing Applications for Payment.
 - g. Distribution of the Contract Documents.
 - h. Submittal procedures.
 - i. Preparation of Record Documents.
 - j. Use of the premises.
 - k. Responsibility for temporary facilities and controls.
 - l. Parking availability.
 - m. Office, work, and storage areas.
 - n. Equipment deliveries and priorities.
 - o. First aid.
 - p. Security.
 - q. Progress cleaning.
 - r. Working hours.
 3. Contractor shall submit the following items at this meeting:
 - a. Preliminary Contractor's Construction Schedule (if schedule has not yet been submitted).
 - b. List of Subcontractors.
 - c. Schedule of Values.
 - d. Submittal Schedule.
 - e. Products List (Proposed products and manufacturers including any substitution products proposed).
- C. Preinstallation Conferences: When required in the individual Specification Section, conduct a Preinstallation conference at Project site before each construction activity that requires coordination with other construction.
1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates in advance.
 2. Contractor shall prepare agenda, preside at conference, record minutes, and distribute copies after conference to participants. Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. Contract Documents.
 - b. Options.

- c. Related Change Orders.
 - d. Purchases.
 - e. Deliveries.
 - f. Submittals.
 - g. Review of mockups.
 - h. Possible conflicts.
 - i. Compatibility problems.
 - j. Time schedules.
 - k. Weather limitations.
 - l. Manufacturer's written recommendations.
 - m. Warranty requirements.
 - n. Compatibility of materials.
 - o. Acceptability of substrates.
 - p. Temporary facilities and controls.
 - q. Space and access limitations.
 - r. Regulations of authorities having jurisdiction.
 - s. Testing and inspecting requirements.
 - t. Required performance results.
 - u. Protection of construction and personnel.
 - 3. Record significant conference discussions, agreements, and disagreements.
 - 4. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Progress Meetings: Architect will conduct progress meetings at weekly intervals, or as needed in the temporary field office at the Project site.
- 1. Architect will preside over these meetings.
 - 2. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 - a. A representative of Contractor shall be present at every progress meeting, regardless of whether or not that Contractor is performing work at the site at the time.
 - b. Any decision reached at a job meeting shall be binding on a Contractor, whether or not he or his representative is present at such job meeting.
 - 3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required

- to ensure that current and subsequent activities will be completed within the Contract Time.
- b. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.
 - 7) Site utilization.
 - 8) Temporary facilities and controls.
 - 9) Work hours.
 - 10) Hazards and risks.
 - 11) Progress cleaning.
 - 12) Quality and work standards.
 - 13) Change Orders.
 - 14) Documentation of information for payment requests.
 - 4. Reporting: Architect will distribute minutes of the meeting to each party present and to parties who should have been present and will include a brief summary, in narrative form, of progress since the previous meeting and report.
 - a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.
- E. Coordination Meetings: Architect will conduct Project coordination meetings at intervals required by the Architect. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
- 1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work
 - 2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - 3. Any decision reached at a job meeting shall be binding on a Contractor, whether or not he or his representative is present at such job meeting
 - 4. Reporting: Architect will record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

ATTACHMENTS:
RFI SUBMITTAL FORM

REQUEST FOR INFORMATION (RFI FORMAT)

Contractor:		Architect: KG&D Architects, PC
Address:		Address: 285 Main Street, Mt. Kisco, NY 10549
Telephone:		Telephone: 914-666-5900
Fax:		Fax: 914-666-0051
Email:		Email: rcarper@kgdarchitects.com
Project Name:		Project Location:
RFI Number:	Date of Request:	Requested Date of Response (5 business days minimum):
Description, complete with backup data as necessary attached hereto:		
Sketches of Conditions	Specification Paragraph Reference(s):	Drawing Reference(s):
Proposed Solution:		
Cost Impact:		Time Impact:
Trade/Specialty Contractors Affected:		
Trade/Specialty Contractors Coordinated With:		
Submitted By:		
Architect's Response:		
By:		Date of Response:

SECTION 013115 – COORDINATION DRAWINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes preparation of coordination drawings for architectural, structural, mechanical, plumbing, fire protection, fire alarm, lighting, information technology, security, and electrical Work.
- B. Related Sections include the following:
 - 1. Division 01 Section "Project Management and Coordination" for administrative provisions for coordinating construction operations.
 - 2. Division 01 Section "Closeout Procedures" for project record drawing requirements.
 - 3. Division 21, 22, 23, 26, 27 and 28 for additional requirements.

1.2 DEFINITION AND INTENT

- A. The Contract Drawings (mechanical, plumbing, electrical, and fire protection plans) are diagrammatic only and are not intended to show the alignment, exact physical locations, or configurations of such Work. Performance by the Contractor shall be required to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the intended results. Where possible, the Contractor shall take field measurements and verify field conditions and shall carefully compare such field measurements and conditions and other information known to the Contractor with the Contract Documents before commencing coordination drawings.
- B. Coordination drawings are drawings prepared by Contractor that superimpose Work of multiple trades involved in the construction process. Coordination drawings indicate systems and components to be installed by the Contractor to maximize clear height and free area in ceiling cavities, allow for proper and adequate equipment service clearances, minimize space required by shafts and chases and provide the most efficient functioning and use of materials possible while complying with the final performance and finished appearance required by the Contract Documents.
- C. Coordination drawings are intended to show the relationship and integration of different construction elements that require coordination during fabrication or installation to fit in the space provided, to function as intended, and to present the intended final finished appearance.
- D. Coordination Drawings are not a replacement for shop drawings specified in the technical specifications or the Record Drawings required in Division 01.
- E. The Contractor shall manage the process so that each trade/ sub contractor provides all required information in a timely manner. Coordination Drawings may be completed on a phased basis so as not to delay the overall project schedule. The CPM Schedule

specified elsewhere in Division 01 Section "Construction Progress Documentation" shall include the submission of Coordination Drawings. The same shall demonstrate how the Contractor intends to integrate the submission of Coordination Drawings to suit the overall project schedule. The Contractor shall pay all costs for reproducing copies of coordination drawings for use in the field.

- F. Contractor shall maintain equipment access and pathways as indicated on the Drawings. Floor space in MEP equipment rooms shall be maintained as indicated on the Architectural Drawings. Contractor shall clearly indicate access and floor space to be maintained in coordinated shop drawings submitted to the Owner and Architect as per the Specifications

1.3 CONTRACTOR'S USE OF ARCHITECT'S CAD FILES

- A. Refer to Division 01 Section "Submittal Procedures" for availability of and use of Architect's CAD Background Drawings.

1.4 SUBMITTALS

- A. Coordination Drawings: Prepare and submit as informational submittal within 15 days of Notice to Proceed.
- B. Submit coordination drawings in the same manner as shop drawings; refer to Section 013300 Submittal Procedures.

1.5 PROJECT CONDITIONS

- A. Maintain marked up set of coordination drawings at Project site available for reference by Owner and Architect.
- B. Maintain original CAD drawings or base drawings used to produce coordination drawings updated with revisions to reflect actual construction. Make drawing revisions at time of change to construction; Transfer information to CAD drawings no later than every 7 days.
- C. Failure to submit coordination drawings will result in no changes to contract sum for necessary corrections to uncoordinated work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PREPARATION OF COORDINATION DRAWINGS, GENERAL

- A. Prepare coordination drawings for Project using CAD drawings or similar coordination documentation overlay drawings indicating coordination of the project.

- B. CAD Drawings: Produce coordination drawings and overlays using Architect's electronic base drawings furnished by the Architect.

1. Each trade shall be assigned a layer to create the detailing work of each section or division of the Specifications requiring coordination. The Contractor shall ensure that the layer assigned to one trade cannot be modified by another trade, and that the final product clearly differentiates which trade is responsible for the respective information shown. The latter may occur through the use of colors or other distinct graphic methods.

3.2 INFORMATION REQUIRED IN COORDINATION DRAWINGS

- A. Architectural Work Information Required in Coordination Drawings:

1. Items which are recessed into ceilings and ceiling plenums, or surface mounted to ceilings.
2. Anchorages, fastenings, and supporting for items recessed in, attached to, or suspended from ceilings or structure above ceilings.
3. Firewalls, Fire Barrier, Fire partitions and smoke partitions on coordination drawings for coordination of life safety requirements.

- B. Plumbing Work Information Required in Coordination Drawings:

1. Sizes and bottom elevations of piping with insulation thickness included.
2. Dimensions of major components, such valves, access doors and cleanouts.
3. Fire-rated enclosures around piping
4. Support of all roof mounted plumbing piping and equipment.
5. Required space to install, service and maintain all plumbing mechanical items and systems.

- C. HVAC Work Information Required in Coordination Drawings:

1. Sizes and bottom elevations of ductwork, piping with insulation thickness included.
2. Fire dampers.
3. Acoustical lining in ductwork.
4. Identification of ductwork pressure class.
5. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
6. Fire-rated enclosures around ductwork.
7. Support of all roof mounted HVAC piping and equipment.
8. Required space to install, service and maintain all HVAC items and systems.

- D. Electrical Work Information Required in Coordination Drawings:

1. Electrical Work, including telecommunications, data, security, lighting and fire alarm systems.
2. Runs of vertical and horizontal conduit 1-1/4-inch diameter and larger.
3. Light fixture locations.

4. Emergency egress light locations.
5. Smoke detector, and other fire alarm device locations.
6. Panelboard, switchboard, transformer, cable tray, and motor control center, and exit signs.
7. Location of pull boxes and junction boxes, dimensioned from column center lines.
8. Bottom elevation of all conduit runs 1-1/4 -inch diameter and larger and of all cable trays.
9. Support of all roof mounted conduit and photovoltaic equipment, cameras, and security system devices.
10. Required space to install, service and maintain all electrical items and systems.
11. Lightning protection.

E. Fire Protection System Information Required in Coordination Drawings:

1. Locations of standpipes, valves, mains piping, branch lines, pipe drops, and sprinkler heads.
2. Bottom elevation of main and branch lines.

F. Structural Work Information Required in Coordination Drawings:

1. Ceiling system.
2. Openings and sleeve locations required in slabs, walls, beams and other structural elements, including required openings not indicated on Contract Documents.
3. Slab edge locations and locations of sleeves dimensioned from building lines and floor lines.

G. Ceiling Systems and Plenum Space in Coordination Drawings:

1. For mechanical, plumbing, fire protection, fire alarm, electrical, controls, and telecommunications Work penetrating acoustical ceilings, show locations of each item (including sprinkler heads, diffusers, grilles, access doors, light fixtures, smoke detectors, exit signs, speakers, and other visible ceiling mounted devices) relative to acoustical ceiling grid or to wall in gypsum board ceilings.
2. Locate components within ceiling plenums to maximize clear area for future installations of lights and equipment.
3. Clearly indicate areas of conflict between light fixtures, diffusers and grilles and plenum boxes and other components on coordination drawings.
4. Draw elements to dimensions appropriate for products to be installed. Use of symbols is not acceptable.

3.3 TRADE CONFLICTS IN CAD DRAWINGS AND OTHER OVERLAY DRAWINGS

- A. The General Construction Contractor shall review the Coordination Drawings and indicate areas of Architectural, Equipment, Structural and other conflicts and obstacles and coordinate locations of rated and exterior walls to assure their continuity and closure as specified. The each trade Contractor shall determine that all work can be installed without interference. In the case of unresolved interference, the General Contractor shall notify the Architect. The Architect will then suggest to the General

Construction Contractor as to how to revise the Drawings to eliminate interference. The General Construction Contractor shall then have the trade(s) revise their respective Drawings to eliminate the interference.

1. Each Contractor or trade shall approve the Coordination drawings in writing indicating approval of installation coordination and clearances

3.4 PREPARATION OF COORDINATION DRAWINGS

A. Organize coordination drawing submittals as follows:

1. Floor Plans: Provide floor plans and reflected ceiling plans for all floors. Show architectural, structural, mechanical, plumbing, fire protection, fire alarm, electrical, and telecommunications elements on floor plans and reflected ceiling plans.
2. Equipment Rooms and Spaces: Provide large scale drawings for equipment rooms and spaces showing plans and elevations of mechanical, plumbing, fire protection, electrical, and telecommunications equipment.
3. Structural Penetrations: Provide coordination drawings for each floor indicating penetrations and openings required for all trades.
4. In public and occupied areas without scheduled finish ceilings, appearance is a major coordination factor. Reposition proposed locations of work after Coordination Drawing review by the Architect. Provide adjustments to the exact size, location and offsets of ducts, pipes, and conduit to achieve reasonable appearance objectives. Provide these adjustments as part of the Contract or notify the Architect immediately as to why the adjustment cannot be made.

B. Prepare coordination drawings to a scale of 1/4" = 1'- 0" or larger (1/2"= 1'-0" for mechanical room plans); detailing major elements, components, and systems of mechanical equipment and materials in relationship with other systems, installations, and building components. Indicate locations where space is limited for installation and access and where sequencing and coordination of installations are of importance to the efficient flow of the Work, including (but not necessarily limited to) the following:

1. Detail complex areas at larger scale than typical floor plans.
2. Use a common architectural layout as background.
3. Indicate ductwork, pipes with 6-inch diameter and greater, and conduits with 3-inch diameter and greater by double lines. Use single lines for smaller mechanical piping and all electrical conduits. Draw piping, ductwork, lighting fixtures, and cable trays in scale.
4. Circle and clearly note deviations from Contract Documents with reason for deviation stated.
5. Provide name of representative of each subcontractor whose Work is indicated on coordination drawings, verifying their review and approval that their Work has been coordinated with each other trade and with architectural and structural Work.

END OF SECTION 013115

SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - 1. Contractor's Construction Schedule.
 - 2. Project Construction Schedule.
 - 3. Submittals Schedule.
 - 4. List of Subcontractors.
 - 5. Daily Log of Construction Activities
- B. Related Sections include the following:
 - 1. Division 01 Section "Payment Procedures" for submitting the Schedule of Values.
 - 2. Division 01 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes.
 - 3. Division 01 Section "Submittal Procedures" for submitting schedules and reports.
 - 4. Division 01 Section "Summary of Work" for additional requirements.

1.2 DEFINITIONS

- A. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- B. Milestone: A key or critical point in time for reference or measurement.
- C. Contractor's Construction Schedule: A construction schedule for the Work of a Prime Contractor, prepared by that Prime Contractor.
- D. Project Construction Schedule: A coordinated construction schedule for the Project, prepared and maintained by the Contractor for General Construction under the direction of the Architect, indicating an overall construction schedule for the entire Project with input from all Prime Contractors, coordinated by the Architect, and accepted by all Prime Contractors.

1.3 SUBMITTALS

- A. Qualification Data: For in-house scheduling personnel to demonstrate their capabilities and experience.

- B. Submittals Schedule: Submit three copies of schedule. Provide the following information on the Schedule of Submittals Form included at the end of this Section or a comparable computer generated form.
 - 1. Scheduled date for first submittal.
 - 2. Specification Section number and title.
 - 3. Submittal category (action or informational).
 - 4. Name of subcontractor.
 - 5. Description of the Work covered.
 - 6. Scheduled date for Architect's final release or approval.
- C. Contractor's Construction Schedule: Submit two printed copies of initial schedule, one a reproducible print and one a blue- or black-line print, large enough to show entire schedule for entire construction period.
 - 1. Architect will review schedule for compliance with Preliminary Milestone Schedule produced by the Architect.
- D. List of Subcontractors: Submit three copies of a complete listing of all Subcontractors to be employed in the Work. Revise, update and resubmit as required.

1.4 QUALITY ASSURANCE

- A. Scheduling Personnel Qualifications: A person in the Contractor's employ who is experienced in project scheduling and reporting, with capability of reviewing Preliminary Milestone Schedule produced by the Architect and Project Construction Schedule, correlating them with Contractor's Construction Schedule, and providing feedback reports within time schedule specified.
 - 1. Submit qualifications of scheduling personnel for Architect approval.
- B. Prescheduling Conference: After receipt of preliminary Contractor's Construction Schedule from all Prime Contractors, Architect will conduct schedule review and coordination conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Architect will review methods and procedures related to the Project Construction Schedule, including, but not limited to, the following:
 - 1. Review software limitations and content and format for reports.
 - 2. Verify availability of qualified personnel needed to develop and update schedule.
 - 3. Discuss constraints, including phasing work stages area separations interim milestones and partial Owner occupancy.
 - 4. Review delivery dates for Owner-furnished products.
 - 5. Review schedule for work of Owner's separate contracts.
 - 6. Review time required for review of submittals and resubmittals.
 - 7. Review requirements for tests and inspections by independent testing and inspecting agencies.
 - 8. Review time required for completion and startup procedures.
 - 9. Review and finalize list of construction activities to be included in schedule.

10. Review submittal requirements and procedures.
11. Review procedures for updating schedule.

1.5 COORDINATION

- A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.
- B. Coordinate Contractor's Construction Schedule with the Schedule of Values, List of Subcontractors, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.
 1. Secure time commitments for performing critical elements of the Work from parties involved.
 2. Coordinate each related construction activity with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 SUBMITTALS SCHEDULE

- A. Preparation: Concurrent with preparation of Contractor's Construction Schedule, prepare complete Schedule of Submittals using Schedule of Submittals Form included at end of this section, or comparable computer generated form. Submit complete Schedule of Submittals at preconstruction meeting, concurrent with Contractor's Construction Schedule. Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.
 1. Coordinate Submittals Schedule with List of Subcontractors, the Schedule of Values, and Contractor's Construction Schedule.
 2. No payment will be made to Contractor until complete Schedule of Submittals has been received and accepted by Owner

2.2 LIST OF SUBCONTRACTORS

- A. Preparation: Concurrent with preparation of Schedule of Submittals, prepare complete list of Subcontractors. Submit complete list of Subcontractors at preconstruction meeting, concurrent with Schedule of Submittals.
 1. Coordinate List of Subcontractors with Submittals Schedule.
 2. No payment will be made to Contractor until complete list of Subcontractors has been received and accepted by Owner

2.3 PROJECT CONSTRUCTION SCHEDULE

- A. Responsibilities: The Architect will provide services as the overall project scheduling coordinator for Project planning, scheduling and control. The Contractor for General

Construction shall prepare and maintain the overall Project Construction Schedule with direction from the Architect.

- B. Procedure: Within 10 days after Notice of Award of Contract or at the preconstruction meeting, whichever comes first, each Prime Contractor shall prepare and submit to the Architect, for review and coordination, a detailed preliminary Contractor's Construction Schedule for his Work showing the details of his compliance with the Preliminary Milestone Schedule produced by the Architect. Contractor's Construction Schedule shall indicate that the Phases of the Project be Substantially Complete by the dates indicated in the Preliminary Milestone Schedule produced by the Architect.
- C. The Architect will review the Contractor's Construction Schedule and shall advise the Contractor if its schedule is acceptable for incorporation into the Project Construction Schedule. If the Contractor's Construction Schedule is unacceptable, the Architect will suggest revisions to coordinate with other Prime Contractor's Construction Schedules.
- D. Each Prime Contractor shall cooperate with each other and with the Architect in coordinating each Contractor's Construction Schedule to produce the Project Construction Schedule.
- E. The General Construction Contractor shall produce the coordinated Project Construction Schedule. The form of the Project Construction Schedule will be a CPM schedule.
- F. When the initial coordinated Project Construction Schedule is produced by the General Construction Contractor, each Prime Contractor shall signify acceptance of Schedule by signing the schedule.
 - 1. No payment will be made to Prime Contractor until initial Project Construction Schedule, signed and accepted by Prime Contractor, has been received by Owner.
- G. The Contractor shall monitor the progress of its work for conformance with the requirements of the Project Construction Schedule and shall promptly advise the Owner of any delays or potential delays. In the event any progress report indicates any delays, the Contractor shall propose an affirmative plan to correct the delay, including overtime and/or additional labor, if necessary. The Contractor shall provide updates and revised schedules at appropriate intervals as required by the conditions of the work and Project.
- H. The Owner reserves the right to adjust the Project Construction Schedule from time to time during construction to mitigate unavoidable problems and insure that the Project Completion Date is achieved. Contractor shall comply with the adjusted Project Construction Schedule without additional cost.
- I. The Architect will update the Project Construction Schedule at bi-weekly intervals to reflect actual construction progress and activities. Contractor for General Construction shall prepare an updated Project Construction Schedule immediately after receiving the Architect's update. Each Prime Contractor shall issue revised scheduling report (update) to Architect one week before each regularly scheduled progress meeting.

2.4 CONTRACTOR'S PRELIMINARY CONSTRUCTION SCHEDULE (GANTT CHART)

- A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal Gantt-chart-type, Preliminary Contractor's Construction Schedule to Architect within 10 days after Notice of Award of Contract or at the preconstruction meeting, whichever occurs first. Base schedule on Contractor's proposed construction schedule that was presented at the Pre-Award, Post-Bid conference if such a document was required, and whatever updating and feedback was received since the start of Project.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.
 - 1. For construction activities that require 3 months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.
- C. Procedures: Comply with procedures contained in AGC's "Construction Planning & Scheduling."
- D. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Final Completion.
 - 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- E. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion

2.5 REPORTS

- A. Daily Log of Construction Activities: Prepare a daily log construction activities and maintain on site for review by the Owner and Architect. At a minimum, record the following information concerning events at Project site:
 - 1. List of subcontractors at Project site.
 - 2. List of separate contractors at Project site.
 - 3. Approximate count of personnel at Project site.
 - 4. High and low temperatures and general weather conditions.
 - 5. Accidents.
 - 6. Meetings and significant decisions.
 - 7. Unusual events.
 - 8. Stoppages, delays, shortages, and losses.
 - 9. Meter readings and similar recordings.
 - 10. Emergency procedures.
 - 11. Orders and requests of authorities having jurisdiction.
 - 12. Services connected and disconnected.
 - 13. Equipment or system tests and startups.
 - 14. Partial Completions and occupancies.
 - 15. Substantial Completions authorized.

- B. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare a detailed report. Submit with a request for information Form. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Scheduling Personnel: Employ a person experienced in project scheduling, planning, evaluation, and reporting to act as Scheduling Coordinator authorized to act on behalf of Contractor on all matters of scheduling of the Work.
 - 1. Meetings: Scheduling coordinator shall attend all meetings related to Project progress, alleged delays, and time impact, as required.
- B. Contractor's Construction Schedule Updating: At bi-weekly intervals, update Contractor's Construction Schedule to reflect actual construction progress and activities. Issue report of updates required to Architect one week before each regularly scheduled progress meeting.
 - 1. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 - 2. As the Work progresses, indicate Actual Completion percentage for each activity.

3.2 PROJECT CONSTRUCTION SCHEDULE

- A. Project Construction Schedule Updating: At bi-weekly intervals, Architect will update Project Construction Schedule to reflect actual construction progress and activities, based on feedback reports of Prime Contractors.
 - 1. Contractor for General Construction shall revise schedule immediately after each meeting or other activity where revisions have been recognized or made and submit to Architect. Architect will issue updated schedule concurrently with the report of each such meeting.
 - 2. As the Work progresses, Project Construction Schedule will indicate Actual Completion percentage for each activity.
- B. Distribution: Architect will distribute copies of approved schedule to Prime Contractors, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Architect with a need-to-know schedule responsibility.
 - 1. Architect will post copies in Project meeting rooms and temporary field offices.
 - 2. When revisions are made, Architect will distribute updated schedules to the same parties and post in the same locations. Architect will delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

- C. Prime Contractors' Acceptance of Project Construction Schedule: Each updated Project Construction Schedule shall be signed by each Prime Contractor, indicating acceptance of such schedule.
 - 1. A copy of the most current Project Construction Schedule signed and accepted by Prime Contractor shall be attached to each Application for Payment. No payment will be processed by the Owner until such document has been received.

END OF SECTION 013200

SCHEDULE OF SUBMITTALS

Facility:				Contractor:		
Project Description:				Date	Page of	Project No.
To be completed by Contractor						
Specification Section Number and Title	List of Samples, Shop Drawings and Other Descriptive Material	Shop Drawings and Descriptive Material	Samples	Date to Be Submitted	Date Approval Required	Date delivery is required

SECTION 013233 – PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for the following work by the Contractor:

1. Preconstruction photographs.
2. Preconstruction videos.

1.2 SUBMITTALS

- A. Key Plan: Submit key plan of Project site and buildings with notation of vantage points marked for location and direction of each photograph and video. Indicate elevation or story of construction. Include same label information as corresponding set of photographs or video.

- B. Photographs: Submit two prints of each photographic view

1. Format: 8-by-10-inch smooth-surface matte prints on single-weight commercial-grade photographic paper, enclosed back to back in clear plastic sleeves that are punched for standard 3-ring binder.
2. Identification: On back of each print, provide an applied label or rubber-stamped impression with the following information:
 - a. Name of project.
 - b. Name of Architect.
 - c. Name of Contractor.
 - d. Date photograph was taken if not date stamped by camera.
 - e. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
 - f. Unique sequential identifier.
3. Digital Images: Submit a complete set of digital image electronic files with each submittal of prints as a Project Record Document on CD-ROM. Identify electronic media with date photographs were taken. Submit images that have same aspect ratio as the sensor, uncropped.

- C. DVD's: Submit 2 copies of each DVD with protective sleeve or case within seven days of recording.

1. Identification: On each copy, provide an applied label with the following information:
 - a. Name of Project.
 - b. Name of Architect.
 - c. Name of Contractor.
 - d. Date video was recorded.

- e. Description of vantage point, indicating location, direction (by encompass point), and elevation or story of construction.
- f. Weather conditions at time of recording.

PART 2 - PRODUCTS

2.1 PHOTOGRAPHIC MEDIA

- A. Photographic Film: Medium format, 2-1/4 by 2-1/4 inches
- B. Digital Images: Provide images in uncompressed TIFF format, produced by a digital camera with minimum sensor size of 4.0 megapixels, and at an image resolution of not less than 1600 by 1200 pixels.
- C. Digital Video Recordings: Provide high-resolution, digital video disc in format acceptable to the Owner.

PART 3 - EXECUTION

3.1 CONSTRUCTION PHOTOGRAPHS

- A. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.
 - 1. Maintain key plan with each set of photographs that identifies each photographic location.
- B. Film Images:
 - 1. Date Stamp: Unless otherwise indicated, date and time stamp each photograph as it is being taken so stamp is integral to photograph.
 - 2. Field Office Prints: Retain one set of prints of photographs in the field office at Project site, available at all times for reference.
- C. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
 - 1. Date and Time: Include date and time in filename for each image.
 - 2. Field Office Images: Maintain one set of images on CD-ROM in the field office at Project site, available at all times for reference.
- D. Preconstruction Photographs: Before commencement of demolition, or starting construction, take color and digital photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points.
 - 1. Take 20 photographs of each existing building to accurately record physical conditions at start of demolition or construction.
 - 2. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.

3.2 CONSTRUCTION DIGITAL VIDEO

- A. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to show area of construction. Display continuous running time and date. At start of each video, record weather conditions from local newspaper or television and the actual temperature reading at Project site.
- B. Narration: Describe scenes on video by audio narration by microphone while video is recorded. Include description of items being viewed, recent events, and planned activities. At each change in location, describe vantage point, location, direction (by compass point), and elevation or story of construction.
 - 1. Confirm date and time at beginning and end of recording.
 - 2. Begin each video with name of Project, Contractor's name, videographer's name, and Project location.
- C. Preconstruction Video: Before starting demolition or construction record video of Project site and surrounding properties from different vantage points.
 - 1. Show existing conditions adjacent to Project site before starting the Work.
 - 2. Show existing buildings either on or adjoining Project site to accurately record physical conditions at the start of demolition, or construction.
 - 3. Show protection efforts by Contractor.

END OF SECTION 013233

SECTION 013300 - SUBMITTALS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other miscellaneous submittals.
- B. Related Sections include, but are not limited to, the following:
 - 1. Division 01 Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's Construction Schedule and the Submittals Schedule.
 - 2. Division 01 Section "Closeout Procedures" for submitting warranties, Project Record Documents and operation and maintenance manuals.

1.2 DEFINITIONS

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

1.3 SUBMITTAL PROCEDURES

- A. General: Electronic copies of CAD Background Drawings of the Contract Drawings will be available from the Architect for use in preparing submittals. Refer to "Contractor Request for Electronic Drawing Files" attached to the end of this Section for procedures for ordering and transfer of files and for Architect's limitations of liability for transfer.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
 - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 - 2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - 3. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
 - 4. Submit product data, shop drawings and samples relating to a complete assembly at one time. Partial submittals will be returned without action.
 - 5. Interrelated color selections will not be made until all pertinent samples are received by the Architect.

C. Submittals Schedule:

1. Comply with requirements in Division 01 Section "Construction Progress Documentation" for list of submittals and time requirements for scheduled performance of related construction activities.

D. Processing Time: Allow sufficient review time so that installation will not be delayed as a result of the time required to process submittals, including time for resubmittals.

1. No extension of Contract Time will be authorized because of failure to transmit submittals to the Architect sufficiently in advance of the Work to permit processing.
2. The average review time required by the Architect for a submittal will be fifteen (15) business days for processing solely by the Architect's office and twenty (20) business days for processing when review by Architect's consultant is required.

E. Identification: Place a permanent label or title block on each submittal for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space approximately 4 by 5 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.

F. Paper and Physical Sample Submittals: Place Architect's Submittal Cover Sheet, which is included at the end of this section, on each submittal for identification. Complete all required information before submitting to Architect. Submittals received without Submittal Cover Sheet or with incomplete information on cover sheet will be returned for resubmission.

1. Include Contractor's stamp indicating information complies with Contract Document requirements.
2. Submittals indicating less than complete review by Contractor will be returned for Contractor's compliance without Architect's review.
3. Transmit all submittals to Architect unless otherwise indicated. Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return submittals, without review, received from sources other than Contractor.
 - a. When submittal requires review of data by Structural Engineer or Mechanical or Electrical Engineers, submit a copy directly to such engineer with a copy to the Architect.

G. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:

1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.
3. Transmittal Form for Electronic Submittals: Use software-generated form from electronic project management software or electronic form acceptable to Owner.

- H. Deviations: Highlight, encircle, or otherwise identify deviations from the Contract Documents on submittals.
- I. Architect's Re-review of Submittals: When resubmittals are required due to Contractor's failure to properly coordinate submittals, including coordination with other Prime Contractors, Contractor shall reimburse the Owner for fees paid to the Architect for re-review of submittals through a credit change order, in accordance with the Architect's current fee schedule.
- J. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- K. Use for Construction: Use only final submittals with mark indicating action taken by Architect in connection with construction.
 - 1. The Contractor shall perform no portion of its work requiring submittal and review of shop drawings, product data, samples or similar submittals until the respective submittal has been approved by the Architect. Such work shall be in accordance with approved submittals.
 - 2. The Contractor shall supply shop drawings to other Contractors engaged by the Owner to perform work in connection with the project to ensure proper coordination of its work with theirs.
 - 3. Do not proceed with installation until an applicable copy of the submittal is in the installer's possession.
 - 4. Do not permit use of unmarked copies of submittals in connection with construction.
- L. Project Information Management System: The submittal process will be implemented through the use of a digital processing and tracking software similar to "Submittal Exchange". Use this Project Information Management (PIM) software to transmit all submittals. Contractors must participate in and become capable in using this system

PART 2 - PRODUCTS

2.1 ACTION SUBMITTALS

- A. General: Prepare and submit Action Submittals required by individual Specification Sections.
 - 1. Post electronic submittals as PDF electronic files directly to Architect's project information transmission web based software specifically established for Project.
 - a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
 2. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.
 3. Mark each copy of each submittal to show which products and options are applicable. Strike extraneous information prior to submittal
 4. Include the following information, as applicable:
 - a. Manufacturer's written recommendations.
 - b. Manufacturer's product specifications.
 - c. Manufacturer's installation instructions.
 - d. Standard color charts.
 - e. Manufacturer's catalog cuts.
 - f. Wiring diagrams showing factory-installed wiring.
 - g. Printed performance curves.
 - h. Operational range diagrams.
 - i. Standard product operating and maintenance manuals.
 - j. Compliance with recognized trade association standards.
 - k. Compliance with recognized testing agency standards.
 - l. Application of testing agency labels and seals.
 - m. Notation of coordination requirements.
 5. Submittals: Submit pdf electronic file.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data. Standard information prepared without specific reference to the Project is not considered a Shop Drawing. Verify field measurements prior to preparation of shop drawings.
1. Preparation: Include the following information, as applicable:
 - a. Dimensions.
 - b. Identification of products.
 - c. Fabrication and installation drawings.
 - d. Roughing-in and setting diagrams.
 - e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
 - f. Shopwork manufacturing instructions.
 - g. Schedules.
 - h. Compliance with specified standards.
 - i. Notation of coordination requirements.
 - j. Notation of dimensions established by field measurement.
 2. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.
 3. Number of Copies: Submit pdf electronic file, unless paper copies are specifically required by Architect.
- D. Samples: Prepare physical units of materials or products, including the following:

1. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
 2. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from the same material to be used for the Work, cured and finished in manner specified, and physically identical with the product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
 3. Submit Samples for review of kind, color, pattern, and texture for a final check of these characteristics with other elements and for a comparison of these characteristics between final submittal and actual component as delivered and installed.
 - a. If variation in color, pattern, texture, or other characteristic is inherent in the product represented by a Sample, submit at least three sets of paired units that show approximate limits of the variations.
 - b. Refer to individual Specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar construction characteristics.
 4. Number of Samples for Initial Selection: Submit one full set of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect, will return submittal with options selected.
 5. Number of Samples for Verification: Submit three sets of Samples. Architect will retain two Sample sets; remainder will be returned.
 - a. Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
 6. Schedule: Include significant sample submittals in the Contractor's Construction Schedule.
 7. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
- E. Mockups: Mock-ups and field samples specified in individual Sections are full-size, physical example assemblies to illustrate finishes and materials. Mockups are used to verify selections made under Sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Mockups establish the standard by which the Work will be judged.
1. Comply with submittal requirements to fullest extent possible. Process transmittal forms to provide record of activity.

- F. Submittals Schedule: Comply with requirements in Division 01 Section "Construction Progress Documentation."

2.2 INFORMATIONAL SUBMITTALS

- A. General: Prepare and submit Informational Submittals required by other Specification Sections.
 - 1. Number of Copies: Submit pdf electronic file.
 - 2. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
 - 3. Test and Inspection Reports: Comply with requirements in Division 01 Section "Quality Requirements."
- B. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- C. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements.
- D. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.
- E. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements and, where required, is authorized for this specific Project.
- F. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements. Include evidence of manufacturing experience where required.
- G. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements.
- H. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements.
- I. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements.

- J. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- K. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements.
- L. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- M. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
 - 1. Name of evaluation organization.
 - 2. Date of evaluation.
 - 3. Time period when report is in effect.
 - 4. Product and manufacturers' names.
 - 5. Description of product.
 - 6. Test procedures and results.
 - 7. Limitations of use.
- N. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements in Division 01 Section "Closeout Procedures."
- O. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.
- P. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:
 - 1. Preparation of substrates.
 - 2. Required substrate tolerances.
 - 3. Sequence of installation or erection.
 - 4. Required installation tolerances.
 - 5. Required adjustments.
 - 6. Recommendations for cleaning and protection.

- Q. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:
1. Name, address, and telephone number of factory-authorized service representative making report.
 2. Statement on condition of substrates and their acceptability for installation of product.
 3. Statement that products at Project site comply with requirements.
 4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 6. Statement whether conditions, products, and installation will affect warranty.
 7. Other required items indicated in individual Specification Sections.
- R. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.
- S. Material Safety Data Sheets: Submit MSDS's for all products used during construction whether incorporated in the Work or used in the performance of the Work.
1. Compile a central file of MSDS's on the site, and make it available to workers and others in accordance with "Right to Know" legislation.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

- A. Review each submittal and check for compliance with the Contract Documents. Note corrections and field verify all dimensions. Mark with approval stamp before submitting to Architect.
- B. Approval Stamp: Stamp each submittal and submittal cover sheet with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

- A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- B. Except for submittals for information or similar purposes, where action and return is required or requested, Architect will review each submittal, mark to indicate action taken, and return.

1. Compliance with specified characteristics is Contractor's responsibility.
- C. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:
1. Contractor may proceed with fabrication on "REVIEWED" or "FURNISH AS NOTED" shop drawings provided that the Contractor adheres to the corrections noted.
 2. Contractor may not proceed with fabrication on shop drawings noted "REVISE AND RESUBMIT" or "REJECTED" until "REVIEWED" or "FURNISH AS NOTED" stamp is received on resubmitted drawing.
 - a. Do not permit submittals marked "Revise and Resubmit," or "Rejected," to be used at Project site, or elsewhere where Work is in progress.
 3. Other Action: Where submittal is primarily for information or record purposes, special processing or other activity, submittal will be returned, marked "Action Not Required."
- D. Informational Submittals: Architect will review each submittal and will not return it, or will reject and return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- E. Submittals not required by the Contract Documents will not be reviewed and may be discarded.

END OF SECTION 013300

ATTACHMENTS:
SUBMITTAL COVER SHEET
CONTRACTOR REQUEST FOR ELECTRONIC DRAWING FILES

SUBMITTAL COVER SHEET

Contractor: _____

Address: _____ Telephone: () _____

Owner: _____

Name of Project: _____

TYPE OF SUBMITTAL:

☐ Shop Drawings

☐ Technical Data

☐ Test Report

☐ Schedule

☐ Certificate

☐ Warranty

☐ Physical Sample

☐ Color Sample

☐ _____

Submission #: 1st, 2nd, 3rd, 4th (circle one)

Description:

Product Identification: _____

Manufacturer: _____

Subcontractor/Supplier: _____

DOCUMENT REFERENCES: (Must be fully filled out)

Spec Section No.: _____ Drawing No(s): _____

Paragraph: _____ Rm. Or Det. No(s): _____

Contractor Remarks:

Contractor Submittal Review Stamp

THE ATTACHED MATERIAL HAS BEEN REVIEWED BY THE UNDERSIGNED AND IS BELIEVED TO COMPLY WITH ALL REQUIREMENTS OF THE CONTRACT DOCUMENTS. THE UNDERSIGNED UNDERSTANDS VERIFICATION OF FIELD DIMENSIONS, AND COORDINATION WITH OTHER TRADES, REMAINS THE RESPONSIBILITY OF THE CONTRACTOR.

DATE: _____ BY (SIGN): _____

Consultant use below this line:

Architect Submittal Review Stamp

☐ NO EXCEPTIONS

☐ REJECTED

☐ EXAMINED

☐ MAKE CORRECTIONS NOTED

☐ REVISE AND RESUBMIT

☐ SUBMIT SPECIFIED ITEM

CHECKING IS ONLY FOR GENERAL CONFORMANCE WITH THE DESIGN CONCEPT OF THE PROJECT AND GENERAL COMPLIANCE WITH THE INFORMATION GIVEN IN THE CONTRACT DOCUMENTS. ANY ACTION SHOWN IS SUBJECT TO THE REQUIREMENTS OF THE PLANS & SPECIFICATIONS. CONTRACTOR IS RESPONSIBLE FOR DIMENSIONS WHICH SHALL BE CONFIRMED & CORRELATED AT THE JOB SITE; FABRICATION PROCESSES AND TECHNIQUES OF CONSTRUCTION; COORDINATION OF HIS WORK WITH THAT OF ALL OTHER TRADES & THE SATISFACTORY PERFORMANCE OF HIS WORK

KAeyer, Garment + Davidson Architects, P.C.

DATE _____ BY _____

CONTRACTOR REQUEST FOR ELECTRONIC DRAWING FILES

The Architect, for the convenience of the Client/Owner, has electronic copies or representations of Drawings, Specifications and Project Manuals. Requests for electronic copies of such Drawings, Specifications and Project Manuals by the Contractor, for the Contractor's use or the use of Subcontractors, shall be made in writing to the Client/Owner as outlined hereinbelow and shall outline the benefit derived from such a request. The Contractor shall be prepared to reimburse the Client/Owner for any costs involved in preparing such electronic documents for the Contractor's use.

Architect's Project Number:	
Project Name:	
Architect:	
Client/Owner:	
Contractor/Recipient's Name:	
Attention to:	
Contractor/Recipient's Address:	
Date of Request:	
Date of Release:	

As requested, attached is a list of electronic drawing files. For the release of these electronic drawing files to the recipient, the following items shall be understood, acknowledged and signed by the authorized personnel of the recipient with the fee included.

- A. The electronic drawing files are the property of the Architect and the Contractor is granted a license to use the electronic files only in connection with the subject project.
- B. The electronic drawing files do not necessarily represent the Contract Documents associated with the referenced project. These files are solely for the use of the recipient and are not a representation of the scope of work for the project. Any use by contractors, subcontractors or fabricators shall be on all of the same terms and conditions being applicable to such users who shall acknowledge the same in writing. The Recipient may use the electronic drawing files only. Electronic drawing files or portions thereof, shall not be provided to anyone else without the written approval of the Client/Owner. The use of the electronic drawing files, documents and any reprographics shall not identify any member of the Architect or Architect's consultants or sub-consultants or the Client/Owner without the written approval from the parties.
- C. The entire risks as to the results and performance of the package including the electronic drawing files, are assumed by the Contractor/recipient. The Client/Owner, the Architect and the Architect's consultants and sub-consultants, including directors, employees,

representatives, and licensors of the company, shall not have any liability to the Contractor/recipient or any other person or entity for any direct, indirect, incidental special or consequential damages whatsoever, including, but not limited to, the loss of revenue or profit, lost data, or any other personnel, commercial or economic loss, and claims by third parties. Even if the Client/Owner and Architect and the Architect's consultants and sub-consultants has been advised of the possibility of such damages; said Client/Owner and Architect and the Architect's consultants and sub-consultants shall not be held liable as stated above.

- D. The Contractor/recipient hereby agrees to indemnify and hold the Client/Owner, the Architect and the Architect's consultants and sub-consultants harmless from and against any cost, damage, liability, loss or claim arising from violation of this license. The Contractor/recipient and all subcontractors of all tiers also agrees that, in addition to all other remedies hereunder, the Contractor/recipient and such parties grant the Client/Owner the right to seek injunctive or other equitable relief to prevent the violation or require the performance of any of the Contractor's/recipient's obligations under this license, and the Contractor/recipient hereby consents to the issuance of such relief by any court of competent jurisdiction without the need to post any bond or security.
- E. The electronic files requested are as follows:

Electronic file name	Corresponding Drawing (close approximation)
1.	
2.	
3.	
Etc.	
Total number of files:	

CONTRACTOR'S/RECIPIENT'S AGENT SIGNATURE: _____

NAME IN BLOCK LETTERS: _____

AUTHORIZED POSITION HELD: _____

DATE OF SIGNATURE: _____

****End of Attachment****

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for quality assurance and quality control.
 - 1. This Section does not include requirements for performing Special Inspections and Tests in compliance with Chapter 17 of the Building Code of New York State; refer to Section 014100.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specific quality-control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's quality-control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
- C. Related Sections include the following:
 - 1. Division 01 Section "Construction Progress Documentation" for developing a schedule of required tests and inspections.
 - 2. Division 01 Section ""Special Inspections and Tests" for requirements for performing Special Inspections and Tests in compliance with Chapter 17 of the Building Code of New York State.
 - 3. Division 01 Section "Cutting and Patching" for repair and restoration of construction disturbed by testing and inspecting activities.
 - 4. Divisions 02 through 49 Sections for specific test and inspection requirements.

1.2 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and ensure that proposed construction complies with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that completed construction complies with

requirements. Services do not include contract enforcement activities performed by Architect.

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

1.3 DELEGATED DESIGN

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

1.4 SUBMITTALS

- A. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.
- B. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
 - 1. Specification Section number and title.
 - 2. Description of test and inspection.
 - 3. Identification of applicable standards.
 - 4. Identification of test and inspection methods.
 - 5. Number of tests and inspections required.
 - 6. Time schedule or time span for tests and inspections.
 - 7. Entity responsible for performing tests and inspections.
 - 8. Requirements for obtaining samples.
 - 9. Unique characteristics of each quality-control service.
- C. Reports: Prepare and submit certified written reports that include the following:
 - 1. Date of issue.
 - 2. Project title and number.
 - 3. Name, address, and telephone number of testing agency.
 - 4. Dates and locations of samples and tests or inspections.
 - 5. Names of individuals making tests and inspections.
 - 6. Description of the Work and test and inspection method.
 - 7. Identification of product and Specification Section.
 - 8. Complete test or inspection data.
 - 9. Test and inspection results and an interpretation of test results.
 - 10. Ambient conditions at time of sample taking and testing and inspecting.

11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

- D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.5 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements
- 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 installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent
- C. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 548; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.
1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
 2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

1.6 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
 2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.
- B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not..

1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
 - a. Contractor shall not employ the same entity engaged by Owner, unless agreed to in writing by Owner.
 - b. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility
 2. Submit a certified written report, in duplicate, of each quality-control service.
 3. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing.
- D. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that revised or replaced Work that failed to comply with requirements established by the Contract Documents.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

- A. Prepare a record of tests and inspections. Include the following:
1. Date test or inspection was conducted.
 2. Description of the Work tested or inspected.
 3. Date test or inspection results were transmitted to Architect.
 4. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for Architect's and Architect's reference during normal working hours.

3.2 TESTS AND INSPECTIONS REQUIRED

- A. General Construction Tests: Refer to each technical spec section in Division 02 - 14 and 31 - 33 for detailed testing requirements and responsibilities assigned for providing such tests. Testing for structural-related elements such as earthwork, concrete, masonry, steel, wood framing, wall panels and veneers and for spray-on fireproofing may require special inspections and testing; refer to Section 014100.
- B. Plumbing Tests: Conform to requirements specified in Division 22 for detailed testing requirements and responsibilities assigned for providing such tests. In general, test shall

be performed and paid for by Contractor and witnessed by the Architect. As a minimum, the following tests shall be conducted:

1. Water supply piping hydrostatic pressure test.
 2. Sanitary piping test before fixture installation. Cap pipes and fill to highest point in system.
 3. Plumbing fixture operation.
- C. Fire Protection Tests: Conform to requirements specified in Division 21 for detailed testing requirements and responsibilities assigned for providing such tests. In general, test shall be performed and paid for by Contractor and witnessed by the Architect. As a minimum, the following tests shall be conducted:
1. Fire protection system flushed and pressure tested.
- D. HVAC Tests: Conform to requirements specified in Division 23 for detailed testing requirements and responsibilities assigned for providing such tests. In general, HVAC testing and balancing shall be performed by independent testing agency paid for by Contractor with testing witnessed by the Contractor and Architect. As a minimum, the following tests shall be conducted:
1. Piping hydrostatic tests.
 2. Air and water balancing
 3. Thermostat control monitoring and testing.
 4. Boiler efficiency testing.
 5. Fume hood face velocity testing. Certification sticker shall be placed on sash.
- E. Electrical Power System Tests: Conform to requirements specified in Division 26 for detailed testing requirements and responsibilities assigned for providing such tests. In general, test shall be performed and paid for by Contractor and witnessed by the Architect. As a minimum, the following tests shall be conducted:
1. Polarity tests.
 2. Operation of all circuits.
 3. Testing of emergency system.
 4. Security systems.
 5. Generation system.
 6. Grounding systems.
- F. Fire Alarm System Tests: Conform to requirements specified in Division 28 for detailed testing requirements and responsibilities assigned for providing such tests. In general, test shall be performed and paid for by Contractor and witnessed by the Architect. As a minimum, the following tests shall be conducted:
1. All smoke and heat detectors.
 2. Proper operation as required by authority having jurisdiction.
- G. In addition, Contractor shall pay for and have completed an inspection by the Fire Underwriters (or equivalent) and provide such certificate with close-out documents.

3.3 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 - 1. Comply with the Contract Document requirements for Division 01 Section "Cutting and Patching."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

SECTION 014100 - SPECIAL INSPECTIONS AND TESTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for performing Special Inspections and Tests in accordance with requirements of Chapter 17 of the *Building Code of New York State* (BCNYS). Testing and inspecting services are required to verify compliance with requirements specified or indicated in the contract documents. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1.2 DEFINITIONS

- A. Registered Design Professional: The Registered Architect whose seal appears on the Construction Drawings.
- B. Testing/Inspecting Agency: An agent retained by the Owner and coordinated by the Special Inspector, to perform some of the testing and/or inspection services on behalf of the Special Inspector. (An example of an Inspecting Agency would be a Geotechnical Engineer).
- C. Statement of Special Inspections: A document prepared by the Registered Design Professional that includes the Schedule of Special Inspections listing the materials and work requiring Special Inspections. A copy of this document is included at the end of this Section.
- D. Continuous Special Inspection: The full-time observation of work requiring Special Inspections by the Special Inspector who is present in the area where the work is being performed.
- E. Periodic Special Inspections: The part-time or intermittent observation of work requiring Special Inspections by the Special Inspector who is present in the area where the work has been or is being performed and at the completion of the work

1.3 CONTRACTOR RESPONSIBILITIES

- A. Contractor shall cooperate with the Special Inspector and his agents so that Special Inspections and testing may be performed without hindrance.
- B. Contractor shall notify the Special Inspector and/or Testing/Inspecting Agency at least 48 hours in advance of a required inspection or test. Contractor shall coordinate sequence of activities to accommodate required inspection and testing services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

- C. The Contractor shall provide incidental labor and facilities to provide access to the work to be inspected or tested, to obtain and handle samples at the site or at source of products to be tested, to facilitate tests and inspections, and for storage and curing of test samples.
- D. The Contractor shall keep at the project site the latest set of Construction Drawings, field sketches, accepted shop drawings, and specifications for field use by the Inspectors and Testing Technicians.
- E. The Special Inspection program shall in no way relieve the Contractor of his obligation to perform work in accordance with the requirements of the Contract Documents or from implementing an effective Quality Control program.

1.4 QUALITY CONTROL

- A. Construction Manager will hold a Special Inspections preconstruction meeting at least 7 days prior to the initial planned date for start of construction.
 1. Discussion shall include review of specifications and Schedule of Special Inspections for work requiring Special Inspections; responsibilities of Contractor, Owner, Testing Agency, Special Inspector, and Registered Design Professional; notification procedures; and reporting procedures.
 2. Attendees shall include the Contractor, Owner's representative, Testing Agency, Special Inspector, and Registered Design Professionals for Structural Engineering and for Architecture.

1.5 LIMITS ON AUTHORITY

- A. The Special Inspector or Testing/Inspecting Agency shall not release, revoke, alter, or enlarge on the requirements of the Contract Documents.
- B. The Special Inspector or Testing/Inspecting Agency shall not have control over the Contractor's means and methods of construction.
- C. The Special Inspector or Testing/Inspecting Agency shall not be responsible for construction site safety.
- D. The Special Inspector or Testing/Inspecting Agency shall not have the authority to stop the work.

1.6 STATEMENT OF SPECIAL INSPECTIONS

- A. The Statement of Special Inspections and Tests, on the form included at the end of this Section, will be prepared by the Registered Design Professional.

- B. Required inspections and tests are described in the Schedule of Special Inspections and Tests attached to the end of this Section and in the individual specification sections for the items to be inspected or tested .

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used).

END OF SECTION 014100

ATTACHMENTS

SPECIAL INSPECTION NON-CONFORMANCE REPORT FORM
NYSED STATEMENT OF SPECIAL INSPECTIONS AND TESTS

SPECIAL INSPECTION NON-CONFORMANCE REPORT NO.

DATE: _____

TO: Registered Design Professional (RDP)
Kaeyer, Garment & Davidson Architects, PC
285 Main St., Mount Kisco, NY 10549
Fax: (914) 666-0051

CC: Contractor: _____

FROM: _____, Special Inspector

PROJECT: Bethune Learning Center Alterations
KG&D Project #2019-1029

PART I: REFERENCE SPECIAL INSPECTION REPORT NO. _____
(Attach copy of report.)

DESCRIPTION OF NON-CONFORMANCE:

RDP RESPONSE: (PROVIDE ATTACHMENTS IF NECESSARY)


RDP SIGNATURE _____ **DATE** _____

IS REINSPECTION BY SPECIAL INSPECTOR REQUIRED ☐ YES ☐ NO

PART II: CONTRACTOR VERIFICATION (To be completed by either the **[General Contractor or Construction Manager]** or Subcontractor and returned to the Special Inspector and the RDP.)

I verify that as of the date listed, the non-conforming item noted above has been corrected as required.

SIGNATURE _____ **DATE** _____

 NYS EDUCATION DEPARTMENT Office of Facilities Planning 89 Washington Avenue, Room 1060 EBA Albany, NY 12234	STATEMENT OF SPECIAL INSPECTIONS AND TESTS As required by the Building Code of NYS (BCNYS)
BCNYS § 1704.1.1 requires the project Design Professional to complete the Statement of Special Inspections and Tests. Completion of the Statement of Special Inspections & Tests and submission to the Office of Facilities Planning with the Construction Permit Application is a condition for issuance of the Building Permit.	
School District Greenburgh Eleven UFSD	Building Bethune Learning Community High School
Project Title	
SED Project # 66-04-11-02-0-003-002	Project Address 1 Echo Hill Bethune Bldg. # 36, Dobbs Ferry, NY 10522
Architect/Engineer KG+D Architects, PC	
Name of Person Completing this Statement Trevor Hill	Phone (203) 490-4140
Date 12/18/2019	
Comments	

INSPECTION AND TESTING (Continuous & Periodic is as Defined by the BCNYS)	CONTINUOUS	PERIODIC	REFERENCE STANDARD	BCNYS REFERENCE	CHECK IF REQUIRED	IDENTIFY SPEC SECTION AND PROVIDE CLARIFYING NOTES IF NECESSARY
A. Steel Construction						
1. Material verification of high-strength bolts, nuts and washers.		X	Applicable ASTM material specifications. AISC 360, Section A3.3	1704.3	<input checked="" type="checkbox"/>	Drawing S001
2. Inspection of high-strength bolting.	X	X	AISC 360, Section M2.5	1704.3, 1704.3.3	<input checked="" type="checkbox"/>	Drawing S001
3. Material verification of structural steel.			ASTM A 6 or A 568	1704.3, 1708.4	<input checked="" type="checkbox"/>	Drawing S001
4. Material verification of weld filler materials.			AISC 360, Section A3.5	1704.3	<input checked="" type="checkbox"/>	Drawing S001
5. Inspection of welding:				1704.3	<input type="checkbox"/>	
a. Structural steel	X	X	AWS D1.1, D1.3	1704.3, 1704.3.1	<input checked="" type="checkbox"/>	Drawing S001
b. Reinforcing steel	X	X	AWS D1.4; ACI 318: 3.5.2	1704.3	<input type="checkbox"/>	
6. Inspection of steel frame joint details.		X		1704.3, 1704.3.2	<input checked="" type="checkbox"/>	Drawing S001
B. Concrete Construction						
1. Inspection of reinforcing steel, including prestressing tendons, and placement.		X	ACI 318: 3.5, 7.1-7.7	1704.4, 1913.4	<input checked="" type="checkbox"/>	Drawing S001
2. Inspection of reinforcing steel welding.			AWS D1.4; ACI 318: 3.5.2	1704.4	<input type="checkbox"/>	

INSPECTION AND TESTING (Continuous & Periodic is as Defined by the BCNYS)	CONTINUOUS	PERIODIC	REFERENCE STANDARD	BCNYS REFERENCE	CHECK IF REQUIRED	IDENTIFY SPEC SECTION AND PROVIDE CLARIFYING NOTES IF NECESSARY
3. Inspection of bolts to be installed in concrete prior to and during placement.	X			1704.4	<input checked="" type="checkbox"/>	Drawing S001
4. Verify use of required design mix.		X	ACI 318: Ch. 4, 5.2-5.4	1704.4, 1904.2.2, 1913.2, 1913.3	<input checked="" type="checkbox"/>	Drawing S001
5. Sampling fresh concrete: slump, air content, temperature, strength test specimens.	X		ASTM C 172, C 31; ACI 318: 5.6, 5.8	1704.4, 1913.10	<input checked="" type="checkbox"/>	Drawing S001
6. Inspection of placement for proper application techniques.	X		ACI, 318: 5.9, 5.10	1704.4, 1913.6, 1913.7, 1913.8	<input checked="" type="checkbox"/>	Drawing S001
7. Inspection for maintenance of specified curing temperature and techniques.		X	ACI, 318: 5.11 - 5.13	1704.4, 1913.9	<input checked="" type="checkbox"/>	Drawing S001
8. Inspection of prestressed concrete.	X		ACI 318: 18.18.4, 18.20	1704.4	<input type="checkbox"/>	
9. Erection of precast concrete members.		X	ACI 318: Ch. 16	1704.4	<input type="checkbox"/>	
10. Verification of in-situ concrete strength prior to stressing of tendons and prior to removal of shores and forms from beams and slabs.		X	ACI 318: 6.2	1704.4	<input type="checkbox"/>	
11. Inspection of formwork		X	ACI 318: 6.1.1		<input checked="" type="checkbox"/>	
C. Masonry Construction						
L1 = Level 1 Inspection required for nonessential facilities.			ACI 530/ASCE 5/TMS 402, Ch. 35	ACI 530.1/ASCE 6/TMS 602, Ch. 35	<input type="checkbox"/>	
L2 = Level 2 Inspection required for essential facilities. In general, schools are not considered essential facilities unless they are a designated emergency shelter			ACI 530/ASCE 5/TMS 402, Ch. 35	ACI 530.1/ASCE 6/TMS 602, Ch. 35	<input type="checkbox"/>	

INSPECTION AND TESTING (Continuous & Periodic is as Defined by the BCNYS)	CONTINUOUS	PERIODIC	REFERENCE STANDARD		BCNYS REFERENCE	CHECK IF REQUIRED	IDENTIFY SPEC SECTION AND PROVIDE CLARIFYING NOTES IF NECESSARY
1. Verify to ensure compliance:							
a. Proportions of site prepared mortar and grout.		L1 & L2		2.6A	1704.5	<input type="checkbox"/>	
b. Placement of masonry units and construction of mortar joints.		L1 & L2		3.3B	1704.5	<input type="checkbox"/>	
c. Location and placement of reinforcement, connectors, tendons, anchorages.		L1	Sec. 1.13	3.4, 3.6A	1704.5	<input type="checkbox"/>	
		L2		3.4, 3.6A	1704.5	<input type="checkbox"/>	
d. Prestressing technique.		L1		3.6B	1704.5	<input type="checkbox"/>	
Grout space prior to grouting.	L2			3.2D	1704.5	<input type="checkbox"/>	
e. Grade and size of prestressing tendons and anchorages.		L1		2.4B, 2.4H	1704.5	<input type="checkbox"/>	
Placement of grout.	L2			3.5	1704.5	<input type="checkbox"/>	
f. Grout specs prior to grouting.	L2			3.6 C	1704.5	<input type="checkbox"/>	
2. Inspection program shall verify:							
a. Size and location of structural elements.		L1 & L2		3.3G	1704.5	<input type="checkbox"/>	
b. Type, size, and location of anchors.	L2	L1	Sec. 1.2.2(e), 2.1.4, 3.1.6		1704.5	<input type="checkbox"/>	
c. Specified size, grade, and type of reinforcement.		L1 & L2	Sec. 1.13	2.4, 3.4	1704.5	<input type="checkbox"/>	
d. Welding of reinforcing bars.	L1 & L2		2.1.7.10.2, 3.3.3.4(b)		1704.5	<input type="checkbox"/>	
e. Cold/hot weather protection of masonry construction.		L1 & L2		1.8C, 1.8D	1704.5, 2104.3, 2104.4	<input type="checkbox"/>	
f. Prestressing force measurement and application.	L2	L1		3.6B	1704.5	<input type="checkbox"/>	
3. Verification prior to grouting.	L2	L1	1.13	3.2D, 3.4, 2.6B, 3.3B 1.4	1704.5, 2105.2.2, 2105.3	<input type="checkbox"/>	
4. Grout placement.	L1			3.5, 3.6C	1704.5	<input type="checkbox"/>	

INSPECTION AND TESTING (Continuous & Periodic is as Defined by the BCNYS)	CONTINUOUS	PERIODIC	REFERENCE STANDARD	BCNYS REFERENCE	CHECK IF REQUIRED	IDENTIFY SPEC SECTION AND PROVIDE CLARIFYING NOTES IF NECESSARY
5. Preparation of grout specimens, mortar specimens, and/or prisms.	L1 & L2		1.4	1704.5, 2105.2.2, 2105.3	<input type="checkbox"/>	
6. Compliance with documents and submittals.		L1 & L2	1.5	1704.5	<input type="checkbox"/>	
D. Wood Construction						
1. Fabrication process of prefabricated wood structural elements and assemblies.				1704.6, 1704.2	<input type="checkbox"/>	
2. High-load diaphragms designed in accordance with Table 2306.3.2				1704.6.1, 1704.1	<input type="checkbox"/>	
E. Soils				1704.7	<input checked="" type="checkbox"/>	Drawing S001
F. Pile Foundations				1704.8	<input type="checkbox"/>	
G. Pier Foundations				1704.9	<input type="checkbox"/>	
H. Sprayed Fire-Resistant Materials						
1. Structural member surface conditions.				1704.10.1	<input type="checkbox"/>	
2. Application.				1704.10.2	<input type="checkbox"/>	
3. Thickness.			ASTM E 605	1704.10.3	<input type="checkbox"/>	
4. Density.			ASTM E 605	1704.10.4	<input type="checkbox"/>	
5. Bond strength.			ASTM E 736	1704.10.5	<input type="checkbox"/>	
I. Mastic and Intumescent Fire-Resistant Coatings				1704.11	<input type="checkbox"/>	
J. Exterior Insulation and Finish Systems (EIFS)				1704.12	<input type="checkbox"/>	
K. Special Cases				1704.13	<input type="checkbox"/>	
L. Smoke Control				1704.14	<input type="checkbox"/>	
M. Special Inspections for Seismic Resistance						
1. Structural steel.	X		AISC 341	1707.2	<input type="checkbox"/>	
2. Structural wood.	X			1707.3	<input type="checkbox"/>	
3. Cold-formed steel framing.		X		1707.4	<input type="checkbox"/>	
4. Pier Foundations.		X		1707.5	<input type="checkbox"/>	
5. Storage racks and access floors.		X		1707.6	<input type="checkbox"/>	

INSPECTION AND TESTING (Continuous & Periodic is as Defined by the BCNYS)	CONTINUOUS	PERIODIC	REFERENCE STANDARD	BCNYS REFERENCE	CHECK IF REQUIRED	IDENTIFY SPEC SECTION AND PROVIDE CLARIFYING NOTES IF NECESSARY
6. Architectural components.		X		1707.7	<input type="checkbox"/>	
7. Mechanical and electrical components.		X		1707.8	<input type="checkbox"/>	
8. Designated seismic system verifications				1707.9	<input type="checkbox"/>	
9. Seismic isolation system.		X		1707.10	<input type="checkbox"/>	
N. Structural Testing for Seismic Resistance						
1. Testing and verification of masonry materials and assemblies prior to construction.				1708.1	<input type="checkbox"/>	
2. Testing for seismic resistance.				1708.2	<input type="checkbox"/>	
3. Reinforcing and prestressing steel.			ACI 318	1708.3	<input type="checkbox"/>	
4. Structural steel.			AISC 341, AWS D1.1	1708.4	<input type="checkbox"/>	
5. Seismic qualification of mechanical and electrical equipment.				1708.5	<input type="checkbox"/>	
6. Seismically isolated structures.			Section 17.8 of ASCE 7	1708.6	<input type="checkbox"/>	
O. Structural Observations						
1. Seismic resistance.				1709.2	<input type="checkbox"/>	
2. Wind requirements.				1709.3	<input type="checkbox"/>	
P. Test Safe Load				1712	<input type="checkbox"/>	
Q. In-Situ Load Tests				1713	<input type="checkbox"/>	
R. Preconstruction Load Tests				1714	<input type="checkbox"/>	
S. Other (list)					<input type="checkbox"/>	

SECTION 014200 - REFERENCES

PART 1 - GENERAL

1.1 DEFINITIONS

- A. "Directed": Terms such as "accepted," "directed," "permitted," "requested," "authorized," "selected," "approved," "required," and "permitted" mean directed by Architect and/or Owner, requested by Architect and/or Owner, and similar phrases. However, no such implied meaning will be interpreted to extend the Architect's responsibility into the Contractor's area of construction supervision.
- B. "Indicated": The term "indicated" refers to graphic representations, notes, or schedules on Drawings; or to other paragraphs or schedules in Specifications and similar requirements in the Contract Documents. Terms such as "shown," "noted," "scheduled," and "specified" are used to help the user locate the reference.
- C. "Regulations": The term "regulations" includes laws, ordinances, statutes, rules, regulations 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.
- D. "Replace:" The term "replace" means remove designated, damaged, rejected, defective, unacceptable, or non- conforming work from the Project and provide new work meeting the requirements of the Contract Documents in place thereof.
- E. "Include:" The term "include" means in any form other than 'inclusive,' is non-limiting and is not intended to mean 'all-inclusive.'"
- F. "Installer": An installer is Contractor or another entity engaged by Contractor, as an employee, subcontractor, or contractor of lower tier, to perform a particular construction operation, including installation, erection, application, and similar operations.
- G. The term "experienced," when used with the term "installer," means having successfully completed a minimum of five years experience with previous projects similar in size and scope to this Project; being familiar with the special requirements indicated; and having complied with requirements of authorities having jurisdiction.
 - 1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.
- H. "Project site" is the space available for performing construction activities, either exclusively or in conjunction with others performing other work as part of Project. The extent of Project site is shown on the Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.2 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with standards in effect as of the date of the Contract Documents, unless otherwise indicated.
- C. Conflicting Requirements: Where compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect in writing for a decision before proceeding.
 - 1. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of the requirements. Refer uncertainties to Architect in writing for a decision before proceeding.
- D. Copies of Standards: Each entity engaged in construction on Project must be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
- E. Abbreviations and Names: Abbreviations and acronyms are frequently used in the Specifications and other Contract Documents to represent the name of a trade association, standards-developing organization, authorities having jurisdiction, or other entity in the context of referencing a standard or publication. Where abbreviations and acronyms are used in the Specifications or other Contract Documents, they mean the recognized name of these entities. Refer to Gale Research's "Encyclopedia of Associations" or Columbia Books' "National Trade & Professional Associations of the U.S.," which are available in most libraries.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes requirements for temporary facilities and controls, including temporary utilities, support facilities, and security and protection facilities.
- B. Temporary utilities include, but are not limited to, the following:
 - 1. Water service and distribution.
 - 2. Sanitary facilities, including toilets, wash facilities, and drinking-water facilities..
- C. Support facilities include, but are not limited to, the following:
 - 1. Project temporary signs.
 - 2. Waste disposal facilities.
 - 3. Field offices.
 - 4. Storage and fabrication sheds.
 - 5. Staging areas.
 - 6. Construction aids and miscellaneous services and facilities.
- D. Security and protection facilities include, but are not limited to, the following:
 - 1. Environmental protection.
 - 2. Tree and plant protection.
 - 3. Site enclosure fence.
 - 4. Security enclosure and lockup.
 - 5. Barricades, warning signs, and lights.
- E. Related Sections include the following:
 - 1. Division 01 Section "Summary".
 - 2. Division 01 Section "Submittal Procedures" for procedures for submitting copies of implementation and termination schedule and utility reports.
 - 3. Division 01 Section "Execution Requirements" for progress cleaning requirements.

1.2 USE CHARGES

- A. General: Cost or use charges for temporary facilities are not chargeable to Owner, Architect or Architect and shall be included in the Contract Sum, unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, the following:
 - 1. Other Contractors.
 - 2. Owner's construction forces.

3. Occupants of Project.
 4. Architect.
 5. Testing agencies.
 6. Personnel of authorities having jurisdiction.
- B. Water Service: Use water from the Owner's existing water system without metering and without payment of use charges. Access to water shall be approved by the Owner and shall not be abused.
- C. Electric Power Service: Use of electric power from the Owner's permanent power system will be granted to Contractor without payment of use charges.
- D. Municipal Sewer Service Use Charges: Non applicable

1.3 SUBMITTALS

- A. Temporary Utility Reports: Contractor shall submit reports of tests, inspections, meter readings, and similar procedures performed on temporary utilities.
- B. Implementation and Termination Schedules: Within 15 days of the date established for submittal of the Contractor's Construction Schedule, Contractor shall submit a schedule indicating implementation and termination of each temporary utility for which the Contractor is responsible.
- C. Dust- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Identify further options if proposed measures are later determined to be inadequate. Include the following:
1. Locations of dust-control partitions at each phase of work.
 2. HVAC system isolation schematic drawing.
 3. Location of proposed air-filtration system discharge.
 4. Waste handling procedures.
 5. Other dust-control measures.

1.4 QUALITY ASSURANCE

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

1.5 PROJECT CONDITIONS

- A. Temporary Utilities: Each Contractor shall prepare a schedule indicating dates for implementation and termination of each temporary utility for which the Contractor is responsible. At the earliest feasible time or unless otherwise noted, when acceptable to the Owner, change over from use of temporary service to use of permanent service.
 - 1. Temporary Use of Permanent Facilities: Installer of each permanent service shall assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.
- B. Conditions of Use: The following conditions apply to use of temporary services and facilities by all parties engaged in the Work:
 - 1. Keep temporary services and facilities clean and neat.
 - 2. Relocate temporary services and facilities as required by progress of the Work.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Provide new materials. Undamaged, previously used materials in serviceable condition may be used if approved by Architect and the Owner. Provide materials suitable for use intended.
- B. Water: Potable.

2.2 EQUIPMENT

- A. General: Provide equipment suitable for use intended.
- B. Field Offices: Mobile units with lockable entrances, operable windows, and serviceable finishes; heated and air conditioned; on foundations adequate for normal loading. May not be installed without prior written permission of Owner.
- C. Fire Extinguishers: Hand carried, portable, UL rated. Provide class and extinguishing agent as indicated or a combination of extinguishers of NFPA-recommended classes for exposures.
 - 1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.
- D. Self-Contained Toilet Units: Single-occupant units of chemical, aerated recirculation, or combustion type; vented; fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material.

- E. Water Hoses: Provide $\frac{3}{4}$ 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 a hose discharge.
- F. Electrical Outlets: Properly configured, NEMA-polarized outlets to prevent insertion of 110- to 120-V plugs into higher-voltage outlets; equipped with ground-fault circuit interrupters, reset button, and pilot light.
- G. Power Distribution System Circuits: Where permitted and overhead and exposed for surveillance, wiring circuits, not exceeding 125-V ac, 20-A rating, and lighting circuits may be nonmetallic sheathed cable.
- H. Electrical Power Cords: Provide grounded extension cords. Use hard-service cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage ratio.
- I. 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.
- J. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
 - 1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
 - 2. Heating Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Use qualified personnel for installation of temporary facilities. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Prior approval must be received by the Owner. Relocate and modify facilities as required.
- B. Contractor shall provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

- A. General: Engage appropriate local utility company to install temporary service or connect to existing service. Where utility company provides only part of the service, provide the

remainder with matching, compatible materials and equipment. Comply with utility company recommendations.

1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
 2. Provide adequate capacity at each stage of construction. Before temporary utility is available, provide trucked-in services.
 3. Obtain easements to bring temporary utilities to Project site where Owner's easements cannot be used for that purpose.
- B. Water Service: Use of Owner's existing water service facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
1. Provide and maintain temporary water service including water distribution as to provide service to all areas of construction activities as directed by the Architect, as required throughout the construction period. Water service shall be portable and modified as required or as directed by the Architect as work progressed.
 2. Users shall provide their own hoses to points of need, but shall practice prudent conservation.
 3. The Owner shall pay for water consumption for construction activities. The contractor shall pay for water consumption for irrigation for turf establishment.
- C. General Contractor shall provide temporary portable chemical toilet facilities for all construction personnel in amounts as required by codes and regulations, and shall maintain, service and clean these facilities for the duration of the project.
1. Disposable Supplies: Provide toilet tissue, paper towels, paper cups, and similar disposable materials for each facility. Maintain adequate supply. Provide covered waste containers for disposal of used material.
 2. Toilets: Install self-contained toilet units. Shield toilets to ensure privacy. Provide separate facilities for male and female personnel.
 3. Wash Facilities: Install wash facilities supplied with potable water at convenient locations for personnel who handle materials that require wash up. Dispose of drainage properly. Supply cleaning compounds appropriate for each type of material handled.
- D. Temporary Electric Service: Unless noted otherwise, Electrical Contractor shall provide and maintain temporary electric service consisting of main power hook-up and panel board. Provide a pedestal, meter, switchgear and distribution panel located per logistics plan for office trailers. Temporary service shall be maintained during all work days, and shall comply with all codes and regulations. System shall be modified as required or as directed by the Architect as work progresses. Contractor shall provide electrical power cords from panel.
1. Each Contractor shall provide his own extension lines, and other special equipment; welding equipment shall run from generators.

2. If practical, power to each location shall be tapped at main distribution panel, ahead of main breakers to minimize demand on service equipment from school operations. Overcurrent protection shall be installed as required.
 3. Contractor shall be responsible for initial connections and final demolition of all temporary fixtures and wiring at direction of the Architect.
 4. Contractor shall maintain OSHA standards for power and foot candle levels in all areas while workers occupy the space. The temporary lighting shall be energized daily at 6:50 A.M. to 4:35 P.M. as a minimum duration until permanent fixtures are installed.
 5. Contractors will be responsible for hookup of their own project trailers. Use of energy, including heat (shall be set back at night) if practical from Owner's electric service will be available. If abused, power from temporary service will be disconnected. Contractor shall erect poles safely sufficient for site power. All installations shall conform to strictest standards. The Contractor shall disconnect all items upon project completion.
 6. Lighting: Provide temporary lighting that provides adequate illumination for construction operations and traffic conditions.
 - a. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
 - b. Provide one 100-W incandescent lamp per 500 sq. ft. (45 sq. m), uniformly distributed, for general lighting, or equivalent illumination.
 - c. Provide one 100-W incandescent lamp every 50 feet (15 m) in traffic areas.
 - d. Temporary lighting shall be controlled by time clocks and lighting contractors; settings to be coordinated by the Architect.
- E. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
- F. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.
1. Prior to commencing work, isolate the HVAC system in area where work is to be performed according to coordination drawings.
 - a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.
 - b. Maintain negative air pressure within work area using HEPA-equipped air-filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.
 2. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust-containment devices.
 3. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.
- G. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed

construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.

1. Provide dehumidification systems when required to reduce substrate moisture levels to level required to allow installation or application of finishes

3.3 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

1. Locate field offices, storage sheds, sanitary facilities, and other temporary construction and support facilities for each access as designated by the Architect.
2. Provide incombustible construction for offices, shops, and sheds. Comply with NFPA 241.
3. Maintain support facilities until near Substantial Completion. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Contractor Parking/ Staging Area: Maintain access for suitable parking areas as indicated on Site plans. Re-grade and re-seed store any areas disturbed by parking/ staging.

1. Temporary parking by construction personnel shall be allowed only in areas so designated. Owner will permit only one vehicle per Contract to be parked on site; other construction vehicles may be parked where directed by Architect. Owner does not have space for construction parking in existing parking lots or roadways and will subsequently have vehicles in violation of parking prohibitions towed from site and back-charged with all fees to the Contractor.
2. Traffic Regulations:
 - a. Access through Owner's entrances shall be limited
 - b. Utilize only entrances/access roads as designated
 - c. Maintain all Owner's traffic regulations
 - d. Construction parking will not be allowed adjacent to school.

C. Traffic Controls: General Contractor shall provide temporary traffic controls at junction of temporary roads with public roads. Include warning signs for public traffic and "STOP" signs for entrance onto public roads. Comply with requirements of authorities having jurisdiction.

D. Temporary Site Safety and Directional Signs: General Contractor shall provide signs in sizes required for legibility or as indicated. Install signs where required or indicated to inform public and persons seeking entrance to Project.

1. Prepare temporary signs to provide directional information to construction personnel and visitors.
2. Paint sign panel and applied graphics with exterior-grade alkyd gloss enamel over exterior primer. Engage an experienced sign painter or fabricator to apply graphics; hand paint sign.

3. Include relocating temporary site safety and directional signs as many times as required or directed.
 4. Furnish and install construction signage as required.
- E. Waste Disposal Facilities: Each Prime Contractor shall provide waste-collection containers in sizes adequate to handle waste from their own construction operations. Containerize and clearly label hazardous, dangerous, or unsanitary waste materials separately from other waste. Comply with Division 01 Section "Execution Requirements" for progress cleaning requirements.
1. If required by authorities having jurisdiction, provide separate containers, clearly labeled, for each type of waste material to be deposited.
 2. Develop a waste management plan for Work performed on Project. Indicate types of waste materials Project will produce and estimate quantities of each type. Provide detailed information for on-site waste storage and separation of recyclable materials. Provide information on destination of each type of waste material and means to be used to dispose of all waste materials.
 3. Do not hold materials more than 3 days during normal weather or 1 day when the temperature is expected to rise above 80°F (27°C). Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material lawfully.
 4. Provide from project start to completion date, a minimum of 2 dumpster boxes to be a minimum size of 30 cubic yards. Remove dumpsters within 2 hours of being full and haul off site to a legal dumpsite. Pay all costs associated with providing the dumpsters and removing project debris from the job site.
 5. The maintenance of a clean work site shall be the responsibility of each contractor.
 6. Remove own debris daily from work area to waste disposal containers (dumpsters), time lapse not acceptable.
 7. The condition of cleanliness in which an area is found, is the condition each Contractor shall leave.
 8. Each and every Contractor working on site shall submit manpower on Friday at 8 A.M. to work as a team to remove debris to dumpsters until complete. At discretion of Architect, a Contractor not complying may be back-charged for work performed by others. The responsibility of broom cleaning and debris disposal remains with the Contractor and shall include use of sweeping compound.
 9. Final cleaning shall be the responsibility of each contractor for his/her own work.
- F. Field Offices: General Contractor shall provide an insulated, weathertight, air-conditioned field office for use as a common facility by all personnel engaged in construction activities; of sufficient size to accommodate required office personnel and meetings of 10 persons at Project site. Keep office clean and orderly
1. Janitorial Services: Provide janitorial services on a weekly basis for temporary office.
 2. Furnish and equip offices as follows:
 - a. Desk and four chairs, four-drawer file cabinet, a plan table, a plan rack, and bookcase.

- b. Provide a room of not less than 240 sq. ft. (22.5 sq. m) for Project meetings. Furnish room with conference table, 12 folding chairs, and 4-foot- (1.2-m-) square tack board.
 - 3. Provide resilient floor covering and painted gypsum wallboard walls and acoustical ceiling. Provide operable windows with adjustable blinds and insect screens.
 - 4. Provide an electric heater with thermostat capable of maintaining a uniform indoor temperature of 68 deg F (20 deg C). Provide an air-conditioning unit capable of maintaining an indoor temperature of 72 deg F (23 deg C).
 - 5. Provide fluorescent light fixtures capable of maintaining average illumination of 20 fc (215 lx) at desk height. Provide 110- to 120-V duplex outlets spaced at not more than 12-foot (4-m) intervals, 1 per wall in each room.
- G. Storage and Fabrication Trailers: Each Prime Contractor shall be permitted to provide one trailer sized, furnished, and equipped to accommodate materials and equipment involved, including temporary utility services.
- H. Existing Elevator Use: Use of Owner's existing elevators will be permitted, provided elevators are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore elevators to condition existing before initial use, including replacing worn cables, guide shoes, and similar items of limited life.
- 1. Do not load elevators beyond their rated weight capacity.
 - 2. Provide protective coverings, barriers, devices, signs, or other procedures to protect elevator car and entrance doors and frame. If, despite such protection, elevators become damaged, engage elevator Installer to restore damaged work so no evidence remains of correction work. Return items that cannot be refinished in field to the shop, make required repairs and refinish entire unit, or provide new units as required.
- I. Existing Stair Usage: Use of Owner's existing stairs will be permitted, provided stairs are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore stairs to condition existing before initial use.
- 1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If stairs become damaged, restore damaged areas so no evidence remains of correction work.
- 3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION
- A. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion, except as permitted by the C.M.
 - B. Environmental Protection: Contractors shall provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects. Avoid using tools and equipment

that produce harmful noise. Restrict use of noisemaking tools and equipment to hours that will minimize complaints from persons or firms near Project site.

- C. Tree and Plant Protection: General Contractor shall install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from construction damage. Protect tree root systems from damage, flooding, and erosion.
- D. Site Enclosure Fence: General Contractor shall provide temporary chain-link fence 6'-0" high with posts 8'-0" on center. Locate around staging area. Comply with details on drawings. Provide double swing access gates and man gates at site entrances and elsewhere as required. Each gate is to have a chain and padlock. Provide (2) keys for each lock to the Architect. Remove fence upon completion of all exterior activities or sooner if directed by Architect.
 - 1. Before construction operations begin, install chain-link enclosure fence with lockable entrance gates. Locate where indicated. Install in a manner that will prevent people, dogs, and other animals from easily entering site except by entrance gates.
 - 2. Set fence posts in compacted mixture of gravel and earth or in concrete bases.
 - 3. Provide gates in sizes and at locations necessary to accommodate delivery vehicles and other construction operations.
 - 4. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Provide Owner with one set of keys.
- E. Barricades, Warning Signs, and Lights: Comply with standards and code requirements for erecting structurally adequate barricades. Paint with appropriate colors, graphics, and warning signs to inform personnel and public of possible hazard. Where appropriate and needed, provide lighting, including flashing red or amber lights.
- F. Temporary closures for specific openings for a contractor to perform their work are the responsibility of contractor creating the opening and shall be installed to protect building from exterior elements. Provide temporary closures for chases and areas which involve multiple trade work.
- G. Areas of Special Protection
 - 1. Operations of the Contractor or their subcontractors may not block, hinder, impede, or otherwise inhibit the safe and expeditious exiting of the building's occupants during an emergency.
 - 2. In the event of an emergency (designated by the sounding of the fire alarm system) all construction activities must immediately cease. Contractor's work force will evacuate themselves from work areas and remain outside of work areas until the "all clear" is given. No work operations will be tolerated during the evacuation of the building or during an emergency.
- H. Temporary Fire Protection: Until fire-protection needs are supplied by permanent facilities, install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.
 - 1. Furnish temporary fire protection in the course of performing their own work.

2. General contractor shall furnish and maintain per OSHA standards, a fire extinguisher at all stair wells, temporary means of egress and any necessary locations.
 3. There shall be no smoking allowed in construction work areas, existing School facilities, or on School grounds.
 4. General contractor shall provide fire extinguishers, installed on walls on mounting brackets, visible and accessible from space being served, with sign mounted above.
 - a. Field Offices: Class A stored-pressure water-type extinguishers.
 - b. Other Locations: Class ABC dry-chemical extinguishers or a combination of extinguishers of NFPA-recommended classes for exposures.
 - c. Locate fire extinguishers where convenient and effective for their intended purpose; provide not less than one extinguisher on each floor at or near each usable stairwell.
 5. Store combustible materials in containers in fire-safe locations.
 6. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire-protection facilities, stairways, and other access routes for firefighting. Prohibit smoking in hazardous fire-exposure areas.
 7. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition.
 8. Permanent Fire Protection: At earliest feasible date in each area of Project, complete installation of permanent fire-protection facility, including connected services, place into operation and use when approved by the Architect. Instruct key personnel on use of facilities.
 9. Develop and supervise an overall fire-prevention and first-aid fire-protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
- I. Protection of Work: Temporarily protect work in place until accepted by the Owner in accordance with the General Conditions of the Contract.
1. Where construction operations on roof do not require removal of existing roofing system, apply roof protection to all roof areas in work area and to approved access route to work area.
- J. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner from fumes and noise.
1. Construct dustproof partitions with two layers of 6-mil (0.14-mm) polyethylene sheet on each side. Cover floor with two layers of 6-mil (0.14-mm) polyethylene sheet, extending sheets 18 inches (460 mm) up the sidewalls. Overlap and tape full length of joints. Cover floor with fire-retardant-treated plywood.
 - a. Construct vestibule and airlock at each entrance through temporary partition with not less than 48 inches (1219 mm) between doors. Maintain water-dampened foot mats in vestibule.

2. Where fire-resistance-rated temporary partitions are indicated or are required by authorities having jurisdiction, construct partitions according to the rated assemblies.
 3. Insulate partitions to control noise transmission to occupied areas.
 4. Seal joints and perimeter. Equip partitions with gasketed dustproof doors and security locks where openings are required.
 5. Protect air-handling equipment.
 6. Provide walk-off mats at each entrance through temporary partition.
- K. Covered Walkway: Erect protective, covered walkway for passage of individuals through building entrances and exits where work is being performed overhead.
1. Construct covered walkways using scaffold or shoring framing.
 2. Provide overhead decking, protective enclosure walls, handrails, barricades, warning signs, exit signs, lights, safe and well-drained walkways, and similar provisions for protection and safe passage.

3.5 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage caused by freezing temperatures and similar elements.
- C. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
1. Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.
- D. Temporary Facility Changeover: Except for using permanent fire protection as soon as available, do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- E. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
1. Materials and facilities that constitute temporary facilities are the property of Contractor. Owner reserves right to take possession of Project identification signs.
 2. Remove temporary paving not intended for or acceptable for integration into permanent paving. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds,

and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.

3. At Substantial Completion, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements in Division 01 Section "Closeout Procedures."

END OF SECTION 015000

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.
- B. Related Requirements:
 - 1. Section 012300 "Alternates" for products selected under an alternate.
 - 2. Section 012500 "Substitution Procedures" for requests for substitutions.
 - 3. Section 014200 "References" for applicable industry standards for products specified.

1.2 DEFINITIONS

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

1.3 ACTION SUBMITTALS

- A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.

2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

- a. Form of Approval: As specified in Section 013300 "Submittal Procedures."
- b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

- B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 013300 "Submittal Procedures." Show compliance with requirements.

1.4 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.
 1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
 2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.
- B. Mechanical Materials and Equipment: When two or more items of same material or equipment are required (pumps, valves, air conditioning units, etc.), they shall be of the same manufacturer. Product manufacturer uniformity does not apply to raw materials, bulk materials, pipe, tube, fittings (except flanged and grooved types), sheet metal, wire, steel bar stock, welding rods, solder, fasteners, motors for dissimilar equipment units, and similar items used in the work, except as otherwise indicated. Provide products which are compatible within systems and other connected items.
- C. Asbestos in Materials: All products submitted for use and incorporated into this project shall be asbestos free.
- D. Mercury-Free Products: All products submitted for use and incorporated into this Project shall be mercury-free. In the absence of mercury-free products, provide products with the lowest amount of mercury possible.
- E. Lead-Free Products: All products submitted for use and incorporated into this Project shall be lead-free. .

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.
- B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.
7. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.6 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
 2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.
1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
 3. See other Sections for specific content requirements and particular requirements for submitting special warranties.

- C. Submittal Time: Comply with requirements in Section 017700 "Project Closeout."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
6. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.
7. A named product and model number establishes the characteristics and salient features of the specifications even when they are not fully described and will serve as the basis of comparison.
8. Whenever a material, article, device, piece of equipment or type of construction is identified by reference to manufacturers' or vendors' names, trade names, catalog numbers, or similar specific information, it is so identified for the purpose of establishing a standard of quality, and such identification shall not be construed as limiting competition. Comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product

- B. Product Selection Procedures:

1. Named Product: Where Specifications name a single manufacturer and product, and "no substitutions" is indicated, provide the named product. Comparable products or substitutions for Contractor's convenience will not be considered.
2. Named Manufacturer/Source: Where Specifications name a single manufacturer or source and "no substitutions" is indicated, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
3. Products: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.
4. Manufacturers: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with

requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product

5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.
- C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
- D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

- A. Conditions for Consideration: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:
 1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
 2. Evidence that the proposed product provides sustainable design characteristics that specified product provides for achieving LEED prerequisites and credits.
 3. Evidence that the proposed product will not adversely affect Contractor's construction schedule.
 4. Evidence that the proposed product has received necessary approvals of authorities having jurisdiction.
 5. Evidence that the proposed product will have no adverse effect on other trades and will not affect or delay progress schedule; or if proposed product involves more than one contractor, proposed product has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
 6. Evidence that the proposed product maintenance service and source of replacement parts, as applicable, is available similar to the specified product.
 7. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 8. Evidence that proposed product provides specified warranty.
 9. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.

10. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

SECTION 017000 - EXECUTION REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. General installation of products.
 - 2. Starting and adjusting.
 - 3. Progress cleaning.
 - 4. Protection of installed construction.
 - 5. Correction of the Work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

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

- b. List of detrimental conditions, including substrates.
 - c. List of unacceptable installation tolerances.
 - d. Recommended corrections.
2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
4. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
5. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

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

3.3 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 1. Make vertical work plumb and make horizontal work level.

2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
4. Maintain maximum headroom clearance in spaces without a suspended ceiling.

B. Mechanical Installations: Comply with the following requirements:

1. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.
2. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.
3. Install mechanical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations. Extend grease fittings to an accessible location.

C. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

D. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

E. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

G. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.

H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.4 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 2. Do not hold materials more than 3 days during normal weather or 1 day if the temperature is expected to rise above 80 deg F (27 deg C).
 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
1. Remove liquid spills promptly.
 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Cutting and Patching: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.
1. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged pipe covering to its original condition.
- H. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.
- I. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- J. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- K. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.5 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Divisions 02 - 49 Section.

3.6 PROTECTION OF INSTALLED CONSTRUCTION

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

3.7 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 01 Section "Cutting and Patching."
 - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Restore permanent facilities used during construction to their specified condition.
- C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
- E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 017000

SECTION 017310 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes procedural requirements for cutting and patching.
- B. Related Sections include the following:
 - 1. Division 01 Section "Selective Demolition" for demolition of selected portions of the site for alterations.
 - 2. Divisions 02 through 49 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.
 - a. Requirements in this Section apply to mechanical and electrical installations. Refer to Divisions 21 through 26 Sections for other requirements and limitations applicable to cutting and patching mechanical and electrical installations.
- C. Coordinate cutting and patching requirements with selective demolition. Removal of portions of existing construction required for the installation or performance of other work may be indicated as selective demolition on the demolition drawings. Cut and patch all construction when not shown on the demolition drawings, or when additional cutting and patching is required after the completion of selective demolition.

1.2 DEFINITIONS

- A. Cutting: Removal of existing construction necessary to permit installation or performance of other Work.
- B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.3 SUBMITTALS

- A. Cutting and Patching Proposal: Where approval of procedures for cutting and patching is required before proceeding (see Article 1.4 below), submit a proposal describing procedures at least 14 days before the time cutting and patching will be performed requesting approval to proceed. Include the following information, as applicable, in the proposal:
 - 1. Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.
 - 2. Changes to Existing Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.

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

1.4 QUALITY ASSURANCE

- A. Minimize cutting and patching of work by properly coordinating construction sequences with Architect.
- B. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.
 1. Obtain Architect's approval before cutting and patching any structural work that is not indicated on drawings.
- C. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
 1. Obtain Architect's approval before cutting and patching any operational element that is not indicated on drawings.
- D. Miscellaneous Elements: Do not cut and patch the following elements or related components, that are not indicated on drawings, in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
 1. Water, moisture, or vapor barriers.
 2. Membranes and flashings.
 3. Exterior curtain-wall construction.
 4. Equipment supports.
 5. Piping, ductwork, vessels, and equipment.
 6. Noise- and vibration-control elements and systems.
- E. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections of these Specifications.
- B. Existing Materials: Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
 - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of existing materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
 - 1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
 - 2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Temporary Support: Provide temporary support of Work to be cut.
- B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- D. Existing Services: Where existing services are required to be removed, relocated, or abandoned, bypass such services before cutting to avoid interruption of services to occupied areas.

3.3 PERFORMANCE

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 - 1. Cut existing construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

- B. Cutting: Cut existing construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 2. Existing Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 4. Excavating and Backfilling: Comply with requirements in applicable Division 2 Sections where required by cutting and patching operations.
 5. Mechanical and Electrical Services: By-pass utility services such as pipe or conduit, before cutting, where services are shown or required to be removed, relocated or abandoned. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 6. Proceed with patching after construction operations requiring cutting are complete.
- C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections of these Specifications.
1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
 4. Ceilings: Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.
 5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

3.4 CLEANING

- A. Thoroughly clean areas and spaces where cutting and patching is performed or used as access. Remove completely paint, mortar, oils, putty and items of similar nature. Thoroughly clean piping, conduit and similar features before painting or other finishing is applied. Restore damaged pipe covering to its original condition.

END OF SECTION 017310

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Inspection procedures.
 - 2. Project Record Documents.
 - 3. Operation and maintenance manuals.
 - 4. Warranties.
 - 5. Instruction of Owner's personnel.
 - 6. Final cleaning.
- B. Related Sections include, but are not limited, to the following:
 - 1. Division 01 Section "Payment Procedures" for requirements for Applications for Payment for Substantial and Final Completion.
 - 2. Division 01 Section "Execution Requirements" for progress cleaning of Project site.
 - 3. Divisions 02 through 49 Sections for specific closeout and special cleaning requirements for products of those Sections.

1.2 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.
 - 1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
 - 2. Advise Owner of pending insurance changeover requirements.
 - 3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 5. Prepare and submit Project Record Documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
 - 6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
 - 7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 - 8. Complete startup testing of systems.
 - 9. Submit test/adjust/balance records.
 - 10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.

11. Advise Owner of changeover in heat and other utilities.
12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
13. Complete final cleaning requirements, including touchup painting.
14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

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

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected
 - a. Reinspection Limits: The Architect is limited to performing the original inspection and two reinspections of the same area as part of their services. The cost of any reinspections required beyond this amount will be borne by the Contractor. Contractor shall reimburse Owner for reinspection fees paid to the Architect through a credit change order in the amount stipulated by the Owner.
2. Results of completed inspection will form the basis of requirements for Final Completion.

1.3 FINAL COMPLETION

- A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:
1. Submit a final Application for Payment according to Division 01 Section "Payment Procedures;" include all required attachments and supporting documents.
 2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 4. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training videotapes.
- B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
 - a. Reinspection Limits: The Architect is limited to performing the original inspection and two reinspections of the same area as part of their services. The cost of any reinspections required beyond this amount will be borne by the Contractor. Contractor shall reimburse Owner for reinspection fees paid to the Architect and/or Architect through a credit change order in the amount stipulated by the Owner.

1.4 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

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

1.5 PROJECT RECORD DOCUMENTS

- A. General: Do not use Project Record Documents for construction purposes. Protect Project Record Documents from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours. Submit to Architect at Substantial Completion of the Work.
- B. Record Drawings: Maintain and submit one set of blue- or black-line white prints of Contract Drawings and Shop Drawings.
 1. Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
 - a. Give particular attention to information on concealed elements that cannot be readily identified and recorded later.
 - b. Accurately record information in an understandable drawing technique.
 - c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.

- d. Mark Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. Where Shop Drawings are marked, show cross-reference on Contract Drawings.
 2. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at the same location.
 3. Mark important additional information that was either shown schematically or omitted from original Drawings.
 4. Note Construction Change Directive numbers, Change Order numbers, alternate numbers, and similar identification where applicable.
 5. Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location. Organize into manageable sets; bind each set with durable paper cover sheets. Include identification on cover sheets.
 6. In addition to submitting paper Record Drawings, transfer information to electronic CAD drawings in .DXF format and prepare set of digital record drawings. Architect will supply a set of base electronic drawings for Contractor's use. Submit electronic Record Drawings to Owner in same manner as paper Record Drawings.
 7. The following certification shall appear on all Record Drawings:
"These record drawings prepared by _____ for the following work _____ have been reviewed by the undersigned and ***appear to be an accurate representation of the work incorporated within the project and are accepted as submitted in accordance with the technical documents.*** This record document review made by this office is for determination of compliance with the requirements of the contract documents.
Firm Name: _____ Date: _____ Reviewer Name: _____
 8. If the Owner or Architect determines the Record Drawings are not complete or contain inaccurate information, they will return the documents to the Contractor for correction and resubmission.
 9. Final payment will not be made to Contractor until complete and accurate Record Drawings both on paper and electronic media have been received and accepted by Owner.
- C. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications. Mark copy to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
 3. Note related Change Orders, Record Drawings, and Product Data, where applicable.
- D. Record Product Data: Submit one copy of each Product Data submittal. Mark one set to indicate the actual product installation where installation varies substantially from that indicated in Product Data.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders, Record Drawings where applicable.

- E. Miscellaneous Record Submittals: Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

1.6 OPERATION AND MAINTENANCE MANUALS

- A. Assemble a three complete sets of operation and maintenance data indicating the operation and maintenance of each system, subsystem, and piece of equipment not part of a system. Include operation and maintenance data required in individual Specification Sections and as follows:

1. Operation Data:

- a. Emergency instructions and procedures.
- b. System, subsystem, and equipment descriptions, including operating standards.
- c. Performance curves, engineering data and tests.
- d. Operating procedures, including startup, shutdown, seasonal, and weekend operations.
- e. Description of controls and sequence of operations.
- f. Piping diagrams.

2. Maintenance Data:

- a. Manufacturer's information, including list of spare parts.
- b. Name, address, and telephone number of Installer or supplier.
- c. Maintenance procedures.
- d. Maintenance and service schedules for preventive and routine maintenance; disassembly, repair, and reassembly; aligning and adjusting instructions; servicing instructions and lubrication charts and schedules.
- e. Complete nomenclature and commercial numbers of replaceable parts.
- f. Maintenance record forms.
- g. Wiring diagrams.
- h. Inspection procedures.
- i. Sources of spare parts and maintenance materials.
- j. Copies of maintenance service agreements.
- k. Copies of warranties and bonds.
- l. Fixture lamping schedule.

- B. Organize operation and maintenance manuals into suitable sets of manageable size. Bind and index data in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, with pocket inside the covers to receive folded

oversized sheets. Identify each binder on front and spine with the printed title "OPERATION AND MAINTENANCE MANUAL," Project name, and subject matter of contents.

1.7 WARRANTIES

- A. Submittal Time: Submit three written copies of warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.
- B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
 - 1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (115-by-280-mm) paper.
 - 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 - 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
- C. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

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

PART 3 - EXECUTION

3.1 DEMONSTRATION AND TRAINING

- A. Instruction: Instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
 - 1. Provide instructors experienced in operation and maintenance procedures.
 - 2. Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at the start of each season.
 - 3. Schedule training with Owner, through Architect with at least seven days' advance notice.

4. Coordinate instructors, including providing notification of dates, times, length of instruction, and course content.
- B. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections. For each training module, develop a learning objective and teaching outline. Include review and instruction for the following:
1. Maintenance manuals.
 2. Record documents.
 3. Spare parts and materials.
 4. Tools.
 5. Lubricants.
 6. Fuels.
 7. Identification systems.
 8. Control sequences.
 9. Hazards.
 10. Cleaning.
 11. Warranties and bonds.
 12. Maintenance agreements and similar continuing commitments.
 13. Operations.
 14. Adjustments.
 15. Troubleshooting.
 16. Maintenance.
 17. Repair.
- C. As part of instruction for operating equipment, demonstrate the following procedures:
1. Start-up.
 2. Shutdown.
 3. Emergency operations.
 4. Noise and vibration adjustments.
 5. Safety procedures.
 6. Economy and efficiency adjustments.
 7. Effective energy utilization.
- D. Provide operating and maintenance instruction to Owner's personnel for following systems and equipment, with minimum instruction periods, comprised of approximately 50 percent classroom instruction and 50 percent "hands-on" instruction, as follows:
- | Systems and Equipment | Training Time |
|--|---------------|
| 1. Miscellaneous Items (as directed) | 6 Hr. |
- E. Prepare written agenda for each session and submit for review and possible modification. Include date, location, purpose, specific scope, proposed attendance, and duration.
- F. Video tape, in VHS format, hands-on training sessions and classroom instruction periods. No special effects are required.

3.2 FINAL CLEANING

- A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
 - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - c. Remove labels that are not permanent.
 - d. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
 - 1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
 - e. Replace parts subject to unusual operating conditions.
 - f. Leave Project clean and ready for occupancy.
 - g. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - h. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 - i. Remove snow and ice to provide safe access to building.
 - j. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - k. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - l. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
 - m. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - n. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.

- o. Clean ducts, blowers, and coils if units were operated without filters during construction.
 - p. Wipe surfaces of HVAC equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - q. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - r. Wipe surfaces of plumbing equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - s. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
 - t. Wipe surfaces of electrical equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
- C. Removal of Protection: Remove temporary protection and facilities installed for protection of the Work during construction.
- D. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION 017700

SECTION 024119 - SELECTIVE STRUCTURE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Demolition and removal of selected portions of a building or structure.
2. Salvage of selected building components and elements.
3. Repair procedures for selective demolition operations.

B. Related Sections include the following:

1. Division 01 General Requirements for temporary construction and environmental-protection measures for selective demolition operations.
2. Division 01 General Requirements for cutting and patching procedures for selective demolition operations.

1.2 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.
- B. Remove and Salvage: Detach items from existing construction and deliver them to Owner ready for reuse.
- C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.
- D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.3 MATERIALS OWNERSHIP

- A. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, demolished materials shall become Contractor's property and shall be removed from Project site.

1.4 SUBMITTALS

- A. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

- B. Proposed Dust-Control, Noise-Control and Other Special Measures: Submit statement or drawing that indicates the measures proposed for use, proposed locations, and proposed time frame for their operation. Identify options if proposed measures are later determined to be inadequate.
- C. Schedule of Selective Demolition Activities: Indicate the following:
 - 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
 - 2. Interruption of utility services.
 - 3. Coordination for shutoff, capping, and continuation of utility services.
- D. Inventory: After selective demolition is complete, submit a list of items that have been removed and salvaged.
- E. Predemolition Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by selective demolition operations. Submit before Work begins.

1.5 QUALITY ASSURANCE

- A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.
- B. Professional Engineer Qualifications: Comply with Division 01 General Requirements.
- C. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- D. Standards: Comply with ANSI A10.6 and NFPA 241.
- E. Predemolition Conference: Conduct conference at Project site to comply with requirements in Division 01 General Requirements.

1.6 PROJECT CONDITIONS

- A. Owner will occupy portions of site and buildings immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted. Provide not less than 2 weeks' notice to Owner of activities that will affect Owner's operations.
- B. Owner may elect to salvage certain items from areas of construction other than those indicated on Drawings as "salvage" prior to selective demolition operations. Give 2 weeks notice to Owner prior to commencing any selective demolition processes to allow for Owner salvage operations.

- C. Maintain access to existing walkways, roadways, and other adjacent occupied or used facilities.
 - 1. Do not close or obstruct walkways, roadways, or other occupied or used facilities without written permission from authorities having jurisdiction.
- D. Owner assumes no responsibility for condition of areas to be selectively demolished.
 - 1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- E. Hazardous Materials: It is not expected that asbestos containing materials will be encountered in the areas of the Work. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner.
 - 1. A hazardous materials report is included in the Specifications for information only.
- F. Storage or sale of removed items or materials on-site will not be permitted.
- G. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

PART 2 - PRODUCTS

2.1 REPAIR MATERIALS

- A. Use repair materials identical to existing materials.
 - 1. If identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
 - 2. Use materials whose installed performance equals or surpasses that of existing materials.
- B. Comply with material and installation requirements specified in individual Specification Sections.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped.
- B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

- C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.
- D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.
- E. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.2 UTILITY SERVICES

- A. Existing Utilities: Maintain services indicated to remain and protect them against damage during selective demolition operations.
- B. Do not interrupt existing utilities serving occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and to authorities having jurisdiction.
 - 1. Provide at least 2 weeks' notice to Owner if shutdown of service is required during changeover.
- C. Utility Requirements: Locate, identify, disconnect, and seal or cap off indicated utilities serving areas to be selectively demolished.
 - 1. Arrange to shut off indicated utilities with utility companies.
 - 2. If utility services are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary utilities that bypass area of selective demolition and that maintain continuity of service to other parts of building.
 - 3. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.
 - 4. Do not start selective demolition work until utility disconnecting and sealing have been completed and verified in writing.

3.3 PREPARATION

- A. Dangerous Materials: Drain, purge, or otherwise remove, collect, and dispose of chemicals, gases, explosives, acids, flammables, or other dangerous materials before proceeding with selective demolition operations.
- B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.

- Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.
2. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction.
- C. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent site improvements, structures and facilities to remain.
1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
 2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
 3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
 4. Cover and protect furniture, furnishings, and equipment that have not been removed.
 5. Provide special protection measures as required by Owner.
- D. Temporary Enclosures: Provide temporary enclosures for protection of existing building and construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
1. Where heating or cooling is needed and permanent enclosure is not complete, provide insulated temporary enclosures. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects
- E. Temporary Partitions: Erect and maintain dustproof partitions and temporary enclosures to limit dust and dirt migration and to separate areas from fumes and noise.
- F. Temporary Shoring: Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent movement, settlement, or collapse of construction to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
1. Strengthen or add new supports when required during progress of selective demolition.

3.4 POLLUTION CONTROLS

- A. Dust Control: Use water mist, temporary enclosures, and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations.
1. Do not use water when it may damage existing construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.

- B. Disposal: Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 - 1. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
- C. Cleaning: Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

3.5 SELECTIVE DEMOLITION

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
 - 1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
 - 2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
 - 3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 - 4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
 - 5. Maintain adequate ventilation when using cutting torches.
 - 6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
 - 7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
 - 8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 - 9. Dispose of demolished items and materials promptly.
 - 10. Return elements of construction and surfaces that are to remain to condition existing before selective demolition operations began.
- B. Removed and Salvaged Items: Comply with the following:
 - 1. Clean salvaged items.
 - 2. Pack or crate items after cleaning. Identify contents of containers.
 - 3. Store items in a secure area until delivery to Owner.
 - 4. Transport items to Owner's storage area designated by Owner.
 - 5. Protect items from damage during transport and storage.

- C. Removed and Reinstalled Items: Comply with the following:
 - 1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
 - 2. Pack or crate items after cleaning and repairing. Identify contents of containers.
 - 3. Protect items from damage during transport and storage.
 - 4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
 - D. Salvage items indicated on the Drawings as "salvage".
 - E. Existing Facilities: Comply with Owner's requirements for using and protecting elevators, stairs, walkways, building entries, and other building facilities during selective demolition operations.
 - F. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.
 - G. Concrete: Demolish in small sections. Cut concrete to a depth of at least 3/4 inch (19 mm) at junctures with construction to remain, using power-driven saw. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete indicated for selective demolition. Neatly trim openings to dimensions indicated.
 - H. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.
 - I. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.
 - J. Air-Conditioning Equipment: Remove equipment without releasing refrigerants.
- 3.6 PATCHING AND REPAIRS
- A. General: Promptly repair damage to adjacent construction caused by selective demolition operations.
 - B. Patching: Comply with Division 01 Section "Cutting and Patching."
 - C. Repairs: Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials.

1. Completely fill holes and depressions in existing masonry walls that are to remain with an approved masonry patching material applied according to manufacturer's written recommendations.
- D. Finishes: Restore exposed finishes of patched areas and extend restoration into adjoining construction in a manner that eliminates evidence of patching and refinishing.
- E. Floors and Walls: Where walls or partitions that are demolished extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish color, texture, and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
1. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections of these Specifications.
 2. Where patching occurs in a painted surface, apply primer and intermediate paint coats over patch and apply final paint coat over entire unbroken surface containing patch. Provide additional coats until patch blends with adjacent surfaces.
 3. Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
- F. Ceilings: Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.
- 3.7 DISPOSAL OF DEMOLISHED MATERIALS
- A. General: Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.
- B. Burning: Do not burn demolished materials.
- C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

END OF SECTION 024119

SECTION 030130 - MAINTENANCE OF CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Removal of deteriorated concrete and subsequent replacement and patching, both on vertical and horizontal surfaces.
2. Patching and repair of damaged and deteriorated areas of concrete, both on vertical and horizontal surfaces.
3. Corrosion-inhibiting treatment for exposed steel reinforcing.

1.2 SUBMITTALS

- A. Product Data: For each type of product. Include construction details, material descriptions, chemical composition, physical properties, test data, and mixing, preparation, and application instructions.
- B. Samples: Cured samples for each exposed product and for each color and texture specified, in manufacturer's standard size appropriate for each type of work.
- C. Qualification Data: For installers and manufacturers.
- D. Field quality-control reports.
- E. Maintenance Program: Submit before work begins.

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Each product manufacturer shall employ factory-trained technical representatives who are available for consultation and Project-site inspection and assistance at no additional cost.
- B. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer to apply packaged patching-mortar materials and corrosion-inhibiting treatments.
- C. Maintenance Program: Prepare a written plan for maintenance of cast-in-place concrete, including each phase or process, protection of surrounding materials during operations, and control of debris and runoff during the Work. Describe in detail materials, methods, equipment, and sequence of operations to be used for each phase of the Work.
- D. Mockups: Build mockups to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Removal and Patching: Remove and repair an approximately 25 sq. ft. (2.3 sq. m) area of deteriorated concrete floor and wall surfaces for each type of repair required.
2. Repair and Patching: Patch and repair an approximately 25 sq. ft. (2.3 sq. m) area of deteriorated concrete floor and wall surfaces for each type of repair required.
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. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

E. Preinstallation Conference: Conduct conference at Project site

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Comply with manufacturer's written instructions for minimum and maximum temperature requirements and other conditions for storage.
- B. Store cementitious materials off the ground, under cover, and in a dry location.

1.5 FIELD CONDITIONS

- A. Cold-Weather Requirements for Cementitious Materials: Do not apply unless concrete-surface and air temperatures are above 40 deg F (5 deg C) and will remain so for at least 48 hours after completion of Work.
- B. Hot-Weather Requirements for Cementitious Materials: Protect repair work when temperature and humidity conditions produce excessive evaporation of water from patching materials. Provide artificial shade and wind breaks, and use cooled materials as required. Do not apply to substrates with temperatures of 90 deg F (32 deg C) and above.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Source Limitations: Obtain all products used for concrete repair and patching process from single source and single manufacturer with resources to provide products of consistent quality in appearance and physical properties.
- B. VOC Content: Provide materials that comply with VOC limits of authorities having jurisdiction.

2.2 BONDING AGENTS

- A. Water-Based, Acrylic Latex Primer/Bonding Agent: ASTM C 1059/C 1059M, Type II .

1. Basis of Design Product: Subject to compliance with requirements, provide Conpro Primer manufactured by Conproco, or equal product by one of the following:
 - a. Dayton Superior Corporation.
 - b. Euclid Chemical Company
 - c. W. R. Meadows, Inc.

2.3 PATCHING MORTAR

A. Patching Mortar, General:

1. Only use patching mortars that are recommended by manufacturer for each applicable horizontal, vertical, or overhead use orientation.
2. Coarse Aggregate for Patching Mortar for Horizontal Use: ASTM C 33, washed aggregate, 3/8" size. Add to patching-mortar mix only as permitted by patching-mortar manufacturer.

B. Polymer-Modified, Cementitious Patching Mortar: Packaged, single-component dry mix for repair of concrete and that contains a latex additive as a dry powder.

1. Basis of Design Product for Vertical Applications: Subject to compliance with requirements, provide Conpro Set manufactured by Conproco Corp. or equal product manufactured by one of the manufacturers listed below.
2. Basis of Design Product for Horizontal Applications: Subject to compliance with requirements, provide Conpro One Shot manufactured by Conproco Corp. or equal product manufactured by one of the manufacturers listed below.
 - a. Dayton Superior Corporation.
 - b. Euclid Chemical Company.
 - c. Fox Industries, Inc.
 - d. Sika Corporation; Construction Product Division.
 - e. Sto Corp.; Concrete Restoration Division.
 - f. W. R. Meadows, Inc.
3. Compressive Strength: Not less than 5000 psi (34.5 MPa) at 28 days when tested according to ASTM C 109/C 109M.

2.4 OTHER MATERIALS

A. Cementitious Bonding and Anticorrosion Treatment: Waterborne solution, single component, anti-corrosion coating for surface application to reinforcing steel and other metal embedded in concrete.

1. Basis of Design Product: Subject to compliance with requirements, provide ECB Electro-Chemical Barrier manufactured by Conproco Corp. or equal product of one of the following:
 - a. Euclid Chemical Company
 - b. Fox Industries, Inc.
 - c. Sika Corporation, Construction Product Division
 - d. Sto Corp., Concrete Restoration Division.

2.5 MIXES

- A. General: Mix products, in clean containers, according to manufacturer's written instructions.
 - 1. Do not add water, thinners, or additives unless recommended by manufacturer.
 - 2. When practical, use manufacturer's premeasured packages to ensure that materials are mixed in proper proportions. When premeasured packages are not used, measure ingredients using graduated measuring containers; do not estimate quantities or use shovel or trowel as unit of measure.
 - 3. Do not mix more materials than can be used within time limits recommended by manufacturer. Discard materials that have begun to set.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Notify Architect seven days in advance of dates when areas of deteriorated or delaminated concrete and deteriorated reinforcing bars will be located.
- B. Locate areas of deteriorated or delaminated concrete using hammer or chain-drag sounding and mark boundaries. Mark areas for removal by simplifying and squaring off boundaries. At columns and walls make boundaries level and plumb unless otherwise indicated.
- C. Pachometer Testing: Locate at least three reinforcing bars using a pachometer, and drill test holes to determine depth of cover. Calibrate pachometer using depth of cover measurements, and verify depth of cover in removal areas using pachometer.
- D. Perform surveys as the Work progresses to detect hazards resulting from concrete-maintenance work.

3.2 PREPARATION

- A. Ensure that supervisory personnel are on-site and on duty when concrete maintenance work begins and during its progress.
- B. Preparation for Removal of Deteriorated Concrete: Examine construction to be repaired to determine best methods to safely and effectively perform concrete maintenance work. Examine adjacent work to determine what protective measures will be necessary. Make explorations, probes, and inquiries as necessary to determine condition of construction to be removed in the course of repair.
 - 1. Verify that affected utilities have been disconnected and capped.
 - 2. Inventory and record the condition of items to be removed for reinstallation or salvage.
 - 3. Provide and maintain shoring, bracing, and temporary structural supports as required to preserve stability and prevent unexpected or uncontrolled movement,

settlement, or collapse of construction being demolished and construction and finishes to remain.

- C. Protect persons, motor vehicles, surrounding surfaces of building being restored, building site, plants, and surrounding buildings from harm resulting from concrete maintenance work.
 - 1. Comply with each product manufacturer's written instructions for protections and precautions. Protect against adverse effects of products and procedures on people and adjacent materials, components, and vegetation.
 - 2. Use only proven protection methods appropriate to each area and surface being protected.
 - 3. Provide barricades, barriers, and temporary directional signage to exclude public from areas where concrete maintenance work is being performed.
 - 4. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during course of concrete maintenance work.
 - 5. Contain dust and debris generated by concrete maintenance work and prevent it from reaching the public or adjacent surfaces.
 - 6. Use water-mist sprinkling and other wet methods to control dust only with adequate, approved procedures and equipment that ensure that such water will not create a hazard or adversely affect other building areas or materials.
 - 7. Protect floors and other surfaces along haul routes from damage, wear, and staining.
 - 8. Provide supplemental sound-control treatment to isolate removal and dismantling work from other areas of the building.
 - 9. Protect adjacent surfaces and equipment by covering them with heavy polyethylene film and waterproof masking tape or a liquid strippable masking agent. If practical, remove items, store, and reinstall after potentially damaging operations are complete.
- D. Existing Drains: Prior to the start of work in an area, test drainage system to ensure that it is functioning properly. Notify Architect immediately of inadequate drainage or blockage. Do not begin work in an area until the drainage system is in working order.
 - 1. Prevent solids such as aggregate or mortar residue from entering the drainage system. Clean out drains and drain lines that become sluggish or blocked by sand or other materials resulting from concrete maintenance work.
 - 2. Protect drains from pollutants. Block drains or filter out sediments, allowing only clean water to pass.
- E. Concrete Removal:
 - 1. Provide shoring, bracing, and supports as necessary. Strengthen or add new supports when required during progress of removal work. Do not overload structural elements with debris.
 - 2. Saw-cut perimeter of areas indicated for removal to a depth of at least 1/8 inch for horizontal repair work and 1/4 inch for vertical work. Make cuts perpendicular to concrete surfaces and no deeper than cover on reinforcement.

3. Remove deteriorated and delaminated concrete by breaking up and dislodging from reinforcement.
 4. Where half or more of the perimeter of reinforcing bar is exposed, bond between reinforcing bar and surrounding concrete is broken, or reinforcing bar is corroded, remove concrete from entire perimeter of bar and to provide at least a 3/4-inch (19-mm) clearance around bar.
 5. Test areas where concrete has been removed by tapping with hammer, and remove additional concrete until unsound and disbonded concrete is completely removed.
 6. For horizontal repair work, remove a minimum of 1/16 inch of surface by abrasive blasting, steel shotblasting, scarifying, high pressure water, or needle-scaling.
 7. Thoroughly clean removal areas of loose concrete, dust, and debris.
- F. Reinforcing-Bar Preparation: Remove loose and flaking rust from reinforcing bars by mechanical methods until only tightly adhered light rust remains.
1. Where section loss of reinforcing bar is more than 25 percent, or 20 percent in two or more adjacent bars, cut bars and remove and replace as directed by Architect. Remove additional concrete as necessary to provide at least 3/4-inch (19-mm) clearance at existing and replacement bars. Splice replacement bars to existing bars according to ACI 318 (ACI 318M) by lapping, welding, or using mechanical couplings.

3.3 APPLICATION

- A. General: Comply with manufacturer's written instructions and recommendations for application of products, including surface preparation.
- B. Cementitious Bonding and Anticorrosion Treatment: Apply to reinforcing bars and adjacent concrete by stiff brush or hopper spray according to manufacturer's written instructions. Apply to reinforcing bars in one or two coats as recommended by manufacturer, allowing first coat to dry two to three hours before applying second coat. Allow to dry before placing patching mortar or concrete.
- C. Water-Based, Acrylic Latex Primer/Bonding Agent: Apply to concrete by brush roller or spray. Allow to dry before placing patching mortar or concrete.
- D. Placing Patching Mortar: Place as follows unless otherwise recommended in writing by manufacturer:
1. Provide forms where necessary to confine patch to required shape.
 2. Wet substrate and forms thoroughly and then remove standing water.
 3. Pretreatment: Apply specified primer/bonding agent..
 4. General Placement: Place patching mortar by troweling toward edges of patch to force intimate contact with edge surfaces. For large patches, fill edges first and then work toward center, always troweling toward edges of patch. At fully exposed reinforcing bars, force patching mortar to fill space behind bars by compacting with trowel from sides of bars.
 5. Vertical Patching: Place material in lifts of not less than 3/8 inches and no more than 2 inches. Do not feather edge.

6. Consolidation: After each lift is placed, consolidate material and screed surface.
7. Multiple Lifts: Where multiple lifts are used, score surface of lifts to provide a rough surface for placing subsequent lifts. Allow each lift to reach final set before placing subsequent lifts.
8. Finishing: Allow surfaces of lifts that are to remain exposed to become firm and then finish to a smooth surface with a wood or sponge float. Finish shall match adjacent undamaged concrete finishes.
9. Appearance of Finished Patches: Finished patched surfaces shall be level and plumb with adjacent concrete surfaces to eliminate appearance of patching to greatest extent possible. Patches and repairs shall match appearance of approved mock-ups.
10. Curing: Wet-cure cementitious patching materials, including polymer-modified cementitious patching materials, for not less than seven days by water-fog spray or water-saturated absorptive cover.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Perform the following tests and inspections:
 1. Packaged, Cementitious Patching Mortar: Three randomly selected sets of samples for each type of mortar required, tested according to ASTM C 928.
- C. Product will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

END OF SECTION 030130

SECTION 035416 - HYDRAULIC CEMENT UNDERLAYMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes hydraulic-cement-based underlayment for use below interior floor coverings.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Plans indicating substrates, locations, and average depths of underlayment based on survey of substrate conditions.
- C. Manufacturer Certificates: Signed by manufacturers of both underlayment and floor covering system certifying that products are compatible.
- D. Qualification Data: For Installer.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: Installer who is approved by manufacturer for application of underlayment products required for this Project.
- B. Product Compatibility: Manufacturers of both underlayment and floor covering system certify in writing that products are compatible.
- C. Mockups: Apply hydraulic-cement-based underlayment mockups to demonstrate surface finish, bonding, texture, tolerances, and standard of workmanship.
 - 1. Apply mockups approximately 100 sq. ft. (9 sq. m) in area in location indicated or, if not indicated, as directed by Architect.
 - 2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 00.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to comply with manufacturer's written instructions to prevent deterioration from moisture or other detrimental effects.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ambient temperature and humidity, ventilation, and other conditions affecting underlayment performance.
 - 1. Place hydraulic-cement-based underlayments only when ambient temperature and temperature of substrates are between 50 and 80 deg F (10 and 27 deg C).

1.6 COORDINATION

- A. Coordinate application of underlayment with requirements of floor covering products, including adhesives, specified in Division 09 Sections, to ensure compatibility of products.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Ardex, Inc.; K-15 Self-Leveling Underlayment Concrete.
 - 2. Dayton Superior Specialty Chemical Corp.; Level Layer I
 - 3. Mapei Corporation; Ultraplan I Plus

2.2 HYDRAULIC-CEMENT-BASED UNDERLAYMENTS

- A. Underlayment: Hydraulic-cement-based, polymer-modified, self-leveling product that can be applied in minimum uniform thicknesses of 1/8 inch (3 mm) and that can be feathered at edges to match adjacent floor elevations. Product shall also be capable of being poured/pumped monolithically (rather than room-by-room).
 - 1. Cement Binder: ASTM C 150, portland cement, or hydraulic or blended hydraulic cement as defined by ASTM C 219.
 - 2. Compressive Strength: Not less than 4100 psi (28 MPa) at 28 days when tested according to ASTM C 109/C 109M.
 - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3 to 6 mm); or coarse sand as recommended by underlayment manufacturer.
 - a. Provide aggregate when recommended in writing by underlayment manufacturer for underlayment thickness required
 - 4. Water: Potable and at a temperature of not more than 70 deg F (21 deg C).
- B. Primer: Product of underlayment manufacturer recommended in writing for substrate, conditions, and application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for conditions affecting performance.
 - 1. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Prepare and clean substrate according to manufacturer's written instructions.
 - 1. Treat nonmoving substrate cracks according to manufacturer's written instructions to prevent cracks from telegraphing (reflecting) through underlayment.
 - 2. Fill substrate voids to prevent underlayment from leaking.
- B. Concrete Substrates: Mechanically remove, according to manufacturer's written instructions, laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants that might impair underlayment bond. Perform moisture tests recommended by manufacturer and as follows.
 - 1. Moisture Testing: Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates do not exceed a maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/100 sq. m) in 24 hours.
 - 2. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have relative humidity level measurement acceptable to manufacturer.
- C. Nonporous Substrates: For ceramic tile, quarry tile, and terrazzo substrates, remove waxes, sealants, and other contaminants that might impair underlayment bond, and prepare surfaces according to manufacturer's written instructions.
- D. Adhesion Tests: After substrate preparation, test substrate for adhesion with underlayment according to manufacturer's written instructions.

3.3 APPLICATION

- A. General: Mix and apply underlayment components according to manufacturer's written instructions.
 - 1. Close areas to traffic during underlayment application and for time period after application recommended in writing by manufacturer.
 - 2. Coordinate application of components to provide optimum underlayment-to-substrate and intercoat adhesion.
 - 3. At substrate expansion, isolation, and other moving joints, allow joint of same width to continue through underlayment.
 - 4. Install perimeter isolation strip along the base of partitions prior to installation of topping. Cut isolation strip flush with finished floor.

5. Apply primer over prepared substrate at manufacturer's recommended spreading rate.
 - B. Apply underlayment to produce uniform, level surface.
 1. Apply a final layer without aggregate to produce surface.
 2. Feather edges to match adjacent floor elevations.
 - C. Cure underlayment according to manufacturer's written instructions. Prevent contamination during application and curing processes.
 - D. Do not install floor coverings over underlayment until after time period recommended in writing by underlayment manufacturer.
 - E. Remove and replace underlayment areas that evidence lack of bond with substrate, including areas that emit a "hollow" sound when tapped.
- 3.4 PROTECTION
- A. Protect underlayment from concentrated and rolling loads for remainder of construction period.

END OF SECTION 035416

SECTION 042000 – UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes unit masonry assemblies consisting of the following:
 - 1. Concrete masonry units. (CMU)
 - 2. Face brick.
 - 3. Mortar and grout.
 - 4. Reinforcing steel.
 - 5. Masonry joint reinforcement.
 - 6. Ties and anchors.
 - 7. Miscellaneous masonry accessories.
- B. Products furnished, but not installed, under this Section include the following:
 - 1. Mortar and grout for cast stone trim installed under Division 04 Section "Cast Stone".
- C. Products installed, but not furnished, under this Section include the following:
 - 1. Steel lintels and shelf angles for unit masonry, furnished under Division 05 Section "Metal Fabrications."
 - 2. Manufactured reglets in masonry joints for metal flashing, furnished under Division 07 Section "Sheet Metal Flashing and Trim."
 - 3. Hollow-metal frames in unit masonry openings, furnished under Division 08 Section "Hollow Metal Doors and Frames."

1.2 DEFINITIONS

- A. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.3 PERFORMANCE REQUIREMENTS

- A. Provide unit masonry that develops net-area compressive strengths (f'_m) at 28 days as indicated in unit masonry performance requirements on the Structural Drawings.

1.4 ACTION SUBMITTALS

- A. Product Data: For each different masonry unit, mortar material, 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.

C. Samples for Initial Selection: For the following:

1. Colored mortar samples in small-scale form showing the full range of colors and textures available for each different exposed mortar color required.

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 mortar color required, showing the full range expected in the finished construction. Make samples using the same sand and mortar ingredients to be used on Project. Label samples to indicate type and amount of colorant used
3. Accessories embedded in the masonry.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For firms and persons specified in "Quality Assurance" Article.

B. 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. Include size-variation data for brick, verifying that actual range of sizes falls within specified tolerances.
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.

C. 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.
2. Each cement product required for mortar and grout, including name of manufacturer, brand, type, and weight slips at time of delivery.
3. Each type and size of joint reinforcement.
4. Each type and size of anchor, tie, and metal accessory.

1.6 QUALITY ASSURANCE

A. Masonry Standard: Comply with requirements of "Specifications for Masonry Structures, ACI 530.1/ASCE 6/TSM 602" published by the American Concrete Institute,

except when more stringent requirements are specified and as modified by the requirements of these Contract Documents.

1. Revise ACI 530.1/ASCE 6/TSM 602 to exclude Article 1.5; Subparagraphs 1.1 C.1 through 4, and Subparagraphs 3.3 E.1 through 5.
- B. Installer Qualifications: Engage an experienced installer who has 10 years experience as a journeymen mason, and who has completed masonry similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
 1. A minimum of one skilled journeyman mason shall be present at all times during masonry erection and shall personally direct the work.
- C. 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.
- D. 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.
- E. 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.
- 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. Final approval of brick bonding pattern, brick color and texture and mortar color and texture will be made based on acceptance of mock-up. Build mockups to comply with the following requirements, using materials indicated for the completed Work:
 1. Locate mockup in the locations as directed by Architect.
 2. Build mockups containing the following types of masonry approximately 96 inches (2400 mm) long by 48 inches (1200 mm) high by full thickness, including face and backup wythes and accessories. Include a sealant-filled joint at least 16 inches (400 mm) long in the mockup.
 - a. New Brick Work: Typical exterior masonry-veneer wall complete with backup and reinforcing/ties. Demonstrate match to existing brick patterns to be used in the Work. Include cast stone trim units.
 3. Re-prepare mock-ups as required to obtain Architect's approval.

4. Protect accepted mockups from the elements with weather-resistant membrane.
5. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
6. Remove mock-up up completion of all masonry work.

H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Coordination."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Deliver preblended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.8 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.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three (3) days after building masonry walls or columns
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
 1. Protect base of walls from rain-splashed mud and from mortar splatter by coverings spread on ground and over wall surface.
 2. Protect sills, ledges, and projections from mortar droppings.
 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

- D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in Part 1.8 C. of ACI 530.1/ASCE 6/TMS 602.
 - 1. Do not lay masonry units that are wet or frozen.
 - 2. Remove masonry damaged by freezing conditions.
- E. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.
- F. Hot-Weather Requirements: Protect unit masonry work when temperature and humidity conditions produce excessive evaporation of water from mortar and grout. Comply with cold-weather construction requirements contained in Part 1.8 D. of ACI 530.1/ASCE 6/TMS 602. Provide artificial shade and wind breaks and use cooled materials as required.
 - 1. When ambient temperature exceeds 100 deg F (38 deg C), or 90 deg F (32 deg C) with a wind velocity greater than 8 mph (13 km/h), do not spread mortar beds more than 48 inches (1200 mm) ahead of masonry. Set masonry units within one minute of spreading mortar.

1.9 SPECIAL INSPECTIONS

- A. The Owner will engage the services of a qualified Special Inspector for this project. The Special Inspector will provide and/or coordinate inspection and testing requirements as necessary in accordance with the provisions of the Statement of Special Inspections Form contained in these Specifications.

PART 2 - PRODUCTS

2.1 CONCRETE MASONRY UNITS

- A. General: Provide shapes indicated and as follows:
 - 1. Provide special shapes for lintels, corners, jambs, sash, control joints, headers, bonding, and other special conditions.
 - 2. Provide bullnose units for outside corners that are exposed to view, unless otherwise indicated.
- B. Concrete Masonry Units (CMU): ASTM C 90 with minimum average net-area compressive strength of 1900 psi; lightweight; and as follows:
 - 1. Size: Manufactured to the following dimensions: 16 inches (407 mm) by 8 inches (203 mm) nominal; 7-5/8 inches (194 mm) by 15-5/8 inches (397 mm) actual; by thickness indicated.
 - 2. Exposed Faces: Manufacturer's standard color and texture, unless otherwise indicated.

3. Provide U.L. classified units for rated walls, or units meeting the fire resistance ratings by equivalent concrete masonry thickness.

2.2 BRICK

- A. General: 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.
 2. Provide lipped brick at steel relieving angles as indicated on drawings.
- B. 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.
- C. Face Brick: ASTM C 216, Grade SW, Type FBS, and as follows:
 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 3000 psi.
 2. Initial Rate of Absorption: Less than 30 g/30 sq. in. per minute when tested per ASTM C 67.
 3. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
 4. Type: Match existing field brick on building.
 5. Sizes: Match existing field brick on building.
 6. Color: Match existing field brick on building.
 7. Texture: Match existing field brick on building.

2.3 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color cement.
 1. For concrete block work, provide natural color cement.
 2. For cast stone and brickwork, provide natural color or white cement as required to produce required mortar colors.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C 150, Type I or Type III, and hydrated lime complying with ASTM C 207.
- D. Masonry Cement: Not permitted.

- E. Aggregate for Mortar: ASTM C 144; except for joints less than 1/4 inch (6.5 mm) thick, use aggregate graded with 100 percent passing the No. 16 (1.18-mm) sieve.
 - 1. For colored mortar, provide natural sand or ground marble, granite, or other sound stone; of color necessary to produce required mortar colors.
- F. Aggregate for Grout: ASTM C 404.
- G. Mortar Pigments: Natural and synthetic iron oxides, compounded for mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortars
- H. Water: Potable.

2.4 REINFORCING STEEL

- A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M; ASTM A 616/A 616M, including Supplement 1; or ASTM A 617/A 617M, Grade 60 (Grade 400).

2.5 MASONRY JOINT REINFORCEMENT

- A. General: ASTM A 951 and as follows:
 - 1. Mill galvanized, carbon-steel wire for interior walls, unless noted below.
 - 2. Hot-dip galvanized, carbon-steel wire for exterior walls and interior walls at Basement locations.
 - 3. Wire Size for Side Rods: W1.7 or 0.148-inch (3.8-mm) diameter.
 - 4. Wire Size for Cross Rods: W1.7 or 0.148-inch (3.8-mm) diameter.
 - 5. Provide in lengths of not less than 10 feet (3 m), with prefabricated corner and tee units where indicated.
- B. For single-wythe masonry, provide ladder type with single pair of side rods and cross rods spaced not more than 16 inches (407 mm) o.c.
- C. For multi wythe masonry, provide types as follows:
 - 1. Adjustable (2-piece) type with single pair of side rods and cross ties spaced not more than 16 inches (407 mm) o.c. and with separate adjustable veneer ties engaging the cross ties. Cross ties are U-shaped with eyes. Space side rods for embedment within each face shell of backup wythe and size adjustable ties to extend at least halfway through outer wythe but with at least 5/8-inch (16-mm) cover on outside face

2.6 TIES AND ANCHORS, GENERAL

- A. General: Provide ties and anchors, specified in subsequent articles, made from materials that comply with this Article, unless otherwise indicated.
- B. Mill Galvanized Carbon-Steel Wire: ASTM A 82; with ASTM A 641 (ASTM A 641M), Class 1 coating.

- C. Hot-Dip Galvanized Carbon-Steel Wire: ASTM A 82; with ASTM A 153, Class B-2 coating.
- D. Steel Sheet, Galvanized after Fabrication: ASTM A 366/A 366M cold-rolled, carbon-steel sheet hot-dip galvanized after fabrication to comply with ASTM A 153
- E. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

2.7 JOINT STABILIZATION ANCHORS

- A. General: Contractor's option to select between the two types listed below.
- B. Three-piece assemblies allowing movement at expansion, contraction or isolation joint while maintaining wall alignment in direction normal to the movement. Two 3/16-inch (4.8-mm) diameter wire rods with plastic sleeves separating two 1/32-inch (0.8-mm) sheet metal sleeves for embedding completely in mortar, zinc plated; Hohmann & Barnard "Slip-Set Stabilizer" or equivalent.
- C. Galvanized 3/8-inch (9-mm) by 6 inches (150 mm) steel dowel vertically welded to a 2-inch (50-mm) by 5-inch (125-mm) steel plate with slotted holes for mounting to the underside of beams or deck, and a plastic sleeve with compressible filler to prevent dowel from bonding with mortar; Hohmann & Barnard PTA-420 with tube or equivalent.

2.8 RIGID ANCHORS

- A. General: Fabricate from steel bars as follows:
 - 1. 1-1/2 inches (38 mm) wide by 1/4 inch (6.4 mm) thick by 24 inches (600 mm) long, with ends turned up 2 inches (50 mm) or with cross pins.
 - 2. Finish: Hot-dip galvanized to comply with ASTM A 153.

2.9 MISCELLANEOUS ANCHORS

- A. Anchor 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; hot-dip galvanized to comply with ASTM A 153, Class C; of diameter and length indicated and in the following configurations:
 - 1. Headed bolts.
- B. Postinstalled Anchors: Anchors as described below, with capability to sustain, without failure, load imposed within factors of safety indicated, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
 - 1. Type: Chemical anchors.
 - 2. Type: Expansion anchors.
 - 3. Corrosion Protection (Indoor): Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (5 microns) for Class SC 1 service condition (mild).

4. Corrosion Protection: Stainless-steel components complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 (ASTM F 738M and ASTM F 836M, Alloy Group 1 or 4) for bolts and nuts; ASTM A 666 or ASTM A 276, Type 304 or 316, for anchors.
5. For Postinstalled Anchors in Concrete: Capability to sustain, without failure, a load equal to four times the loads imposed.
6. For Postinstalled Anchors in Grouted Masonry Units: Capability to sustain, without failure, a load equal to six times the loads imposed.

2.10 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.
- B. Preformed Control-Joint Gaskets: Material as indicated below, designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated, or required.
 1. Styrene-Butadiene-Rubber Compound: ASTM D 2000, Designation M2AA-805.
 2. Product: Hohmann & Barnard, Inc., RS Series or equal.
- C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

2.11 MASONRY CLEANERS

- A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.
 1. Products for Cleaning Unit Masonry: Subject to compliance with requirements, provide one of the following:
 - a. Cleaners for Red and Light-Colored Brick Not Subject to Metallic Staining with Mortar Not Subject to Bleaching: Sure Klean No. 600 Detergent; ProSoCo, Inc.
 - b. Cleaners for Red and Dark-Colored Brick Not Subject to Metallic Staining: Sure Klean No. 101 Lime Solvent; ProSoCo, Inc.
 - c. Cleaners for Brick Subject to Metallic Staining: Sure Klean Vana Trol; ProSoCo, Inc.

2.12 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.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in the form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Colored Mortar for Cast Stone and Brickwork: Produce mortar of color specified, and to match approved mock-ups by using selected ingredients. Do not alter specified proportions without Architect's approval.
 1. Use naturally colored aggregates to produce required mortar color to greatest extent possible, before adding pigments.
 2. Pigments: Where mortar pigments are used, do not exceed a pigment-to-cement ratio of 1:10 by weight.
 3. Color: As selected by Architect from manufacturer's standard colors.
- D. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification.
 1. Limit cementitious materials in mortar to portland cement and lime.
 2. For masonry below grade, in contact with earth, and where indicated, use Type M.
 3. For reinforced masonry, shear walls, exterior above-grade load-bearing and exterior above-grade non-load-bearing walls, interior load-bearing walls, parapet walls, and where indicated, use Type N.
 4. For interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.
 5. For brickwork and cast stone units, use Type N.
- E. Grout for Unit Masonry: Comply with ASTM C 476.
 1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 5 of ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
 2. Provide grout with a slump of 8 to 11 inches (200 to 280 mm) as measured according to ASTM C 143.

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. 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. For cold-weather construction comply with requirements contained in ACI 530.1-05
- B. 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.
- C. Build chases and recesses to accommodate items specified in this Section and in other Sections of the Specifications.
- D. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to the opening.
- E. Cut masonry units with motor-driven saws to provide clean, sharp, un-chipped 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.
- F. 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.
- G. Wetting of Brick: Wet brick before laying if the initial rate of absorption exceeds 30 g/30 sq. in. (30 g/194 sq. cm) 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 CONSTRUCTION TOLERANCES

- A. Comply with tolerances in ACI 530.1/ASCE 6/TMS 602 and the following:
- B. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/4 inch in 20 feet (6 mm in 6 m), nor 1/2 inch (12 mm) maximum.
- C. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), nor 1/2 inch (12 mm) maximum.
- D. For conspicuous horizontal lines, such as exposed lintels, sills, parapets, and reveals, the following tolerances will apply.
 - 1. Variation from Plumb: Do not exceed 1/8 inch in 10 feet (3 mm in 3 m) or 1/4 inch in 20 feet (6 mm in 6 m) or more.

2. Variation from Level: Do not exceed 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 3/8 inch (9 mm) maximum.
 3. Variation in Joint Width: Do not vary joint thickness more than 1/8 inch in 36 inches (3 mm in 900 mm) or one-fourth of nominal joint width, whichever is less.
 4. Variation in Plane between Adjacent Surfaces (Lipping): Do not exceed 1/16-inch (1.5-mm) difference between planes of adjacent units or adjacent surfaces indicated to be flush with units.
- E. For exposed bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to 1/2 inch (12 mm). Do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch (3 mm).
- F. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm). Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch (3 mm).

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 running bond pattern unless otherwise indicated; do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.
1. For brickwork, lay brick in bond pattern to match existing.
- C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2 inches (50 mm). Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch (100-mm) 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 (600 mm) under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated, and at all exterior wall locations.
- I. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above, unless otherwise indicated.
 - 1. Install compressible filler in joint between top of partition and underside of structure above.
 - 2. At fire-rated partitions, install firestopping in joint between top of partition and underside of structure above to comply with Division 07 Section "Firestopping."

3.5 MORTAR BEDDING AND JOINTING

- A. Lay hollow masonry units as follows:
 - 1. With full mortar coverage on horizontal and vertical face shells.
 - 2. Bed webs in mortar in starting course on footings and in all courses of piers, columns, and pilasters, and where adjacent to cells or cavities to be filled with grout.
 - 3. For starting course on footings where cells are not grouted, spread out full mortar bed, including areas under cells.
- B. Lay solid brick-size masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than the joint thickness, unless otherwise indicated.
- D. Collar Joints in Masonry: Fill the vertical, longitudinal joint between wythes solidly with grout for exterior walls noted, do not fill insulated cavity walls.

3.6 MASONRY JOINT REINFORCEMENT

- A. General: Provide continuous masonry joint reinforcement as indicated. Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch (16 mm) on exterior side of walls, 1/2 inch (13 mm) elsewhere. Lap reinforcement a minimum of 6 inches (150 mm).
 - 1. Space reinforcement not more than 16 inches (406 mm) o.c.
 - 2. Space reinforcement not more than 8 inches (203 mm) o.c. in foundation walls and parapet walls.
 - 3. Provide reinforcement not more than 8 inches (203 mm) above and below wall openings and extending 12 inches (305 mm) beyond openings.
 - a. Reinforcement above is in addition to continuous reinforcement.
- B. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.

- C. Provide continuity at corners and wall intersections by using prefabricated "L" and "T" sections. Cut and bend reinforcing units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.7 CONTROL AND EXPANSION JOINTS

- A. General: Install vertical control and expansion joints at one side of all doorways and at wall locations maximum 25 ft. o.c., and where indicated. Build-in related items as masonry progresses. Do not form a continuous span through movement joints unless provisions are made to prevent in-plane restraint of wall or partition movement.
- B. Form control joints in concrete masonry with preformed control-joint gaskets designed to fit standard sash block.
- C. Form expansion joints in brick made from clay or shale by building in joint fillers not less than 3/8 inch (10 mm) for installation of sealant and backer rod specified in Division 07 Section "Joint Sealants." Keep joint free and clear of mortar.
- D. Build in horizontal, pressure-relieving joints where indicated; construct joints by either leaving an air space or inserting a compressible filler of width required for installing sealant and backer rod specified in Division 07 Section "Joint Sealants."
 - 1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry veneer and attached to structure behind masonry veneer.

3.8 LINTELS

- A. Install steel lintels where indicated.
- B. Provide masonry lintels where shown and where openings of more than 12 inches (305 mm) for brick-size units and 24 inches (610 mm) for block-size units are shown without structural steel or other supporting lintels.
 - 1. Provide prefabricated or built-in-place masonry lintels. Use specially formed bond beam units with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.
- C. Provide minimum bearing of 8 inches (200 mm) at each jamb, unless otherwise indicated.

3.9 REINFORCED UNIT MASONRY INSTALLATION

- A. General: Provide reinforced unit masonry walls at all walls as indicated.
- B. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.

1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.

C. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.

D. 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 ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.

3.10 FIELD QUALITY CONTROL

A. Inspectors: Owner will engage qualified certified testing agency to perform inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform inspections.

1. Place grout only after inspectors have verified compliance of grout spaces and grades, sizes, and locations of reinforcement.
2. Retesting of materials failing to meet specified requirements shall be done at Contractor's expense.

B. Testing Frequency: Tests and Evaluations listed in this Article will be performed during construction for each 5000 sq. ft. (465 sq. m) of wall area or portion thereof.

C. Mortar Test (Property Specification): For each mix provided, per ASTM C 780 . Test mortar for mortar air content and compressive strength

D. Grout Test (Compressive Strength): For each mix provided, per ASTM C 1019.

3.11 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
 3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
 4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing the surfaces thoroughly with clear water.
 5. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2 applicable to type of stain on exposed surfaces.
 6. Clean brick masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.

END OF SECTION 042000

SECTION 042120 - MASONRY REPLACEMENT WORK

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes:
 - 1. Unit replacement of damaged or deteriorated brick units at exterior walls, to match existing.
- B. Related Work Specified elsewhere:
 - 1. Cleaning masonry is specified in Division 04 Section "Masonry Cleaning."
 - 2. Pointing mortar and repointing masonry are specified in Division 04 Section "Masonry Repointing."

1.2 SUBMITTALS

- A. Product Data: For each different masonry unit, mortar ingredient, accessory, and other manufactured product specified.
- B. Mixes: Submit proposed mixes for each type of mortar and grout required, indicating materials and proportions to be used.
- C. Samples for Verification: For the following:
 - 1. Full-size brick units. Provide sets for each color and texture of brick required. Include 2 or more samples in each set showing the full range of variations expected in these characteristics.
 - 2. Mortar:
 - a. Existing Mortar: Submit minimum 1 inch square sample of original cleaned mortar for each type and color of mortar to be matched.
 - b. New Mortar: Mortar samples, 5 inch square or 5 inch diameter, for each mortar color required, showing the full range expected in the finished construction. Label samples to indicate type and amount of colorant used. Reformulate and resubmit until match to existing mortar is approved by Architect.
- D. Shop Drawings: Indicating replacement work for masonry elements.
 - 1. Include plans, elevations, sections, and locations of replacement brick units on the structure and their jointing, showing relation of existing and new or reset units.
 - 2. Show provisions for expansion joints or other sealant joints.
- E. Material Certificates: Signed by manufacturers certifying that each of the following items

complies with requirements:

1. Each cement product required for mortar and grout, including name of manufacturer, brand, type, and weight slips at time of delivery.

F. Qualification Data: For firms and persons specified in "Quality Assurance" Article.

1.3 QUALITY ASSURANCE

A. Source Limitations for Brick: Obtain all brick from single source with resources to provide materials of consistent quality in appearance and physical properties without delaying the work.

B. Single Source Responsibility for Installation of Masonry Work: All masonry work of this section shall be performed by a single firm meeting qualifications specified in this section.

C. Installer Qualifications for Masonry Replacement Work: Work must be performed by a firm having not less than five (5) years successful experience in comparable masonry replacement work and employing personnel skilled in the installation processes and operations indicated.

1. Only skilled journeymen masons who are thoroughly trained and experienced in performing masonry replacement work and installing replacement brick units in existing construction, and completely familiar with the materials and methods required shall be used for the work.
2. One skilled journeyman mason shall be present at all times during execution of the work and shall personally direct the work.
3. In acceptance or rejection of masonry replacement work, no allowance will be made for lack of skill on the part of the workmen

D. Mockups: Before beginning masonry replacement work, build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and qualities of materials and execution. Final approval of exposed mortar color and texture, mortar tooling, and brick replacement work will be made based on acceptance of mock-up. Build mockups to comply with the following requirements, using materials indicated for the completed Work:

1. Locate mockups in the locations as directed by Architect.
2. Prepare mock-ups by demonstrating removal techniques on existing masonry units to be replaced and also insertion of replacement masonry units in wall construction.
3. Prepare a mock-up of typical brick replacement in wall consisting of minimum ten bricks.
4. Protect accepted mockups from the elements with weather-resistant membrane.
5. Mock-up shall demonstrate match to existing brickwork.
6. Approved mock-ups may become part of the final work upon acceptance by Architect.
7. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such

deviations in writing.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store and handle masonry and related materials to prevent deterioration or damage due to moisture, temperature changes, contaminants, corrosion, breaking, chipping, or other causes.

1.5 PROJECT CONDITIONS

- A. 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 masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in Part 1.8 C. of ACI 530.1/ASCE 6/TMS 602.

- 1. Do not lay masonry units that are wet or frozen.
- 2. Remove masonry damaged by freezing conditions.

- B. Hot-Weather Requirements: Protect masonry work when temperature and humidity conditions produce excessive evaporation of water from mortar and grout. Comply with cold-weather construction requirements contained in Part 1.8 D. of ACI 530.1/ASCE 6/TMS 602. Provide artificial shade and wind breaks and use cooled materials as required.

- 1. When ambient temperature exceeds 100 deg F (38 deg C), or 90 deg F (32 deg C) with a wind velocity greater than 8 mph (13 km/h), do not spread mortar beds more than 48 inches (1200 mm) ahead of masonry. Set masonry units within one minute of spreading mortar.

- C. Coordination of Work:

- 1. Submit samples of exterior exposed brick and mortar for Architect approval only after cleaning existing brick and mortar to ensure new brick and mortar match color and texture of existing brick and mortar on building.

1.6 SEQUENCING AND SCHEDULING

- A. Perform masonry replacement work in the following sequence, unless otherwise indicated or approved:

- 1. Clean existing masonry.
- 2. Replace existing masonry with new masonry materials.
- 3. Rake out joints that are to be repointed.
- 4. Point mortar joints.

PART 2 - PRODUCTS

2.1 BRICK

- A. Replacement Face Brick: ASTM C 216, Grade SW, Type to match all characteristics of existing brick and as follows:
 - 1. Color and Texture: Match existing adjacent brick.
 - 2. Size and Shape: Match existing adjacent brick.

2.2 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction.
 - 1. Provide natural color or white cement as required to produce required mortar color
- B. Hydrated Lime: ASTM C 207, Type S, formed into lime putty, or pulverized quicklime, thoroughly slaked and left standing for 72 hours after slaking.
- C. Masonry Cement: Not permitted.
- D. Aggregate for Mortar: Clean, fine, natural bank silica sand free from excessive organic or deleterious matter and graded in compliance with ASTM C 144; except for joints less than 1/4 inch (6.5 mm) thick, use aggregate graded with 100 percent passing the No. 16 (1.18-mm) sieve.
 - 1. For colored mortar, provide natural sand or ground marble, granite, or other sound stone; of color necessary to produce required mortar color.
 - 2. Provide sand of special grade as required to produce mortar matching texture of original mortar.
- E. Aggregate for Grout: ASTM C 404.
- F. Mortar Pigments: Natural and synthetic iron oxides, compounded for mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortars
- G. Water: Potable.
- H. Color and Texture of Mix: Provide mortar in color and texture to match existing mortar.
- I. Mortar Proportions: Mix mortar materials in the following proportions:
 - 1. ASTM C270, Type N.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to receive masonry replacement work and conditions under which masonry replacement work will be installed, 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 of the work.
 - 2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 REMOVAL OF MASONRY UNITS

- A. Carefully remove existing units to be replaced, without causing damage to adjacent areas. Do not spall or in any other way damage the faces or edges of the masonry units being removed and reset.
 - 1. Hand tools or professional pneumatic stone cutting tools specially designed for mortar removal and masonry restoration (manufactured by Trow & Holden Co., Barre, Vt. or equal) only shall be used for removal of masonry units.
 - 2. When permitted by Architect, and based on acceptance of mock-up techniques for brick replacement work, saw cutting down the center of the bed joint in brickwork prior to hand tool use may be performed.
 - 3. No other power tools will be permitted during this procedure.
- B. Remove all mortar from the surfaces of the masonry units to be reset so that new mortar bonds to masonry and not to old mortar.

3.3 PREPARATION

- A. Brick:
 - 1. Clean new units prior to setting, leaving edges and surfaces free of dirt and foreign material.
 - 2. Soak units in a vat or box of clean water for one hour or more just prior to installation. Units shall be noticeably damp at the time of setting. Units shall be drained sufficiently to eliminate surface water.
- B. Fill in void spaces in back-up masonry and paint existing steel members. Carefully examine substrate construction before installing the work; correct as necessary to provide a plumb and true substrate to accommodate a proper installation of the replacement masonry units. Install new back-up masonry as required. Install replacement masonry ties as required.

3.4 SETTING OF MASONRY, GENERAL

- A. Arrange new masonry units for accurate fit in original bonding pattern.
- B. Set masonry units to comply with approved Shop Drawings and mock-ups. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure masonry units in place. Set units accurately in locations indicated with edges and faces

aligned according to established relationships and indicated tolerances.

- C. Set masonry units in solid mortar bed. Fill all spaces between masonry and substrate with mortar. Provide teflon shims or wood to set depth of joint, removing shims after mortar has set.
- D. Maintain uniform joint widths except for variations due to different masonry sizes and where minor variations are required to maintain bond alignment, if any.
 - 1. Lay walls with joint widths to match original joint widths.
- E. Provide expansion, control, and pressure-relieving joints of widths and at locations indicated.
 - 1. Keep expansion and pressure-relieving joints free of mortar and other rigid materials.
 - 2. Sealing expansion, control, and pressure-relieving joints is specified in Division 07 Section "Joint Sealants."
- F. Contiguous Work: Provide openings as required to accommodate contiguous work.
- G. As work progresses, install built-in flashings and sheet metal as indicated on approved shop and setting drawings. Seal penetrations in flashing using mastic.
- H. Rake out mortar and point joints as specified in Division 04 Section "Masonry Repointing."
- I. Tool exposed joints to a smooth profile when thumbprint hard, using a jointer larger than the joint thickness, to match approved mock-ups. Match existing tooling profile.

3.5 ADJUSTING AND CLEANING

- A. Remove and replace masonry units of the following description:
 - 1. Broken, chipped, stained, or otherwise damaged masonry unit. Stone may be repaired if methods and results are approved by Architect.
 - 2. Defective joints.
 - 3. Masonry not matching approved samples and mockups.
 - 4. Masonry not complying with other requirements indicated.
- B. Replace in a manner that results in masonry matching approved samples and mockups, complying with other requirements, and showing no evidence of replacement.
- C. In-Progress Cleaning: Clean masonry as work progresses. Remove mortar fins and smears before tooling joints.
- D. Clean masonry after mortar has had opportunity to cure, using clean water and stiff-bristle fiber brushes. Do not use wire brushes, acid-type cleaning agents, cleaning agents containing caustic compounds or abrasives, or other materials or methods that could

damage masonry.

3.6 PROTECTION

- A. Protection: Provide final protection that ensures masonry replacement work is without damage and deterioration at the time of final acceptance.

END OF SECTION 042120

SECTION 047200 – CAST STONE

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Cast stone sills, base, caps, and other shapes indicated on drawings.
2. Stainless steel support and retention connections for cast stone, including all ties, anchors, and necessary shims to supporting structure.

B. Related Sections:

1. Division 04 Section "Unit Masonry" for mortar and grout.

1.2 DEFINITIONS

A. Cast Stone: Architectural precast concrete building units intended to simulate natural cut stone.

B. Arris: The sharp edge of a Cast Stone Unit.

1.3 ACTION SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for cast stone units.

B. Design Mixes: For each different mix.

C. Shop Drawings: Detail fabrication and installation of cast stone units. Indicate member locations, plans, elevations, dimensions, shapes, cross sections, limits of each finish, and types of reinforcement, including special reinforcement, and lifting devices necessary for handling and erection.

D. Samples for Initial Selection: For colored mortar, showing the full range of colors available.

E. Samples for Verification:

1. For each mortar color required, showing the full range expected in the finished construction. Make samples using the same sand and mortar ingredients to be used on Project. Label samples to indicate type and amount of colorant used.
2. For each color and texture of cast stone required, 10-inches (250 mm) square in size.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Fabricator.
- B. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of cast stone with requirements indicated.
- C. Certification that the materials incorporated in this Work are free from hazardous contaminants.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: A firm experienced in manufacturing cast stone units similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to manufacture required units.
 - 1. Fabricator is a producing member of the Cast Stone Institute
- B. Testing Agency Qualifications: An independent testing agency qualified according to ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.
- C. Source Limitations for Cast Stone: Obtain cast stone units through one source from a single manufacturer.
- D. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color, from one manufacturer for each cementitious component and from one source or producer for each aggregate.
- E. Mock-ups: Incorporate cast stone units in mock-up specified in Division 04 Section "Unit Masonry".

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Pack, handle, and ship cast stone units in suitable packs or pallets.
 - 1. Lift with wide-belt slings; do not use wire rope or ropes that might cause staining. Move cast stone units, if required, using dollies with wood supports.
 - 2. Store cast stone units on wood skids or pallets with nonstaining, waterproof covers. Arrange to distribute weight evenly and to prevent damage to units. Ventilate under covers to prevent condensation.
- B. Store installation materials on elevated platforms, under cover, and in a dry location.
- C. Store mortar aggregates where grading and other required characteristics can be maintained and contamination avoided.

1.7 COORDINATION

- A. Coordinate production and delivery of cast stone with unit masonry work to minimize the need for on-site storage and to avoid delaying the Work.

- B. Furnish 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 MANUFACTURERS

- A. Manufacturer: Provide products of Continental Cast Stone Manufacturing, Inc. or equal products manufactured by one of the following
 - 1. Arriscraft
 - 2. American ArtStone.

2.2 CAST STONE MATERIALS

- A. General: Comply with ASTM C 1364 and the following:
- B. Portland Cement: ASTM C 150, Type I, containing not more than 0.60 percent total alkali when tested according to ASTM C 114.
- C. Coarse Aggregates: Granite, quartz, or limestone complying with ASTM C 33; gradation as needed to produce required textures.
- D. Fine Aggregates: Manufactured or natural sands complying with ASTM C 33, gradation as needed to produce required textures.
- E. Color Pigment: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, free of carbon black, nonfading, and resistant to lime and other alkalis.
- F. Reinforcement: Deformed steel bars complying with ASTM A 615/A 615M.
 - 1. Epoxy Coating: ASTM A 775/A 775M.
 - 2. Galvanized Coating: ASTM A 767/A 767M.
- G. Embedded Anchors and Other Inserts: Fabricated from stainless steel complying with ASTM A 276 or ASTM A 666, Type 304.

2.3 STAINLESS-STEEL SUPPORT AND CONNECTION MATERIALS

- A. Anchors: Type and size indicated, fabricated from stainless steel complying with ASTM A 276 or ASTM A 666, Type 304.
- B. Dowels: Round stainless-steel bars complying with ASTM A 276, Type 304, 1/2-inch (12-mm) diameter.
- C. Accessories: Provide clips, hangers, plastic shims, and other accessories required to install cast stone units.

2.4 CAST STONE UNITS

- A. Provide cast stone units complying with ASTM C 1364.
 - 1. Provide units that are resistant to freezing and thawing as determined by laboratory testing according to ASTM C 666, Procedure A, as modified by ASTM C 1364.
- B. Physical Properties:
 - 1. Compressive Strength: Minimum 6,500 psi when tested per ASTM C 1194.
 - 2. Absorption: Maximum 6% when tested per ASTM C 1195.
- C. Reinforce units as indicated and as required by ASTM C 1364. Use galvanized or epoxy-coated reinforcement when covered with less than 1-1/2 inches (38 mm) of material. Minimum coverage shall be twice the diameter of the bars.
 - 1. Area of reinforcement in panels greater than 12" wide shall be not less than 1/4 percent of the cross section area when steel is specified.
- D. Fabrication Method: Use a Vibrant-Tamp placement method or machine manufacture using a zero slump mixture to achieve desired appearance and physical properties.
- E. Fabricate units with sharp arris and details accurately reproduced with indicated texture on all exposed surfaces, unless otherwise indicated.
 - 1. Slope exposed horizontal surfaces at least 1:12, unless otherwise indicated.
 - 2. Provide raised fillets at backs of sills and at ends indicated to be built into jambs.
 - 3. Provide drips on projecting elements, unless otherwise indicated.
- F. Cure and finish units as follows:
 - 1. Cure units in totally enclosed curing room under dense fog and water spray at 95 percent relative humidity for 24 hours.
 - 2. Yard cure units until the sum of the mean daily temperatures for each day equals or exceeds 350 deg F.
 - 3. Acid etch units to remove cement film from surfaces indicated to be finished.
- G. Color and Texture: Exposed surfaces shall exhibit a fine-grained texture similar to natural stone; no bug-holes or air voids shall be permitted.
 - 1. Color and Texture: Color and texture to match existing cast stone, after it has been cleaned (under Section 049100)

2.5 MORTAR MATERIALS

- A. Provide mortar materials that comply with Division 04 Section "Unit Masonry."

2.6 MASONRY CLEANERS

- A. Cast Stone Cleaner: Sure Kleen #600 by ProSoCo Products Inc., or equal.

2.7 MORTAR MIXES

- A. Provide ASTM C 270, Type N colored mortar. Comply with requirements in Division 04 Section "Unit Masonry" for mortar mixes.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of cast stone.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Comply with Cast Stone Institute recommendation for installation of cast stone units.
- B. Set cast stone as indicated on Contract Drawings. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure units in place. Set units accurately in locations indicated with edges and faces aligned according to established relationships and indicated tolerances.
- C. Drench units with clear water just before setting.
- D. Set units in full bed of mortar with full head joints, unless otherwise indicated. Build anchors and ties into mortar joints as units are set.
 - 1. Fill dowel holes and anchor slots with mortar.
 - 2. Fill collar joint solid as units are set.
 - 3. Build concealed flashing into mortar joints as units are set.
 - 4. Leave head joints open in coping and other units with exposed horizontal surfaces. Keep joints clear of mortar, and rake out to receive sealant.
- E. Rake out joints for pointing with mortar to depths of not less than 3/4 inch (19 mm). Rake joints to uniform depths with square bottoms and clean sides. Scrub faces of units to remove excess mortar as joints are raked.
- F. Point mortar joints by placing and compacting mortar in layers not greater than 3/8 inch (10 mm). Compact each layer thoroughly and allow to become thumbprint hard before applying next layer.
- G. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.

- H. Provide expansion, control, and pressure-relieving joints of widths and at locations indicated.
 - 1. Sealing joints is specified in Division 07 Section "Joint Sealants."
 - 2. Keep joints free of mortar and other rigid materials.

3.3 INSTALLATION TOLERANCES

- A. Variation from Plumb: Do not exceed 1/8 inch in 10 feet (3 mm in 3 m) or 1/4 inch in 20 feet (6 mm in 6 m) or more.
- B. Variation from Level: Do not exceed 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 3/8 inch (9 mm) maximum.
- C. Variation in Joint Width: Do not vary joint thickness more than 1/8 inch in 36 inches (3 mm in 900 mm) or one-fourth of nominal joint width, whichever is less.
- D. Variation in Plane between Adjacent Surfaces (Lipping): Do not exceed 1/16-inch (1.5-mm) difference between planes of adjacent units or adjacent surfaces indicated to be flush with units.

3.4 ADJUSTING AND CLEANING

- A. Remove and replace stained and otherwise damaged units and units not matching approved Samples. Cast stone may be repaired if methods and results are approved by Architect.
- B. Replace units in a manner that results in cast stone matching approved Samples, complying with other requirements, and showing no evidence of replacement.
- C. In-Progress Cleaning: Clean cast stone as work progresses. Remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed cast stone as follows:
 - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 - 2. Protect adjacent surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
 - 3. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing thoroughly with clear water.
 - 4. Clean cast stone in conformance cleaner manufacturer's directions.

END OF SECTION 047200

SECTION 049100 - MASONRY CLEANING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes masonry cleaning as follows:
 - 1. Cleaning exterior exposed clay masonry surfaces.
 - 2. Cleaning exterior exposed cast stone surfaces.
 - 3. Cleaning mortar of interior glazed CMU surfaces.

1.2 DEFINITIONS

- A. Low-Pressure Spray: 100 to 400 psi (690 to 2750 kPa); 4 to 6 gpm (0.25 to 0.4 L/s).
- B. Medium-Pressure Spray: 400 to 800 psi (2750 to 5500 kPa); 4 to 6 gpm (0.25 to 0.4 L/s).
- C. High-Pressure Spray: 800 to 1200 psi (5500 to 8250 kPa); 4 to 6 gpm (0.25 to 0.4 L/s).

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include recommendations for application and use. Include test data substantiating that products comply with requirements.
- B. Qualification Data: For restoration specialists including field supervisors and chemical manufacturer.
- C. Cleaning Program: Describe cleaning process in detail, including materials, methods, and equipment to be used and protection of surrounding materials on building and Project site, and control of runoff during operations.
 - 1. If materials and methods other than those indicated are proposed for cleaning work, provide a written description, including evidence of successful use on comparable projects, and a testing program to demonstrate their effectiveness for this Project.

1.4 QUALITY ASSURANCE

- A. Masonry Cleaning Specialist Qualifications: Engage an experienced masonry cleaning firm to perform work of this Section. Firm shall have completed work similar in material, design, and extent to that indicated for this Project with a record of successful in-service performance.
 - 1. Field Supervision: Masonry cleaning specialist firms shall maintain experienced full-time supervisors on Project site during times that masonry cleaning is in

progress. Supervisors shall not be changed during Project except for causes beyond the control of masonry cleaning specialist firm.

2. Masonry Cleaning Worker Qualifications: Persons who are experienced and specialize in masonry cleaning work of types they will be performing.
- B. Chemical Manufacturer Qualifications: A firm regularly engaged in producing masonry cleaners that have been used for similar applications with successful results, and with factory-trained representatives who are available for consultation and Project-site inspection and assistance at no additional cost.
- C. Mockups: Prepare mockups of masonry cleaning as follows to demonstrate aesthetic effects and qualities of materials and execution. Prepare mockups on existing walls under same weather conditions to be expected during remainder of the Work.
1. Locate mock-ups where directed by Architect.
 2. Clean an area approximately 25 sq. ft. (2.3 sq. m) in area for each type of masonry and surface condition requiring cleaning.
 3. Test cleaners and methods on samples of adjacent materials for possible adverse reactions unless cleaners and methods are known to have deleterious effect.
 4. Begin with application of low pressure water wash to mock-up areas and progress to job-mixed detergent and then to chemical cleaners only as required to obtain desired results. Perform test cleaning with non-acidic chemical cleaners before progressing to acidic chemical cleaners.
 - a. Perform test cleaning panels in presence of Architect. If Architect rejects mock-up, proceed with additional test cleaning panels.
 5. Do not commence general masonry cleaning work until Architect's acceptance of mock-ups' visual qualities has been obtained.
 6. Allow a waiting period of not less than seven days after completion of sample cleaning to permit a study of sample panels for negative reactions.
 7. Cover and protect approved mock-ups until completion of all general masonry cleaning work.
 8. Approved mock-ups will be used as standard against which all masonry cleaning work will be judged.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in manufacturer's original and unopened containers, labeled with manufacturer's name and type of products.

1.6 PROJECT CONDITIONS

- A. Clean masonry surfaces only when air temperature is 40 deg F (4 deg C) and above and is predicted to remain so for at least 7 days after completion of cleaning.
- B. Clean masonry before proceeding with repointing and brick replacement work to ensure color match of pointing mortar and replacement brick to original cleaned masonry units and mortar.

1. Clean masonry before ordering new brick or cast stone units to ensure new masonry materials match existing cleaned materials.

PART 2 - PRODUCTS

2.1 CLEANING MATERIALS

- A. Water for Cleaning: Potable.
- B. Job-Mixed Detergent Solution: Solution prepared by mixing 2 cups (0.5 L) of tetrasodium polyphosphate (TSP), 1/2 cup (125 mL) of water soluble, non-ionic cleaner, and 20 quarts (20 L) of hot water for every 5 gal. (20 L) of solution required.
- C. Job-Mixed Mold, Mildew, and Algae Remover: Solution prepared by mixing 2 cups (0.5 L) of tetrasodium polyphosphate (TSP), 5 quarts (5 L) of 5 percent sodium hypochlorite (bleach), and 15 quarts (15 L) of hot water for every 5 gal. (20 L) of solution required.
- D. Nonacidic Liquid Cleaner: Manufacturer's standard mildly alkaline liquid cleaner formulated for removing mold, mildew, and other organic soiling from ordinary building materials, including polished stone, brick, aluminum, plastics, and wood.
 1. Product: Subject to compliance with requirements, provide one of the following:
 - a. Dumond Chemicals, Inc.; Safe n' Easy Architectural Cleaner/Restorer.
 - b. Price Research, Ltd.; Price Non-Acid Masonry Cleaner.
 - c. ProSoCo; Enviro Klean Restoration Cleaner, EnviroKlean Klean N' Release Cleaner, or EnviroKlean 2010 All Surface Cleaner.
- E. Mild Acidic Cleaner: Manufacturer's standard mildly acidic cleaner containing no hydrochloric, hydrofluoric, or sulfuric acid; or chlorine bleaches.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Diedrich Technologies Inc.; Envirostore 100.
 - b. Dumond Chemicals, Inc.; Safe n' Easy Heavy Duty Restoration Cleaner
 - c. ProSoCo; Sure Klean Light-Duty Restoration Cleaner.
- F. Acidic Cleaner: Manufacturer's standard acidic masonry restoration cleaner composed of hydrofluoric acid blended with other acids, detergents, wetting agents, and inhibitors.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. American Building Restoration Products, Inc.; 801 Heavy Duty Masonry Cleaner.
 - b. Diedrich Technologies Inc.; 101 Masonry Restorer or 101G Granite, Terra Cotta, and Brick Cleaner.
 - c. Hydrochemical Techniques, Inc.; Hydroclean Brick, Granite, Sandstone and Terra Cotta Cleaner (HT-626).

- d. Price Research, Ltd.; Price Heavy Duty Restoration Cleaner or Price Restoration Cleaner.
 - e. ProSoCo; Sure Klean Heavy-Duty Restoration Cleaner, Sure Klean 1028 Restoration Cleaner or Sure Klean Restoration Cleaner.
- G. One-Part Limestone and Cast Stone Cleaner: Manufacturer's standard one-part or non-acidic formulation for cleaning limestone that does not contain hydrofluoric acid.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. ProSoCo; Sure Klean Limestone Restorer.
 - b. Dumond Chemicals, Inc.; Safe n' Easy Limestone Cleaner
 - c. Chemique; C-13 Limestone Cleaner/Restorer
- H. Two-Part Limestone Cleaner: Manufacturer's standard system consisting of potassium or sodium hydroxide based, alkaline prewash cleaner and acidic afterwash cleaner that does not contain hydrofluoric acid.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. ProSoCo; Sure Klean 766 Limestone & Masonry Prewash and Afterwash
 - b. Diedrich Technologies Inc.; 707X Limestone Cleaner Pre-Rinse and 707N Limestone Neutralizer After-Rinse.
 - c. Price Research, Ltd.; Limestone Pre-Wash and Afterwash
- I. All Surface Cleaner for Interior Mortar: Provide multi-surface non-acidic cleaner designed for cleaning and degreasing light-to-heavily soiled stone, tile, masonry and other surfaces, and appropriate for cleaning interior surfaces.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. ProSoCo; Enviro Klean 2010 All Surface Cleaner or 942 Limestone and Marble Cleaner
 - b. Diedrich Technologies, Inc.; 910PM Polished Marble/Granite Cleaner
 - c. Dumond Chemicals, Inc.; Safe n Easy All Purpose Cleaner.

PART 3 - EXECUTION

3.1 PROTECTION

- A. Protect persons, motor vehicles, surrounding surfaces of building being cleaned, building site, plants, and surrounding buildings from harm resulting from masonry cleaning work.
 - 1. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during course of masonry cleaning work.
- B. Comply with chemical cleaner manufacturer's written instructions for protecting building and other surfaces against damage from exposure to its products. Prevent chemical

cleaning solutions from coming into contact with pedestrians, motor vehicles, landscaping, buildings, and other surfaces that could be harmed by such contact.

1. Cover adjacent surfaces with materials that are proven to resist chemical cleaners used unless chemical cleaners being used will not damage adjacent surfaces. Use materials that contain only waterproof, UV-resistant adhesives. Apply masking agents to comply with manufacturer's written instructions. Do not apply liquid masking agent to painted or porous surfaces. When no longer needed, promptly remove masking to prevent adhesive staining.
2. Keep wall wet below area being cleaned to prevent streaking from runoff.
3. Do not clean masonry during winds of sufficient force to spread cleaning solutions to unprotected surfaces.
4. Neutralize and collect alkaline and acid wastes for disposal off Owner's property.
5. Dispose of runoff from cleaning operations by legal means and in a manner that prevents soil erosion, undermining of paving and foundations, damage to landscaping, and water penetration into building interiors.

3.2 CLEANING MASONRY, GENERAL

- A. Proceed with cleaning in an orderly manner; work from top to bottom of each scaffold width and from one end of each elevation to the other.
- B. Select cleaning agents for their compatibility with masonry substrates being cleaned and materials to be removed from surfaces. Begin with most gentle cleaning materials and methods and progress to stronger materials and application techniques only as needed. Begin with non-acidic and alkaline cleaners before using acidic cleaners.
 1. Do not use acidic cleaners on cast stone or glazed face CMU surfaces unless its use is expressly permitted by chemical cleaner manufacturer.
- C. Use only those cleaning methods indicated for each masonry material and location.
 1. Do not use wire brushes or brushes that are not resistant to chemical cleaner being used. Do not use plastic-bristle brushes if natural-fiber brushes will resist chemical cleaner being used.
 2. Use spray equipment that provides controlled application at volume and pressure indicated, measured at spray tip. Adjust pressure and volume to ensure that cleaning methods do not damage masonry.
 - a. Equip units with pressure gages.
 3. For chemical cleaner spray application, use low-pressure tank or chemical pump suitable for chemical cleaner indicated, equipped with cone-shaped spray tip.
 4. For water spray application, use fan-shaped spray tip that disperses water at an angle of 25 to 50 degrees.
- D. Perform each cleaning method indicated in a manner that results in uniform coverage of all surfaces, including corners, moldings, and interstices, and that produces an even effect without streaking or damaging masonry surfaces.

- E. Removing Plant Growth: Completely remove plant, moss, and shrub growth from masonry surfaces. Carefully remove plants, creepers, and vegetation by cutting at roots and allowing to dry as long as possible before removal. Remove loose soil and debris from open masonry joints to whatever depth they occur.
- F. Water Application Methods:
 - 1. Water Soak Application: Soak masonry surfaces by applying water continuously and uniformly to limited area for time indicated. Apply water at low pressures and low volumes in multiple fine sprays using perforated hoses or multiple spray nozzles. Erect a protective enclosure constructed of polyethylene sheeting to cover area being sprayed.
 - 2. Spray Applications: Unless otherwise indicated, hold spray nozzle at least 6 inches (150 mm) from surface of masonry and apply water in horizontal back and forth sweeping motion, overlapping previous strokes to produce uniform coverage.
- G. Chemical Cleaner Application Methods: Apply chemical cleaners to masonry surfaces to comply with chemical cleaner manufacturer's written instructions; use brush or spray application methods, at Contractor's option. Do not spray apply at pressures exceeding 50 psi (345 kPa). Do not allow chemicals to remain on surface for periods longer than those indicated or recommended by manufacturer.
- H. Rinse off chemical residue and soil by working upward from bottom to top of each treated area at each stage or scaffold setting. Periodically during each rinse, test pH of rinse water running off of cleaned area to determine that chemical cleaner is completely removed.
 - 1. Apply neutralizing agent and repeat rinse, if necessary, to produce tested pH of between 6.7 and 7.5.
- I. After cleaning is complete, remove protection no longer required. Remove tape and adhesive marks.

3.3 CLEANING MASONRY

- A. Cold-Water Wash: Use cold water applied by low-pressure spray.
- B. Cold Water Soak:
 - 1. Apply cold water by intermittent soaking.
 - 2. Use perforated hoses or other means that will apply a fine water mist to entire surface being cleaned.
 - 3. Apply water in cycles with at least 30 minutes between cycles.
 - 4. Continue water application until surface encrustation has softened sufficiently to permit its removal by water wash, as indicated by cleaning tests.
 - 5. Remove soil and softened surface encrustation from masonry with cold water applied by low-pressure spray.

C. Detergent Cleaning:

1. Wet masonry with cold water applied by low-pressure spray.
2. Scrub masonry with detergent solution using medium-soft brushes until soil is thoroughly dislodged and can be removed by rinsing. Use small brushes to remove soil from mortar joints and crevices. Dip brush in solution often to ensure that adequate fresh detergent is used and that masonry surface remains wet.
3. Rinse with cold water applied by low-pressure spray to remove detergent solution and soil.
4. Repeat cleaning procedure above where required to produce cleaning effect established by mockup.

D. Mold, Mildew, and Algae Removal:

1. Wet masonry with cold water applied by low-pressure spray.
2. Apply mold, mildew, and algae remover by brush.
3. Scrub masonry with medium-soft brushes until mold, mildew, and algae are thoroughly dislodged and can be removed by rinsing. Use small brushes for mortar joints and crevices. Dip brush in mold, mildew, and algae remover often to ensure that adequate fresh cleaner is used and that masonry surface remains wet.
4. Rinse with cold water applied by low-pressure spray to remove mold, mildew, and algae remover and soil.
5. Repeat cleaning procedure above where required to produce cleaning effect established by mockup.

E. Chemical Cleaning:

1. Wet masonry with cold water applied by low-pressure spray.
2. Apply cleaner to masonry by brush or low-pressure spray. Let cleaner remain on surface for period recommended by manufacturer.
3. Rinse with cold water applied by low-pressure spray to remove chemicals and soil.
4. Adjust dilution of solution, dwell time, and application procedures as required to produce cleaning effect established by mockup.

END OF SECTION 049100

SECTION 049110 - MASONRY REPOINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes repointing mortar joints in the following:

1. Brick exterior wall surfaces.
2. Glass block exterior wall surfaces.

1.2 SUBMITTALS

- A. Mixes: Submit proposed mixes for each type of mortar and grout required, indicating materials and proportions to be used.
- B. Product Data: For each type of product indicated. Include recommendations for application and use. Include test data substantiating that products comply with requirements.
- C. Samples for Verification: Before erecting mockup, submit samples of the following:
1. Existing Mortar: Submit minimum 1 square inch sample of original mortar for each type and color of pointing mortar to be matched.
 2. Proposed Mortar: Submit each type of pointing mortar proposed for use in the form of sample mortar strips, 6 inches (150 mm) long by 1/2 inch (13 mm) wide, set in aluminum or plastic channels. Provide samples for each mortar color required, showing the full color range expected in the finished construction
 - a. Include with each sample a list of ingredients with proportions of each. Identify sources, both supplier and quarry, of each type of sand and brand names of cementitious materials and pigments if any.
 - b. Make samples using the same sand and mortar ingredients to be used on Project. Label samples to indicate type and amount of colorant used.
 - c. Reformulate and resubmit until match is approved by Architect.
- D. Qualification Data: For repointing specialists including field supervisors.
- E. Repointing Program: Provide detailed description of materials, methods, equipment, and sequence of operations to be used for each phase of repointing work including protection of surrounding materials on building and Project site.
1. Include methods for keeping pointing mortar damp during curing period.
 2. If materials and methods other than those indicated are proposed for any phase of repointing work, provide a written description, including evidence of successful use on comparable projects, and a testing program to demonstrate their effectiveness for this Project.

3. Program shall include provisions for supervising performance of workers and preventing damage due to worker fatigue.

1.3 QUALITY ASSURANCE

- A. Restoration Specialist Qualifications: Work must be performed by a firm having not less than five (5) years successful experience in comparable masonry repointing work in the last five years and employing personnel skilled in the installation processes and operations indicated.
 1. Only skilled journeymen masons who are thoroughly trained and experienced in removal and insertion of mortar in joints of historic masonry buildings, and completely familiar with the materials and methods required shall be used for the work.
 2. One skilled journeyman mason shall be present at all times during execution of the work and shall personally direct the work.
 3. In acceptance or rejection of masonry repointing work, no allowance will be made for lack of skill on the part of the workmen.
- B. Source Limitations: Obtain each type of material for masonry repointing work (cement, sand, etc.) from one source with resources to provide materials of consistent quality in appearance and physical properties..
- C. Mockups: Before beginning masonry repointing work, prepare mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and qualities of materials and execution. Final approval of exposed mortar color and texture, mortar tooling, and mortar removal techniques will be made based on acceptance of mock-up. Prepare mockups on existing walls under same weather conditions to be expected during remainder of the Work. Build mockups to comply with the following requirements, using materials indicated for the completed Work:
 1. Rake out joints in two separate areas approximately 36 inches (900 mm) high by 72 inches (1800 mm) wide for each type of repointing required and repoint one of the two areas.
 2. Prepare mock-ups by demonstrating removal techniques on existing mortar joints and also insertion of pointing mortar in these joints.
 3. Locate mock-ups in area of cleaned masonry where directed by Architect
 4. Do not commence general repointing work until Architect's acceptance of mock-ups' visual qualities has been obtained. Reprepare panels as required to obtain such approval.
 5. Cover and protect approved mock-ups until completion of all general masonry repointing work.
 6. Approved mock-ups will be used as standard against which all masonry repointing work will be judged.
 7. Approved mock-ups may become part of the final work upon acceptance by Architect.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in manufacturer's original and unopened containers, labeled with manufacturer's name and type of products.
- 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 hydrated lime in manufacturer's original and unopened containers. Discard lime if containers have been damaged or have been opened for more than two days.
- D. Store lime putty covered with water in sealed containers.
- E. Store sand where grading and other required characteristics can be maintained and contamination avoided.

1.5 PROJECT CONDITIONS

- A. Repoint mortar joints only when air temperature is between and 40 and 90 deg F (4 and 32 deg C) and is predicted to remain so for at least 7 days after completion of work.
- B. Cold-Weather Requirements: Comply with the following procedures for mortar-joint pointing:
 - 1. When air temperature is below 40 deg F (4 deg C), heat mortar ingredients and existing masonry walls to produce temperatures between 40 and 120 deg F (4 and 49 deg C).
 - 2. When mean daily air temperature is below 40 deg F (4 deg C), provide enclosure and heat to maintain temperatures above 32 deg F (0 deg C) within the enclosure for 7 days after repair and pointing.
- C. Hot-Weather Requirements: Protect mortar-joint pointing when temperature and humidity conditions produce excessive evaporation of water from mortar materials. Provide artificial shade and wind breaks and use cooled materials as required. Do not apply mortar to substrates with temperatures of 90 deg F (32 deg C) and above.
- D. Do not remove mortar from more than 25 square feet of contiguous wall area at any one time before repointing, as structural integrity of existing wall may be compromised.

1.6 SEQUENCING AND SCHEDULING

- A. Do not proceed with preparation of mortar samples or mock-ups until masonry has been cleaned to ensure repointing mortar matches color and texture of original cleaned mortar.
- B. Coordinate masonry pointing work with other masonry work of Division 04 to ensure proper completion of all masonry work.

PART 2 - PRODUCTS

2.1 MORTAR MATERIALS FOR BRICKWORK

- A. Portland Cement: ASTM C 150, Type I or Type II, natural or white color as required to match existing pointing mortar.
 - 1. Provide white cement containing not more than 0.60 percent total alkali when tested according to ASTM C 114.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Quicklime: ASTM C 5, pulverized lime.
- D. Factory-Prepared Lime Putty: Screened, fully-slaked lime putty, prepared from pulverized lime complying with ASTM C 5.
- E. Mortar Sand: ASTM C 144, unless otherwise indicated.
 - 1. Color: Provide natural sand or ground marble, granite, or other sound stone; of color necessary to produce required mortar color.
 - 2. For pointing mortar, provide sand with rounded edges.
 - 3. Match size, texture, and gradation of existing mortar sand as closely as possible. Blend several sands, if necessary, to achieve suitable match.
- F. Mortar Pigments: Natural and synthetic iron oxides, compounded for mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortars.
- G. Water: Potable.

2.2 MORTAR MIXES FOR BRICKWORK

- A. General: Provide mortar in color, texture and formulation to match existing pointing mortar at brickwork.
- B. Preparing Lime Putty: Slake quicklime and prepare lime putty according to appendix to ASTM C 5 and manufacturer's written instructions.
- C. Measurement and Mixing: Measure cementitious materials and sand in a dry condition by volume or equivalent weight. Do not measure by shovel; use known measure. Mix materials in a clean, mechanical batch mixer.
 - 1. Mixing Pointing Mortar: Thoroughly mix cementitious materials and sand together before adding any water. Then mix again adding only enough water to produce a damp, unworkable mix that will retain its form when pressed into a ball. Maintain mortar in this dampened condition for 15 to 30 minutes. Add remaining water in small portions until mortar reaches desired consistency. Use mortar within one hour of final mixing; do not retemper or use partially hardened material.
- D. Colored Mortar: Produce mortar of color to match existing by using selected ingredients. Do not alter specified proportions without Architect's approval.

1. Use naturally colored aggregates to produce required mortar color to greatest extent possible, before adding pigments.
 2. Pigments: Where mortar pigments are used, do not exceed a pigment-to-cement ratio of 1:10 by weight.
- E. Do not use admixtures of any kind in mortar, unless otherwise indicated.
- F. Mortar Proportions: Mix mortar materials in the following proportions:
1. Pointing Mortar for Brick: 1 part cement to 2 parts of lime to 6 parts of sand.

2.3 MORTAR MATERIALS AND MIXES FOR GLASS BLOCK WORK

- A. Provide bagged, pre-mixed mortar dry mix of white cement, lime, white sand and chemical additives designed to provide a water resistant mortar for use in pointing and constructing exterior glass block walls. Mortar shall meet ASTM C270 property requirements for Type S Mortar (compressive strength of minimum 1,800 psi).
1. Products: Provide one of the following or equal:
 - a. Glass Block Mortar manufactured by Sakrete.
 - b. Glass Block Mortar Product No. 1610 manufactured by Commercial Grade QUIKRETE or equal.
- B. Water: Potable
- C. Mix bagged mortar mix with potable water in proportions as recommended by mortar manufacturer, to a stiff consistency. Mix materials in a clean, mechanical batch mixer. Comply with manufacturer's mixing directions.

PART 3 - EXECUTION

3.1 PROTECTION

- A. Protect persons, motor vehicles, surrounding surfaces of building being repointed, building site, plants, and surrounding buildings from harm resulting from masonry repointing work.
1. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during course of repointing work.
- B. Prevent mortar from staining face of surrounding masonry and other surfaces.
1. Cover sills, ledges, and projections to protect from mortar droppings.
 2. Keep wall area wet below repointing work to discourage mortar from adhering.
 3. Immediately remove mortar in contact with exposed masonry and other surfaces.
 4. Clean mortar splatters from scaffolding at end of each day

3.2 REPOINTING MASONRY

- A. Rake out and repoint mortar joints to the following extent:
1. Joints where mortar is missing or where they contain holes.
 2. Cracked joints where cracks can be penetrated at least 1/4 inch (6 mm) by a knife blade 0.027 inch (0.7 mm) thick.
 3. Cracked joints where cracks are 1/8 inch (3 mm) or more in width and of any depth.
 4. Joints where they sound hollow when tapped by metal object.
 5. Joints where they are worn back 1/4 inch (6 mm) or more from surface.
 6. Joints where they are deteriorated to point that mortar can be easily removed by hand.
 7. Joints, other than those indicated as sealant-filled joints, where they have been filled with substances other than mortar.
 8. Joints filled with sealant, to the extent and in the locations indicated on Drawings.
- B. Do not rake out and repoint joints where not required.
- C. Rake out joints as follows:
1. Remove mortar from joints to depth of 2 to 2-1/2 times the height of the joint, but not less than that required to expose sound, unweathered mortar.
 2. Remove mortar from masonry surfaces within raked-out joints to provide reveals with square backs and to expose masonry for contact with pointing mortar. Brush, vacuum, or flush joints to remove dirt and loose debris.
 3. Do not spall edges of masonry units or widen joints. Replace or patch damaged masonry units as directed by Architect.
 4. Hand tools or professional pneumatic stone cutting tools specially designed for mortar removal and masonry restoration (manufactured by Trow & Holden Co., Barre, Vt. or equal) only shall be used for removal of mortar. Only chisels narrower than the joints shall be used.
 5. When permitted by Architect, and based on acceptance of mock-up techniques for repointing brickwork, saw cutting down the center of the bed joint in brickwork prior to hand tool use may be performed.
 6. No other power tools will be permitted during this procedure.
- D. Notify Architect of unforeseen detrimental conditions including voids in mortar joints, cracks, loose masonry units, rotted wood, rusted metal, and other deteriorated items.
- E. Point joints as follows:
1. Rinse masonry-joint surfaces with water to remove dust and mortar particles. Time rinsing application so, at time of pointing, joint surfaces are damp but free of standing water. If rinse water dries, dampen masonry-joint surfaces before pointing.
 2. Apply pointing mortar first to areas where existing mortar was removed to depths greater than surrounding areas. Apply in layers not greater than 3/8 inch (9 mm) until a uniform depth is formed. Fully compact each layer thoroughly and allow it to become thumbprint hard before applying next layer.
 3. After low areas have been filled to same depth as remaining joints, point all joints by placing mortar in layers not greater than 3/8 inch (9 mm). Fully compact each

layer and allow to become thumbprint hard before applying next layer. Where existing masonry units have worn or rounded edges, slightly recess finished mortar surface below face of masonry to avoid widened joint faces. Take care not to spread mortar over edges onto exposed masonry surfaces or to feather edge mortar.

4. When mortar is thumbprint hard, tool joints to match original appearance of joints. Remove excess mortar from edge of joint by brushing.

- F. Cure mortar by maintaining in thoroughly damp condition for at least 72 hours including weekends and holidays.

1. Acceptable curing methods include covering with wet burlap and plastic sheeting, periodic hand misting, and periodic mist spraying using system of pipes, mist heads, and timers.
2. Adjust curing methods to ensure that pointing mortar is damp throughout its depth without eroding surface mortar.

- G. Where repointing work precedes cleaning of existing masonry, allow mortar to harden at least 30 days before beginning cleaning work.

3.3 FINAL CLEANING

- A. After mortar has fully hardened, thoroughly clean exposed masonry surfaces of excess mortar and foreign matter; use wood scrapers, stiff-nylon or -fiber brushes, and clean water, spray applied at low pressure.

1. Do not use metal scrapers or brushes.
2. Do not use acidic or alkaline cleaners.

- B. Wash adjacent woodwork, glass and other nonmasonry surfaces. Use detergent and soft brushes or cloths.

END OF SECTION 049110

SECTION 054000 – COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:

1. Exterior ceiling joist framing.

1.2 PERFORMANCE REQUIREMENTS

- A. Cold-Formed Steel Framing Standards: Unless more stringent requirements are indicated, framing shall comply with AISI S100 and AISI S200.

1.3 SUBMITTALS

- A. Product Data: For each type of cold-formed metal framing product and accessory indicated.
- B. Shop Drawings: 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.
- C. Welding certificates.
- D. Product Test Reports: From a qualified testing agency, unless otherwise stated, indicating that each of the following complies with requirements, based on evaluation of comprehensive tests for current products:
1. Steel sheet.
 2. Expansion anchors.
 3. Power-actuated anchors.
 4. Mechanical fasteners.
 5. Miscellaneous structural clips and accessories.
- E. Research/Evaluation Reports: For cold-formed metal framing.

1.4 QUALITY ASSURANCE

- A. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.

- B. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."

1.5 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:
 - 1. ClarkDietrich Building Systems.
 - 2. MarinoWare; a division of Ware Industries.
 - 3. Super Stud Building Products, Inc.

2.2 MATERIALS

- A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
 - 1. Grade: ST33H (ST230H) and ST50H (ST340H) as required by structural performance.
 - 2. Coating: G60 (Z180).

2.3 CEILING JOIST FRAMING

- A. Steel Ceiling Joists: Manufacturer's standard C-shaped steel sections, of web depths indicated, unpunched, with stiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: 0.0538 inch (1.37 mm) minimum, unless otherwise indicated Drawings.
 - 2. Flange Width: 1-5/8 inches (41 mm), minimum.

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.
 - 3. Web stiffeners.
 - 4. Anchor clips.
 - 5. End clips.
 - 6. Gusset plates.
 - 7. Hole reinforcing plates.
 - 8. 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 ASTM A 123/A 123M.
- B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel hex-headed bolts headless, hooked bolts headless bolts, with encased end threaded, and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C mechanically deposition according to ASTM B 695, Class 50.
- 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: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping 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-21035
- 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.

2.7 FABRICATION

- A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, 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, screw fastening, clinch fastening, or riveting 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.
 - 4. 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 (1:960) and as follows:
 - 1. Spacing: Space individual framing members no more than plus or minus 1/8 inch (3 mm) 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 (3 mm).

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.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- 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 AISI's "Standard for Cold-Formed Steel Framing - General Provisions" and to 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.
- D. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened.
 - 1. Cut framing members by sawing or shearing; do not torch cut.
 - 2. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting. 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, and complying with requirements for spacing, edge distances, and screw penetration.
- 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. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.
- I. 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 (1:960) and as follows:
 - 1. Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.3 FIELD QUALITY CONTROL

- A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Field and shop welds and screw connections will be subject to testing and inspecting.

- C. Testing agency will report test results within 24 hours and in writing to Contractor and Architect.
- D. Remove and replace work where test results indicate that it does not comply with specified requirements.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- F. Inspect all prefabricated trusses before installation.

3.4 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. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 054000

SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Handrails and railings at stairs.
2. Handrails attached to walls adjacent to stairs.
3. Guardrails, including guardrails at exterior locations.
4. Steel framing and supports for mechanical and electrical equipment.
5. Steel framing and supports for applications where framing and supports are not specified in other Sections.

1.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design metal handrails and railings and guardrails.

B. Structural Performance of Handrails and Railings: Provide handrails and railings capable of withstanding the following structural loads without exceeding the allowable design working stress of materials for handrails, railings, anchors, and connections:

1. Top Rail of Guards: Capable of withstanding the following loads applied as indicated:
 - a. Concentrated load of 200 lbf (890 N) applied at any point and in any direction.
 - b. Uniform load of 50 lbf/ft. (730 N/m) applied horizontally and concurrently with uniform load of 100 lbf/ft. (1460 N/m) applied vertically downward.
 - c. Concentrated and uniform loads above need not be assumed to act concurrently.
2. Handrails Not Serving as Top Rails: Capable of withstanding the following loads applied as indicated:
 - a. Concentrated load of 200 lbf (890 N) applied at any point and in any direction.
 - b. Uniform load of 50 lbf/ft. (730 N/m) applied in any direction.
 - c. Concentrated and uniform loads above need not be assumed to act concurrently.
3. Infill Area of Guards: Capable of withstanding a horizontal concentrated load of 200 lbf (890 N) applied to 1 sq. ft. (0.09 sq. m) at any point in system, including panels, intermediate rails, balusters, or other elements composing infill area.
 - a. Load above need not be assumed to act concurrently with loads on top rails in determining stress on guards.

1.3 ACTION SUBMITTALS

- A. Product Data: For all fabricated products including the following:
 - 1. Paint products.
 - 2. Grout.
- 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. 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.

1.4 INFORMATIONAL SUBMITTALS

- A. Welding Certificates: Copies of certificates for welding procedures and personnel.
- B. 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.
- C. Delegated-Design Submittal: For handrails and railings, and guardrails, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 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. 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 metal handrails and railing systems that are similar to those indicated for this Project in material, design, and extent.
- C. Welding: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1, "Structural Welding Code--Steel."
 - 2. AWS D1.3, "Structural Welding Code--Sheet Steel."
 - 3. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.
- D. Mockups: Build mockups of each type of handrail, railing and guardrail system to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Each mock-up shall consist of a typical panel including two posts, top rail, infill area, and anchorage system components that are full height and are not less than 24 inches (600 mm) in length.
2. Notify Architect seven days in advance of dates and times when mock-up will be constructed
3. Remove/dismantle and reprepare mock-up as required to obtain Architect's approval.
4. Approved mock-ups may be incorporated in the finished work.

1.6 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.

1.7 COORDINATION

- A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

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. Steel Tubing: Cold-formed steel tubing complying with ASTM A 500. For exterior installations and where indicated, provide tubing with hot-dip galvanized coating.
- C. Steel Pipe: ASTM A 53, standard weight (Schedule 40), unless another weight is indicated or required by structural loads. For exterior installations and where indicated, provide pipe with hot-dip galvanized coating.

- D. Slotted Channel Framing: Cold-formed metal channels with flange edges returned toward web and with 9/16-inch- (14.3-mm-) wide slotted holes in webs at 2 inches (51 mm) o.c.
 - 1. Width of Channels: 1-5/8 inches (41 mm).
 - 2. Depth of Channels: As indicated.
 - 3. Metal and Thickness: Galvanized steel complying with ASTM A 653/A 653M, structural quality, Grade 33 (Grade 230), with G90 (Z275) coating; 0.108-inch (2.8-mm) nominal thickness.
 - 4. Finish: Unfinished.
- E. Malleable-Iron Castings: ASTM A 47, Grade 32510 (ASTM A 47M, Grade 22010).
- F. Gray-Iron Castings: ASTM A 48, Class 30 (ASTM A 48M, Class 200), unless another class is indicated or required by structural loads.
- G. Cast-in-Place Anchors in Concrete: Anchors of type indicated below, fabricated from corrosion-resistant materials capable of sustaining, without failure, the load imposed within a safety factor of 4, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
 - 1. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47 (ASTM A 47M) malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per ASTM A 153/A 153M.
- H. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

2.3 PAINT

- A. Shop Primer for Interior Ferrous Metal: Modified oil-alkyd primer, Tnemec 88-559 or 10-1009, or equivalent. Primer shall be compatible with finish paint specified in Section 09900.
- B. Shop Primer for Galvanized Ferrous Metal: Polyamide epoxy primer, Tnemec F.C. Typoxy Series 27, or equivalent. Primer shall be compatible with finish paint specified in Section 09900.
- C. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.
- D. Shop Primer for Exterior Ferrous Metal: Organic zinc-rich primer, complying with SSPC-Paint 20 and compatible with topcoat; Tnemec-Zinc 90-97; Tnemec Company, Inc.
- E. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers, or cold-applied asphalt emulsion complying with ASTM D 1187.

2.4 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, except as noted below. Select fasteners for type, grade, and class required.
- B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.
- C. Anchor Bolts: ASTM F 1554, Grade 36.
- D. Machine Screws: ASME B18.6.3 (ASME B18.6.7M).
- E. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).
- F. Wood Screws: Flat head, carbon steel, ASME B18.6.1.
- G. Plain Washers: Round, carbon steel, ASME B18.22.1 (ASME B18.22M).
- H. Lock Washers: Helical, spring type, carbon steel, ASME B18.21.1 (ASME B18.21.2M).
- I. 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.
- J. Toggle Bolts: FS FF-B-588, tumble-wing type, class and style as needed.

2.5 GROUT

- A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.6 FABRICATION, GENERAL

- A. 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 (1 mm), 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 (67 deg C), ambient; 180 deg F (100 deg C), 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.

2.7 HANDRAILS AND RAILINGS AND GUARDRAILS

- A. General: Fabricate handrails and railings to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of tube, post spacings, and anchorage, but not less than that needed to withstand indicated loads.

- B. Interconnect members by butt-welding or welding with internal connectors, at fabricator's option, unless otherwise indicated.
 - 1. At tee and cross intersections of pipe and tube, cope ends of intersecting members to fit contour of tube to which end is joined, and weld all around.
- C. Form changes in direction of handrails and rails as detailed.
- D. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- E. Close exposed ends of pipe and tube handrail and railing members with prefabricated end fittings.
- F. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated. Close ends of returns, unless clearance between end of rail and wall is 1/4 inch (6 mm) or less.
- G. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnecting railings and for attaching to other work. Furnish inserts and other anchorage devices for connecting to concrete or masonry work.
 - 1. Connect railing posts to concrete by inserting into existing post openings; enlarge holes by core drilling if required.
- H. Fillers: Provide fillers made from steel plate, or other suitably crush-resistant material, where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thicknesses and to produce adequate bearing area to prevent bracket rotation and overstressing of substrate.
- I. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.
- J. For galvanized handrails and railings, provide galvanized fittings, brackets, fasteners, sleeves, and other ferrous-metal components.
- K. Steel Handrail Finishes:
 - 1. Provide hot-dipped galvanized finish for all components of exterior steel handrail and railing system including fittings, brackets, anchors, fasteners, and sleeves.
 - 2. Shop prime and field paint all steel handrails and railings.

2.8 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. Fabricate units from structural-steel shapes, plates, tubes, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.
 - 1. Fabricate units from slotted channel framing where indicated.
 - 2. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors 1-1/4 inches (32 mm) wide by 1/4 inch (6 mm) thick by 8 inches (200 mm) long at 24 inches (600 mm) o.c., unless otherwise indicated.
 - 3. Furnish inserts if units must be installed after concrete is placed.
- C. Galvanize miscellaneous framing and supports where indicated, and in exterior locations.

2.9 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal fabrications after assembly.

2.10 STEEL 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 indicated as unpainted, and those to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Paint embedded steel that is partially exposed on exposed portions and initial 2 inches of embedded areas only.
 - 1. Do not paint surfaces to be welded or high-strength bolted with friction-type connections.
 - 2. Apply 2 coats of paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first..

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.
- F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

3.2 INSTALLING RAILINGS AND HANDRAILS

- A. Adjust handrails and railing systems before anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated or, if not indicated, as required by design loads. Plumb posts in each direction. Secure posts and railing ends to building construction as follows:
 - 1. Insert new posts into existing post openings in concrete substrate. If required, core-drill holes not less than 5 inches (125 mm) deep and 3/4 inch (20 mm) larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic

grout, mixed and placed to comply with anchoring material manufacturer's written instructions

2. Cover anchorage joint of post with flange of same metal as post where indicated.
3. Anchor handrail ends to concrete and masonry with steel round flanges welded to rail ends and anchored with postinstalled anchors and bolts.

3.3 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings, if any.
- B. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.
 1. Where grout space under bearing plates is indicated at girders supported on concrete or masonry, install as specified above for setting and grouting bearing and leveling plates.

3.4 ADJUSTING AND CLEANING

- A. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 09 Section "Painting."
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 055000

Greenburgh Eleven - Bethune Bldg			
Location	Room Name	Description	Comments
Note: Window sills are solid wood, apron, stained & sealed.			
LL06	K-6 Elementary Classroom	Solid Surface countertop/splash with upper and base cabinets, sink base, cubbies, storage cabinet.	Vertical Surface PL-1, Solid Surface
LL07A	Staff Pantry	Solid Surface countertop/splash with pantry style upper and base cabinets, sink base.	Vertical Surface PL-1, Solid Surface
LL22	Classroom/ Speech	Solid Surface countertop/splash with upper and base cabinets, sink base, storage cabinet.	Vertical Surface PL-1, Solid Surface
LL22A	K-6 Elementary Classroom	Solid Surface countertop/splash with upper and base cabinets, sink base, storage cabinet, coat hooks	Vertical Surface PL-1, Solid Surface
LL31	K-6 Elementary Classroom	Solid Surface countertop/splash with upper and base cabinets, sink base, cubbies, storage cabinets.	Vertical Surface PL-1, Solid Surface
LL34	K-6 Elementary Classroom	Solid Surface countertop/splash with upper cabinet and sink base, storage cabinet, coat hooks.	Vertical Surface PL-1, Solid Surface

PL-1: Wilsonart Limber Maple 10734-60
 Solid Surface: Corian, Everest

SECTION 061053 - MISCELLANEOUS CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Wood blocking, cants, furring, supports, and nailers.
2. Plywood backing panels.
3. Plywood ceiling sheathing at canopy

1.2 DEFINITIONS

A. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. NELMA - Northeastern Lumber Manufacturers Association.
2. NLGA - National Lumber Grades Authority.
3. SPIB - Southern Pine Inspection Bureau.
4. WCLIB - West Coast Lumber Inspection Bureau.
5. WWPA - Western Wood Products Association.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used, net amount of preservative retained, and chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials, both before and after exposure to elevated temperatures when tested according to ASTM D 5516 and ASTM D 5664.
3. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
4. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

1.4 INFORMATIONAL SUBMITTALS

A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses.

- B. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:

1. Preservative-treated wood.
2. Fire-retardant-treated wood.

1.5 QUALITY ASSURANCE

- A. All composite wood, engineered wood, or agrifiber products (e.g., plywood, particleboard, medium density fiberboard) shall contain no added urea-formaldehyde resins. Laminating adhesives used to fabricate on-site and shop-applied composite wood and agrifiber assemblies shall contain no added urea-formaldehyde resins. Acceptable resins and binders include, but are not limited to, phenol formaldehyde and methyl diisocyanate (MDI).

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber, plywood, and other panels; place spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings..

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of lumber grading agencies certified by the American Lumber Standards Committee Board of Review.
1. Factory mark each piece of lumber with grade stamp of grading agency.
 2. Provide dressed lumber, S4S, unless otherwise indicated.
 3. 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.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with ground, and Use Category UC3b for exterior construction not in contact with ground.
1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.
 2. The use of CCA preservative treated wood is prohibited.
- B. Kiln-dry material after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.

- C. Mark each treated item with treatment quality mark of an inspection agency approved by the American Lumber Standards Committee Board of Review.
- D. Application: Treat items indicated on Drawings, and the following:
 - 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 - 2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.

2.3 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
- B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.
 - 1. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D2898. Use for exterior locations and where indicated.
 - 2. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D3201 at 92 percent relative humidity. Use at interior unless otherwise noted.
 - 3. Use treatment that does not promote corrosion of metal fasteners.
- C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Kiln-dry plywood after treatment to a maximum moisture content of 15 percent.

2.4 MISCELLANEOUS LUMBER

- A. Provide miscellaneous lumber for support or attachment of other construction, including the following:
 - 1. Blocking.
 - 2. Nailers.
 - 3. Furring.
 - 4. Sleepers
 - 5. Cants

- B. For items of dimension lumber size, provide Construction, Stud, or No. 2 grade lumber with 19 percent maximum moisture content and the following species: Mixed southern pine; SPIB.
- C. For concealed boards, provide lumber with 19 percent maximum moisture content of the following species and grades:
 - 1. Spruce-pine-fir (south) or Spruce-pine-fir, Construction or 2 Common grade; NELMA, NLGA, WCLIB, or WWPA.

2.5 PLYWOOD PANELS

- A. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2 inch (12.7 mm) thick.
 - 1. Paint before mounting of equipment. Do not paint over classification marking of testing agency indicating fire-retardant treatment.
- B. Plywood Ceiling Sheathing: Exposure 1, Structural I sheathing; span rating to suit framing in each location and in thickness indicated.
 - 1. Provide fire-retardant treated plywood ceiling sheathing in exterior locations.
- C. Miscellaneous Concealed Plywood: Exposure 1 sheathing, span rating to suit framing in each location, and thickness as indicated but not less than 1/2 inch (13 mm).
 - 1. Provide fire-retardant-treated panels for interior locations unless indicated.
 - 2. Provide preservative-treated panels for exterior locations unless indicated. Do not preservative treat fire-retardant treated plywood ceiling sheathing in exterior locations.

2.6 MISCELLANEOUS MATERIALS

- A. Fasteners:
 - 1. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
 - 2. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

2.7 ACCESSORY MATERIALS

- A. Weather Resistant Barrier: Asphalt-saturated organic felt, ASTM D 226, Type 1 (No. 15 asphalt felt), unperforated.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Discard units of material with defects that impair quality of carpentry and that are too small to use with minimum number of joints or optimum joint arrangement.
- B. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- C. Apply field treatment complying with AWPAC M4 to cut surfaces of preservative-treated lumber and plywood.
- D. Securely attach carpentry work as indicated and according to applicable codes and recognized standards.
- E. Use fasteners of appropriate type and length. Predrill members when necessary to avoid splitting wood.

3.2 PANEL PRODUCT INSTALLATION

- A. Fastening Methods: Fasten panels as indicated below:
 - 1. Plywood Backing Panels: Screw to supports.. Install fire-retardant-treated plywood backing panels with classification marking of testing agency exposed to view.
 - 2. Miscellaneous Concealed Plywood Panels: Screw to supports.
 - 3. Ceiling Sheathing: Screw to supports.

3.3 WOOD BLOCKING, AND NAILER INSTALLATION

- A. Install where indicated and where required for screeding or attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.

END OF SECTION 061053

SECTION 062013 - EXTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Wood strip ceiling at canopy.
 - 2. Air and moisture barrier under wood strip ceiling.

1.2 SUBMITTALS

- A. Product Data: For each type of product and process specified and incorporated into items of exterior finish carpentry during fabrication, finishing, and installation.
 - 1. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
- B. Shop Drawings: Show installation details including location and layout of wood strip ceiling members.
- C. Samples for Verification: For each type of wood strip and accessory, with stain color and finish required, approximately 12 inches (300 mm) long and of same thickness and material indicated for the Work. Include sample sets showing the full range of normal color and texture variations expected.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed exterior finish carpentry similar in material, design, and extent to that indicated for this Project and whose work has resulted in exterior finish carpentry installations with a record of successful in-service performance.
- B. Source Limitations: Obtain each type of material and product from one source with resources to provide materials and products of consistent quality in appearance and physical properties.

1.4 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation of exterior finish carpentry only when existing and forecasted weather conditions permit work to be performed and at least one coat of specified finish to be applied without exposure to rain, snow, or dampness.

- B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed and indicate measurements on Shop Drawings.

1.5 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, reinforcements, and other related units of Work specified in other Sections to ensure that exterior finish carpentry can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Wood Boards: 3/4" x 6" with shiplap edges, random lengths.
 - 1. Wood Species and Cut: Western red cedar, clear vertical grade.
 - 2. Faces: Smooth sanded faces.
 - 3. Finish: Unfinished, for field finishing.

2.2 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
- B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.
 - 1. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D2898. Use for exterior locations.
 - 2. Use treatment that does not promote corrosion of metal fasteners.
- C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent.
- D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.

1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.
- E. For exposed items indicated to receive a stained or natural finish, chemical formulations shall not bleed through, contain colorants, or otherwise adversely affect finishes

2.3 INSTALLATION MATERIALS

- A. Blocking, Shims, and Nailers: Softwood or hardwood lumber, pressure-preservative treated, kiln-dried to less than 15 percent moisture content.
- B. Screws and Nails: Stainless steel or hot dipped galvanized, type of fastener recommended by manufacturer.
- C. Felt Underlayment: ASTM D 226, Type I, No. 15, asphalt-saturated felt.
- D. Applications: Treat items indicated on Drawings, and the following:
 1. Wood strip ceiling at canopy.

2.4 FINISHING MATERIALS

- A. As specified in Section 099100.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements, installation tolerances, and other conditions affecting performance of exterior wood finish carpentry. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Felt Underlayment: Install wood strip ceiling boards over a layer of asphalt-saturated felt on plywood ceiling sheathing.
- B. Pattern: Lay wood ceiling boards in pattern/direction indicated on Drawings or, if not indicated, as directed by Architect
- C. Scribe and cut finish carpentry to fit adjoining work.
- D. Anchor finish carpentry to plywood ceiling sheathing and to anchors or blocking built in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing. Use fine finishing nails for exposed nailing, countersunk and filled flush with finish carpentry.

- E. Field finish immediately upon completion of installation of wood strip ceiling system.

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective finish carpentry, where possible, to eliminate functional and visual defects; where not possible to repair, replace finish carpentry. Adjust joinery for uniform appearance.
- B. Clean finish carpentry on exposed and semiexposed surfaces.

END OF SECTION 062013

SECTION 064020 - INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Plastic-laminate cabinets and casework.
2. Interior wood trim and rails
3. Coat hooks, wall mounted, for classrooms.

B. Related Work Specified Elsewhere:

1. Solid surface countertops are specified in Division 06 Section "Solid Surface Material Fabrications."

1.2 DEFINITIONS

- A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items, unless concealed within other construction before woodwork installation.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated, including cabinet hardware and accessories, and finishing materials and processes.

- B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

1. Show details full size.
2. Show locations and sizes of furring, blocking, and hanging strips and clips, cabling and connectors, and attachment devices, including concealed blocking and reinforcement specified in other Sections.
3. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap dispensers, wire management, and other items installed in architectural woodwork.

- C. Samples for Verification: For the following:

1. Lumber with or for transparent finish, 50 sq. in. (300 sq. cm), for each species and cut, finished on 1 side and 1 edge.
2. Plastic-laminate-clad products, 8 by 10 inches (200 by 250 mm), for each type, color, pattern, and surface finish.

- D. Product Certificates: Signed by manufacturers of woodwork certifying that products furnished comply with 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.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed architectural woodwork similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production and installation of interior architectural woodwork.
- C. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards" for grades of interior architectural woodwork, construction, finishes, and other requirements.
 - 1. Provide AWI Quality Certification Program certificate indicating that woodwork complies with requirements of grades specified.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver woodwork until painting and similar operations that could damage woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed and indicate measurements on Shop Drawings.

1.7 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. General: Provide materials that comply with requirements of the AWI quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.
- B. Low-Emitting Materials: All composite wood, engineered wood, or agrifber products (e.g., plywood, particleboard, medium density fiberboard) shall contain no added urea-formaldehyde resins. Laminating adhesives used to fabricate on-site and shop-applied composite wood and agrifiber assemblies shall contain no added urea-formaldehyde resins. Acceptable resins and binders include, but are not limited to, phenol formaldehyde and methyl diisocyanate (MDI)
- C. Wood Species and Cut for Transparent Finish: Grade A Red Oak, plain sawn/sliced.
 - 1. Matching: Solid stock shall be matched for color and grain; veneer faces shall be compatible in color with solid stock.
- D. Cabinet Interiors (Cabinets with Doors): Plastic laminate with 3 mm PVC edgebanding (kerf and adhesion installation) on shelves.
- E. Wood Products: Comply with the following:
 - 1. Hardboard: Tempered, S1S, Class 1 minimum 1/4 inch and conforming to PS 58-73.
 - 2. Particleboard: Minimum 48 lb. density, straw-based particleboard complying with requirements in ANSI A208.1, Grade M - 2, except for density.
 - 3. Medium-Density Fiberboard: ANSI A208.2, Grade 130
 - 4. Softwood Plywood: DOC PS 1, Medium Density Overlay.
 - 5. Hardwood Plywood and Face Veneers: HPVA HP-1.
- F. Melamine-Faced Particleboard: Particleboard complying with ANSI A208.1, Grade M-2, finished on both faces with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD3, Grade VGL, for test methods 3.3, 3.4, 3.6, 3.8, and 3.10.
 - 1. Provide PVC or polyester edge banding complying with LMA EDG-1 on components with exposed or semiexposed edges.
- G. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated, or if not indicated, as required by woodwork quality standard.

1. Colors, Patterns and Finishes: As scheduled, or if not scheduled as selected by Architect.
2. Basis of Design Products: As scheduled, or if not scheduled as selected by Architect.
3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering high-pressure decorative laminates that may be incorporated into the Work include, but are not limited to, the following:
 - a. Formica Corporation.
 - b. Laminart.
 - c. Panolam Industries International, Inc.
 - d. Wilsonart

H. Adhesive for Bonding Plastic Laminate: Contact cement.

1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

2.2 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items specified in Division 08 Section "Door Hardware."
- B. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
 1. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.
 2. Other specific finishes are scheduled on Drawings
- C. Bumpers: Clear pressure sensitive non-skid vinyl bumpers 1/2 inch diameter by 5/32 inches thick; Grass #GF-BP-C, or equivalent.
- D. Frameless Concealed Hinges (European Type): 180 degrees of opening, self-closing, three-way adjustable; Grass #GF-1200VX-8, or equivalent.
- E. Catches: Magnetic catches, 5 lb. holding power; Ives 324-P69, or equivalent. Provide 1 top mounted at each door.
- F. Pulls: Mockett Rounded Square Pull #1088-SS Platinum finish.
- G. Wire Management Grommets: Plastic grommets with cut-out covers cap, 1-1/2 inch I.D. unless otherwise indicated; Hughes Plastic Parts, or equivalent. Color as selected by Architect from manufacturer's standard colors.
- H. Drawer Slides: 3/4 extension type, constructed from zinc plated cold-rolled steel, with ball-bearing rollers, 75 lbf (330 N) load rated; Accuride 214 Series, or equivalent.
- I. Slides for File Drawers: Full extension type, constructed from zinc plated cold-rolled steel, with ball-bearing rollers, 200 lbf (890 N) load rated; Accuride 4437 Series, or equivalent.

- J. Pencil Drawer Slides: 45 lbf (200 N), Accuride 214 Series, or equivalent
- K. Adjustable Shelf Supports: Peg type, steel, 5/16" stem length, 1/4" bore, spoon width 25/64"; Progressive IF-739NP, or equivalent.
- L. Locks: Door locks - NL-C8173-26D; drawer locks - NL-C8178-26D; strike - NL-C2004-14A; National Cabinet Lock, or equivalent. Keyed as requested by Owner.
- M. Levelers: Plastic leveling system, including socket, leveler, toe kick clip, and toe kick handle; Camar model CM-835-E1-00, CM-345-10-P2, CM-202-V1-T2, and CM-230-01-DE, or equivalent.
- N. Hooks for Cubbies: Double-pronged stainless steel hooks, ceiling mounted.

2.3 ACCESSORIES

- A. Shelving: 3/4" thick with 3 mm PVC kerfed edges, unless otherwise indicated.
 - 1. Provide MDO plywood for painted shelving.
 - 2. Provide plastic laminate faced panel product where scheduled or indicated on drawings.
 - 3. Shelving as part of a bookcase assembly shall be 1" thick.
- B. Adjustable Shelf Supports: Decorative, heavy-duty double-slotted standards adjustable on 1-1/4" centers with decorative brackets in length indicated on drawings. Include all accessories including cover strips, end caps, joiners, spacers and fasteners, as required for complete installation. Provide with epoxy finish in color as selected by Architect from manufacturer's standards.
 - 1. Product: Knap & Vogt #82 standards and #182 brackets, or equivalent.
- C. Coat Hooks, Wall-Mounted, for Classrooms: Polyamide nylon double coat hooks, 3-9/16" wide x 6-1/2" h x 3-7/16" d; hooks are 3" center-to-center, as follows:
 - 1. Basis of Design Product: HEWI Nylon Double Coat Hook - Wall Mounted - 801.90.040, from Harbor City Supply, or equal.
 - 2. Color: Yellow

2.4 INSTALLATION MATERIALS

- A. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

2.5 FABRICATION, GENERAL

- A. Interior Woodwork Grade: Provide Premium grade interior woodwork complying with the referenced quality standard.
- B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.
- C. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
 - 1. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members and Rails: 1/16 inch (1.5 mm)
- D. Complete fabrication, including assembly, and hardware application, to maximum extent possible, before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
 - 1. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on Shop Drawings before disassembling for shipment.
- E. Shop cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

2.6 INTERIOR WOOD TRIM AND RAILS

- A. Quality Standard: Comply with AWI Section 6.
- B. Grade: Premium, for transparent finish items.
- C. For trim items wider than available lumber, use veneered construction. Do not glue for width.
- D. Backout or groove backs of flat trim members and kerf backs of other wide, flat members, except for members with ends exposed in finished work
- E. Assemble casings in plant except where limitations of access to place of installation require field assembly.
- F. Assemble moldings in plant to maximum extent possible. Miter corners in plant and prepare for field assembly with bolted fittings designed to pull connections together.

2.7 PLASTIC-LAMINATE CABINETS AND CASEWORK

- A. Quality Standard: Comply with AWI Section 10 requirements for custom laminate cabinets.
- B. Grade: Premium
- C. AWI Type of Cabinet Construction: Full overlay.
- D. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate complying with the following requirements:
 - 1. Horizontal Surfaces Other Than Tops: HGS.
 - 2. Postformed Surfaces: HGP.
 - 3. Vertical Surfaces: HGS.
 - 4. Edges: HGS
- E. Materials for Semiexposed Surfaces Other Than Drawer Bodies:
 - 1. Drawer Sides and Backs: Thermoset decorative overlay.
 - 2. Drawer Bottoms: Thermoset decorative overlay.
- F. Colors, Patterns, and Finishes: As scheduled, or if not scheduled, as selected by Architect.
- G. Substrate: Plywood.
- H. Provide dust panels of 1/4-inch (6.4-mm) plywood or tempered hardboard above compartments and drawers, unless located directly under tops.

2.8 SHOP FINISHING

- A. Quality Standard: Comply with AWI Section 5, unless otherwise indicated.
 - 1. Grade: Provide finishes of same grades as items to be finished.
- B. General:
 - 1. Finish all transparent finished architectural woodwork at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.
- C. Preparations for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural woodwork, as applicable to each unit of work.
 - 1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of woodwork. Apply two coats to back of paneling and to end-grain surfaces. Concealed surfaces of plastic-laminate-clad woodwork do not

require backpriming when surfaced with plastic laminate, backing paper, or thermoset decorative overlay.

- D. Transparent Finish: Comply with requirements indicated below for grade, finish system, staining, and sheen, with sheen measured on 60-degree gloss meter per ASTM D 523:
 - 1. AWI Finish System 9: UV Curable, Acrylated Epoxy, Polyester or Urethane.
 - 2. Staining: As selected by Architect.
 - 3. Wash Coat for Stained Finish: Apply a vinyl wash coat to woodwork made from closed-grain wood before staining and finishing.
 - 4. Open Finish for Open-Grain Woods: Do not apply filler to open-grain woods.
 - 5. Sheen: Satin.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Condition woodwork to average prevailing humidity conditions in installation areas before installation.
- B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION

- A. Quality Standard: Install woodwork to comply with AWI Sections cited for fabrication and in the same grade, as specified in Part 2 of this Section for type of woodwork involved
- B. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm).
- C. Scribe and cut woodwork to fit adjoining work, and refinish cut surfaces and repair damaged finish at cuts.
- D. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.
- E. Wood Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible. Do not use pieces less than 36 inches (900 mm) long, except where shorter single-length pieces are necessary.
 - 1. Fill gaps, if any, between top of base and wall with plastic wood filler, sand smooth, and finish same as wood base, if finished.

2. Install trim with no more variation from a straight line than 1/8 inch in 96 inches (3 mm in 2400 mm).
- F. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
1. Install cabinets with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
 2. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches (400 mm) o.c. with No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish.
- G. Complete the finishing work specified in this Section to extent not completed at shop or before installation of woodwork. Fill nail holes with matching filler where exposed. Apply specified finish coats, including stains and paste fillers if any, to exposed surfaces where only sealer/prime coats were applied in shop.
- 3.3 ADJUSTING AND CLEANING
- A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
 - B. Clean, lubricate, and adjust hardware.
 - C. Clean woodwork on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 064020

SECTION 066116 - SOLID SURFACE MATERIAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes solid surface material fabricated into the following:
 - 1. Solid surface material countertops.
- B. Related Sections include the following:
 - 1. Blocking and grounds, including supports for solid surface material countertops, is specified in Division 06 Section "Miscellaneous Carpentry".
 - 2. Sealants are specified in Division 07 Section "Sealants."

1.2 ACTION SUBMITTALS

- A. Shop Drawings: Indicate dimensions, component sizes, fabrication details, attachment provisions, cutouts for insertion of accessories, and coordination requirements with adjacent work.
- B. Samples: Submit minimum 6" x 6" samples of selected colors and patterns. Where color is not specified, provide full range of manufacturer's available color samples for selection by Architect.
- C. Product Data: Indicate product description, fabrication information, and compliance with specified performance requirements.

1.3 INFORMATIONAL SUBMITTALS

- A. Maintenance Data: Submit manufacturer's care and maintenance data, including repair and cleaning instructions. Include in project closeout documents.
- B. Fabricator's Certificate: Submit certificate from manufacturer stating that fabricator is certified by manufacturer for this work.

1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications: Firm experienced and licensed by manufacturer for production of solid surface fabrications similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units without delaying the Work.
- B. Fire-Test-Response Characteristics: Provide materials with surface-burning characteristics as indicated below, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction.

1. Flame Spread: 25 or less.
2. Smoke Developed: 450 or less

1.5 JOB CONDITIONS

- A. Do not deliver components to project site until areas are ready for installation. Store indoors.
- B. Handle materials to prevent damage to finished surfaces. Provide protective coverings to prevent physical damage or staining following installation for duration of project.
- C. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication, where possible, to ensure proper fitting of work. Allow for adjustments where taking of field measurements before fabrication might delay work.
- D. Coordination: Furnish inserts and anchorages which must be built into other work. Coordinate delivery with other work to avoid delay.

1.6 WARRANTY

- A. General: The special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Manufacturer's Warranty. The manufacturer warrants to the original purchaser for commercial use that the manufacturer will at its option repair or replace, without charge, such product if it fails due to a manufacturing defect during the first 10 years after initial installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design Manufacturers: Provide Basis of Design Products or equal product of one of the following:
 1. AristechAcrylics, LLC.
 2. DuPont Polymers
 3. Formica

2.2 MATERIALS

- A. General: Provide materials which have been selected for surface flatness and smoothness. Exposed surfaces which exhibit pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections on finished units are not acceptable.

- B. Solid Surface Material: Homogeneous solid sheets of filled plastic resin complying with ICPA SS-1.
 - 1. Thickness: 12 mm (1/2").
 - 2. Color(s) and Pattern(s): Everest.
 - 3. Finish: Semigloss.
 - 4. Basis of Design Product: Corian Solid Surface by DuPont Polymers, or equal.

2.3 MISCELLANEOUS MATERIALS

- A. Joint Adhesive: Manufacturer's standard two-part adhesive kit to create inconspicuous, non-porous joints with chemical bonding.
- B. Installation Adhesive: Product recommended by fabricator for each substrate for secure anchorage.

2.4 FABRICATION

- A. General: All fabrications shall be made using solid surface material. Fabrications shall be adhesively jointed with no exposed seams and having edge details as indicated on drawings. No exposed fasteners shall be allowed.
- B. Factory fabricate components into single unit to sizes and shapes indicated, in accordance with approved shop drawings.
- C. Form joints between components using manufacturer's standard joint adhesive without conspicuous joints.
- D. Provide factory cutouts for bowls, plumbing fittings and accessories as indicated on the drawings.
- E. Cut and finish component edges with clean, sharp returns. Route radii and contours to template. Repair or reject defective and inaccurate work.
- F. Countertops: Fabricate tops in one piece. Comply with solid surfacing material manufacturer's recommendations for adhesives, sealers, fabrication, and finishing. Provide countertops with backsplash, endsplashes, aprons and nosings as shown.
 - 1. Total top thickness shall be as indicated on the Drawings or if not indicated, 1-1/2" thick. Provide built-up fabrication as required to obtain required total thickness.
- G. Edges: Built-up, 1-1/2" thick, with eased edge.
- H. Allowable Tolerances
 - 1. Variation in component size: $\pm 1/8"$.
 - 2. Location of openings: $\pm 1/8"$ from indicated location.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine surface to receive work and conditions under which work will be installed. Do not proceed with work until all unsatisfactory conditions are corrected.

3.2 INSTALLATION

- A. Install components plumb and level, scribed to adjacent finishes, in accordance with approved shop drawings and product installation data.
- B. Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work. Keep components and hands clean when making joints.

3.3 ADJUST AND CLEAN

- A. Clean exposed surfaces using materials and methods recommended by manufacturer, and provide protection as necessary to prevent damage during remainder of construction period. Repair work or replace damaged work that cannot be repaired as required.
- B. Keep components and hands clean during installation. Remove adhesives, sealants, and other stains. Replace stained components.

END OF SECTION 066116

SECTION 074213.53 - COMPOSITE METAL WALL AND SOFFIT PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Metal-faced composite core wall panels used for fascia cladding.
2. Metal wall panel accessories including closures, fasteners and clips, corners, flashings, and other components of wall panel system.

B. Related Sections include the following:

1. Division 07 Section "Joint Sealants" for field-applied sealants not otherwise specified in this Section.

1.2 PERFORMANCE REQUIREMENTS

A. General: Provide metal panel assemblies that comply with performance requirements specified as determined by testing manufacturers' standard assemblies similar to those indicated for this Project, by a qualified testing and inspecting agency.

B. Thermal Movements: Provide metal panel assemblies that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

C. Air Infiltration: Air leakage through assembly of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) of wall area when tested according to ASTM E 283 at the following test-pressure difference:

1. Test-Pressure Difference: 1.57 lbf/sq. ft. (75 Pa) for metal-faced composite core wall panels.

D. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:

1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa) for metal-faced composite core wall panels.

1.3 ACTION SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal panel and accessory.
- B. Shop Drawings: Show fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment systems, trim, flashings, closures, and accessories; and special details. Distinguish between factory- and field-assembled work.
- C. Samples for Initial Selection: Include manufacturer's color charts showing the full range of colors available, for metal panels and for exposed sealants.
- D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.
 - 1. Metal Panels: 12 inches (300 mm) long by actual panel width. Include fasteners, clips, closures, and other metal panel accessories.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Maintenance Data: For metal panels to include in maintenance manuals.
- C. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer. Firm shall have completed work similar in material, design, and extent to that indicated for this Project with a record of successful in-service performance.
- B. Source Limitations: Obtain each type of metal panels through one source from a single manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, sheets, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.
- B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal panels on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.

- D. Protect strippable protective covering on metal panels from exposure to sunlight and high humidity, except to extent necessary for period of metal panel installation.

1.7 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.
- B. Field Measurements: Verify locations of framing dimensions by field measurements before metal panel 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 metal panel assemblies that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures, including rupturing, cracking, or puncturing.
 - b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 2. Warranty Period: Two years from date of Substantial Completion.
- B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal wall panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PANEL MATERIALS

- A. Aluminum Sheet: Coil-coated sheet, ASTM B 209 (ASTM B 209M), alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required.

2.2 MISCELLANEOUS METAL FRAMING

- A. Steel Sheet Components, General: Complying with ASTM C 645 requirements for metal and with ASTM A 653/A 653M, G60 (Z180), hot-dip galvanized zinc coating.
- B. Subgirts: C- or Z-shaped sections fabricated from 0.0598-inch (1.5-mm) bare steel thickness, shop-painted, cold-formed, metallic-coated steel sheet.
- C. Base or Sill Angles and Channels: 0.079-inch (2.0-mm) bare steel thickness, cold-formed, galvanized steel sheet.
- D. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
 - 1. Minimum Base Metal Thickness: 0.0179 inch (0.45 mm).
 - 2. Depth: 7/8 inch (22 mm) unless otherwise indicated.
- E. Cold-Rolled Furring Channels: 0.0538-inch (1.37-mm) bare steel thickness, with minimum 1/2-inch- (13-mm-) wide flange.
 - 1. Depth: As indicated.
- F. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum bare steel thickness of 0.0312 inch (0.79 mm).
- G. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch- (1.59-mm-) diameter wire, or double strand of 0.0475-inch- (1.21-mm-) diameter wire.
- H. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

2.3 MISCELLANEOUS MATERIALS

- A. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating.

2.4 METAL-FACED COMPOSITE CORE WALL AND SOFFIT PANELS

- A. General: Provide factory-formed and -assembled, metal-faced composite panels fabricated from two metal facings bonded, using no glues or adhesives, to solid, extruded thermoplastic core; formed into profile for installation method indicated. Include attachment system components and accessories required for weathertight system.
 - 1. Surface-Burning Performance: Product shall have the following surface-burning characteristics as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 450 or less.

2. Basis of Design Product: Provide Alucobond PLUS manufactured by 3A composites USA or one of the following:
 - a. Alcoa Inc.; Reynobond .
- B. Aluminum-Faced Composite Wall Panels: Formed with 0.020-inch- (0.50-mm-) thick, coil-coated aluminum sheet facings.
 1. Panel Thickness: 4 mm.
 2. Core: Regular core.
 3. Exterior Finish: Two-coat or three-coat fluoropolymer. AAMA 2605. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coats. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - a. Color: As selected by Architect.
- C. Attachment System Components: Formed from extruded aluminum.
 1. Include manufacturer's standard perimeter extrusions with integral weather stripping, panel stiffeners, panel clips and anchor channels as indicated or as required for a complete assembly.
- D. System Installation Method: Rout and return wet seal.
- E. Applications: Fascia, trim, and other articulated exterior metal wall panels, and other applications indicated on Drawings.
- F. Flashing and Trim Color: Same material, finish, and color as facings of adjacent panels

2.5 ACCESSORIES

- A. Wall Panel Accessories: Provide components required for a complete metal wall panel assembly including corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal wall panels, unless otherwise indicated.

2.6 FABRICATION

- A. General: Fabricate and finish metal panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. Fabricate metal wall panels in a manner that eliminates condensation on interior side of panel and with joints between panels designed to form weathertight seals
- C. Metal-Faced Composite Wall Panels: Factory form panels in a continuous process with no glues or adhesives between dissimilar materials. Trim and square edges of sheets with no displacement of face sheets or protrusion of core material.

1. Form panel lines, breaks, and angles to be sharp and true, with surfaces free from warp and buckle.
 2. Fabricate panels with sharply cut edges, with no displacement of face sheets or protrusion of core material.
 3. Fabricate panels with panel stiffeners, as required to comply with deflection limits, attached to back of panels with structural silicone sealant or bond tape.
 4. Dimensional Tolerances:
 - a. Panel Bow: 0.8 percent maximum of panel length or width.
 - b. Squareness: 0.25 inch (5 mm) maximum.
- D. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of item indicated.
1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
 2. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.
 3. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
 4. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended by metal panel manufacturer.
 - a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal panel manufacturer for application but not less than thickness of metal being secured.

2.7 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of work.

- B. Examine primary and secondary framing to verify that structural panel support members and anchorages have been installed within alignment tolerances required by manufacturer.
 - 1. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before metal panel installation
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Miscellaneous Framing: Install furring, and other miscellaneous panel support members and anchorage according to metal panel manufacturer's written recommendations.

3.3 METAL PANEL INSTALLATION, GENERAL

- A. General: Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 - 1. Factory cut metal panels as required for penetrations and openings. Cut openings as small as possible, neatly to size required, and without damage to adjacent metal panel finishes.
 - a. Field cutting of metal panels by saw or torch is not permitted.
 - 2. Install metal panels perpendicular to structural supports, unless otherwise indicated.
 - 3. Flash and seal metal panels with weather closures at perimeter of openings and similar elements. Fasten with self-tapping screws.
- B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal panel manufacturer.
- C. Joint Sealers: Install sealants where indicated and where required for weatherproof performance of metal panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by metal panel manufacturer.

3.4 METAL WALL AND SOFFIT PANEL INSTALLATION

- A. General: Install metal wall panels in orientation, sizes, and locations indicated on Drawings. Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 - 1. Shim or otherwise plumb substrates receiving metal wall panels.
 - 2. Install flashing and trim as metal wall panel work proceeds.

- B. Clip Installation: Attach panel clips to supports at each metal-faced composite wall panel joint at locations, spacings, and with fasteners recommended by manufacturer. Attach routed-and-turned flanges of wall panels to panel clips with manufacturer's standard fasteners.
 - 1. Seal horizontal and vertical joints between adjacent panels with sealant backing and sealant. Install sealant backing and sealant according to requirements specified in Division 07 Section "Joint Sealants."
- C. Installation Tolerances: Shim and align metal wall panels within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m), nonaccumulative, on level, plumb, and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.5 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.
- B. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074213.53

SECTION 078123 – INTUMESCENT FIREPROOFING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes mastic and intumescent fire-resistive coatings (MIFRC).

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review products, design ratings, restrained and unrestrained conditions, thicknesses, and other performance requirements.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
 - 1. Material List: Provide an inclusive list of required intumescent 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.
- B. UL Designs: For each UL Design proposed for use.
- C. Shop Drawings: Structural framing plans indicating the following:
 - 1. Extent of fireproofing for each construction and fire-resistance rating.
 - 2. Applicable fire-resistance design designations of a qualified testing and inspecting agency acceptable to authorities having jurisdiction.
 - 3. Minimum fireproofing thicknesses needed to achieve required fire-resistance rating of each structural component and assembly.
 - 4. Treatment of fireproofing after application.
- D. Samples: For each exposed product and for each color and texture specified, in manufacturer's standard dimensions.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For each type of fireproofing.
- C. Evaluation Reports: For fireproofing, from ICC-ES.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A firm or individual certified, licensed, or otherwise qualified by fireproofing manufacturer as experienced and with sufficient trained staff to install manufacturer's products according to specified requirements..
- B. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.
 - 1. Build mockup of each type of fireproofing and different substrate as shown on Drawings.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 PROJECT CONDITIONS

- A. Apply waterborne coatings only when temperatures of surfaces to be coated and surrounding air are between 50 and 90 deg F (10 and 32 deg C).
- B. Ventilation: Ventilate building spaces during and after application of fireproofing, providing complete air exchanges according to manufacturer's written instructions. Use natural means or, if they are inadequate, forced-air circulation until fireproofing dries thoroughly.

PART 2 - PRODUCTS

2.1 INTUMESCENT COATING MATERIALS, GENERAL

- A. Assemblies: Provide fireproofing, including auxiliary materials, according to requirements of each fire-resistance design and manufacturer's written instructions.
- B. Source Limitations: Obtain fireproofing from single source.
- C. Fire-Resistance Design: Indicated on Drawings, tested according to ASTM E 119 or UL 263 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Steel members are to be considered unrestrained unless specifically noted otherwise
- D. Low-Emitting Materials: Products shall comply with VOC content limits of authorities having jurisdiction and the following VOC limits when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - 1. Flat Paints and Coatings: 50 g/L.
 - 2. Nonflat Paints and Coatings: 150 g/L.
 - 3. Primers, Sealers, and Undercoaters: 200 g/L.

4. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.

- E. Asbestos: Provide products containing no detectable asbestos.

2.2 MASTIC AND INTUMESCENT FIRE-RESISTIVE COATINGS

- A. Mastic and Intumescent Fire-Resistive Coating: Manufacturer's standard, water-based, factory-mixed formulation, and complying with indicated fire-resistance design:

1. Basis of Design Product: CAFCO SprayFilm WB 4 manufactured by Isolatek International, or the following equal (listed in the UL Designs indicated):
 - a. ISOLATEK Type WB 4 manufactured by Isolatek International
 - b. Type WB 4 manufactured by Greentech Thermal Insulation Products Mfg Co LLC
 - c. Type WB 4 manufactured by Berlin Co. Ltd.
 - d. Type WB 4 manufactured by Newkem Products Corp
2. Application: Designated for "exterior" use by a qualified testing agency acceptable to authorities having jurisdiction.
3. Thickness: As required for fire-resistance design indicated, measured according to requirements of fire-resistance design.
4. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 450 or less.
5. Hardness: Not less than 80, Type D durometer, according to ASTM D 2240.
6. VOC Content: Zero.
7. UL Design No.:
 - a. Steel Tube or Pipe Columns: UL X650.
 - b. Floor Deck and Beams: UL D601.

- B. Sealer for Exterior Mastic and Intumescent Fire-Resistive Coating: Manufacturer's standard water-based, two-component high performance epoxy sealer engineered as a sealer/top coat for the specified intumescent coating, and complying with indicated fire-resistance design:

1. Basis of Design Product: CAFCO SprayFilm Topseal manufactured by Isolatek International, or the following equal (listed in the UL Designs indicated):
 - a. ISOLATEK Topseal manufactured by Isolatek International
 - b. Topseal manufactured by Berlin Co. Ltd.
 - c. Topseal manufactured by Greentech Thermal Insulation Products Mfg Co LLC
 - d. Topseal manufactured by Newkem Products Corp..

2.3 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that are compatible with fireproofing and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistance designs indicated.
- B. Substrate Primers: Primers approved by fireproofing manufacturer and complying with required fire-resistance design by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Refer to Division 09 Section "Painting" for additional information on prime paint.
- C. Decorative Topcoat: Finish paint specified in Division 09 Section "Painting". Topcoat shall be suitable for application over applied fireproofing; of type recommended in writing by fireproofing manufacturer for each fire-resistance design.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrates and other conditions affecting performance of the Work and according to each fire-resistance design. Verify compliance with the following:
 - 1. Substrates are free of dirt, oil, grease, release agents, rolling compounds, mill scale, loose scale, incompatible primers, paints, and encapsulants, or other foreign substances capable of impairing bond of fireproofing with substrates under conditions of normal use or fire exposure.
 - 2. Objects penetrating fireproofing, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.
 - 3. Substrates receiving fireproofing are not obstructed by ducts, piping, equipment, or other suspended construction that will interfere with fireproofing application.
- B. Conduct tests according to fireproofing manufacturer's written recommendations to verify that substrates are free of substances capable of interfering with bond.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Cover other work subject to damage from fallout or overspray of fireproofing materials during application.
- B. Clean substrates of substances that could impair bond of fireproofing.

- C. Prime substrates where included in fire-resistance design and where recommended in writing by fireproofing manufacturer unless compatible shop primer has been applied and is in satisfactory condition to receive fireproofing.
- D. For applications visible on completion of Project, repair substrates to remove surface imperfections that could affect uniformity of texture and thickness in finished surface of fireproofing. Remove minor projections and fill voids that would telegraph through fire-resistive products after application.

3.3 APPLICATION

- A. Construct fireproofing assemblies that are identical to fire-resistance design indicated and products as specified, tested, and substantiated by test reports; for thickness, primers, topcoats, finishing, and other materials and procedures affecting fireproofing work.
- B. Comply with fireproofing manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and apply fireproofing; as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.
- C. Coordinate application of fireproofing with other construction to minimize need to cut or remove fireproofing.
 - 1. Do not begin applying fireproofing until clips, hangers, supports, sleeves, and other items penetrating fireproofing are in place.
 - 2. Defer installing ducts, piping, and other items that would interfere with applying fireproofing until application of fireproofing is completed.
- D. Install auxiliary materials as required, as detailed, and according to fire-resistance design and fireproofing manufacturer's written recommendations for conditions of exposure and intended use. For auxiliary materials, use attachment and anchorage devices of type recommended in writing by fireproofing manufacturer.
- E. Spray apply fireproofing to maximum extent possible. Following the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by fireproofing manufacturer.
- F. Extend fireproofing in full thickness over entire area of each substrate to be protected.
- G. Install body of fireproofing in a single course unless otherwise recommended in writing by fireproofing manufacturer.
- H. Provide a uniform finish complying with description indicated for each type of fireproofing material and matching finish approved for required mockups.
- I. Cure fireproofing according to fireproofing manufacturer's written recommendations.

- J. Do not install enclosing or concealing construction or apply finish paint coat until after fireproofing has been applied, inspected, and tested and corrections have been made to deficient applications.
- K. Finishes: Apply fireproofing to produce surface finish matching approved mock-up.
- L. Field Painting: Refer to Division 09 Section "Painting".

3.4 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
 - 1. Test and inspect as required by the IBC, 1704.11.
- B. Perform the tests and inspections of completed Work in successive stages. Do not proceed with application of fireproofing for the next area until test results for previously completed applications of fireproofing show compliance with requirements. Tested values must equal or exceed values as specified and as indicated and required for approved fire-resistance design.
- C. Fireproofing will be considered defective if it does not pass tests and inspections.
 - 1. Remove and replace fireproofing that does not pass tests and inspections, and retest.
 - 2. Apply additional fireproofing, per manufacturer's written instructions, where test results indicate insufficient thickness, and retest.
- D. Prepare test and inspection reports.

3.5 CLEANING, PROTECTING, AND REPAIRING

- A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.
- B. Protect fireproofing, according to advice of manufacturer and Installer, from damage resulting from construction operations or other causes, so fireproofing will be without damage or deterioration at time of Substantial Completion.
- C. As installation of other construction proceeds, inspect fireproofing and repair damaged areas and fireproofing removed due to work of other trades.
- D. Repair fireproofing damaged by other work before concealing it with other construction.
- E. Repair fireproofing by reapplying it using same method as original installation or using manufacturer's recommended trowel-applied product.

November 6, 2020
Construction Documents
SED 66-04-11-02-0-003-002

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Alterations

END OF SECTION 078123

SECTION 078413 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Penetrations in fire-resistance-rated walls.
2. Penetrations in fire-resistance-rate horizontal assemblies.
3. Penetrations in non-fire-resistance-rate horizontal assemblies.
4. Penetrations in smoke barriers, smoke partitions and smoke tight partitions.

B. Related Sections:

1. Section 078446 "Fire-Resistive Joint Systems" for joints in or between fire-resistance-rated construction, at exterior curtain-wall/floor intersections, and in smoke barriers.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product Schedule: For each penetration firestopping system. Include location and design designation of qualified testing and inspecting agency.

1. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping condition, submit illustration, with modifications marked, approved by penetration firestopping manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Installer Certificates: From Installer indicating penetration firestopping has been installed in compliance with requirements and manufacturer's written recommendations.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for penetration firestopping.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A firm experienced in installing penetration firestopping similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include

having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its penetration firestopping products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.

- B. Fire-Test-Response Characteristics: Penetration firestopping shall comply with the following requirements:
 - 1. Penetration firestopping tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
 - 2. Penetration firestopping is identical to those tested per testing standard referenced in "Penetration Firestopping" Article. Provide rated systems complying with the following requirements:
 - a. Penetration firestopping products bear classification marking of qualified testing and inspecting agency.
 - b. Classification markings on penetration firestopping correspond to designations listed by the following:
 - 1) UL in its "Fire Resistance Directory."
 - 2) Intertek ETL SEMKO in its "Directory of Listed Building Products."
 - 3) FM Global in its "Building Materials Approval Guide."
- C. Preinstallation Conference: Conduct conference at Project site.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install penetration firestopping when ambient or substrate temperatures are outside limits permitted by penetration firestopping manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.
- B. Install and cure penetration firestopping per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.6 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping is installed according to specified requirements.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping.
- C. Notify Owner's testing agency at least seven days in advance of penetration firestopping installations; confirm dates and times on day preceding each series of installations.

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:
 - 1. Penetration Firestop Systems specified in the Schedule in Part - 3 include:
 - a. Fire Barrier Products, 3M Fire Protection Products
 - b. RectorSeal Corporation.
 - 2. Subject to compliance with specified requirements, provide Penetration Firestop Systems (XHEZ) listed in Volume II of the UL Fire Resistance Directory (BXRH), by one of the following:
 - a. Hilti, Inc.
 - b. Nelson Firestop Products.
 - c. RectorSeal Corporation.
 - d. Specified Technologies Inc.
 - e. 3M Fire Protection Products.
 - f. Wiremold/Legrand

2.2 PENETRATION FIRESTOPPING

- A. Provide penetration firestopping that is produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.
- B. Penetrations in Fire-Resistance-Rated Walls: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).
 - 1. Fire-resistance-rated walls include fire walls, fire-barrier walls, smoke-barrier walls, and fire partitions.
 - 2. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
- C. Penetrations in Horizontal Assemblies: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).
 - 1. Horizontal assemblies include floors and floor/ceiling assemblies.
 - 2. F-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated.
 - 3. T-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
- D. Penetrations in Smoke Barriers: Provide penetration firestopping with ratings determined per UL 1479.
 - 1. L-Rating: Not exceeding 5.0 cfm/sq. ft. (0.025 cu. m/s per sq. m) of penetration opening at 0.30-inch wg (74.7 Pa) at both ambient and elevated temperatures.

- E. W-Rating: Provide penetration firestopping showing no evidence of water leakage when tested according to UL 1479.
- F. Exposed Penetration Firestopping: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
- G. VOC Content: Penetration firestopping sealants and sealant primers shall 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.
- H. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping manufacturer and approved by qualified testing and inspecting agency for firestopping indicated.
 - 1. Permanent forming/damming/backing materials, including the following:
 - a. Slag-wool-fiber or rock-wool-fiber insulation.
 - b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
 - c. Fire-rated form board.
 - d. Fillers for sealants.
 - 2. Temporary forming materials.
 - 3. Substrate primers.
 - 4. Collars.
 - 5. Steel sleeves.

2.3 FILL MATERIALS

- A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.
- B. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.
- C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
- D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized-steel sheet.
- E. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.

- F. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
- G. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.
- H. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.
- I. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.
- J. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:
 - 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and nonsag formulation for openings in vertical and sloped surfaces, unless indicated firestopping limits use of nonsag grade for both opening conditions.

2.4 MIXING

- A. For those products requiring mixing before application, comply with penetration firestopping manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Clean out openings immediately before installing penetration firestopping to comply with manufacturer's written instructions and with the following requirements:
 - 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping.

2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping. Remove loose particles remaining from cleaning operation.
 3. Remove laitance and form-release agents from concrete.
- B. Priming: Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent penetration firestopping from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing firestopping's seal with substrates.

3.3 INSTALLATION

- A. General: Install penetration firestopping to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestopping.
- C. Install fill materials for firestopping by proven techniques to produce the following results:
1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

- A. Identify penetration firestopping with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of firestopping edge so labels will be visible to anyone seeking to remove penetrating items or firestopping. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
 2. Contractor's name, address, and phone number.

3. Designation of applicable testing and inspecting agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.5 FIELD QUALITY CONTROL

- A. Owner will engage a qualified testing agency to perform tests and inspections.
- B. Where deficiencies are found or penetration firestopping is damaged or removed because of testing, repair or replace penetration firestopping to comply with requirements.
- C. Proceed with enclosing penetration firestopping with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

- A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping is without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping and install new materials to produce systems complying with specified requirements.

3.7 PENETRATION FIRESTOPPING SCHEDULE

- A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHEZ.
- B. For penetrations in non-fire rated horizontal assemblies, smoke barriers, smoke partitions and smoke tight partitions, provide systems tested for 1 hour unless otherwise noted.
- C. Basis of Design Assemblies: Subject to compliance with requirements, provide the design indicated below or a comparable UL design by one of manufacturer's listed in Part 2 above.
 1. Schedule of construction components, type of penetrant, and U.L. Penetration Firestop Systems include, but are not limited to the following:
 2. Schedule of construction components, type of penetrant, and U.L. Penetration Firestop Systems include, but are not limited to the following:

	P E N E T R A N T
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	Metal Conduit	Cable Tray⁴	Cables	Non-Insul. Metal Pipe	Insul. Pipe	FR Polypropylene Pipe	Insul. Metal Duct
GWB Stud Wall, or Shaft Wall up to 2 Hr Rating	W-L-1001	W-L-4004	W-L-3001	W-L-1001	W-L-5011	W-L-2002	W-L-7006 ³
CMU Wall up to 2 Hr Rating	C-AJ-1044	C-AJ-4003	C-AJ-3030	C-AJ-1044	C-AJ-5001	C-AJ-2001	C-AJ-7003 ³ , 7016 ³
Concrete Floor / Metal Deck 1 Hr Rated F and T-Rating²	C-AJ-1008	N/A	C-AJ-3029	C-AJ-1008	C-AJ-5002	F-A-2002	C-AJ-7009 ⁵
Concrete Floor / Metal Deck 2 Hr Rated F and T-Rating²	C-AJ-1008	N/A	C-AJ-3029	C-AJ-1008	C-AJ-5060	F-A-2002	N/A
Concrete Floor / Metal Deck up to 2 Hr F Rated¹	F-A-1002	N/A	C-AJ-3030	C-AJ-1044	C-AJ-5001	F-A-2002	N/A

KEY TO NOTES

1. Penetration within wall cavity.
2. Penetration that does not fall within wall cavity, T-Rating required.
3. Up to 1 hour rating, submit engineered judgement firestopping system for this combination of penetrant, wall/floor assembly, and fire rating. Install fire dampers in 2-hour walls in accordance with manufacturer's instructions and testing agency requirements.
4. Where cable tray extends through wall.
5. For floor penetrations not enclosed above and below the floor with shaft wall.

D. Membrane Penetrations:

1. Firestop membrane penetrations by cables, pipes and conduit similar to through wall penetrations.
 2. Provide putty pad box wrap firestopping for membrane penetrations in rated walls for electrical back boxes over 16 sq. inches, where any back boxes are located within 24 inches horizontal of another back box, or when total area of back boxes exceeds 100 sq in. in 100 sq. ft. of wall area.
- E. Where another type of construction or penetrant is encountered, or if field conditions vary from those described in the U.L. System listed (i.e. annular space is greater/smaller, insulation type varies, etc.), provide firestopping systems which are appropriate, and U.L. tested, for that condition.

END OF SECTION 078413

SECTION 078446 - FIRE-RESISTIVE JOINT SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Joints in or between fire-resistance-rated constructions.
2. Joints in smoke barriers.

B. Related Sections:

1. Section 078413 "Penetration Firestopping" for penetrations in fire-resistance-rated walls, horizontal assemblies, and smoke barriers.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product Schedule: For each fire-resistive joint system. Include location and design designation of qualified testing agency.

1. Where Project conditions require modification to a qualified testing agency's illustration for a particular fire-resistive joint system condition, submit illustration, with modifications marked, approved by fire-resistive joint system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Installer Certificates: From Installer indicating fire-resistive joint systems have been installed in compliance with requirements and manufacturer's written recommendations.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for fire-resistive joint systems.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A firm experienced in installing fire-resistive joint systems similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its fire-resistive joint

system products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.

- B. Fire-Test-Response Characteristics: Fire-resistive joint systems shall comply with the following requirements:
 - 1. Fire-resistive joint system tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
 - 2. Fire-resistive joint systems are identical to those tested per testing standard referenced in "Fire-Resistive Joint Systems" Article. Provide rated systems complying with the following requirements:
 - a. Fire-resistive joint system products bear classification marking of qualified testing agency.
 - b. Fire-resistive joint systems correspond to those indicated by reference to designations listed by the following:
 - 1) UL in its "Fire Resistance Directory."

- C. Preinstallation Conference: Conduct conference at Project site.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install fire-resistive joint systems when ambient or substrate temperatures are outside limits permitted by fire-resistive joint system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Install and cure fire-resistive joint systems per manufacturer's written instructions using natural means of ventilation or, where this is inadequate, forced-air circulation.

1.6 COORDINATION

- A. Coordinate construction of joints to ensure that fire-resistive joint systems are installed according to specified requirements.
- B. Coordinate sizing of joints to accommodate fire-resistive joint systems.
- C. Notify Owner's testing agency at least seven days in advance of fire-resistive joint system installations; confirm dates and times on day preceding each series of installations.

PART 2 - PRODUCTS

2.1 FIRE-RESISTIVE JOINT SYSTEMS

- A. Where required, provide fire-resistive joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which fire-resistive joint systems are installed. Fire-resistive joint systems shall

accommodate building movements without impairing their ability to resist the passage of fire and hot gases.

- B. Joints in or between Fire-Resistance-Rated Construction: Provide fire-resistive joint systems with ratings determined per ASTM E 1966 or UL 2079:
 - 1. Joints include those installed in or between fire-resistance-rated walls, floor or floor/ceiling assemblies and roofs or roof/ceiling assemblies.
 - 2. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of construction they will join.
 - 3. 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:
 - a. Grace Construction Products.
 - b. Hilti, Inc.
 - c. RectorSeal Corporation.
 - d. Specified Technologies Inc.
 - e. 3M Fire Protection Products.
 - f. Tremco, Inc.; Tremco Fire Protection Systems Group.
- C. Joints in Smoke Barriers: Provide fire-resistive joint systems with ratings determined per UL 2079.
 - 1. L-Rating: Not exceeding 5.0 cfm/ft (0.00775 cu. m/s x m) of joint at 0.30 inch wg (74.7 Pa) at both ambient and elevated temperatures.
 - 2. 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:
 - a. Grace Construction Products.
 - b. Hilti, Inc.
 - c. Johns Manville.
 - d. RectorSeal Corporation.
 - e. Specified Technologies Inc.
 - f. 3M Fire Protection Products.
 - g. Tremco, Inc.; Tremco Fire Protection Systems Group.
- D. Exposed Fire-Resistive Joint Systems: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
- E. VOC Content: Fire-resistive joint system sealants shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - 1. Architectural Sealants: 250 g/L.
 - 2. Sealant Primers for Nonporous Substrates: 250 g/L.
 - 3. Sealant Primers for Porous Substrates: 775 g/L.
- F. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install fill materials and to maintain ratings

required. Use only components specified by fire-resistive joint system manufacturer and approved by the qualified testing agency for systems indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Clean joints immediately before installing fire-resistive joint systems to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:
 - 1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of fill materials.
 - 2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with fill materials. Remove loose particles remaining from cleaning operation.
 - 3. Remove laitance and form-release agents from concrete.
- B. Priming: Prime substrates where recommended in writing by fire-resistive joint system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent fill materials of fire-resistive joint system from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing fire-resistive joint system's seal with substrates.

3.3 INSTALLATION

- A. General: Install fire-resistive joint systems to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming materials and other accessories of types required to support fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
 - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of fire-resistive joint system.

- C. Install fill materials for fire-resistive joint systems by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.
 - 2. Apply fill materials so they contact and adhere to substrates formed by joints.
 - 3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

- A. Identify fire-resistive joint systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of joint edge so labels will be visible to anyone seeking to remove or penetrate joint system. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
 - 1. The words "Warning - Fire-Resistive Joint System - Do Not Disturb. Notify Building Management of Any Damage."
 - 2. Contractor's name, address, and phone number.
 - 3. Designation of applicable testing agency.
 - 4. Date of installation.
 - 5. Manufacturer's name.
 - 6. Installer's name.

3.5 FIELD QUALITY CONTROL

- A. Inspecting Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Where deficiencies are found or fire-resistive joint systems are damaged or removed due to testing, repair or replace fire-resistive joint systems so they comply with requirements.
- C. Proceed with enclosing fire-resistive joint systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTING

- A. Clean off excess fill materials adjacent to joints as the Work progresses by methods and with cleaning materials that are approved in writing by fire-resistive joint system manufacturers and that do not damage materials in which joints occur.
- B. Provide final protection and maintain conditions during and after installation that ensure fire-resistive joint systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated fire-resistive joint systems immediately and install new materials to produce fire-resistive joint systems complying with specified requirements.

3.7 FIRE-RESISTIVE JOINT SYSTEM / FIRESTOP JOINT SYSTEM SCHEDULE

- A. Where UL-classified firestop joint systems are indicated, they refer to alphanumeric designations listed in UL's "Fire Resistance Directory" under product Category XHBN.

Firestop Joint System Location	Basis-of-Design	Assembly Rating	Nominal Joint Width	Movement Capabilities ²
Floor-to-Wall				
Rated concrete masonry wall construction intersection with adjacent floor construction	FW-D-1012, FW-D-1013	1 hour or 2 hours ¹	As indicated, or required by tested assembly	Class II
Head-of-Wall				
Rated gypsum wall construction intersection with steel floor deck above	HW-D-0087, or HW-D-0089	1 hour or 2 hours ¹	As indicated, or required by tested assembly	Class II or III,
Rated gypsum wall construction intersection with concrete floor deck above	HW-D-0083, HW-D-209	1 hour or 2 hours ¹	As indicated, or required by tested assembly	Class II
Rated concrete masonry wall construction intersection with steel floor deck above	HW-D-0081, or HW-D-0098	1 hour or 2 hours ¹	As indicated, or required by tested assembly	Class II
Rated concrete masonry wall construction intersection with concrete floor deck above	HW-D-0268, HW-D-0097	1 hour or 2 hours ¹	As indicated, or required by tested assembly	Class II
Bottom-of-Wall				
Rated gypsum wall construction intersection with concrete floor	BW-S-0002	1 hour or 2 hours ¹	As indicated, or required by tested assembly	Static

1. Rating to match wall construction.
2. Class UL2079

- B. Where another type of construction is encountered, or if field conditions vary from those described in the U.L. System listed (i.e. annular space is greater/smaller,

insulation type varies, etc.), provide firestopping systems which are appropriate, and U.L. tested, for that condition.

END OF SECTION 078446

ATTACHMENT: FIRESTOP JOINT SYSTEMS SUBMITTAL SHEET

3.8 FIRESTOP JOINT SYSTEMS SUBMITTAL SHEET

- A. **HEAD-OF-WALL FIRESTOPPING:** Fill in the U.L. Design number and attach copy of U.L. Test. Insert n/a if condition is not applicable.
1. Gypsum wall construction intersection with floor deck above: _____.
Gypsum wall construction intersection with roof deck above: _____.
 2. Concrete masonry wall construction intersection with floor deck above: _____.
 3. Concrete masonry wall construction intersection with roof deck above: _____.
- B. **FLOOR-TO-WALL FIRESTOPPING:** Fill in the U.L. Design number and attach copy of U.L. Test. Insert n/a if condition is not applicable.
1. Concrete masonry wall construction intersection with adjacent floor construction: _____.
- C. **BOTTOM-OF-WALL FIRESTOPPING:** Fill in the U.L. Design number and attach copy of U.L. Test. Insert n/a if condition is not applicable.
1. Gypsum wall construction intersection with floor deck: _____. Gypsum wall construction intersection with roof deck above: _____.
 2. Concrete masonry wall construction intersection with floor _____.
 3. Concrete masonry wall construction intersection with roof deck above: _____.
- D. **CURTAIN WALL FIRESTOPPING:** Fill in the design number and copy test. Insert n/a if condition is not applicable.
1. Aluminum mullion and glass spandrel panel curtainwall intersection with adjacent floor construction:
 2. Gypsum sheathed curtainwall intersection with adjacent floor construction: _____.
- E. **OTHER:** Where another type of construction or penetrant is encountered, attach a separate sheet listing each condition and attach copy of the U.L. Test.

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes joint sealants for the following locations:
1. Exterior joints in the following vertical surfaces and nontraffic horizontal surfaces:
 - a. Control and expansion joints in cast-in-place concrete
 - b. Joints in brick veneer wall surfaces.
 - c. Joints at cast stone units.
 - d. Joints between different materials listed above
 - e. Perimeter joints between materials listed above and frames of doors, louvers and windows.
 - f. Control and expansion joints in ceiling and overhead surfaces.
 - g. Other joints as indicated.
 2. Exterior joints in the following horizontal traffic surfaces:
 - a. Control, expansion, and isolation joints in cast-in-place concrete slabs.
 - b. Other joints as indicated.
 3. Interior joints in the following vertical surfaces and horizontal nontraffic surfaces:
 - a. Control and expansion joints on exposed interior surfaces of exterior walls.
 - b. Perimeter joints of exterior openings where indicated.
 - c. Vertical control joints on exposed surfaces of interior unit masonry and concrete walls and partitions.
 - d. Perimeter joints between interior wall surfaces and frames of interior doors and windows.
 - e. Joints between plumbing fixtures and adjoining walls, floors, and counters.
 - f. Tile control and expansion joints
 - g. Openings and joints in sound-rated partitions.
 - h. Other joints as indicated.
 4. Interior joints in the following horizontal traffic surfaces:
 - a. Control and expansion joints in tile flooring.
 - b. Control and expansion joints in cast-in-place concrete slabs.
 - c. Other joints as indicated.
- B. Related Sections include the following:
1. Sealants used in glazing are specified in Division 08 "Glazing."

2. Coordinate work of this section with all sections referencing it.

1.2 SYSTEM 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 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Samples for initial selection purposes in form of manufacturer's standard bead samples, consisting of strips of actual products showing full range of colors available, for each product exposed to view.
- C. Samples for verification purposes of each type and color of joint sealant required. Install joint sealant samples 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.

1.4 INFORMATIONAL SUBMITTALS

- A. Certificates from manufacturers of joint sealants attesting that their products comply with specification requirements and are suitable for the use indicated.
- B. Qualification data complying with requirements specified in "Quality Assurance" article. Include list of completed projects with project names addresses, names of Architects and Owners, plus other information specified.
- C. Compatibility and adhesion test reports from elastomeric sealant manufacturer indicating that materials forming joint substrates and joint sealant backings have been tested for compatibility and adhesion with joint sealants. Include sealant manufacturer's interpretation of test results relative to sealant performance and recommendations for primers and substrate preparation needed to obtain adhesion.
- D. Product test reports for each type of joint sealants indicated, evidencing compliance with requirements specified.
- E. Preconstruction field test reports indicating which products and joint preparation methods demonstrate acceptable adhesion to joint substrates.
- F. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an installer who has successfully completed at least three (3) joint sealer applications similar in type and size to that of this project within the last five (5) years. All workers used for work of this Section shall be experienced in the techniques of sealant application and shall be completely familiar with the published recommendations of the manufacturer of the joint sealant materials being used.
- B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.
- C. Preconstruction Field Testing: Prior to installation of joint sealants, field-test their adhesion to joint substrates as follows:
 - 1. Locate test joints where indicated or, if not indicated, as directed by Architect.
 - 2. Conduct field tests for each application indicated below:
 - a. Each type of elastomeric sealant and joint substrate indicated.
 - b. Each type of non-elastomeric sealant and joint substrate indicated.
 - 3. Notify Architect one week in advance of the dates and times when mock-ups will be erected.
 - 4. Arrange for tests to take place with joint sealant manufacturer's technical representative present.
 - 5. Test Method: Test joint sealants by hand pull method described below:
 - a. Install joint sealants in 60 inches (1500 mm)) joint lengths using same materials and methods for joint preparation and joint sealant installation required for completed Work. Allow sealants to cure fully before testing.
 - b. Make knife cuts horizontally from one side of joint to the other followed by 2 vertical cuts approximately 2 inches (50 mm) long at side of joint and meeting horizontal cut at top of 2-inch (50-mm) cuts. Place a mark 1 inch (25 mm) from top of 2-inch (50-mm) piece.
 - c. Use fingers to grasp 2-inch (50-mm) piece of sealant just above 1-inch (25-mm) mark; pull firmly down at a 90-degree angle or more while holding a ruler along side of sealant. Pull sealant out of joint to the distance recommended by sealant manufacturer for testing adhesive capability, but not less than that equaling specified maximum movement capability in extension; hold this position for 10 seconds.
 - 6. Report whether or not sealant in joint connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate.
 - 7. Evaluation of Field Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.
- D. Field-Constructed Mock-Ups: Prior to installation of joint sealants, apply elastomeric sealants as follows to verify selections made under sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution:

1. Joints in field-constructed mock-ups of assemblies specified in other Sections that are indicated to receive elastomeric joint sealants specified in this Section.

- E. Pre-Installation Conference: Conduct conference at Project site to comply with requirements of the Division 01 Section covering this activity.
- F. Random Field Tests: Periodically test sealants, in place, for adhesion, using methods recommended by sealant manufacturer. Promptly replace any sealant that does not adhere, fails to cure, or fails to perform as specified by the sealant manufacturer.
- G. Field Water Test: Perform two field water tests on completed areas including as many conditions as possible. If leakage occurs during testing, repair as required, and re-test area and also test two additional locations.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multicomponent materials.
- B. Store and handle materials in compliance with manufacturer's recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.7 PROJECT CONDITIONS

- A. Environmental Conditions: Do not proceed with installation of joint sealants under the following conditions:
 1. When ambient and substrate temperature conditions are outside the limits permitted by joint sealant manufacturer or below 40 deg F (4 deg C).
 2. When joint substrates are wet.
- B. Joint Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than allowed by joint sealant manufacturer for application indicated.
- C. Joint Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with their adhesion are removed from joint substrates.

1.8 COORDINATION

- A. Coordinate the work with all sections referencing this section.

1.9 WARRANTY

- A. Special Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.
- B. Manufacturer's Warranty: Provide written warranty agreeing to repair or replace, at no cost to Owner, defective materials for twenty (20) years, and workmanship for two (2) years from the Date of Substantial Completion. Defective materials and workmanship shall include, but are not limited to:
1. Deterioration, aging or weathering of the work;
 2. Water leakage and/or air leakage;
 3. Sealant loss of adhesion, loss of cohesion, cracking or discoloration;
 4. Staining or discoloration of adjacent surfaces;
 5. Joint failure due to building or joint movement up to the limits prescribed by the manufacturer;
 6. Cracks or bubbles on sealant surface.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, joint fillers, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
- B. Colors: Provide color of exposed joint sealants to comply with the following:
1. Provide selections made by Architect from manufacturer's standards or custom colors to match Architect's samples, as directed by Architect.
- C. Additional Movement Capability: Where additional movement capability is specified, provide products with the capability, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, to withstand the specified percentage change in the joint width existing at time of installation and remain in compliance with other requirements of ASTM C 920 for Uses indicated.
- D. VOC Content of Interior Sealants: Provide sealants and sealant primers for use inside the weatherproofing system that comply with the following limits for VOC content when calculated according to 40 CFR 59, Part 59, Subpart D (EPA Method 24):
1. Architectural Sealants: 250 g/L.
 2. Sealant Primers for Nonporous Substrates: 250 g/L.
 3. Sealant Primers for Porous Substrates: 775 g/L.
- E. Stain-Test-Response Characteristics: Where 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

2.2 LATEX JOINT SEALANT

- A. Acrylic-Emulsion Sealant: Manufacturer's standard, one part, nonsag, mildew-resistant, paintable latex acrylic-emulsion sealant complying with ASTM C 834, formulated to be paintable and recommended for exposed applications on interior locations involving joint movement of not more than plus or minus 5 percent.
 - 1. Available Products: Subject to compliance with requirements, latex joint sealants that may be incorporated in the Work include, but are not limited to, the following:
 - a. AC-20; Pecora Corporation.
 - b. Tremflex 834; Tremco.
 - c. ALEX PLUS; DAP .
- B. Uses: General interior use, paintable.

2.3 MILDEW-RESISTANT SILICONE JOINT SEALANT

- A. Single-Component Mildew-Resistant Silicone Sealant: Manufacturer's standard, non-modified, one-part, silicone sealant; complying with ASTM C 920, Type S, Grade NS, Class 25, Uses NT, G, A, and, as applicable to non-porous joint substrates indicated, O. Formulate sealant with fungicide and specifically intended for sealing interior joints with nonporous substrates and subject to in-service exposure to conditions of high humidity and temperature extremes.
 - 1. Available Products: Subject to compliance with requirements, silicone joint sealants that may be incorporated in the Work include, but are not limited to, the following:
 - a. 786 Mildew Resistant; Dow Corning.
 - b. Sanitary 1700; GE Silicones.
 - c. 898 Silicone Sanitary Sealant; Pecora Corporation.
 - d. Tremsil 600 White; Tremco.
- B. Uses: Interior use in wet locations, and all toilet and shower rooms.

2.4 NONSAG URETHANE JOINT SEALANT

- A. Multicomponent Nonsag Urethane Sealant: Manufacturer's standard, non-modified, multi-part, nonsag urethane sealant; complying with ASTM C 920, Type M, Grade NS, Class 25, Uses NT, M, G, A, and as applicable to joint substrates indicated, O.
 - 1. Available Products: Subject to compliance with requirements, urethane joint sealants that may be incorporated in the Work include, but are not limited to, the following:
 - a. Dynatrol II, Pecora Corporation
 - b. Sikaflex-2c NS, Sika Corporation
 - c. Dymeric 240FC; Tremco.
 - d. Masterseal NP 2; Master Builders Solutions Div., BASF

- B. Uses: Interior use for exposed concrete or masonry wall control joints

2.5 SILICONE JOINT SEALANT

- A. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100, for Use G, A, M, O; non-staining and field-tintable.
 - 1. Basis of Design Product: Provide Pecora Corporation "890FTS" sealant or equal manufactured by one of the following:
 - a. Dow Corning Corporation.
 - b. GE Advanced Materials - Silicones
 - c. Sika Corporation, Construction Products Division
 - d. Tremco Incorporated
- B. Additional Movement Capability: 100 percent movement in extension and 50 percent in compression for a total of 150 percent movement.
- C. Uses: General exterior use.

2.6 POURABLE URETHANE JOINT SEALANT

- A. Multicomponent Pourable Urethane Sealant: Manufacturer's standard, non-modified, two-part, urethane sealant; complying with ASTM C 920, Type M, Grade P, Class 25, Uses T, M, A and, as applicable to joint substrates indicated, O.
 - 1. Available Products: Subject to compliance with requirements, urethane joint sealants that may be incorporated in the Work include, but are not limited to, the following:
 - a. NR-200 Urexpan, Pecora Corporation
 - b. Sikaflex 2c SL, Sika Corporation
 - c. Masterseal SL 2; Master Builders Solutions Div., BASF
- B. Uses: Interior or exterior use for level pavement or slab joints.

2.7 NONSAG URETHANE JOINT SEALANT

- A. Multi-Part Non-Sag Urethane Sealant: Except as otherwise indicated, provide manufacturer's standard, non-modified, two-part, urethane sealant; complying with ASTM C 920, Type M, Grade NS, Class 25, Uses T, M, A and, as applicable to joint substrates indicated, O.
 - 1. Available Products: Subject to compliance with requirements, urethane joint sealants that may be incorporated in the Work include, but are not limited to, the following:
 - a. Sikaflex 2c NS; Sika Corp
 - b. Dynatred, Pecora Corporation
 - c. Masterseal NP 2; Master Builders Solutions Div., BASF

- B. Uses: Interior or exterior use for pavement or slab joints where slope exceeds one percent.

2.8 ACOUSTICAL JOINT SEALANTS

- A. Acoustical Sealant: Non-sag (gun grade), non-flammable, latex-based sealant designed to limit sound transmission through interior STC-rated partitions. Sealant remains flexible and adhered to metal, wood, plaster, gypsum, and concrete after drying.
 - 1. Maintains the STC rating of partitions with intersections and penetrations sealed with product: Tested by independent, accredited, NVLAP facility according to ASTM E 90.
 - 2. Products: Provide one of the following:
 - a. QuietZone Acoustic Sealant by Owens Corning.
 - b. OSI GreenSeries SC-175 Draft & Acoustical Sound Sealant by Henkel Corporation
 - c. Pecora AIS-919: Acoustical and Insulation Latex Sealant by Pecora Corporation
 - d. Smoke 'N' Sound Acoustical Sealant by Specified Technologies Inc.
- B. Uses: At penetrations through and intersections of sound-rated wall, floor and ceiling assemblies in order to preserve their ability to reduce airborne sound impact noise transmission.

2.9 PREFORMED FOAM SEALANTS

- A. Preformed Foam Sealants: Manufacturer's standard preformed, precompressed, impregnated open-cell foam sealant manufactured from high-density urethane foam impregnated with a nondrying, water repellent agent; factory-produced in precompressed sizes and in roll or stick form to fit joint widths indicated and to develop a watertight and airtight seal when compressed to the degree specified by manufacturer; and complying with the following requirements:
 - 1. Properties: Permanently elastic, mildew-resistant, nonmigratory, nonstaining, and compatible with joint substrates and other joint sealants.
 - 2. Impregnating Agent: Chemically stabilized acrylic.
 - 3. Density: Manufacturer's standard.
 - 4. Backing: None.
 - 5. Available Products: Subject to compliance with requirements, preformed foam sealants that may be incorporated in the Work include, but are not limited to, the following:
 - a. "Emseal," Emseal Corp.
 - b. "Emseal Greyflex," Emseal Corp.
 - c. "Wil-Seal 150," Wil-Seal Construction Foams Div., Illbruck.
 - d. "Wil-Seal 250," Wil-Seal Construction Foams Div., Illbruck.

2.10 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. Plastic Foam Joint Fillers: Preformed, compressible, resilient, nonstaining, nonwaxing, nonextruding strips of flexible plastic foam of material indicated below and of size, shape, and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
 - 1. Closed-cell polyethylene foam, nonabsorbent to liquid water and gas, nonoutgassing in unruptured state.
 - 2. Manufacturer: Provide Cera-Rod manufactured by W.R. Meadows, Inc., or equivalent.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape as 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.

2.11 JOINT FILLERS FOR EXTERIOR CONCRETE SLABS

- A. General: Provide joint fillers of thickness and depth indicated, or if not indicated 1/2" thick by depth of joint.
- B. Bituminous Fiber Joint Filler: Provide preformed strips of with asphalt binder encased between two layers of saturated felt or glass-fiber felt, complying with ASTM D 1751.
 - 1. Protect top edge of joint filler during concrete placement with a metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint and seal with sealant.

2.12 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 in any way joint substrates and adjacent nonporous surfaces, and formulated to promote optimum adhesion of sealants with joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint sealant performance. Do not proceed with installation of joint sealants until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with recommendations of joint sealant manufacturer and the following requirements:
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 - 2. Clean concrete, masonry, unglazed surfaces of ceramic tile, and similar porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.
 - 3. Remove laitance and form release agents from concrete.
 - 4. Clean metal, glass, porcelain enamel, glazed surfaces of ceramic tile, and other 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 indicated or where recommended by joint sealant manufacturer based on preconstruction joint sealant-substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's recommendations. Confine primers to areas of joint sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint sealant manufacturer's printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.

- B. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:
 - 1. Install joint fillers of type indicated to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - a. Do not leave gaps between ends of joint fillers.
 - b. Do not stretch, twist, puncture, or tear joint fillers.
 - c. Remove absorbent joint fillers that have become wet prior to sealant application and replace with dry material.
 - 2. Install bond breaker tape between sealants where backer rods are not used between sealants and joint fillers or back of joints.
- D. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability. Install sealants at the same time sealant backings are installed.
- E. Tooling of Nonsag Sealants: Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets, and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.
 - 1. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.
 - a. Use masking tape to protect adjacent surfaces of recessed tooled joints.
- F. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping, taking care not to pull or stretch material, and to comply with sealant manufacturer's directions for installation methods, materials, and tools that produce seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures where expansion of sealant requires acceleration to produce seal, apply heat to sealant in conformance with sealant manufacturer's recommendations.

3.4 CLEANING

- A. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so that and installations with repaired areas are indistinguishable from original work.

END OF SECTION 079200

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes the following hollow-metal work:
 - 1. Steel doors
 - 2. Steel door frames
- B. Related Requirements:
 - 1. Section 087100 "Door Hardware" for door hardware for hollow-metal doors.
 - 2. Section 088000 "Glazing" for glazing inserted in hollow metal doors and frames.

1.2 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to SDI A250.8.

1.3 COORDINATION

- A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include construction details, material descriptions, core descriptions, fire-resistance ratings, temperature-rise ratings and finishes.
- B. Shop Drawings: Include the following:
 - 1. Elevations of each door type.
 - 2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
 - 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 - 4. Locations of reinforcement and preparations for hardware.
 - 5. Details of each different wall opening condition.
 - 6. Details of anchorages, joints, field splices, and connections.

7. Details of accessories.
8. Details of moldings, removable stops, and glazing.
9. Details of conduit and preparations for power, signal, and control systems.

- C. Schedule: Provide a schedule of hollow-metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.

1.6 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each type of hollow-metal door and frame assembly, for tests performed by a qualified testing agency.
- B. Oversize Construction Certification: For assemblies required to be fire rated and exceeding limitations of labeled assemblies.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
1. Provide additional protection to prevent damage to factory-finished units.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow-metal work vertically under cover at Project site with head up. Place on minimum 4-inch- (102-mm-) high wood blocking. Provide minimum 1/4-inch (6-mm) space between each stacked door to permit air circulation.

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:
1. Ceco Door Products; an Assa Abloy Group company.
 2. Curries Company; an Assa Abloy Group company.
 3. Republic Doors and Frames; an Allegion company.
 4. Steelcraft; an Allegion company.
- B. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Smoke- and Draft-Control Assemblies: Provide an assembly with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.
- B. Exterior Door and Frame Performance Criteria for Air Infiltration: Maximum 0.2 CFM/SQ FT when tested in accordance with NFRC 400.
- C. Thermally Rated Door Assemblies: Provide exterior door assemblies with U-factor of not more than 0.40 deg Btu/F x h x sq. ft. (2.27 W/K x sq. m) when tested according to ASTM C518.

2.3 INTERIOR DOORS AND FRAMES

- A. Construct interior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Extra-Heavy-Duty Doors and Frames: SDI A250.8, Level 3. Provide for interior door and frame locations.
 - 1. Physical Performance: Level A according to SDI A250.4.
 - 2. Doors:
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1-3/4 inches (44.5 mm).
 - c. Face: Uncoated, cold-rolled steel sheet, minimum thickness of 16 gage 0.053 inch (1.3 mm).
 - d. Edge Construction: Model 1, Full Flush
 - e. Core: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core at manufacturer's discretion.
 - f. Basis of Design Product: Regent Door by Ceko Doors, or equal.
 - 3. Frames:
 - a. Materials: Minimum thickness of 14 gage, 0.067 inch (1.7 mm), uncoated, steel sheet (except provide metallic coated where door is metallic coated) for the following locations:
 - 1) Level 3 steel doors
 - b. Construction: Full profile welded.
 - 4. Exposed Finish: Prime paint door and frames.

2.4 EXTERIOR HOLLOW-METAL DOORS AND FRAMES

- A. Construct exterior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Maximum-Duty Doors and Frames: SDI A250.8, Level 4.

1. Physical Performance: Level A according to SDI A250.4.
2. Doors:
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1-3/4 inches (44.5 mm.)
 - c. Faces: Metallic-coated steel sheet, minimum thickness of 14 gage, 0.067 inch (1.7 mm), with minimum A60 (ZF180) coating.
 - d. Edge Construction: Model 2, Seamless (continuously welded seams, edge filled, dressed smooth).
 - e. Core: Manufacturer's standard polystyrene, polyurethane, or polyisocyanurate core at manufacturer's discretion, to meet performance criteria specified.
 - f. Basis of Design Product: Mercury Energy Efficient Door by Ceco Doors or equal.
3. Frames:
 - a. Materials: Metallic-coated steel sheet, minimum thickness of 12 gage, 0.093 inch (2.3 mm), with minimum A60 (ZF180) coating.
 - b. Construction: Full profile welded.
4. Exposed Finish: Prime paint door and frames.

2.5 FRAME ANCHORS

A. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch (1.0 mm) thick, with corrugated or perforated straps not less than 2 inches (51 mm) wide by 10 inches (254 mm) long; or wire anchors not less than 0.177 inch (4.5 mm) thick.
2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch (1.0 mm) thick.
3. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch- (9.5-mm-) diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

B. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042 inch (1.0 mm), and as follows:

1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch (51-mm) height adjustment. Terminate bottom of frames at finish floor surface.

2.6 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.
- D. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z (12G) coating designation; mill phosphatized.
 - 1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.
- E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- F. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.
- G. Grout: ASTM C 476, except with a maximum slump of 4 inches (102 mm), as measured according to ASTM C 143/C 143M.
- H. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
- I. Glazing: Comply with requirements in Section 088000 "Glazing."
- J. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.7 FABRICATION

- A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Hollow-Metal Doors:
 - 1. Steel-Stiffened Door Cores: Provide minimum thickness 0.026 inch (0.66 mm), steel vertical stiffeners of same material as face sheets extending full-door height, with vertical webs spaced not more than 6 inches (152 mm) apart. Spot weld to face sheets no more than 5 inches (127 mm) o.c. Fill spaces between stiffeners with glass- or mineral-fiber insulation.

2. Vertical Edges for Single-Acting Doors: Bevel edges 1/8 inch in 2 inches (3.2 mm in 51 mm).
 3. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets.
 4. Bottom Edge Closures: Close bottom edges of doors where required for attachment of weather stripping with end closures or channels of same material as face sheets.
 5. Exterior Doors: Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration
- C. Hollow-Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
1. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 2. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
 3. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
 4. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Masonry Type: Locate anchors not more than 16 inches (406 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c., to match coursing, and as follows:
 - 1) Two anchors per jamb up to 60 inches (1524 mm) high.
 - 2) Three anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
 - 3) Four anchors per jamb from 90 to 120 inches (2286 to 3048 mm) high.
 - 4) Four anchors per jamb plus one additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 120 inches (3048 mm) high.
 - b. Stud-Wall Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:
 - 1) Three anchors per jamb up to 60 inches (1524 mm) high.
 - 2) Four anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
 - 3) Five anchors per jamb from 90 to 96 inches (2286 to 2438 mm) high.
 - 4) Five anchors per jamb plus one additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 96 inches (2438 mm) high.

- c. Postinstalled Expansion Type: Locate anchors not more than 6 inches (152 mm) from top and bottom of frame. Space anchors not more than 26 inches (660 mm) o.c.
- 5. Head Anchors: Two anchors per head for frames more than 42 inches (1067 mm) wide and mounted in metal-stud partitions.
- 6. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
 - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- D. Fabricate concealed stiffeners and edge channels from either cold- or hot-rolled steel sheet.
- E. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
 - 1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
 - 2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.
- F. Stops and Moldings: Provide stops and moldings around glazed lites and louvers where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
 - 1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow-metal work.
 - 2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
 - 3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
 - 4. Provide loose stops and moldings on inside of hollow-metal work.
 - 5. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.

2.8 STEEL FINISHES

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
 - 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

2.9 ACCESSORIES

- A. Grout Guards: Formed from same material as frames, not less than 0.016 inch (0.4 mm) thick.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for embedded and built-in anchors, and for electrical wiring as required, to verify actual locations before frame installation.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

- A. General: Install hollow-metal work plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer's written instructions.
- B. Hollow-Metal Frames: Install hollow-metal frames of size and profile indicated. Comply with SDI A250.11 as required by standards specified.
 - 1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
 - b. Install frames with removable stops located on secure side of opening.
 - c. Install door silencers in frames before grouting.
 - d. Remove temporary braces necessary for installation only after frames have been properly set and secured.

- e. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 - f. Field apply bituminous coating to backs of frames that will be filled with grout containing antifreezing agents.
- 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
 - a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
- 3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation inside frames.
- 4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
- 5. Concrete Walls: Solidly fill space between frames and concrete with mineral-fiber insulation.
- 6. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
- 7. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.
- C. Hollow-Metal Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.
 - 1. Non-Fire-Rated Steel Doors:
 - a. Between Door and Frame Jambs and Head: 1/8 inch (3.2 mm) plus or minus 1/32 inch (0.8 mm).
 - b. Between Edges of Pairs of Doors: 1/8 inch (3.2 mm) to 1/4 inch (6.3 mm) plus or minus 1/32 inch (0.8 mm).
 - c. At Bottom of Door: 3/4 inch (19.1 mm) plus or minus 1/32 inch (0.8 mm).
 - d. Between Door Face and Stop: 1/16 inch (1.6 mm) to 1/8 inch (3.2 mm) plus or minus 1/32 inch (0.8 mm).
 - 2. Smoke-Control Doors: Install doors and gaskets according to NFPA 105.
- D. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollow-metal manufacturer's written instructions.

1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (51 mm) o.c. from each corner.

3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow-metal work immediately after installation.
- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

END OF SECTION 081113

SECTION 082250 - POLYESTER FACED DOORS AND ALUMINUM FRAMING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Fiberglass reinforced polyester (FRP) faced doors
 - 2. Aluminum frames for FRP doors, including frames for sidelites and transoms.
 - 3. Installation of hardware (except surface mounted hardware).
- B. Related sections include the following:
 - 1. Division 07 Section "Joint Sealants" for joint sealants installed as part of aluminum entrance and storefront systems.
 - 2. Division 08 Section "Door Hardware."
 - 3. Division 08 Section "Glazing."

1.2 SYSTEM DESCRIPTION

- A. General: Provide polyester faced doors and aluminum framing systems capable of withstanding loads and thermal and structural movement requirements indicated without failure, based on testing manufacturer's standard units in assemblies similar to those indicated for this Project.
- B. Thermal Movements: Provide polyester faced doors and aluminum framing systems, including anchorage, that accommodate thermal movements of systems and supporting elements resulting from the following maximum change(range) in ambient and surface temperatures without buckling, damaging stresses on glazing, failure of joint sealants, damaging loads on fasteners, failure of doors or other operating units to function properly, and other detrimental effects.
 - 1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- C. Structural-Support Movement: Provide polyester faced doors and aluminum framing systems that accommodate structural movements including, but not limited to, sway and deflection.
- D. Dimensional Tolerances: Provide polyester faced doors and aluminum framing systems that accommodate dimensional tolerances of building frame and other adjacent construction.
- E. Exterior Door and Frame Performance Criteria for Air Infiltration:

1. Opaque Swinging Doors (less than 50% glass): Maximum 0.2 CFM/SQ FT when tested in accordance with NFRC 400.
2. Commercially Glazed Swinging Entrance Doors (greater than 50% glass): Maximum 1.0 CFM/SQ FT when tested in accordance with NFRC 400 or with ASTM E283 at 1.57psf.

1.3 SUBMITTALS

- A. Product data including specifications, standard details, and installation recommendations for polyester faced doors and panels and aluminum frames including test reports certifying that products have been tested and comply with performance requirements, details of core and edge construction, trim for openings, and finish.
- B. Shop drawings showing fabrication and installation of polyester faced doors, panels and frames. Include elevations of door design types, details of construction, location and installation requirements of door hardware and reinforcements, and details of openings.
 1. Provide schedule of doors indicating sizes, locations, and other pertinent information using same reference numbers for details and openings as those on contract drawings.
- C. Samples for initial selection purposes in form of manufacturer's color charts showing full range of colors available for doors and panels.
- D. Samples for Verification Purposes: Submit 6" square samples of each color of face sheet specified and 12" long sections of aluminum extrusions with specified finish system applied. Where normal color and texture variations are to be expected, include 2 or more units in each set of samples showing limits of such variations.

1.4 QUALITY ASSURANCE

- A. Single Source Responsibility: Provide doors and frames produced by single manufacturer for entire Project.
- B. Manufacturer Qualifications: Provide product series that has produced by the manufacturer for at least five years, for similar building type and size as this project.
- C. Installer's Qualifications: Firm with not less than 4 years successful experience installing systems similar to those required.
- D. Fire Performance Characteristics: Where indicated, provide class "A" fiber reinforced polyester faces with the following surface burning characteristics as determined by testing identical products per ASTM E 84 by UL or other testing and inspecting organizations acceptable to authorities having jurisdiction.
 1. Flame Spread: 25 or less.
 2. Smoke Developed: 450 or less.

- E. Design Criteria: The construction documents are based on a specific polyester door faced and aluminum frame system. Other manufacturer's system of similar and equivalent nature will be acceptable when, in Architect's judgement, differences do not materially detract from design concept or intended performance.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver doors cardboard-wrapped or crated to provide protection during transit and job storage. Provide additional protection to prevent damage to surface finishes.
- B. Inspect doors upon delivery for damage. Minor damages may be repaired provided refinished items are equal in all respects to new work and acceptable to Architect; otherwise, remove and replace damaged items as directed.
- C. Store doors and frames at building site under cover. Place units on minimum 4-inches high wood blocking. Avoid use of non-vented plastic or canvas shelters which could create humidity chamber. If cardboard wrapper on door becomes wet, remove carton immediately. Provide 1/4-inches spaces between stacked doors to promote air circulation.
- D. Identify each door and frame with individual opening numbers which correlate with designation system used on shop drawings for door, frames, and hardware, using temporary, removable or concealed markings.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Check openings by field measurement before fabrication to ensure proper fitting of work; show measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay in work.
- B. Coordinate work of this section with that specified in Section 087100 to ensure proper installation of hardware.

1.7 WARRANTY

- A. Product Warranty: Provide manufacturer's standard written warranty agreeing to repair or replace polyester faced doors which fail in materials or workmanship within time period indicated below. Warranty shall include door manufacturer's guarantee that hardware installed by factory will be installed correctly and not come loose within time period indicated below.
 - 1. Warranty period for doors and finish, and hardware installed by factory is ten years after date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturer: Provide polyester faced doors, panels and aluminum frames manufactured by one of following:
 - 1. Special-Lite, Inc.
 - 2. Tubelite, Inc.
 - 3. Commercial Door Systems.

2.2 MATERIALS

- A. Aluminum Members: Alloy and temper recommended by manufacturer for strength, corrosion resistance, and application of required finish; comply with ASTM B 221 for extrusions and ASTM B 209 for sheet and plate.
- B. Steel Reinforcement: Complying with ASTM A 36 (ASTM A 36M)) for structural shapes, plates, and bars; ASTM A 611 for cold-rolled sheet and strip; or ASTM A 570 (ASTM A 570M) for hot-rolled sheet and strip.
- C. Fiberglass Reinforced Polyester Face Material: 0.120" minimum thickness, with color integral through full thickness of face sheet. Provide sandstone textured finish for doors and panels. Face material meeting the following performance criteria:
 - 1. Impact Strength of Face Sheets: ASTM D 256, Izod Impact Strength, 15 foot pounds per inch of notch.
 - 2. Abrasion Resistance of Face Sheets: ASTM D 1242, 25 cycles of Taber Abraser with CH-17 wheel with a 1000 gram load, not to exceed 0.029 percent weight loss.
 - 3. Hardness of Face Sheets: ASTM D 2583, Barcol Meter Hardness Test, not less than 55.
 - 4. Humidity Resistance of Face Sheets: ASTM D 570, water absorption not more than 0.40 percent weight gain after 24-hour immersion.
 - 5. Ultra-Violet Degradation: Only slight color change, and negligible change in surface gloss and other physical properties after exposure to 500,000 Langleys.
 - 6. Fire-Resistance and Flammability: Provide Class A rated faces for door faces of interior doors and for interior face of exterior doors and panels.
 - 7. Product: SpecLite 3 FRP by Special Lite, or equivalent.
 - 8. Per 2015 IBC 2603.4.1.7 for non-rated swing doors with plastic foam cores- provide a thermal barrier of not less than 0.032" thick aluminum or steel with basic thickness of not less than 0.016" between the foam core and FRP skin; or complying with NFPA 275 - per IBC 2603.4.
- D. Core Material: Urethane foam of 5 pounds per cubic foot density for doors and panels.
- E. Fasteners: Aluminum or stainless steel materials warranted by manufacturer to be non-corrosive and compatible with aluminum components, hardware, anchors and other components.
- F. Brackets and Reinforcements: Manufacturer's high-strength aluminum extrusions. Provide manufacturer's standard reinforcement for each type of hardware required.

- G. 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.
- H. Spacers, Setting Blocks, Gaskets, and Bond Breakers: Manufacturer's standard permanent, nonmigrating types in hardness recommended by manufacturer, compatible with sealants, and suitable for system performance requirements.
- I. Framing system gaskets, sealants, and joint fillers as recommended by manufacturer for joint type.
- J. Sealants and joint fillers for joints at perimeter of entrance and storefront systems as specified in Division 07 Section "Joint Sealants."
- K. Glazing: 1" insulating tempered glass units as specified in Division 08 Section "Glazing."

2.3 DOORS

- A. General: Provide manufacturer's standard flush and wide stile style doors as indicated on Drawings constructed of aluminum stiles and rails joined with steel tie rods, with polyester face sheets and foamed-in-place urethane inner core. Minimum thermal rating U-factor of 0.09.
 - 1. Basis of Design Product: Provide SL-20 Sandstone Texture FRP/Aluminum Hybrid Doors by Special Lite, or equivalent.
 - 2. Color shall be as selected by Architect.
- B. Provide extruded aluminum 2-7/16" tubular stiles designed to accept specified hardware and a minimum extruded aluminum 2-5/16" top and bottom rails with legs for interlocking rigidity weather bar. Minimum thickness of 1/16 inches at face and 1/8 inch at hinge and concealed vertical stiles.
 - 1. Meeting Stiles: Pile brush weatherseals. Extrude meeting stile to include integral pocket to accept pile brush weatherseals.
 - 2. Bottom of Door: Install bottom weather bar with nylon brush weatherstripping into extruded interlocking edge of bottom rail.
- C. Lock polyester face sheets in on all four sides by extruded interlocking edges which are integral part of stiles and rails. Snap in or applied door edge trim is not acceptable.
- D. Miter or mortise and tenon corner joints and mechanically fasten with reinforcing brackets that incorporate concealed minimum 3/8" galvanized steel tie-rods at top and bottom with aviation type nuts.
- E. Internally reinforce doors to receive specified hardware with .125 inch thick aluminum.
- F. Foam-in-place core after the door is completely assembled.

- G. Manufacture doors with cutouts for required vision lites. Provide screw-applied aluminum stops to match perimeter door rails.

2.4 FRAMES

- A. Standard Frame: Provide tubular extruded aluminum frame members, 2 by 4-1/2 inch in size unless otherwise indicated on drawings, with minimum 1/8 inch thick walls and closed back. Fabricate with mechanical joints using heavy inserted reinforcing plates and concealed tie-rods or j-bolts. Supply with 1/2 by 1-1/4 inch door stop, with heavy duty weathering pile included.
 - 1. Provide Tube Frame with Applied Stops, Model SL-245, by Special Lite, or equivalent.

2.5 HARDWARE

- A. Hardware is specified in Section 087100.

2.6 FABRICATION

- A. Factory-prefit and premachine doors for all hardware and to fit frame opening sizes indicated with the following uniform clearances and bevels:
 - 1. Clearances: Not more than 1/8 inch at jambs and heads except between pairs of doors not more than 1/4 inch. Not more than 3/4 inch at bottom.
 - 2. Comply with final hardware schedules and door frame shop drawings and with hardware templates.
 - 3. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before proceeding with factory premachining.
- B. Complete fabrication, assembly, installation of hardware, finishing and other work before shipment to project site. Disassemble components only as necessary for shipment and installation. Field stick framing is not acceptable.
- C. Factory install vision lites and panels.
- D. Install hinges and all other hardware, with the exception of any surface-applied hardware such as door closer and locksets or push/pull hardware, at the manufacturer's plant.
 - 1. Locate hardware as indicated on final shop drawings or, if not indicated, in accordance with "Recommended Locations for Builder's Hardware on Standard Steel Doors and Frames," published by Door and Hardware Institute.
- E. Separate dissimilar metals with zinc chromate primer, bituminous paint, or other separator to prevent corrosion.
- F. Maintain accurate relation of planes and angles, hairline fit contacting members.

- G. Conceal fasteners where possible provide countersunk flat or oval heads for exposed screws and bolts.

2.7 ALUMINUM FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.
- D. High-Performance Organic Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 1. Fluoropolymer 3-Coat System: Manufacturer's standard 3-coat, thermocured system consisting of specially formulated inhibitive primer, fluoropolymer color topcoat and clear fluoropolymer topcoat, with both color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2605.
 - 2. Color: As selected by Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and supports, with the Installer present, for compliance with requirements indicated, installation tolerances, and other conditions that affect installation of polyester faced doors. Correct unsatisfactory conditions before proceeding with the installation.
- B. Examine door frames prior to hanging door:
 - 1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with plumb jambs and level heads.
 - 2. Reject doors with defects.
- C. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Comply with manufacturer's written instructions for protecting, handling, and installing FRP doors and aluminum framing systems. Do not install damaged components. Fit frame joints to produce hairline joints free of burrs and distortion. Rigidly secure nonmovement joints.
- B. Metal Protection: Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint
- C. Install framing components plumb and true in alignment with established lines and grades without warp or rack of framing members.
- D. Install doors and frames plumb and true in alignment with established lines and grades without warp or rack. Lubricate operating hardware and other moving parts according to hardware manufacturers' written instructions.
 - 1. Install surface-mounted hardware according to manufacturer's written instructions using concealed fasteners to greatest extent possible.
 - 2. Install frames with anchors appropriate for wall conditions to anchor framing to wall materials. A minimum of five anchors up to 7'- 4" on jamb members, and one additional anchor for each 12 inches over that height.
- E. Construction Tolerances: Install doors and frames to comply with the following tolerances:
 - 1. Variation from Plane: Do not exceed 1/16 inch in 12 feet of length or 1/8 inch in any total length.
 - 2. Offset from Alignment: The maximum offset from true alignment between two identical members abutting end to end in line shall not exceed 1/16 inch.
 - 3. Diagonal Measurements: The maximum difference in diagonal measurements shall not exceed 1/8 inch.
 - 4. Offset at Corners: The maximum out-of-plane offset of framing at corners shall not exceed 1/32 inch.
- F. Separate aluminum and other corrodible metal surfaces from sources of corrosion or electrolytic action at points of contact with other materials.
 - 1. Zinc or cadmium plate steel anchors and other unexposed fasteners after fabrication.
 - 2. Paint dissimilar metals where drainage from them passes over aluminum.
 - 3. Paint aluminum surfaces in contact with mortar, concrete or other masonry with alkali resistant coating.

- 4. Paint wood and similar absorptive material in contact with aluminum and exposed to the elements or otherwise subject to wetting, with two coats of aluminum house paint. Seal joints between the materials with sealant.
- G. Drill and tap frames and doors and apply surface-mounted hardware items. Comply with hardware manufacturer's instructions and template requirements. Use concealed fasteners wherever possible. Refer to Section 087100 for additional installation requirements.
- H. Install perimeter sealant to comply with requirements of Division 07 Section "Joint Sealants," unless otherwise indicated.

3.3 ADJUSTING, CLEANING AND PROTECTION

- A. Adjust operating hardware to function properly, for smooth operation without binding, and for weathertight closure.
- B. Clean complete system, inside and out, promptly after installation, exercising care to avoid damage to coatings.
- C. Institute protective measures required throughout remainder of construction period to ensure polyester faced doors will be without damage and deterioration, other than normal weathering, at time of acceptance.

END OF SECTION 082250

SECTION 083113 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wall access doors and frames for interior locations.
2. Fire-rated wall access doors and frames for interior locations
3. Ceiling access doors and frames for interior locations.
4. Fire-rated ceiling access doors and frames for interior locations.

B. Locations and Quantities of Access Doors: Not all access doors are shown on the Drawings. It is the intent of this section that access doors be provided wherever access is required for operation and maintenance of concealed equipment, dampers, valves, controls or similar devices.

C. Cylinders for access doors are specified in Division 08 Section "Door Hardware."

D. Related Requirements:

1. Division 07 Section "Roof Accessories" for roof hatches.
2. Division 23 Section "Air Duct Accessories" for heating and air-conditioning duct access doors.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product. Include construction details, fire ratings, materials, individual components and profiles, and finishes.

B. Shop Drawings:

1. Include plans, elevations, sections, details, and attachments to other work.
2. Detail fabrication and installation of access doors and frames for each type of substrate.

C. Samples: For each door face material, at least 3 by 5 inches (75 by 125 mm) in size, in specified finish.

D. Product Schedule: Provide complete access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

1.3 COORDINATION

A. Verification: Determine specific locations and sizes for access doors needed to gain access to concealed equipment, and indicate on schedule specified in "Submittals" Article

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to access door and frame assemblies tested for fire-test-response characteristics according to the following test method and that are listed and labeled by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. NFPA 252 or UL 10B for fire-rated access door assemblies installed vertically.
2. NFPA 288 for fire-rated access door assemblies installed horizontally.

2.2 PRODUCTS, GENERAL

- A. Source Limitations: Obtain each type of access door and frame from single source from single manufacturer.

2.3 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

- 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:

1. Babcock-Davis.
2. J. L. Industries, Inc.; Div. of Activar Construction Products Group.
3. Karp Associates, Inc.
4. Larsen's Manufacturing Company.
5. Milcor Inc.
6. Nystrom, Inc.

- B. Flush Access Doors, with Exposed Trim, for CMU Surfaces: Units consisting of frame with exposed trim, door, hardware, and complying with the following requirements

1. Basis-of-Design Product: Karp Model DSC-214M, Universal Flush Access Door.
2. Assembly Description: Fabricate door to fit flush to frame. Provide flange integral with frame, 3/4 inch (19 mm) wide, overlapping surrounding finished surface.
3. Locations: Provide at non-rated concrete block walls.
4. Uncoated Steel Sheet for Door: Nominal 0.074 inch (1.9 mm), 14 gage.
 - a. Finish: Factory prime.
5. Stainless-Steel Sheet for Door for Toilet Rooms, Shower Rooms, and Other Wet Areas: Nominal 0.074 inch (1.9 mm), 14 gage; No. 4 finish.
6. Frame Material: Nominal 0.060 inch (1.52 mm), 16 gage
7. Hinges: Concealed continuous piano hinge.
8. Latches: Self-latching key-operated bolt type, with interior release; for locking.

- C. Trimless, Flush Access Doors for Gypsum Board Surfaces: Units consisting of frame, concealed edge trim, door, hardware, and complying with the following requirements:

1. Basis-of-Design Product: Karp KDW for drywall
 2. Assembly Description: Fabricate door to fit flush to frame. Provide frame with gypsum board beads for concealed flange installation.
 3. Locations: Provide at non-rated gypsum board walls and ceilings.
 4. Uncoated Steel Sheet for Door: Nominal 0.074 inch (1.9 mm), 14 gage.
 - a. Finish: Factory prime.
 5. Stainless-Steel Sheet for Door for Toilet Rooms, Shower Rooms, and Other Wet Areas: Nominal 0.074 inch (1.9 mm), 14 gage; No. 4 finish.
 6. Frame Material: Nominal 0.060 inch (1.52 mm), 16 gage.
 7. Hinges: Concealed continuous piano hinge.
 8. Latches: Self-latching key-operated bolt type, with interior release; for locking.
- D. Recessed Doors for Acoustical Ceiling Tiles: Units consisting of frame with no exposed trim, recessed door to receive tile, hardware, and complying with the following requirements.
1. Basis-of-Design Product: Karp, Model DSC-210, Recessed Acoustical Ceiling Tile Access Doors.
 2. Locations: Provide at non-rated acoustical ceilings tiles.
 3. Uncoated Steel Sheet for Door: Nominal 0.060 inch (1.52 mm), 16 gage thick steel sheet; recessed 1-inch (25.4 mm).
 - a. Finish: Factory prime.
 4. Stainless-Steel Sheet for Door for Toilet Rooms, Shower Rooms, and Other Wet Areas: Nominal 0.060 inch (1.52 mm), 16 gage; No. 4 finish.
 5. Frame Material: Nominal 0.074 inch (1.9 mm), 14 gage.
 6. Hinges: Concealed, pivoting-rod type.
 7. Latches: Self-latching key-operated bolt type, with interior release; for locking.
- E. Insulated, Fire-Rated Access Doors for Drywall Walls and Ceilings: Units consisting of frame with gypsum board bead concealed edge trim, self-latching insulated door, and hardware, and complying with the following requirements:
1. Basis-of-Design Product: Karp, Model KRP-350FR, Insulated Fire Rated Access Door, with Drywall Bead, for Walls and Ceilings.
 2. Assembly Description: Fabricate door to fit flush to frame, with a core of mineral-fiber insulation enclosed in sheet metal. Provide self-latching door with automatic closer and interior latch release.
 3. Locations: Provide at rated gypsum board walls and ceilings.
 4. Fire-Resistance Ratings:
 - a. Walls: 1-1/2 hours.
 - b. Ceilings: 3 hours.
 5. Uncoated Steel Sheet for Door: 20 ga., 0.0359-inch- (0.91-mm-) thick steel sheet, welded pan type, filled with 2-inch (50 mm) thick fire-rated mineral-fiber insulation.
 - a. Finish: Factory prime.
 6. Stainless-Steel Sheet for Door for Toilet Rooms, Shower Rooms, and Other Wet Areas: Same gage and style as steel door; with No. 4 finish.

7. Frame Material: 16 ga., 0.0598-inch- (1.52-mm-) thick steel sheet, 1-inch (25.4 mm) wide, surrounded by galvanized drywall bead.
 8. Hinges: Concealed continuous piano hinge.
 9. Hardware: Self-latching key-operated bolt type, with interior release; for locking.
- F. Insulated, Fire-Rated Access Doors for CMU Walls: Units consisting of frame with exposed edge trim, self-latching insulated door, and hardware, and complying with the following requirements:
1. Basis-of-Design Product: Karp, Model KRP-150FR, Insulated Fire Rated Access Door, with Exposed Flange, for Walls and Ceilings.
 2. Assembly Description: Fabricate door to fit flush to frame, with a core of mineral-fiber insulation enclosed in sheet metal. Provide flange integral with frame, 1 inch (25 mm) wide, overlapping surrounding finished surface. Provide self-latching door with automatic closer and interior latch release.
 3. Locations: Provide at rated concrete block walls.
 4. Fire-Resistance Ratings:
 - a. Walls: 1-1/2 hours.
 5. Uncoated Steel Sheet for Door: 20 ga., 0.0359-inch- (0.91-mm-) thick steel sheet, welded pan type, filled with 2-inch (50 mm) thick fire-rated mineral-fiber insulation.
 - a. Finish: Factory prime.
 6. Stainless-Steel Sheet for Door for Toilet Rooms, Shower Rooms, and Other Wet Areas: Same gage and style as steel door; with No. 4 finish.
 7. Frame Material: 16 ga., 0.0598-inch- (1.52-mm-) thick steel sheet, 1-inch (25.4 mm) wide exposed trim.
 8. Hinges: Concealed continuous piano hinge.
 9. Hardware: Self-latching key-operated bolt type, with interior release; for locking.
- G. Hardware:
1. Lock: Cylinder, keyed alike for project
 2. Lock for Fire Rated Access Doors: Rim cylinder.
 - a. Lock Preparation: Prepare door panel to accept cylinder specified in Section 087100 "Door Hardware."

2.4 MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A 879/A 879M, with cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

- D. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304. Remove tool and die marks and stretch lines or blend into finish.
- E. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T5.
- F. Aluminum Plate and Sheet: ASTM B 209 (ASTM B 209M), Alloy 6061-T6.
- G. Frame Anchors: Same type as door face.
- H. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

2.5 FABRICATION

- A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.
- B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access doors to types of supports indicated.
 - 1. For concealed flanges with drywall bead, provide edge trim for gypsum board securely attached to perimeter of frames.
 - 2. For concealed flanges with plaster bead for full-bed plaster applications, provide zinc-coated expanded metal lath and exposed casing bead welded to perimeter of frames.
 - 3. Provide mounting holes in frames for attachment of units to metal or wood framing.
 - 4. Provide mounting holes in frame for attachment of masonry anchors.
- D. Recessed Access Doors: Form face of panel to provide recess for application of applied finish. Reinforce panel as required to prevent buckling.
- E. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.
 - 1. Non-Rated Doors: For cylinder locks, furnish two keys per lock and key all locks alike.
 - 2. Fire-Rated Doors: Cylinder and keys are specified in Section 087100 "Door Hardware."

2.6 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Steel and Metallic-Coated-Steel Finishes:
 - 1. Factory Prime: Apply manufacturer's standard, VOC-free, electrostatic-applied powder coat finish immediately after surface preparation and pretreatment.
- E. Stainless-Steel Finishes:
 - 1. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
 - 2. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - a. Run grain of directional finishes with long dimension of each piece.
 - b. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
 - c. Directional Satin Finish: No. 4.
- F. Aluminum Finishes:
 - 1. Mill finish and factory primed, as specified.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates 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. Comply with manufacturer's written instructions for installing access doors and frames.
- B. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finish surfaces.
- C. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.3 ADJUSTING

- A. Adjust doors and hardware, after installation, for proper operation.

- B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION 083113

SECTION 083326 - OVERHEAD COILING DOORS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following types of overhead coiling doors:

1. Insulated service doors, manual operation.

1.2 DEFINITIONS

- A. Operation Cycle: One complete cycle of a door begins with the door in the closed position. The door is then moved to the open position and back to the closed position.

1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide overhead coiling doors capable of withstanding the effects of gravity loads and stresses without evidencing permanent deformation of door components.
1. Exterior Wind Load: Uniform pressure (velocity pressure) of 20 lbf/sq. ft. (960 Pa), acting inward and outward
- B. Operation-Cycle Requirements: Design overhead coiling door components and operator to operate for not less than 100,000 cycles.
- C. Air Infiltration Performance: Provide overhead coiling doors with maximum air infiltration rate of 1.0 CFM/SQ FT when tested in accordance with NFRC 400 or with ASTM E283 at 1.57psf.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type and size of overhead coiling door and accessory. Include details of construction relative to materials, dimensions of individual components, profiles, and finishes. Provide roughing-in diagrams, operating instructions, and maintenance information. Include the following:
1. Setting drawings, templates, and installation instructions for built-in or embedded anchor devices.
 2. Summary of forces and loads on walls and jambs.
- B. Shop Drawings: For special components and installations not dimensioned or detailed in manufacturer's data sheets.

- C. Samples for Initial Selection: Manufacturer's color charts showing full range of colors available for units with factory-applied finishes

1.5 INFORMATIONAL SUBMITTALS

- A. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer who is an authorized representative of the overhead coiling door manufacturer for both installation and maintenance of units required for this Project.
- B. Source Limitations: Obtain overhead coiling doors through one source from a single manufacturer.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form, signed by manufacturer, Installer, and Contractor, in which manufacturer agrees to repair or replace doors that are defective in materials or workmanship, for the following period:
 - 1. Door Assemblies: Two years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design Products: Provide specified products of Cornell Iron Works Inc. or equal from one of the following manufacturers:
 - 1. The Cookson Company.
 - 2. Raynor Garage Doors
 - 3. Pacific Rolling Door Co.
 - 4. Overhead Door Corporation.
 - 5. Wayne-Dalton Corp.
 - 6. Windsor Door; A United Dominion Company.

2.2 DOOR CURTAIN MATERIALS AND CONSTRUCTION

- A. Basis of Design Product: Thermiser Insulated Rolling Door Model ESD20 by Cornell in steel, or equal
- B. Door Curtain: Fabricate overhead coiling door curtain of interlocking slats, designed to withstand wind loading indicated, in a continuous length for width of door without splices.

Unless otherwise indicated, provide slats of material thickness recommended by door manufacturer for performance, size, and type of door indicated, and as follows:

1. Galvanized Steel Door Curtain Slats: Double skin interlocking roll formed interior and exterior metal slats with foamed-in-place insulation between slats.
 - a. Profile: Manufacturer's standard flat-profile slats
 - b. Thickness: Minimum 20 gauge exterior faces, 24 gauge interior faces.
 - c. Insulation: 7/8" thick closed cell pressure foamed in place urethane insulation, Min R value of 8. Foam shall meet the following criteria:
 - 1) Flame Spread Index of 0
 - 2) Smoke Developed Index of 10 as tested per ASTM E84
 - 3) CFC-free process with an Ozone Depletion Potential rating of 0
 - 4) Meets foam plastic insulation requirements of the 2012 IBC®, section 2603.
- C. Service Door Windlocks and Endlocks: Malleable-iron castings galvanized after fabrication, secured to curtain slats with galvanized rivets, or high-strength nylon. Provide locks on not less than alternate curtain slats for curtain alignment and resistance against lateral movement
- D. Service Door Bottom Bar: Consisting of 2 angles, each not less than 1-1/2 by 1-1/2 by 1/8 inch (38 by 38 by 3 mm) thick, either galvanized or stainless-steel extrusions to suit type of curtain slats.
- E. Service Door Curtain Jamb Guides: Fabricate curtain jamb guides of steel angles, or channels and angles, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Build up units with not less than 3/16-inch- (5-mm-) thick, galvanized steel sections complying with ASTM A 36 (ASTM A 36M), and ASTM A 123. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain and a continuous bar for holding windlocks.

2.3 HOODS AND ACCESSORIES

- A. Hood: Form to entirely enclose coiled curtain and operating mechanism at opening head. Contour to suit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Provide closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting projecting beyond wall face. Provide intermediate support brackets as required to prevent sag.
- B. Weatherseals: Provide replaceable, adjustable, continuous, compressible weather-stripping gaskets fitted to bottom and top of doors, unless otherwise indicated. At door head, use 1/8-inch- (3-mm-) thick, replaceable, continuous sheet secured to inside of hood.
 1. In addition, provide replaceable, adjustable, continuous, flexible, 1/8-inch- (3-mm-) thick seals of flexible vinyl, rubber, or neoprene at door jambs for a weathertight installation.

- C. Push/Pull Handles: For push-up-operated or emergency-operated doors, provide galvanized steel lifting handles on each side of door.
 - 1. Provide pull-down straps or pole hooks for doors more than 84 inches (2130 mm) high.
- D. Fabricate locking device assembly with lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bar to engage through slots in tracks.
 - 1. Locking Bars: Single-jamb side, operable from inside only.
 - 2. Provide lock cylinder to match cylinders and keying of building as specified in Division 08 Section "Door Hardware."

2.4 COUNTERBALANCING MECHANISM

- A. General: Counterbalance doors by means of adjustable-tension steel helical torsion spring, mounted around a steel shaft and contained in a spring barrel connected to door curtain with required barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.
- B. Counterbalance Barrel: Fabricate spring barrel of hot-formed, structural-quality, welded or seamless carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than 0.03 in./ft. (2.5 mm/m) of span under full load.
- C. Provide spring balance of one or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Provide cast-steel barrel plugs to secure ends of springs to barrel and shaft.
- D. Fabricate torsion rod for counterbalance shaft of cold-rolled steel, sized to hold fixed spring ends and carry torsional load.
- E. Brackets: Provide mounting brackets of manufacturer's standard design, either cast-iron or cold-rolled steel plate with bell-mouth guide groove for curtain.

2.5 OPERATION

- A. Manual Chain Hoist: Provide chain hoist operator with endless steel chain, chain pocket wheel and guard, geared reduction unit, and chain keeper secured to guide. Chain hoist shall include integral brake mechanism that will immediately stop upward or downward travel and maintain the door in a stationary position when the hand chain is released by the user.

2.6 FINISHES, GENERAL

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast..

2.7 STEEL FINISHES

- A. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.
 - 1. Color: As selected by Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install door and operating equipment complete with necessary hardware, jamb and head mold strips, anchors, inserts, hangers, and equipment supports according to Shop Drawings, manufacturer's written instructions, and as specified.
- B. Install overhead coiling doors, hoods, and operators at the mounting locations indicated for each door.
- C. Accessibility: Install overhead coiling doors, switches, and controls along accessible routes in compliance with regulatory requirements for accessibility.

3.3 ADJUSTING

- A. Lubricate bearings and sliding parts; adjust doors to operate easily, free from warp, twist, or distortion and fitting weathertight for entire perimeter.

END OF SECTION 083326

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Commercial door hardware for the following:
 - a. Swinging doors.
 - 2. Cylinders for doors specified in other Sections.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 08 Section "Hollow Metal Doors and Frames" for factory prefitting and factory premachining of doors and frames for door hardware.
 - 2. Division 08 Section "FRP Doors" for factory prefitting and factory premachining of doors and frames for door hardware.

1.2 SUBMITTALS

- A. Product data including manufacturers' technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
- B. Final hardware schedule coordinated with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 - 1. Final Hardware Schedule Content: Based on hardware indicated, organize schedule into "hardware sets" indicating complete designations of every item required for each door or opening. Include the following information:
 - a. Type, style, function, size, and finish of each hardware item.
 - b. Name and manufacturer of each item.
 - c. Fastenings and other pertinent information.
 - d. Location of each hardware set cross referenced to indications on Drawings both on floor plans and in door and frame schedule.
 - e. Explanation of all abbreviations, symbols, and codes contained in schedule.
 - f. Mounting locations for hardware.
 - g. Door and frame sizes and materials.
 - h. Keying information.
 - 2. Submittal Sequence: Submit final schedule at earliest possible date particularly where acceptance of hardware schedule must precede fabrication of other work that is critical in the Project construction schedule. Include with schedule the product

data, samples, shop drawings of other work affected by door hardware, and other information essential to the coordinated review of schedule.

3. Keying Schedule: Submit separate detailed schedule indicating clearly how the Owner's final instructions on keying of locks has been fulfilled.

- C. Qualification Data: For firms and persons specified in "Quality Assurance" Article.
- D. Templates for doors, frames, and other work specified to be factory prepared for the installation of door hardware. Check shop drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

1.3 QUALITY ASSURANCE

- A. Single Source Responsibility: Obtain each type of hardware (latch and lock sets, hinges, closers, etc.) from a single manufacturer.
- B. Supplier Qualifications: A recognized architectural door hardware supplier, with warehousing facilities in the Project's vicinity, that has a record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that employs an experienced Door and hardware Institute, Architectural Hardware Consultant (AHC) who is available to Owner, Architect, and Contractor, at reasonable times during the course of the Work, for consultation and who shall review the schedule for overall coordination of hardware.
 1. Require supplier to meet with Owner to finalize functions of locking devices, keying requirements and to obtain final instructions in writing.
 2. Hardware schedule shall be prepared and sealed by AHC.
- C. Regulatory Requirements: Comply with provisions of the following:
 1. Comply with Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," and ANSI A117.1-2017 , as follows:
 - a. Handles, Pulls, Latches, Locks, and other Operating Devices: Shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist.
 - b. Door Closers: Comply with the following maximum opening-force requirements indicated:
 - 1) Interior Hinged Doors: 5 lbf (22.2 N) applied perpendicular to door.
 - 2) Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
 - c. Thresholds: Not more than ½ inch (13 mm high). Bevel raised thresholds with a slope of not more than 1:2.
 2. NFPA 101: Comply with the following for means of egress doors:

- a. Latches, Locks, and Exit Devices: Not more than 15 lbf (67 N) to release the latch. Locks shall not require the use of a key, tool, or special knowledge for operation.
 - b. Door Closers: Not more than 30 lbf (133 N) to set door in motion and not more than 15 lbf (67 N) to open door to minimum required width.
 - c. Thresholds: Not more than 1/2 inch (13 mm) high.
- D. Function and Keying Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Incorporate function and keying conference decisions into final hardware and keying schedule after reviewing door hardware functions and keying system including, but not limited to, the following:
- 1. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
 - 2. Preliminary key system schematic diagram.
 - 3. Address for delivery of keys.

1.4 PRODUCT HANDLING

- A. Tag each item or package separately with identification related to final hardware schedule, and include basic installation instructions with each item or package.
- B. Packaging of door hardware is responsibility of supplier. As material is received by hardware supplier from various manufacturers, sort and repackage in containers clearly marked with appropriate hardware set number to match set numbers of approved hardware schedule. Two or more identical sets may be packed in same container.
- C. Inventory door hardware jointly with representatives of hardware supplier and hardware installer until each is satisfied that count is correct.
- D. Deliver individually packaged door hardware items promptly to place of installation (shop or Project site).
- E. Provide secure lock-up for door hardware delivered to the Project, but not yet installed. Control handling and installation of hardware items that are not immediately replaceable so that completion of the Work will not be delayed by hardware losses both before and after installation.

1.5 PROJECT CONDITIONS

- A. Coordination: Coordinate hardware with other work. Furnish hardware items of proper design for use on doors and frames of the thickness, profile, swing security and similar requirements indicated, as necessary for the proper installation and function, regardless of omissions or conflicts in the information on the Contract Documents.

- B. Upon request, check the Shop Drawings for doors and entrances to confirm that adequate provisions will be made for the proper installation of hardware.

1.6 WARRANTY

- A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Special Warranty: Written warranty, executed by manufacturer agreeing to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:
 - 1. Structural failures including excessive deflection, cracking, or breakage.
 - 2. Faulty operation of operators and door hardware.
 - 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
- C. Warranty Period: From date of Substantial Completion, unless otherwise indicated.:
 - 1. Closers: Ten (10) years.
 - 2. Locksets: Three (3) years
 - 3. Exit Devices: Three (3) years
 - 4. All other Hardware: Two (2) years.

1.7 MAINTENANCE

- A. 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 door hardware.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Provide products and manufacturers as listed in "Schedule of Acceptable Manufacturers and Products" included at end of this section.

2.2 SCHEDULED HARDWARE

- A. Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of finish hardware are indicated in the "Hardware Schedule" at the end of this Section. Products are identified by using hardware designation numbers of the following:

1. Manufacturer's Product Designations: The product designation and name of one manufacturer are listed for each hardware type required for the purpose of establishing minimum requirements. Provide either the product designated, or equivalent product.

2.3 MATERIALS AND FABRICATION

- A. Fasteners: Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation. Do not provide hardware that has been prepared for self-tapping sheet metal screws, except as specifically indicated..
 1. Provide stainless steel fasteners for thresholds.
- B. Furnish screws for installation with each hardware item. Provide Phillips flat-head screws except as otherwise indicated. Finish exposed (exposed under any condition) screws to match hardware finish or, if exposed in surfaces of other work, to match finish of this other work as closely as possible including "prepared for paint" surfaces to receive painted finish.
- C. Provide concealed fasteners for hardware units that are exposed when door is closed except to the extent no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work unless their use is the only means of reinforcing the work adequately to fasten the hardware securely. Where thru-bolts are used as a means of reinforcing the work, provide sleeves for each thru-bolt or use sex screw fasteners.
 1. Thru-bolting of hardware will only be permitted where required by NFPA 80, door assembly listing requirements, and the door assembly manufacturer's installation instructions. Fasteners for closer, exit devices and similar hardware that are exposed on opposite face of door from unit will not be permitted.

2.4 HINGES, BUTTS

- A. Templates: Provide only template-produced units for hinges at new frames. Provide units to match existing frame mortises where frame is being re-used.
- B. Screws: Provide Phillips flat-head screws complying with the following requirements:
 1. For metal doors and frames install machine screws into drilled and tapped holes.
 2. For wood doors and frames install wood screws.
 3. For fire-rated wood doors install #12 x 1-1/4-inch, threaded-to-the-head steel wood screws.
 4. Finish screw heads to match surface of hinges.
- C. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
 1. Out-Swing Exterior Doors: Nonremovable pins.

2. Out-Swing Corridor Doors: Nonremovable pins.
3. Interior Doors: Nonrising pins.
4. Tips: Flat button and matching plug, finished to match leaves.

2.5 CONTINUOUS HINGES

- A. Continuous Hinges: Heavy-duty anodized aluminum non-handed pinless hinge assembly of three interlocking extrusions applied to full height of door and frame without mortising. Provide units with door leaf and jamb leaf geared together for the entire length of the hinge and joined by a channel. Provide hinge knuckle with monolithic appearance. Vertical door loads shall be carried on minimum 3/4 inch acetal bearings through a full 180 degrees.

2.6 LOCK CYLINDERS, CORES AND KEYING

- A. Keying System: Provide keying system as selected by Owner; coordinate with Owner's requirements.
- B. Equip locks with Owner's standard cylinders for interchangeable-core 7-pin tumbler inserts as specified in Part 3. Furnish only temporary inserts for the construction period, and remove these when directed.
 1. Furnish final cores and keys for installation by Owner.
- C. Comply with Owner's instructions for masterkeying and, except as otherwise indicated, provide individual change key for each lock that is not designated to be keyed alike with a group of related locks.
 1. Permanently inscribe each key with number of lock that identifies cylinder manufacturer's key symbol, and notation, "DO NOT DUPLICATE."
 2. Design master key system allowing for 300 percent expansion.
- D. Metals: Construct lock cylinder and core parts from brass or bronze, stainless steel, or nickel silver.
- E. Key Material: Provide keys of nickel silver only.
- F. Key Quantity: Furnish 10 construction master keys, and 2 construction control keys.

2.7 LOCKS, LATCHES AND BOLTS

- A. Locksets and Latchsets: Provide heavy-duty cylindrical locksets meeting ANSI A 156.2, Series 4000, Grade 1; provide Schlage ND Series.
 1. Lever Trim: Similar to Schlage "Rhodes" style.

- B. Strikes: Provide manufacturer's standard wrought box strike for each latch or lock bolt, with curved lip extended to protect frame, finished to match hardware set, unless otherwise indicated.
 - 1. Provide flat lip strikes for locks with 3-piece, antifriction latchbolts as recommended by manufacturer.
 - 2. Provide recess type top strikes for bolts locking into head frames, unless otherwise indicated.
 - 3. Provide dust-proof strikes for foot bolts, except where special threshold construction provides nonrecessed strike for bolt.
 - 4. Provide roller type strikes where recommended by manufacturer of the latch and lock units.
- C. Lock Throw: Provide 5/8-inch minimum throw of latch on pairs of doors. Comply with UL requirements for throw of bolts and latch bolts on rated fire openings.
 - 1. Provide 1/2-inch minimum throw of latch for other bored and preassembled types of locks and 3/4-inch minimum throw of latch for mortise locks. Provide 1-inch minimum throw for all dead bolts.
- D. Flush Bolt Heads: Minimum of 1/2-inch-diameter rods of brass, bronze, or stainless steel with minimum 12-inch-long rod for doors up to 7'-0" in height. Provide longer rods as necessary for doors exceeding 7'-0" in height.

2.8 CLOSERS AND DOOR CONTROL DEVICES

- A. Size of Units: Except as otherwise specifically indicated, provide non-sized closers for all units.
- B. Access-Free Manual Closers: Where manual closers are indicated for doors required to be accessible to the physically handicapped, provide adjustable units complying with ADA provisions for door opening force and delayed action closing.
- C. Piston: Minimum 1-1/2" diameter one piece steel.
- D. Provide all parallel arm closers with one piece forged extra duty arms or 3/8-inch (9 mm) thick stamped solid steel main and one piece forged or 5/16-inch (8 mm) thick stamped solid steel forearm with bronze bushings.
 - 1. Provide spring cushion arms at all exterior doors, and where indicated.
 - 2. Provide standard stop arms at all parallel arm closers scheduled for interior doors where a wall or floor stop is not feasible, and where indicated.
 - 3. Provide only handed closers.
 - 4. Provide only heavy-duty closers recommended by manufacturer for instructional applications. Standard weight products are not acceptable.
- E. Provide all regular arm closers with forged or stamped steel mainarm.

- F. Provide heavy-duty steel stud shoulder bolts (including main arm and forearm connection) at all regular arm, hold open arm, built-in stop arm, and hold open / built-in stop closers.
- G. Provide exterior closers with all weather hydraulic fluid, suitable from 120°F to -35°F without adjustment.
- H. Provide closers with powder coat finish on body, arm and plate adapter, or corrosion inhibitor primer and sprayed finish coat.
- I. Provide grey resilient parts for exposed bumpers.

2.9 DOOR TRIM UNITS

- A. Fabricate protection plates the width of single leaf doors less 1-1/2-inches, and width of door leaf less 1" for pairs of doors, to yield a uniform reveal. Provide on push side by height indicated.
 - 1. Metal Plates: Stainless steel , 0.050 inch (U.S. 18 gage).
- B. Provide wrap around plates at doors where hardware is retrofitted and existing prep for lock throws does not align with new lock throws. Manufacturer: DonJo or equal.

2.10 EXIT DEVICES

- A. General: All devices and mullions shall be of one manufacturer to provide for proper installation and servicing. Devices shall be furnished non-handed and capable of direct field conversion for all available trim functions. All devices shall carry a three year warranty against manufacturing defects and workmanship. Exit device(s) being submitted for approval shall have been manufactured for at least 10 years. A list of (10) years old projects using submitted exit device shall be available upon request.
- B. Furnish maintenance kit Von Duprin #050046 to owner at closeout of project. Furnish mullion stabilizer similar to Von Duprin #154 for all mullions.
- C. Furnish cylinders for all locking function exit devices.
- D. Exit device shall be tested to ANSI/BHMA A156.3 test requirements by a BHMA certified independent testing laboratory. A written certification showing successful completion of a minimum of 1,000,000 cycles for surface and concealed vertical rod devices, 5,000,000 cycles for rim devices, and 10,000,000 cycles for mortise devices.
- E. Low Profile Type Exit Devices:
 - 1. Devices shall be push through type touch pad design with a straight or horizontal motion to eliminate pinch points. The angular motion type pad with end cavity exposed when depressed is unacceptable. Latch bolt shall have a self-lubricating

- coating which reduces friction and wear. Plated latch bolts are unacceptable. Device housing shall be heavy duty extruded aluminum.
2. Mechanism Case or Housing: Shall have an average minimum thickness of (.140") EXTRUDED aluminum, and shall have the adaptability to convert from standard hex key dogging to a high security cylinder dog operation in the field.
 3. No exposed screws shall be seen from the back side (pull side) of the device through a glass lite.
 4. The use of plastic parts to retract the latchbolt is unacceptable.
 5. Springs: Only minimum (1/16") diameter compression springs are acceptable. All internal parts shall be zinc dichromate coated to prevent rusting.
 6. Quiet Feature: All devices shall incorporate a hydraulic sound damper to which decelerates the touchpad on its return stroke and eliminates noise associated with exit device operation.
 7. Touch Pad: Shall be architectural metal with a minimum height of 2-3/16". Plastic is not acceptable.
 8. Outside Trim: Shall be heavy duty type and fastened by means of concealed welded lugs and thru-bolts from the inside. Lever trim shall be forged brass with a minimum average thickness on the escutcheon of (.130"). Plate with pull shall be minimum average thickness of (.090") and have forged pulls. Lever trim shall be furnished with "Break-Away Levers" (996L Trim).
 9. End caps shall be sloped and of heavy-duty metal alloy construction and provide horizontal adjustment to provide flush alignment with device cover plate. When device end cap is installed, no raised edges will protrude. End cap shall be cast metal or forged aluminum and have a minimum thickness of (.250"). Plastic or metal stamping will not be acceptable.
 10. All devices with US28 finish to have stainless steel touch bars with US26D trim.
 11. All floor strikes on interior vertical rod panic devices to be similar to Von Duprin 385A.
 12. Provide all shim kits and filler plates to allow flush mounting of exit devices on all types of doors used in this project.
 13. Furnish all exit devices with deadlocking latchbolts.
- F. Acceptable Manufacturers: Subject to compliance with requirements, provide exit device products of the following manufacturers:
1. Von Duprin - No Substitutions
- 2.11 SMOKE SEALS
- A. General: Provide continuous smoke seals on doors where indicated or scheduled.
 - B. Smoke-Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled, based on testing according to UL 1784.
- 2.12 WEATHERSTRIPPING AND SEALS
- A. General: Provide continuous weatherstripping on exterior doors and interior doors where indicated or scheduled. Provide noncorrosive fasteners.

- B. Weatherstripping at Jambs and Heads: Provide brush type insert and extruded aluminum with anodized finish retainer strips, surface applied, of design and size scheduled.
- C. Weatherstripping Sweep: Provide sweep consisting of brush type insert and extruded aluminum with anodized finish housing, surface applied, of design and size scheduled.

2.13 THRESHOLDS

- A. General: Except as otherwise indicated, provide standard metal threshold unit of type, size, and profile as shown or scheduled.
- B. Thresholds: Not more than ½ inch (13 mm high). Bevel raised thresholds with a slope of not more than 1:2.

2.14 HARDWARE FINISHES

- A. Provide satin chrome, BHMA 626 (US26D) finish for all hardware items to greatest extent possible or manufacturer's standard finish matching this finish.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances, door and frame supports, and other conditions affecting performance of door hardware.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Mount hardware units at heights indicated in following applicable publications, except as specifically indicated or required to comply with governing regulations and except as otherwise directed by Architect.
 - 1. All doors with lever trim shall have hardware mounted at heights required by ADA regulations.
 - 2. "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute.
- B. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Where cutting and fitting is required to install hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation or application of surface protection with finishing work specified

in the Division 9 Sections. Do not install surface-mounted items until finishes have been completed on the substrates involved.

- C. Set units level, plumb, and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
- D. Pre-drill and countersink doors, frames and units that are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.
- E. Hand tighten screws and fasteners, use of power driven tools must be limited to preliminary driving screws if permitted by door and hardware manufacturer.
- F. Replace doors damaged by improper hardware installation.
- G. Set thresholds for exterior doors in full bed of sealant specified in Division 07 Section "Joint Sealant."
- H. Seals: Comply with manufacturer's instructions and recommendations to the extent installation requirements are not otherwise indicated.

3.3 ADJUSTING, CLEANING, AND DEMONSTRATING

- A. Adjust and check each operating item of hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate freely and smoothly or as intended for the application made.
 - 1. Where door hardware is installed more than one month prior to acceptance or occupancy of a space or area, return to the installation during the week prior to acceptance or occupancy and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.
- B. Adjust door closers in accordance with manufacturer's instructions for proper door closer adjustment for spring power, backcheck, closing and latching speed.
- C. Clean adjacent surfaces soiled by hardware installation.
- D. Instruct Owner's personnel in the proper adjustment and maintenance of door hardware and hardware finishes.
- E. Six-Month Adjustment: Approximately six months after the date of Substantial Completion, the Installer, accompanied by representatives of the manufacturers of latchsets and locksets and of door control devices, and of other major hardware suppliers, shall return to the Project to perform the following work:

1. Examine and re-adjust each item of door hardware as necessary to restore function of doors and hardware to comply with specified requirements.
2. Consult with and instruct Owner's personnel in recommended additions to the maintenance procedures.
3. Replace hardware items that have deteriorated or failed due to faulty design, materials, or installation of hardware units.
4. Prepare a written report of current and predictable problems (of substantial nature) in the performance of the hardware.

3.4 HARDWARE SCHEDULE

- A. **SCHEDULE OF ACCEPTABLE MANUFACTURERS AND PRODUCTS:** Manufacturers and products are listed to establish the general product appearance, type and quality intended for use, and Owner preference for the Project. Certain items have been specially selected for their appearance and function, and to match existing hardware. Equal products of manufacturers other than those listed below may be acceptable where "or equal" is indicated, subject to the approval of the Architect. Substitutions proposed for hardware items must be equivalent in every way, as judged solely by Architect

1. Hinges Interior Doors: Hager BB 1279, standard Weight, BHMA 652 (US26D) finish; 4-1/2" x 4-1/2", 2-ball bearing 5-knuckle; or approved equivalent by Bommer or McKinney.
2. Hinges Exterior Doors: Hager BB 1199 (heavy weight), Stainless steel with stainless steel pin, BHMA 630 (US32D) finish; 4-1/2" x 4-1/2", 4-ball bearing 5-knuckle; or approved equivalent by Bommer or McKinney.
3. Locksets/Latchsets: Schlage ND Series cylindrical locksets with "Rhodes" style lever trim; BHMA 626 finish, with interchangeable / removable core. Provide Construction cores for 20-percent of locksets.
4. Rim Type Exit Devices: Von Duprin 99 series with trim and function as scheduled; provide electric latch retraction (EL) option, PS914 power supply and EPT-2 power transfer for electrified rim exit devices.
5. Interchangeable Cores: Exterior- Primus Everest - JD - Large Format Core - Primus XP High Security and interior - Primus - JD - Large Format core. For insertion in locksets, exit devices, and elsewhere as scheduled; finish to match lockset, to match existing. Provide with key and concealed cylinder stamping.
6. Cylinders for use with Interchangeable Core: Primus type required for hardware and cores specified, with temporary construction cores, finish to match lockset. No substitution. Provide Construction cores for all cylinders at exit devices
7. Closers: LCN 4040xp
 - a. Exterior Doors: reduced opening force for handicapped; in aluminum painted finish BHMA 689 (except as noted).
 - b. Interior Doors: Provide parallel or standard arm closers as indicated in the General Notes below; reduced opening force for handicapped; in aluminum painted finish BHMA 689; Options: provide built-in stop arm, advanced back check and spring cushion stop arm where indicated (order of options).

8. Wall Stops: Ives WS406CCV OR WS407CCV as required by wall material, with grey bumper and BHMA 630 finish; or approved equivalent by Rockwood.
9. Overhead Stops: Glynn Johnson No. 90S Series, stop only, no hold open, BHMA 630 finish; or approved equivalent.
10. Silencers: Ives No. SR64 for hollow metal frames, or approved equivalent by Rockwood.
11. Combination Bolts (Automatic Flush Bolts): Rockwood No. 2845 with 1880 strike unless threshold is indicated, BHMA 626, or equivalent by Ives.
12. Coordinator: Rockwood 1600 Series, with mounting brackets, as required 576 series at doors with overhead stops, or where 1600 is not feasible; or equivalent by Ives.
13. Kickplates: Ives No. 8400 LDW, stainless steel, 10-inches high unless otherwise indicated, by door width, where indicated, or approved equivalent by Rockwood.
14. Thresholds for Exterior Doors: Pemko Aluminum No. 171A, 2005AV, or approved equivalent by National Guard Products or Zero, length as required, width as shown on details (Refer to Division 9 Section "Ceramic Tile" for marble thresholds)
15. Weatherstripping: National Guard Products 670A brush type, or approved equivalent by Pemko or Zero.
16. Sweep: Pemko 315CN, or approved equivalent by National Guard Products or Zero.
17. Rain Drip: National Guard Products: 17, or approved equivalent by Pemko or Zero.

B. SCHEDULED HARDWARE SETS

GENERAL NOTES:

1. Doors hardware shall not prohibit exiting from spaces.
2. Provide hardware finishes above unless noted otherwise for a specific set or door.
3. Provide all required installation accessories and options necessary for complete installation of each hardware component, to ensure proper operation of the product.
4. Coordinate all hardware components for each door leaf for overall compatibility.
5. Through-bolting of hardware is not permitted, coordinate all blocking requirements with door manufacturer.
6. Provide all interior doors with wall stops, one per leaf; provide overhead type as required when wall stop not feasible. Specific stops scheduled are exceptions to this.
7. Provide 3 silencers per single door and 2 silencers per pair doors except omit on weatherstripped and smoke and sound sealed doors.
8. Where door closers are scheduled below, provide parallel or standard arm closers placed on the least conspicuous side of the door, unless noted otherwise.
9. Furnish hardware for aluminum doors (field apply closer) to manufacturer's plant for installation
10. Functions: The lockset/exit device function specified is for BIDDING ONLY. Review all lock and exit device functions with Owner prior to submission of door schedule.
11. The Door Schedule specifies some products for aluminum doors in this Section to ensure one manufacturer of exit devices, locksets, and closers throughout the Project. These items must match throughout the building regardless of who supplies them.

C. HARDWARE SETS.

SCHEDULE OF FINISH HARDWARE - see attached

END OF SECTION 087100

SECTION 087101

DOOR HARDWARE SCHEDULE

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 references specification sections relating to commercial door hardware for the following:

- 1. Swinging doors.
- 2. Sliding Doors.
- 3. Other doors to the extent indicated.

- B. Commercial door hardware includes, but is not necessarily limited to, the following:

- 1. Mechanical door hardware.
- 2. Electromechanical and access control door hardware.
- 3. Electromechanical and access control door hardware power supplies, back-ups and surge protection.
- 4. Automatic operators.
- 5. Cylinders specified for doors in other sections.

- C. Related Sections:

- 1. Division 08 Section "Metal Doors and Frames"
- 2. Division 08 Section "Wood Doors"
- 3. Division 08 Section "Door Hardware"

- D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

- 1. ANSI A117.1 - Accessible and Usable Buildings and Facilities
- 2. ICC/IBC - International Building Code
- 3. NFPA 70 - National Electrical Code
- 4. NFPA 80 - Fire Doors and Windows
- 5. NFPA 101 - Life Safety Code
- 6. NFPA 105 - Installation of Smoke Door Assemblies
- 7. State Building Codes, Local Amendments

- E. Standards: Reference Related Sections for requirements regarding compliance with applicable industry standards.

1.3 SUBMITTALS

- A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.
- B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 - 1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."

2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
 3. Content: Include the following information:
 - a. Type, style, function, size, label, hand, and finish of each door hardware item.
 - b. Manufacturer of each item
 - c. Fastenings and other pertinent information
 - d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule
 - e. Explanation of abbreviations, symbols, and codes contained in schedule.
 - f. Mounting locations for door hardware
 - g. Door and frame sizes and materials
 4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
- C. Keying Schedule: Prepared under the supervision of the Owner, separate schedule detailing final keying instructions for locksets and cylinders in writing. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner to approve submitted keying schedule prior to the ordering of permanent cylinders.
- D. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.
- E. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Submittals. The manual to include the name, address, and contact information of the manufacturers providing the hardware and their nearest service representatives. The final copies delivered after completion of the installation test to include "as built" modifications made during installation, checkout, and acceptance.
- F. Warranties and Maintenance: Special warranties and maintenance agreements specified in the Related Sections.
- 1.4 QUALITY ASSURANCE
- A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum [5] years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.
- B. Installer Qualifications: Installers, trained by the primary product manufacturers, with a minimum [3] years documented experience installing both standard and electrified builders hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- C. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum [5] years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor in good standing by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

- D. Source Limitations: Obtain each type and variety of Door Hardware specified in the Related Sections from a single source, qualified supplier unless otherwise indicated.
- E. Regulatory Requirements: Comply with NFPA 70, NFPA 80, NFPA 101 and ANSI A117.1 requirements and guidelines as directed in the applicable model building code.
- F. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.
- B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.
- C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference."

1.6 COORDINATION

- A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.
- B. Door and Frame Preparation: Division 08 Sections (Steel, Aluminum and Wood) doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.7 WARRANTY

- A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

1.8 MAINTENANCE SERVICE

- A. 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 door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. Refer to "PART 3 – EXECUTION" for required specification sections.

PART 3 - EXECUTION

3.1 DOOR HARDWARE SETS

- A. The door hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule.

Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

- B. The supplier is responsible for handing and sizing all products as listed in the door hardware sets. Quantities listed are for each pair of doors, or for each single door.
- C. Products listed in the Door Hardware Sets must meet the requirements described in the specification sections noted.
 - 1. Section 08 71 00 – Door Hardware

HARDWARE SETS

AS: Assembly

- Corridor function lockset
- Single: Rim cylinder exit device
- Paired: If Removable mullion is called for on door schedule use Rim cylinder exit device
- Paired: Concealed vertical rod and astragal w/door coordinator (Wood, use matching cover)
- Overhead closer on active leafs

CL: Classroom

- Classroom function lockset w/keyed interior cylinder (Intruder function) and Indicator
- Overhead closer on active leafs
- Paired: Inactive leaf w/integral astragal and top & bottom flush bolts

CS: Corridor Smoke & Fire Doors

- Corridor function lockset
- Single: Rim cylinder exit device
- Paired: If Removable mullion is called for on door schedule use Rim cylinder exit device
- Paired: Concealed vertical rod and astragal w/door coordinator (Wood, use matching cover)
- Electromagnetic hold-open / closer – single point type – auxiliary stop as required
- Cylinder & pull side lever

EF: Exterior FRP

- Single: Electrified rim exit device w/keyed cylinder dogging
- Paired: Keyed alum removable mullion with electrified rim exit device w/keyed cylinder dogging
- Overhead closers
- Auxiliary Stop
- Architectural Pull on each leaf
- Aluminum saddle
- Weather-stripping & door sweeps
- Card / FOB reader by others

OF: Offices

- Dormitory function lockset
- Coat hook on back (door type FLNG & F only)
- Overhead closers at rated door

SE: Secure (Storage/Janitor/Mech/etc.)

- Storeroom function lockset
- Overhead closers
- Paired: Inactive leaf w/integral astragal, coordinator, top & bottom flush bolts and overhead closer

SW: Stairway Door

- Passage function lockset
- Overhead closers
- Rim cylinder exit device

TM: Toilet, Multi-User

- Passage function lockset
- Deadbolt w/anti-locking thumb turn
- Overhead closer

TS: Toilet, Single-User

- Dormitory function lockset w/occupancy indicator
- Coat hook on back
- Overhead closer

TYPICAL HARDWARE NOTES:

1. Do not order any door hardware until keying and keying system, has been selected and coordinated with the District.
2. Provide "Fire Bolt" hardware (w/suitable UL listing & fire rating) for doors within fire walls & smoke barriers (no-dogging permitted).
3. Hardware within fire walls shall be rated for the fire rating of that wall.
4. Hollow metal frames within fire walls shall be rated for the fire rating of that wall.
5. All glazing added in the new or existing gyms shall be safety glazing in addition to fire ratings denoted.
6. All hardware shall be stainless steel US32D.
7. All exterior hardware shall be stainless steel US32D.
8. Provide continuous hinges at all exterior doors and as noted elsewhere. All other doors to receive 1½ pr. H.D. Butt hinges per leaf unless noted otherwise (doors over 7' shall receive 2pr. of hinges per leaf).
9. Provide integral hold-open feature on overhead closers at main entry doors & associated vestibule doors and as noted in door schedule & where adjacent wall(s) cannot provide 90° wall type magnetic hold open.
10. Provide kick plate on push side of all doors except aluminum doors. Provide mop plates on pull side of all doors except at carpeted areas.
11. Provide 3 silencers on all strike jambs.
12. Provide appropriate wall, or overhead stop for each door location. Floor stops are not to be used unless specifically approved by the architect, on a case by case basis.
13. Provide panic device glass bead shim kit where required.
14. See plans for hardware swing extent and provide hardware accordingly.
15. Size hinges and closers to match door size and weight.
16. Provide 'safety' fire-rated glass in rated doors/frames. Provide tempered glass for all other doors/frames requiring safety glazing. At minimum, safety glazing is required for all locations where glazing is 18" or less above finished floor and for all glazing that is in a corridor that is 48" or less above finished floor. See door schedule for ratings, safety & heat transfer information.
17. Smoke /Fire doors are to have Smoke Fire Gaskets.
18. At smoke & fire doors with magnetic hold- open feature that do not have a wall adjacent for mounting hold-open, provide integrated type within frame. G.C. to coordinate this with E.C. for inclusion of wiring.
19. Provide dust-proof strike with all vertical rod exit devices.
20. See door schedule for specific exceptions to hardware sets.
21. See door schedule for door saddle requirements & details.
22. Coordinate door undercuts with saddle requirements.
23. For Narrow Stile Doors (NS1) – prior to ordering doors or hardware, confirm hardware will function properly.

END OF SECTION 087101

SECTION 088000 - 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.

1.2 DEFINITIONS

- A. Manufacturer: A firm that produces primary glass or fabricated glass as defined in referenced glazing publications.
- B. Interspace: Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.
- C. Deterioration of Coated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in metallic coating.
- D. Deterioration of Laminated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.
- E. Deterioration of Insulating Glass: Failure of the hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1.3 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.

1.4 SUBMITTALS

- A. Product Data: For each glass product and glazing material indicated.
- B. Samples: For the following products, in the form of 12-inch- (300-mm-) square Samples for glass and of 12-inch- (300-mm-) long Samples for sealants. Install sealant Samples between two strips of material representative in color of the adjoining framing system.
 - 1. Insulating glass for each designation indicated.
 - 2. Each type of laminated glass specified.
- C. Glazing Schedule: Use same designations indicated on Drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.
- D. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.
 - 1. For solar-control low-e-coated glass, provide documentation demonstrating that manufacturer of coated glass is certified by coating manufacturer
- E. Qualification Data: For 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. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Source Limitations: Obtain each type of glass from one primary-glass manufacturer.
- C. Source Limitations for Glass Sputter-Coated with Solar-Control Low-E Coatings: Where solar-control low-e coatings of a primary glass manufacturer that has established a certified fabricator program is specified, obtain sputter-coated solar-control low-e-coated glass in fabricated units from a manufacturer that is certified by coated-glass manufacturer
- D. Glass Product Testing: Obtain glass test results for product test reports in "Submittals" Article from a qualified testing agency based on testing glass products.
 - 1. Glass Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.

- E. Elastomeric Glazing Sealant Product Testing: Obtain sealant test results for product test reports in "Submittals" Article from a qualified testing agency based on testing current sealant formulations within a 36-month period.
 - 1. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated, as documented according to ASTM E 548.
 - 2. Test elastomeric glazing sealants for compliance with requirements specified by reference to ASTM C 920, and where applicable, to other standard test methods.
- F. Safety Glass: Category II materials complying with testing requirements in 16 CFR 1201 and ANSI Z97.1.
 - 1. Subject to compliance with requirements, permanently mark safety glass with certification label of Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction.
 - 2. Safety glass includes fully tempered glass and laminated glass.
- G. 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. SIGMA Publications: SIGMA TM-3000, "Vertical Glazing Guidelines."
 - 2. GANA Publications: GANA'S "Glazing Manual" and "Laminated Glass Design Guide."
 - 3. IGMA Publication for Insulating Glass: SIGMA TM-3000, "Glazing Guidelines for Sealed Insulating Glass Units."
- H. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the following inspecting and testing agency:
 - 1. Insulating Glass Certification Council.
 - 2. Associated Laboratories, Inc.
 - 3. National Accreditation and Management Institute.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install liquid glazing sealants when ambient and substrate temperature conditions are outside limits permitted by glazing sealant manufacturer or below 40 deg F (4.4 deg C).

1.8 WARRANTY

- A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Manufacturer's Special Warranty on Coated-Glass Products: Written warranty, made out to Owner and signed by coated-glass manufacturer agreeing to furnish replacements for those coated-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
 1. Warranty Period: 10 years from date of Substantial Completion.
- C. Manufacturer's Special Warranty on Insulating Glass: Written warranty, made out to Owner and signed by insulating-glass manufacturer agreeing to furnish replacements for 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.
- D. Manufacturer's Special Warranty on Laminated Glass: Written warranty, made out to Owner and signed by laminated-glass manufacturer agreeing to furnish replacements for laminated-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PRIMARY FLOAT GLASS

- A. Float Glass: ASTM C 1036, Type I (transparent glass, flat), Quality q3 (glazing select); Class 1 unless otherwise indicated in schedules at the end of Part 3.

2.2 HEAT-TREATED FLOAT GLASS

- A. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed, unless otherwise indicated.
- A. Heat-Treated Float Glass: ASTM C 1048; Type I (transparent glass, flat); Quality q3 (glazing select); class, kind, and condition as indicated in schedules at the end of Part 3.

2.3 COATED FLOAT GLASS

- A. General: Provide coated glass complying with requirements indicated in this Article and in schedules at the end of Part 3.
 - 1. Provide Kind HS (heat-strengthened) coated float glass in place of coated annealed glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in "Performance Requirements" Article. Provide Kind FT (fully tempered) where safety glass is indicated.
- B. Sputter-Coated Float Glass: ASTM C 1376, float glass with metallic-oxide or -nitride coating deposited by vacuum deposition process after manufacture and heat treatment (if any), and complying with other requirements specified in schedules at the end of Part 3.
 - 1. Basis of Design Product: Solarban 70 by Vitro Architectural Glass, or equal.
 - a. Equal acceptable product: Viracon VNE-63.

2.4 LAMINATED GLASS

- A. Laminated Glass: Comply with ASTM C 1172 for kinds of laminated glass indicated and other requirements specified, including those in the Laminated-Glass Schedule at the end of Part 3.
- B. Interlayer: Interlayer material as indicated below, clear or in colors, and of thickness indicated with a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after laminating glass lites and installation.
 - 1. Interlayer Material: Polyvinyl butyral sheets
 - 2. Interlayer Thickness: .030" except provide .060" thickness for laminating two lites of heat strengthened glass together, and where scheduled.
 - 3. Interlayer Color: Clear.
- C. Laminating Process: Fabricate laminated glass to produce glass free of foreign substances and air or glass pockets as follows:
 - 1. Laminate lites with polyvinyl butyral interlayer in autoclave with heat plus pressure.

2.5 INSULATING GLASS

- A. Insulating-Glass Units: Preassembled units consisting of sealed lites of glass separated by a dehydrated interspace, and complying with ASTM E 774 for Class CBA units and with requirements specified in this Article and in the Insulating-Glass Schedule at the end of Part 3.
 - 1. Provide Kind HS (heat-strengthened) float glass in place of annealed glass where needed to resist thermal stresses induced by differential shading of

individual glass lites and to comply with glass design requirements specified in "Performance Requirements" Article. Provide Kind FT (fully tempered) where safety glass is indicated. Provide heat soaked glass where scheduled.

- B. Overall Unit Thickness and Thickness of Each Lite: Dimensions indicated in the Insulating-Glass Schedule at the end of Part 3 are nominal and the overall thicknesses of units are measured perpendicularly from outer surfaces of glass lites at unit's edge.
- C. Sealing System: Dual seal, with primary and secondary sealants as follows:
 - 1. Manufacturer's standard sealants.
- D. Spacer Specifications: Manufacturer's standard spacer material and construction complying with the following requirements:
 - 1. Aluminum with mill or clear-anodized finish.
 - 2. Desiccant: Molecular sieve or silica gel, or blend of both.
 - 3. Corner Construction: Manufacturer's standard corner construction.

2.6 ELASTOMERIC GLAZING SEALANTS

- A. General: Provide products of type indicated, complying with the following requirements:
 - 1. Compatibility: Select glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
 - 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
 - 3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range for this characteristic.
 - 4. Field-applied sealants shall have a VOC content of not more than 250 g/L.
- B. Single-Component Neutral-Curing Silicone Sealant: ASTM C 920; Type S; Grade NS; Class 50; Uses NT, M, G, A, and, as applicable to joint substrates indicated, O.
 - 1. Products:
 - a. Dow Corning Corporation; 791.
 - b. Dow Corning Corporation; 795.
 - c. GE Silicones; SilPruf NB SCS9000.
 - d. GE Silicones; UltraPruf II SCS2900.
 - e. Pecora Corporation; 865.
 - f. Pecora Corporation; 895.
 - g. Pecora Corporation; 898

2.7 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tape: Preformed, butyl-based elastomeric tape with a solids content of 100 percent; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C 1281 and AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
- B. Expanded Cellular Glazing Tape: Closed-cell, PVC foam tape; 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.

2.8 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: Silicone elastomeric material with a Shore A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions with a Shore A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.9 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS

- A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing standard, to comply with system performance requirements.
- B. Grind smooth and polish exposed glass edges.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine framing glazing, with Installer present, for compliance with the following:
 - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 - 2. Presence and functioning of weep system.
 - 3. Minimum required face or edge clearances.
 - 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.
- C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.
- E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- G. Provide spacers for glass lites where the length plus width is larger than 50 inches (1270 mm) as follows:
 - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances,

unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.

2. Provide 1/8-inch (3-mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Where framing joints are vertical, cover these joints by applying tapes to heads and sills first and then to jambs. Where framing joints are horizontal, cover these joints by applying tapes to jambs and then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until just before each glazing unit is installed.
- F. Apply heel bead of elastomeric sealant.
- G. 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.
- H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

- A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with stretch allowance during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Install gaskets so they protrude past face of glazing stops.

3.6 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.7 PROTECTION AND CLEANING

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.
- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for build-up of dirt, scum, alkaline deposits, or stains; remove as recommended by glass manufacturer.
- D. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents, and vandalism, during construction period.

- E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

3.8 GLASS SCHEDULE

A. Exterior Glazing:

1. Exterior Doors: Provide 1 inch insulated tempered glass as follows:
 - a. Outboard Lite: 1/4-inch thick clear, fully tempered (Kind FT) glass, low-E coated on the second surface.
 - 1) Low-Emissivity Sputter Coating: Solarban 70; by Vitro Architectural Glass, Inc.
 - b. Air Space: 1/2 inch.
 - c. Inboard Lite: 1/4-inch thick clear, fully tempered (Kind FT) glass
 - d. Performance Characteristics:
 - 1) Visible Light Transmittance: Min 64%.
 - 2) Winter Nighttime U-Value: Max. 0.28
 - 3) Summer Daytime U-Value: Max 0.26.
 - 4) Solar Heat Gain Coefficient (SHGC): Max. 0.27
 - 5) Shading Coefficient: Max. 0.32.
 - 6) Outdoor Visible Light Reflectance: 12%
2. Replacement Glazing for Windows: Match existing.

B. Interior Glazing, as Scheduled:

1. Non-Fire Rated Doors, Transoms, Sidelights and Borrowed Lights: 1/4 inch clear tempered glass.

END OF SECTION 088000

SECTION 092216 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Non-load-bearing steel framing systems for interior gypsum board assemblies.
2. Suspension systems for interior gypsum ceilings, soffits, and grid systems.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 DESCRIPTION

- A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 FRAMING SYSTEMS

- A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
 2. Protective Coating: ASTM A 653/A 653M, G40 (Z120), hot-dip galvanized, unless otherwise indicated.
- B. Studs and Runners: ASTM C 645.
1. Steel Studs and Runners:
 - a. Minimum Base-Metal Thickness: 0.0296 inch, 20 ga. (0.752 mm).
 - b. Depth: As scheduled on Drawings for each location.
- C. Slip-Type Head Joints: Provide one of the following:
1. Single Long-Leg Runner System: ASTM C 645 top runner with 2-inch- (51-mm-) deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top runner and with continuous cold rolled channel bridging

- attached to each stud located within 12 inches (305 mm) of the top of studs to provide lateral bracing.
2. Double-Runner System: ASTM C 645 top runners, inside runner with 2-inch- (51-mm-) deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit inside runner.
 3. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) ClarkDietrich; MaxTrak Slotted Deflection Track
 - 2) Steel Network Inc. (The); VertiClip SLD Series.
 - 3) Telling Industries; True-Action™ Slotted Track.
- D. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
1. Minimum Base-Metal Thickness: 0.033 inch, 20 ga. (0.84 mm).
- E. Cold-Rolled Channel Bridging and Bracing: Steel, 0.053-inch (1.34-mm) minimum base-metal thickness, with minimum 1/2-inch- (13-mm-) wide flanges.
1. Depth: 1-1/2 inches (38 mm) unless otherwise indicated.
 2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches (38 by 38 mm), 0.068-inch- (1.72-mm-) thick, galvanized steel.
- F. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
1. Minimum Base-Metal Thickness: 0.018 inch (0.45 mm).
 2. Depth: 7/8 inch (22.2 mm) unless otherwise indicated.
- G. Resilient Furring Channels: 1/2-inch- (13-mm-) deep, steel sheet members designed to reduce sound transmission.
1. Configuration: Asymmetrical.
- H. Cold-Rolled Furring Channels: 0.053-inch (1.34-mm) uncoated-steel thickness, with minimum 1/2-inch- (13-mm-) wide flanges.
1. Depth: 3/4 inch (19 mm) unless otherwise indicated.
 2. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum uncoated-steel thickness of 0.033 inch (0.8 mm).
 3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- (1.59-mm-) diameter wire, or double strand of 0.048-inch- (1.21-mm-) diameter wire.

2.3 SUSPENSION SYSTEMS

- A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- (1.59-mm-) diameter wire, or double strand of 0.048-inch- (1.21-mm-) diameter wire.
- B. Hanger Attachments to Concrete:
 - 1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E 488 by an independent testing agency.
 - a. Type: Postinstalled, chemical anchor or postinstalled, expansion anchor.
 - 2. Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E 1190 by an independent testing agency.
- C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch (4.12 mm) in diameter.
- D. Flat Hangers: Steel sheet, 1 by 3/16 inch (25 by 5 mm) by length indicated.
- E. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.053 inch (1.34 mm) and minimum 1/2-inch- (13-mm-) wide flanges.
 - 1. Depth: 1-1/2 inches (38 mm) unless otherwise indicated on Drawings.
- F. Furring Channels (Furring Members):
 - 1. Cold-Rolled Channels: 0.053-inch (1.34-mm) uncoated-steel thickness, with minimum 1/2-inch- (13-mm-) wide flanges, 3/4 inch (19 mm) deep.
 - 2. Steel Studs and Runners: ASTM C 645.
 - a. Minimum Base-Metal Thickness: 0.018 inch, 25 ga. (0.45 mm).
 - b. Depth: As indicated on Drawings.
 - 3. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch (22 mm) deep.
 - a. Minimum Base-Metal Thickness: 0.018 inch (0.45 mm).
 - 4. Resilient Furring Channels: 1/2-inch- (13-mm-) deep members designed to reduce sound transmission.
 - a. Configuration: Asymmetrical or hat shaped.
- G. Grid Suspension System for Gypsum Board Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Armstrong World Industries, Inc.; Drywall Grid Systems.

- b. Chicago Metallic Corporation; Drywall Grid System.
- c. USG Corporation; Drywall Suspension System.

2.4 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
 - 1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- B. Isolation Strip at Exterior Walls: Provide one of the following:
 - 1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.
 - 2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch (3.2 mm) thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
 - 1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

3.3 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754, except comply with framing sizes and spacing indicated.
 - 1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
- B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

- C. Install bracing at terminations in assemblies.
- D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.
- E. Cutting, Notching and Boring Holes in Nonstructural Steel Wall Framing:
 - 1. Flanges and lips of nonstructural steel wall studs shall not be cut or notched.
 - 2. Holes in webs of nonstructural steel wall studs shall be permitted along the centerline of the web of the framing member, shall not exceed 1-1/2 inches (38 mm) in width or 4 inches (102 mm) in length, and the holes shall not be spaced less than 24 inches (610 mm) center to center from another hole or less than 10 inches (254 mm) from the bearing end.

3.4 INSTALLING FRAMED ASSEMBLIES

- A. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- B. Install studs so flanges within framing system point in same direction.
 - 1. Space studs at 16 inches (406 mm) o.c. unless otherwise indicated.
- C. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.
 - 1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
 - 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
 - a. Install two studs at each jamb unless otherwise indicated.
 - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch (13-mm) clearance from jamb stud to allow for installation of control joint in finished assembly.
 - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
 - 3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
 - 4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.

- D. Install steel studs used as furring with clip angles at midpoint of wall span. Install additional clips to limit deflection to L/240 for walls finished with gypsum wall board and L/360 for walls finished with tile or plaster when subject to 5 psf (239 Pa) lateral load.
- E. Direct Furring: Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (610 mm) o.c.
- F. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by faces of adjacent framing.

3.5 INSTALLING SUSPENSION SYSTEMS

- A. Install suspension system components in sizes and spacings indicated on Drawings, but not less than those required by referenced installation standards for assembly types and other assembly components indicated.
- B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- C. Suspend hangers from building structure as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
 - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
 - a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
 - 3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 - 4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 - 5. Do not attach hangers to steel roof deck.
 - 6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
 - 7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
 - 8. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

- E. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.
- F. Installation Tolerances: Install suspension systems that are level to within $\frac{1}{8}$ inch in 12 feet (3 mm in 3.6 m) measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 092216

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior gypsum board.
2. Cement board.
3. Sound-attenuation blankets

B. Related Requirements:

1. Section 092216 "Non-Structural Metal Framing" for non-structural framing and suspension systems that support gypsum board panels.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For the following products:

1. Trim Accessories: Full-size Sample in 12-inch- (300-mm-) long length for each trim accessory indicated.

1.3 QUALITY ASSURANCE

A. Mockups: Before beginning gypsum board installation, install mockups of at least 100 sq. ft. (9 sq. m) in surface area to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Install mockups for the following:
 - a. Each level of gypsum board finish indicated for use in exposed locations.
2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
3. Simulate finished lighting conditions for review of mockups.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.4 DELIVERY, STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
- B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

- A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Georgia-Pacific Gypsum LLC.
 - 2. National Gypsum Company.
 - 3. USG Corporation.
- B. Gypsum Wallboard: ASTM C 1396/C 1396M.
 - 1. Thickness: 1/2 inch (12.7 mm).
 - 2. Where drawings indicate regular type 5/8 inch (15.9 mm), provide 5/8 inch (15.9 mm) Type X indicated below.
 - 3. Long Edges: Tapered.
- C. Gypsum Board, Type X: ASTM C 1396/C 1396M.
 - 1. Thickness: 5/8 inch (15.9 mm).
 - 2. Long Edges: Tapered.

D. Gypsum Ceiling Board: ASTM C 1396/C 1396M.

1. Thickness: 1/2 inch (12.7 mm).
2. Long Edges: Tapered.

E. Abuse-Resistant Gypsum Board: ASTM C 1629/C 1629M.

1. Core: 5/8 inch (15.9 mm), Type X.
2. Long Edges: Tapered.
3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
4. Performance Data:
 - a. Surface Abrasion: ASTM C1629. Classification Level 2
 - b. Surface Indentation: ASTM C1629. Classification Level 1
 - c. Soft-body Impact Test: ASTM C1629. Classification Level 1
5. Products: Subject to compliance with requirements, provide one of the following or equal:
 - a. Protecta AR 100 Type X with Mold Defense; Lafarge North America Inc.
 - b. ProRoc Gypsum Board Panels; Certainteed, Division of BPB.

2.4 SPECIALTY GYPSUM BOARD

A. Gypsum Board, Type C: ASTM C 1396/C 1396M. Manufactured to have increased fire-resistive capability.

1. Products: Subject to compliance with requirements, provide one of the following or equal:
 - a. CertainTeed Corp.; ProRoc Type C.
 - b. Lafarge North America Inc.; Firecheck Type C.
 - c. National Gypsum Company; Gold Bond Fire-Shield C.
 - d. USG Corporation; Firecode C Core.
2. Thickness: 5/8 inch (15.9 mm), unless otherwise indicated.
3. Long Edges: Tapered.
4. Provide where required by UL Design or NER 258.

2.5 TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A118.9 and ASTM C 1288 or 1325, with manufacturer's standard edges.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. CertainTeed Corp.; FiberCement BackerBoard.
 - b. Custom Building Products; Wonderboard.
 - c. James Hardie Building Products, Inc.; Hardiebacker 500.
 - d. National Gypsum Company, Permabase Cement Board.
 - e. USG Corporation; DUROCK Cement Board.
2. Thickness: 1/2 inch (12.7 mm) or 5/8 inch (15.9 mm) as indicated.

3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.6 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized-coated steel sheet or rolled zinc
2. Shapes:
 - a. Cornerbead.
 - b. Bullnose bead.
 - c. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - d. L-Bead: L-shaped; exposed long flange receives joint compound.
 - e. Expansion (control) joint.
 - f. Curved-Edge Cornerbead: With notched or flexible flanges.

B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Fry Reglet Corp.
 - b. Gordon, Inc.
 - c. Pittcon Industries.
2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221 (ASTM B 221M), Alloy 6063-T5.
3. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified
4. Products: Provide Contura curved drywall trim by Gordon Inc. for locations indicated on the Drawings, in sizes required.

2.7 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Board: Paper.
2. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints, beveled panel edges, and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use factory mixed drying-type, all-purpose compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.

3. Fill Coat: For second coat, use factory mixed drying-type, all-purpose compound.
4. Finish Coat: For third coat, use setting-type, sandable topping compound.
5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound.

D. Joint Compound for Tile Backing Panels:

1. Cementitious Backer Units: As recommended by backer unit manufacturer.

2.8 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

C. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

1. Laminating adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

1. Fire-Resistance-Rated Assemblies: Provide mineral-fiber SAFB where required by the UL assembly.

E. Acoustical Joint Sealant: As specified in Section 079200 "Joint Sealants"

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
 - 2. Fit gypsum panels around ducts, pipes, and conduits.
 - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- I. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
 - 1. Type X: Vertical surfaces unless otherwise indicated.
 - 2. Ceiling Type: Ceiling surfaces.
 - 3. Abuse-Resistant Type: As indicated on Drawings.

4. Type C: Where required for specific fire-resistance-rated assembly indicated.

B. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
2. On partitions/walls, apply gypsum panels vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:

1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches (400 mm) minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
3. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

- D. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.

3.4 APPLYING TILE BACKING PANELS

- A. Cementitious Backer Units: ANSI A108.11, at showers, tubs, and where indicated.
- B. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.5 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

- B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.
 - 1. Install control joints on 30 foot maximum centers, for all partitions, at locations indicated, and as detailed. Align control joints with door frames wherever possible, with space between edges of adjoining gypsum panels, as well as supporting framing behind gypsum panels.
 - 2. Install control joints at 50 foot maximum centers, with areas not to exceed 2,500 sq. ft. for all ceiling areas, at locations indicated, and as detailed.
- C. Interior Trim: Install in the following locations:
 - 1. Cornerbead: Use at outside corners unless otherwise indicated.
 - 2. Bullnose Bead: Use where indicated.
 - 3. LC-Bead: Use at exposed panel edges.
 - 4. L-Bead: Use where indicated.
 - 5. Curved-Edge Cornerbead: Use at curved openings.
- D. Aluminum Trim: Install in locations indicated on Drawings.

3.6 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
 - 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 - 2. Level 2: Panels that are substrate for tile.
 - 3. Level 4: At all panel surfaces that will be exposed to view unless otherwise indicated.
 - 4. Level 5: Provide Level 5 finish at all areas where wall washed lighting is indicated and at surfaces scheduled to receive gloss paint, and elsewhere specifically indicated on Drawings and schedules.
- E. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.7 IDENTIFICATION

- A. Fire walls, fire barriers, fire partitions, smoke barriers and smoke partitions or any other wall required to have protected openings or penetrations shall be effectively and permanently identified with signs or stenciling. Such identification shall:

1. Be located in accessible concealed floor, floor-ceiling or attic spaces.
2. Be repeated at intervals not exceeding 30 feet (914 mm) measured horizontally along the wall or partition.
3. Include lettering not less than 0.5 inch (12.7 mm)) in height, incorporating the followings wording: "FIRE AND/OR SMOKE BARRIER—PROTECT ALL OPENINGS," or other wording to reflect the wall type as indicated on the Code Summary Drawings.

3.8 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900

SECTION 093100 - CERAMIC TILING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Porcelain tile
 - 2. Ceramic tile
 - 3. Trim and edge accessories.
 - 4. Waterproof membrane for tile installations
 - 5. Stone thresholds.
- B. Sealing of expansion, contraction, control, and isolation joints in tile surfaces is specified in Division 07 Section "Joint Sealant."

1.2 ACTION SUBMITTALS

- A. Product data for each type of product specified.
- B. Samples of each color of tile, marble threshold, or accessory to be provided, for verification purposes.
- C. Samples of grout demonstrating full range of colors available, for initial selection purposes.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification data for firms and persons specified in "Quality Assurance" article to demonstrate their capabilities and experience. Include list of completed projects with project names, addresses, names of Architects and Owners, plus other information specified.

1.4 QUALITY ASSURANCE

- A. Single-Source Responsibility for Tile: Obtain each color, grade, finish, type, composition, and variety of tile from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.
- B. Single-Source Responsibility for Setting and Grouting Materials: Obtain ingredients of a uniform quality from one manufacturer for each cementitious and admixture component and from one source or producer for each aggregate.
- C. Installer Qualifications: Engage an experienced Installer who has successfully completed tile installations similar in material, design, and extent to that indicated for Project.

- D. Unit Mock-up: Provide mock-up on a board min. 2' x 2' in size, one for each different tile and grout color to be provided in the work; for final approval of grout color before ordering grout.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirement of ANSI A137.1 for labeling sealed tile packages.
- B. Prevent damage or contamination to materials by water, freezing, foreign matter, and other causes.

1.6 PROJECT CONDITIONS

- A. Maintain environmental conditions and protect work during and after installation to comply with referenced standards and manufacturer's printed recommendations.
- B. Vent temporary heaters to exterior to prevent damage to tile work from carbon dioxide buildup.
- C. Maintain temperatures at 50 deg F (10 deg C) or more in tiled areas during installation and for 7 days after completion, unless higher temperatures are required by referenced installation standard or manufacturer's instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Manufacturers: The design for each tile type and other material specified is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the following manufacturers:
 - 1. Tile:
 - a. American Olean; Div. of Dal-Tile International Corp
 - b. Creative Materials Corp.
 - c. Crossville Inc
 - d. Daltile; Div. of Dal-Tile International Inc.
 - e. Garden State Tile
 - f. Olympia Tile
 - g. Florida Tile Industries, Inc.
 - h. Summitville Tiles, Inc.
 - i. United States Ceramic Tile Company
 - 2. Mortars and Grouts:
 - a. Bostik Construction Products Div. (Hydroment)
 - b. Laticrete International Inc.

- c. Mapei Corp.
 - d. TEC Specialty Construction Brands Inc.
- 3. Waterproofing Membranes: The Noble Co.
 - 4. Termination, Trim and Transition Strips: Schluter

2.2 PRODUCTS, GENERAL

- A. ANSI Standard for Ceramic Tile: Comply with ANSI A137.1 "American National Standard Specifications for Ceramic Tile" for types, compositions, and grades of tile indicated.
 - 1. Furnish tile complying with "Standard Grade" requirements unless otherwise indicated.
- B. ANSI Standard for Tile Installation Materials: Comply with ANSI standard referenced with products and materials indicated for setting and grouting.
- C. Colors, Textures, and Patterns: Where manufacturer's standard products are indicated for tile, grout, and other products requiring selection of colors, surface textures, patterns, and other appearance characteristics, provide specific products or materials complying with the following requirements:
 - 1. Match color, texture, and pattern indicated by reference to manufacturer's standard designations for these characteristics.
 - 2. Provide tile trim and accessories that match color and finish of adjoining flat tile.
- D. Factory Blending: For tile exhibiting color variations within the ranges selected during sample submittals, blend tile in factory and package accordingly so that tile units taken from one package show the same range in colors as those taken from other packages and match approved samples.
- E. Large Format Tiles: Large format tiles are defined to be tiles with any one single side larger than 15".

2.3 TILE PRODUCTS

- A. Porcelain Floor Tile PT1: Provide flat tile complying with the following requirements:
 - 1. Module Size: 12" x 24", rectified
 - 2. Thickness: 10.5 mm
 - 3. Finish: Matte
 - 4. Color: Grey , solid color
 - 5. Basis of Design Products: Veneziano Collection, distributed by Garden State Tile or equal.
 - 6. Location: Toilet Room floors.
- B. Porcelain Floor Tile PT2: Provide flat tile complying with the following requirements:

1. Module Size: 12" x 24", rectified
2. Thickness: 10.5 mm
3. Finish: Matte
4. Color: Light Grey, Terrazzo
5. Basis of Design Products: Veneziano Collection, distributed by Garden State Tile or equal.
6. Location: Lobby floors.

C. Ceramic Wall Tile CT1: Provide flat tile complying with the following requirements:

1. Module Size: 3" x 6"
2. Thickness: 5/16"
3. Finish: Glossy
4. Color: Ice White #0025
5. Basis of Design Product: American Olean "Profiles" or equal.
6. Location: Elementary Toilet Rooms, general tile.

D. Ceramic Wall Tile CT2: Provide flat tile complying with the following requirements:

1. Module Size: 4-1/4" x 4-1/4"
2. Thickness: 5/16"
3. Finish: Glossy
4. Color: Lemon Zest #Q075
5. Basis of Design Product: American Olean "Bright and Matte" or equal
6. Location: Elementary Toilet Rooms, accent tile.
7. Installation: Set on a 45 degree angle.

E. Ceramic Wall Tile CT3: Provide flat tile complying with the following requirements:

1. Module Size: 8" x 24"
2. Thickness: 5/16"
3. Finish: Matte
4. Color: Pacific Blue #PE11
5. Basis of Design Product: American Olean "Perspecta" or equal.
6. Location: Mens/Boys Multiuser Toilet Rooms, accent tile.

F. Ceramic Wall Tile CT5: Provide flat tile complying with the following requirements:

1. Module Size: 1/2" x 6"
2. Thickness: 5/16"
3. Finish: Glossy
4. Color: Ice White #0025
5. Basis of Design Product: American Olean "Linea" or equal
6. Location: Elementary Toilet Rooms, trim at hex stripe

G. Ceramic Wall Tile CT6: Provide flat tile complying with the following requirements:

1. Module Size: 8" x 24"

2. Thickness: 5/16"
 3. Finish: Matte
 4. Color: Gravity Grey #PE10
 5. Basis of Design Product: American Olean "Perspecta" or equal.
 6. Location: Mens/Womens/Boys Multiuser Toilet Rooms, general tile.
- H. Ceramic Wall Tile CT7: Provide flat tile complying with the following requirements:
1. Module Size: 6" x 6"
 2. Thickness: 5/16"
 3. Finish: Glossy
 4. Color: Combination of Light Smoke #0042, Peacock Blue #Q084 and Glacier #0062.
 5. Basis of Design Product: American Olean "Bright and Matte" or equal.
 6. Location: Womens Toilet Rooms, accent tile
- I. Ceramic Wall Tile CT8: Provide flat tile complying with the following requirements:
1. Module Size: 8" x 20"
 2. Thickness: 5/16"
 3. Finish: Matte
 4. Color: Bleu Baltique 03
 5. Basis of Design Product: "Design Positive 2", distributed by Garden State Tile or equal.
 6. Location: Staff, 218, 218A Toilet Rooms, accent tile.
- J. Ceramic Wall Tile CT9: Provide flat tile complying with the following requirements:
1. Module Size: 6" x 6"
 2. Thickness: 5/16"
 3. Finish: Glossy
 4. Color: Combination of Light Smoke #0042, Sapphire Sky #0070 and Summer Rain #0081.
 5. Basis of Design Product: American Olean "Bright and Matte" or equal.
 6. Location: Mens Toilet Rooms, accent tile.
- K. Trim Units: Provide tile trim units and to comply with following requirements:
1. Porcelain Wall Base PTB:
 - a. Size: 2.4" x 48"
 - b. Thickness: 10.5mm
 - c. Finish: Matte
 - d. Color: Light Grey , solid color
 - e. Basis of Design Products: Veneziano Collection, distributed by Garden State Tile or equal.
 - f. Location: Lobby
 2. Ceramic Cove Base, Flat Top CT4:

- a. Size: 4-1/4" x 4-1/4"
- b. Thickness: 5/16"
- c. Finish: Glossy
- d. Color: Storm Grey #0040
- e. Basis of Design Product: American Olean "Bright and Matte" #A-3401, or equal.
- f. Location: Elementary School

2.4 STONE THRESHOLDS

- A. General: Provide stone that is uniform in color and finish, fabricated to sizes and profiles indicated or required to provide transition between tile surfaces and adjoining finished floor surfaces.
 - 1. Bevel edges at 1:2 slope, aligning lower edge of bevel with adjacent floor finish. Limit height of bevel to 1/2 inch (12.7 mm) or less, and finish bevel to match face of threshold.
- B. Marble Thresholds: Provide marble thresholds complying with ASTM C 503 requirements for exterior use and for abrasion resistance where exposed to foot traffic, a minimum hardness of 10 per ASTM C 241.
 - 1. Provide white marble thresholds.

2.5 WATERPROOFING/CRACK ISOLATION FOR TILE INSTALLATIONS

- A. General: Provide products that comply with ANSI A118.10 and the descriptions in this Article.
- B. Polyethylene-Sheet Waterproofing: Manufacturer's standard proprietary product consisting of composite sheets, 60 inches (1524 mm) wide by a nominal thickness of 0.030-inch (0.76 mm), composed of an inner layer of nonplasticized, chlorinated polyethylene sheet faced on both sides with laminated, high-strength, nonwoven polyester material, designed for embedding in latex-portland cement mortar and as the substrate for latex-portland cement mortar setting bed. Provide at all locations for thin-setting.
 - 1. Products: Provide Nobleseal TS manufactured by the Noble Company, or approved equal.
 - 2. Location: Use at all thin set tile floors in bathrooms.

2.6 SETTING MATERIALS

- A. Medium-Bed, Latex-Portland Cement Mortar. Comply with requirements in ANSI A118.4. Provide product that is approved by manufacturer for application thickness of up to 3/4 inch. Provide one of the following, or approved equal:
 - 1. MegaLite® Ultimate Crack Prevention Large Format Tile Mortar by Custom Building Products.

2. 4-XLT by Laticrete.
 3. Large Tile and Stone Mortar by Mapei
- B. Latex-Portland Cement Mortar: Two component mortar system, comply with ANSI A118.4. Provide one of the following, or approved equal:
1. Laticrete 317 with Laticrete 333 additive; Laticrete International, Inc.
 2. Kerabond with Keralastic; Mapei Corp.
 3. Or equivalent.

2.7 GROUTING MATERIALS

- A. Water-Cleanable Epoxy Grout: ANSI A118.3. with a VOC content of 65 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24). Grout shall be stain resistant, color fast, mold and mildew inhibiting, non-sag, suitable for joints 1/16" to 1/2" and type suitable for installing with glazed tiles.
1. Basis of Design Product: Laticrete "Spectralock Pro Epoxy Grout" or equal.
 2. Colors: As selected by Architect.

2.8 MISCELLANEOUS MATERIALS

- A. Metal Edge Strips: Zinc alloy or stainless steel terrazzo strips, 1/8-inch wide at top edge with integral provision for anchorage to mortar bed or substrate unless otherwise indicated.
- B. Notched Trowel: Use type recommended by tile manufacturer for setting large-format tiles, for setting bed thickness utilized.
- C. Termination, Trim and Transition Strips: Provide Schluter units as scheduled below, or indicated on Drawings.
1. Wall Tile Outside Corners Trim: JOLLY by Schluter, in aluminum, or equal.
- D. Trowelable Underlayments and Patching Compounds: Latex-modified, portland-cement-based formulation provided or approved by tile manufacturer for applications indicated.
- E. Grout Release: Product indicated below that is formulated to protect exposed surfaces of tile against adherence of mortar and grout; compatible with tile, mortar, and grout products; and easily removable after grouting is completed without damaging grout or tile.
1. Mapei "UltraCare Grout Release".
 2. Miracle Sealants Co. "511 Impregnator"
- F. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

G. Grout Sealers: Water-based sealer for tile for protection from stains, as follows:

1. Mapei "UltraCare Grout Sealer".
2. Miracle Sealants Co. "511 Impregnator"

2.9 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with requirements of referenced standards and manufacturers including those for accurate proportioning of materials, water, or additive content; type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other procedures needed to produce mortars and grouts of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and areas where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
1. Verify that substrates for setting tile are firm, dry, clean, and free from oil or waxy films and curing compounds.
 2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed before installing tile.
 3. Verify that subfloors are free of cracks, ridges, depressions, scale, and foreign deposits of any kind.
 4. Perform moisture test at rate of one per 2,000 sq.ft.
 5. Verify that concrete substrates are within the flatness tolerances required for setting large format tiles.
- B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with manufacturer's installation specifications to prepare substrates indicated to receive tile.
- B. Use trowelable leveling and patching compounds per manufacturer's directions to fill cracks, holes, and depressions in substrates and to patch and level floors as required to provide suitable substrate for tile application.
- C. Remove coatings, including curing compounds, and other substances that could interfere with adhesion of tile by using a grinder, sander, or polishing machine with a heavy-duty wire brush.

- D. Broom or vacuum clean substrates to be covered by tiles immediately before tile installation. Following cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust.
- E. Blending: For tile exhibiting color variations within the ranges selected during sample submittals, verify that tile has been blended in factory and packaged accordingly so that tile units taken from one package show the same range in colors as those taken from other packages and match approved samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.
- F. Transitions: Transitions of new to existing floor surfaces must be level. Use transition and edge pieces as required to obtain level abutting surfaces.
- G. For large format tile thin-set with medium bed mortar, level substrate to 1/8-inch variance in 10 feet, with no more than 1/16 inch variation in 24 inches by one of the following methods:
 - 1. Floors: Provide one of the following methods:
 - a. Provide self-leveling hydraulic cement underlayment throughout project where new large format tile is installed.
 - b. Grind concrete substrate and patch with trowelable leveling and patching compound to achieve indicated flatness.
 - 2. Walls: Skim coat and patch wall surfaces using manufacturer approved trowel-applied cement-based compound to bring surface into acceptable tolerances

3.3 INSTALLATION, GENERAL

- A. ANSI Tile Installation Standard: Comply with parts of ANSI 108 series of tile installation standards included under "American National Standard Specifications for the Installation of Ceramic Tile" that apply to type of setting and grouting materials and methods indicated.
- B. TCNA Installation Guidelines: TCNA "Handbook for Ceramic Tile Installation"; comply with TCNA installation methods indicated.
- C. Extend tile work into recesses and under or behind equipment and fixtures to form a complete covering without interruptions except as otherwise shown. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- D. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so that plates, collars, or covers overlap tile.
 - 1. Cut and grind tile edges where they abut curved surfaces to produce a close and uniform abutting joint.

- E. Jointing Pattern: Lay tile in grid pattern. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths unless otherwise shown.
 - 1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so that extent of each sheet is not apparent in finished work
- F. Tile Patterns: Comply with pattern indicated on drawings.
- G. Expansion Joints: Provide expansion joints, control joints and pressure relieving joints of widths and at locations as per TCNA Handbook Construction #EJ171. Do not saw cut joints after installation of tiles.
 - 1. Sealing of joints is included in Division 07 Section "Joint Sealers."
- H. Apply grout release to tile surfaces prior to grouting. Prepare a small mock-up area of grout release application for Architect's approval before proceeding with application of grout release to installed tile surfaces.
- I. Grout tile to comply with ANSI A108.10.

3.4 WATERPROOFING INSTALLATION

- A. Install waterproofing to comply with waterproofing manufacturer's written instructions to produce a waterproof membrane of uniform thickness bonded securely to substrate.
- B. Do not install tile over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

3.5 FLOOR INSTALLATION METHODS

- A. Floor Tile: Install tile to comply with requirements indicated below for setting bed methods, TCNA installation methods related to types of subfloor construction, and grout types:
 - 1. Concrete subfloor, TCNA F205, modified to comply with tile manufacturer's installation instructions, and as follows:
 - a. Bond Coat for Tile: Medium-Bed, Latex-Portland Cement Mortar, ANSI A108.5 over subfloor.
 - b. Grout: Epoxy.
 - c. Setting bed thickness shall be as required to produce finished floor surface at correct level for project.
 - d. Provide at non-wet floors.

2. Concrete subfloor with waterproofing/crack suppression membrane, TCNA F205 modified to comply with membrane manufacturer's installation instructions, details on drawings and as follows:
 - a. Bond Coat for Membrane: Medium-Bed, Latex-Portland Cement Mortar, ANSI A108.5 over subfloor.
 - b. Sheet membrane over bond coat, extend up walls 4 inches
 - c. Bond Coat for Tile: Medium-Bed, Latex-Portland Cement Mortar—ANSI A108.5 over membrane
 - d. Grout: Epoxy.
 - e. Provide at toilet room floors.

B. Joint Widths:

1. Porcelain Tile: 3/32".

- C. Metal Edge Strips: Install at locations indicated or where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile.
- D. Transition Strips: Install at all edges where new tile meets existing flooring to ensure a smooth transition meeting ADA requirements.
- E. Stone Thresholds: Install stone thresholds at tile transitions at restrooms. Allow for bevel/chamfer as required. Set in same type of setting bed as abutting field tile unless otherwise indicated. Sealant is specified in Section 079200.

3.6 WALL INSTALLATION METHODS

- A. Wall Tile: Install tile to comply with requirements indicated below for setting-bed methods, TCNA installation methods related to subsurface wall conditions, tile manufacturer's directions, and grout types:

1. Gypsum Board - TCNA W243, and as follows:
 - a. Bond Coat for Large Format Tile: Medium-Bed, Latex-Portland Cement Mortar, ANSI A108.5 over gypsum board.
 - b. Bond Coat for Other Tile: Latex-portland cement mortar, ANSI A108.5 over gypsum board.
 - c. Grout: Epoxy.
2. Concrete Masonry Units - TCNA W202, and as follows:
 - a. Bond Coat for Large Format Tile: Medium-Bed, Latex-Portland Cement Mortar, ANSI A108.5 over concrete masonry units.
 - b. Bond Coat for Other Tile: Latex-portland cement mortar, ANSI A108.5, over concrete masonry units.
 - c. Grout: Epoxy.

- B. Joint Widths: 1/16".

3.7 CLEANING AND PROTECTION

- A. Cleaning: Upon completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
 - 1. Remove 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.
- B. Finished Tile Work: Leave finished installation clean and free of cracked, chipped, broken, unbonded, and otherwise defective tile work.
- C. Provide final protection and maintain conditions in a manner acceptable to manufacturer and installer that ensures that tile is without damage or deterioration at time of Substantial Completion.
 - 1. Prohibit foot and wheel traffic from tiled floors for at least 7 days after grouting is completed.
- D. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

END OF SECTION 093100

SECTION 095113 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes ceilings consisting of acoustical panels and exposed suspension systems.
- B. Related Sections include the following:
 - 1. Acoustical sealants are specified in Division 07 Section "Joint Sealants"

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product specified
- B. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items. Show the following:
 - 1. Ceiling suspension members.
 - 2. Method of attaching hangers to building structure.
 - 3. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
 - 4. Minimum Drawing Scale: 1:100
- C. Samples for Verification: For each component indicated and for each exposed finish required, prepared on samples of size indicated below.
 - 1. 6-inch- (150-mm-) square samples of each acoustical panel type, pattern, and color.
 - 2. Set of 12-inch- (300-mm-) long samples of exposed suspension system members, including moldings, for each color and system type required.

1.3 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: Indicate compliance of acoustical panel ceilings and components with requirements based on comprehensive testing of current products.
- B. Research/Evaluation Reports: Evidence of acoustical panel ceiling's and components' compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
- C. Maintenance Data: For finishes to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer who has completed acoustical panel ceilings similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- B. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system through one source from a single manufacturer..
- C. Fire-Test-Response Characteristics: Provide acoustical panel ceilings that comply with the following requirements:
 - 1. Fire-Resistance Characteristics: Where indicated, provide acoustical panel ceilings identical to those of assemblies tested for fire resistance per ASTM E 119 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - a. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency .
 - b. Identify materials with appropriate markings of applicable testing and inspecting agency.
 - 2. Surface-Burning Characteristics: Provide acoustical panels with the following surface-burning characteristics complying with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84:
 - a. Smoke-Developed Index: 450 or less

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels and suspension system components to Project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.7 COORDINATION

- A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design Products: Subject to compliance with requirements, provide specified products by Armstrong World Industries or equivalent products.

2.2 ACOUSTICAL PANELS

- A. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.
 - 1. Mounting Method for Measuring Noise Reduction Coefficient: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches (400 mm) away from test surface per ASTM E 795.
 - 2. Provide fire-resistance rated panels where indicated.
- B. Acoustical Ceiling Panels ACT1: Armstrong - Ultima High NRC, beveled tegular edge, # 1911, 24" x 24" x 3/4" size, or equal.
 - 1. Color: White.
 - 2. Location: At Classrooms, Multipurpose, Entry LL28
- C. Acoustical Ceiling Panels ACT2: Armstrong - Ultima High NRC, beveled tegular edge, # 1914, 24" x 48" x 3/4" size, or equal.
 - 1. Color: White.
 - 2. Location: At Corridors.

2.3 METAL SUSPENSION SYSTEMS

- A. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable ASTM C 635 requirements.
 - 1. Provide fire-resistance rated metal suspension system where indicated
- B. Suspension System for Acoustical Panel Ceilings ACT1 and ACT2: Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, G30 (Z120) coating designation, with prefinished 15/16-inch- (24-mm-) wide metal caps on flanges; other characteristics as follows:
 - 1. Structural Classification: Intermediate-duty system.
 - 2. End Condition of Cross Runners: Override (stepped) or butt-edge type, as standard with manufacturer.
 - 3. Face Design: Flush face.

4. Cap Material: Steel sheet.
 5. Cap Finish: Manufacturer's standard factory-applied painted finish in white.
 6. Basis of Design Product: Armstrong Prelude XL.
- C. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung, unless otherwise indicated.
1. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing per ASTM E 1190, conducted by a qualified testing and inspecting agency.
- D. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
1. Zinc-Coated Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
 2. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635, Table 1, Direct Hung) will be less than yield stress of wire, but provide not less than 0.106-inch- (2.69-mm-) diameter wire.
- E. Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that fit acoustical panel edge details and suspension systems indicated; formed from sheet metal of same material, finish and color as that used for exposed flanges of suspension system runners.
- F. Hold-Down Clips: Where indicated or required for fire-rating, provide manufacturer's standard hold-down clips spaced 24 inches (610 mm) o.c. on all cross tees.
- 2.4 ACOUSTICAL SEALANT
- A. Refer to Division 07 Section "Joint Sealants".

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage, and other conditions affecting performance of acoustical panel ceilings.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Coordination: Furnish layouts for cast-in-place anchors, clips, and other ceiling anchors whose installation is specified in other Sections.
- B. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

- A. General: Install acoustical panel ceilings to comply with publications referenced below per manufacturer's written instructions and Cisca's "Ceiling Systems Handbook."
 - 1. Standard for Ceiling Suspension System Installations: Comply with ASTM C 636.
 - 2. Fire-Rated Assembly: Install fire-rated ceiling systems according to tested fire-rated design.
- B. Suspend ceiling hangers from building's structural members and as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 - 2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
 - 4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure; that are appropriate for substrate; and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 - 5. Do not attach hangers to steel deck tabs.
 - 6. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 - 7. Space hangers not more than 48 inches (1200 mm) o.c. along each member supported directly from hangers, unless otherwise indicated; and provide hangers not more than 8 inches (200 mm) from ends of each member.
- C. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
 - 1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
 - 2. Screw attach moldings to substrate at intervals not more than 16 inches (400 mm) o.c. and not more than 3 inches (75 mm) from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3 mm in 3.6 m). Miter corners accurately and connect securely.

3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- D. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- E. Install acoustical panels with undamaged edges and fitted accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
 1. Arrange directionally patterned acoustical panels as indicated on reflected ceiling plans.
 2. Install hold-down clips in areas indicated, in areas required by authorities having jurisdiction, and for fire-resistance ratings; space as recommended by panel manufacturer's written instructions, unless otherwise indicated.

3.4 CLEANING

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095113

SECTION 096500 - RESILIENT FLOORING AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Vinyl tile.
2. Floating luxury vinyl tile.
3. Luxury vinyl tile
4. Rubber wall base.
5. Resilient flooring accessories.

1.2 ACTION SUBMITTALS

- A. Product data for each type of product specified.
- B. Samples for verification purposes in form of actual flooring or sections of accessories for each color and pattern specified.
- C. Shop Drawings: Indicate decorative pattern layout, if any. Show location of seams and edges. Indicate location of columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutout locations.

1.3 INFORMATIONAL SUBMITTALS

- A. Maintenance data for resilient flooring and accessories.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an installer who is competent in the technique required by sheet flooring manufacturer for heat-welding seams.
- B. Single-Source Responsibility for Floor Tile and Accessories: Obtain each type, color, and pattern of tile and accessory from a single source; all stair accessories shall be from one manufacturer.
- C. Fire Performance Characteristics: Provide resilient flooring with the following fire performance characteristics as determined by testing products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
1. Critical Radiant Flux: 0.45 watts per sq. cm or more per ASTM E 648 or NFPA 253.

- D. In-Place Mock-up: Prepare mock-ups of types indicated below following requirements of this section. Reprepare mock-ups as many times as required by Architect until satisfactory result is obtained, as judged solely by Architect. Obtain Architect's approval of visual qualities before proceeding with work. Protect approved mock-ups until all work has been completed. Approved mock-ups will represent the minimum standard of acceptability for each portion of the work.

- 1. Provide in-place sample minimum 5' x 5' of typical flooring layout in corridor where directed by Architect.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient materials on flat surface in dry space protected from the weather with ambient temperatures maintained between 50 deg F (10 deg C) and 90 deg F (32 deg C).
- B. Move floor coverings and installation accessories into spaces where they will be installed at least 48 hours before installation, unless longer conditioning periods are recommended in writing by manufacturer.

1.6 PROJECT CONDITIONS

- A. Maintain a minimum temperature of 70 deg F (21 deg C) in spaces to receive resilient flooring for at least 72 hours prior to installation, during installation, and for not less than 72 hours after installation. After this period, maintain a temperature of not less than 55 deg F (13 deg C).
- B. Moisture Testing of Concrete Substrates: Perform moisture tests recommended by manufacturer and as follows:
 - 1. Testing Procedures: Perform calcium chloride or moisture meter tests as required by floor topping and resilient tile manufacturers.
 - a. Calcium Chloride Testing: Anhydrous calcium chloride test, ASTM F 1869.
 - b. Moisture Meter Testing: Relative humidity test using in situ probes, ASTM F 2170.
 - 2. Proceed with installation only after substrates do not exceed maximum moisture-vapor-emission rate or relative humidity level measurement acceptable to flooring material manufacturer.
- C. Do not install flooring or accessories until they are at the same temperature as the space where they are to be installed.
- D. Close spaces to traffic during flooring installation.

1.7 SEQUENCING AND SCHEDULING

- A. Install flooring and accessories after other finishing operations, including painting, have been completed.

1.8 EXTRA MATERIALS

- A. Extra Materials: Furnished from same production run as resilient base and accessories installed. Furnish 2 boxes of each type and color of material provided in the work. Package materials with protective covering and identify with labels describing contents. Deliver extra materials to Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the Work include, but are not limited to, the following:
 - 1. Tiles:
 - a. Armstrong World Industries
 - b. Mannington
 - c. Mohawk Group
 - d. Shaw Hard Surface
 - e. Tarkett
 - 2. Base and Other Accessories:
 - a. Armstrong
 - b. Endura
 - c. Roppe
 - d. Johnsonite

2.2 PRODUCTS, GENERAL

- A. Colors, Textures, and Patterns: Provide tile, sheet goods and accessories in color, texture and pattern to match specified products. Colors and patterns indicated by reference to manufacturer's name and designations are for color and pattern identification only and are not intended to limit selection of other manufacturer's products with similar colors and patterns. If no colors or patterns are indicated, provide color(s) and pattern(s) as selected by Architect from manufacturer's standards.

2.3 RESILIENT TILE FLOORING

- A. Solid Vinyl Floor Tile (VT1 through VT7): Products complying with ASTM F 1700, Class 1 (through color and pattern tile), Type A (smooth); 16" x 16" x 1/8" thick.
 - 1. Basis of Design Product: Cortina Grande by Johnsonite, a Tarkett Company.

2. Color(s): As selected by Architect from manufacturer's full range.
 3. Location: Classrooms
- B. Luxury Vinyl Tile (LVT1 through LVT4): Luxury vinyl tile complying with ASTM F1700, Class III, Type B and as follows:
1. Basis of Design Product: Shaw Hard Surfaces "Level 20 mil" 0551V from Hexagon collection.
 2. Size: 28.8" w x 24.9" l x 14.4" side
 3. Thickness: 0.157 inches
 4. Wear Layer Thickness: 20 mil
 5. Finish: ExoGuard
 6. Colors:
 - a. LVT1: Weight 51535 (General color)
 - b. LVT2: Blank 51515 (Accent color)
 - c. LVT3: Smooth 51201 (Accent color)
 - d. LVT4: Steady 51436 (Accent color)
 7. Installation: Diagonal
 8. Location: Kindergarten Classrooms.
- C. Floating Luxury Vinyl Tile (LVT5, LVT6 and LVT8): Luxury vinyl tile complying with ASTM F1700, Class III, Type A and Type B, and as follows:
1. Basis of Design Product: Mohawk Group "Lineate" C0089 from Hot and Heavy collection.
 2. Size: 9" w x 59" l (235mm x 1505mm)
 3. Thickness: 0.2 inches (5mm)
 4. Wear Layer Thickness: 20 mil (0.5mm)
 5. Surface Profile: Wood emboss
 6. Finish: M-Force Ultra
 7. Colors:
 - a. LVT5: Strake 565 (General color)
 - b. LVT6: Figured 948 (Accent color)
 - c. LVT8: as selected by Architect.
 8. Installation: Full spread adhesive
 9. Location: Corridors
- D. Floating Luxury Vinyl Tile (LVT7): Luxury vinyl tile complying with ASTM F1700, Class III, Type A and Type B, and as follows:
1. Basis of Design Product: Mohawk Group "Secoya" C0009 from Hot and Heavy collection.
 2. Size: 9" w x 59" l (235mm x 1505mm)
 3. Thickness: 0.2 inches (5mm)
 4. Wear Layer Thickness: 20 mil (0.5mm)

5. Surface Profile: Wood emboss; light emboss
6. Edge Profile: Bevel
7. Finish: M-Force Ultra
8. Color: Alder Creek 945
9. Installation: Full spread adhesive
10. Location: Multipurpose Room

2.4 RESILIENT WALL BASE

- A. Rubber Wall Base: ASTM F 1861, Type TP, Group 1 (solid), 4" high, 1/8" thick, smooth surface, and as follows:
 1. Style: Straight (toeless) style for all carpeted areas and cove base with toe (set-on type) elsewhere
 2. Lengths: Coils in manufacturer's standard length.
 3. Inside and Outside Corners: Preformed.
 4. Products: Rubber Base by Johnsonite/Tarkett.
 5. Colors: As selected by Architect.

2.5 MISCELLANEOUS RESILIENT ACCESSORIES

- A. Colors: As selected by Architect from manufacturer's full range of colors produced for accessory molding complying with requirements indicated.
- B. Rubber Accessory Moldings: Provide rubber accessory molding complying with the following:
 1. Product Description: Carpet edge for glue-down applications, carpet nosing, reducer strip for resilient flooring, and tile and carpet joiner.
 - a. Provide rubber transition strip at resilient floor tile color changes - at doors.
 2. Profile and Dimensions: As indicated or required.

2.6 INSTALLATION ACCESSORIES

- A. Concrete Slab Primer: Nonstaining type as recommended by flooring manufacturer.
- B. Concrete Sealer: Type recommended and approved by resilient flooring manufacturer and adhesive manufacturer to ensure proper adhesion of resilient flooring to substrate.
- C. Trowelable Underlayments and Patching Compounds: Latex-modified, portland-cement-based formulation provided or approved by flooring manufacturer for applications indicated.
- D. Adhesives (Cements): Products supplied by resilient flooring and accessory manufacturers, of type recommended to suit resilient products and substrate conditions.

- E. Floor Polish: Acrylic type, as recommended by flooring material manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. General: Examine areas where installation of flooring will occur, with Installer present, to verify that substrates and conditions are satisfactory for flooring installation and comply with flooring manufacturer's requirements and those specified in this Section.
- B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:
 - 1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials whose presence would interfere with bonding of adhesive. Determine adhesion and dryness characteristics by performing bond tests recommended by flooring manufacturer.
 - 2. Finishes of subfloors comply with tolerances and other requirements specified in Division 03 Section "Cast-In-Place Concrete" for slabs receiving resilient flooring.
 - 3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits of any kind.
- C. Concrete Moisture Emission Tests: Perform calcium chloride test and moisture meter test as per manufacturer's directions, as follows, and other tests if recommended by resilient flooring and adhesive manufacturer:
 - 1. Perform moisture test at rate of one per 2,000 sq.ft. of new and existing floor area to be covered.
 - 2. Report test results in writing to Architect, and Contractor within 24 hours after tests are completed. Reports of concrete moisture emission tests shall contain the Project identification name and number, date of test location of test within structure.
 - 3. Perform additional moisture emission tests of in-place concrete when test results indicate specified moisture content has been exceeded, as directed by Architect.
 - a. Repeat test one week after initial test minimally and additionally repeat test if required by field conditions to determine moisture levels in area of resilient flooring application.
- D. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with manufacturer's installation specifications to prepare substrates indicated to receive flooring.

- B. Use trowelable leveling and patching compounds per flooring manufacturer's directions to fill cracks, holes, and depressions in substrates and to patch and level floors as required to provide suitable substrate for flooring application.
- C. Remove coatings, including curing compounds, and other substances that are incompatible with flooring adhesives by using a grinder, sander, or polishing machine with a heavy-duty wire brush.
- D. Broom or vacuum clean substrates to be covered by flooring immediately before installation of flooring. Following cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust.
- E. Apply concrete slab primer, if recommended by flooring manufacturer, prior to applying adhesive. Apply according to manufacturer's directions.
- F. Seal concrete substrates as required by moisture test results to ensure proper adhesion of resilient flooring to substrate.

3.3 TILE INSTALLATION

- A. General: Comply with tile manufacturer's installation directions and other requirements indicated that are applicable to each type of tile installation included in Project.
- B. Lay out tiles from center marks established with principal walls so tiles at opposite edges of room are of equal width. Install tiles square with room axis, unless otherwise indicated.
- C. Match tiles for color and pattern by selecting tiles from cartons in same sequence as manufactured and packaged, if so numbered. Cut tiles neatly around all fixtures. Discard broken, cracked, chipped, or deformed tiles.
 - 1. Lay tiles in decorative pattern as indicated on drawings.
- D. Scribe, cut, and fit tiles to butt tightly to vertical surfaces and edgings.
- E. Extend tiles into toe spaces, door reveals, closets, and similar openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use chalk or other nonpermanent, nonstaining marking device.
- G. Install tiles on covers for telephone and electrical ducts, and similar items in finished floor areas. Maintain overall continuity of color and pattern with pieces of flooring installed on covers. Tightly adhere edges to perimeter of floor around covers and to covers.
- H. Adhere tiles to flooring substrates without producing open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, or other surface imperfections in completed tile installation.

- I. Use full spread of adhesive applied to substrate in compliance with tile manufacturer's directions including those for trowel notching, adhesive mixing, and adhesive open and working times.
- J. Hand roll tiles where required by tile manufacturer.

3.4 INSTALLATION OF WALL BASE AND ACCESSORIES

- A. General: Install resilient accessories according to manufacturer's written installation instructions.
- B. Apply resilient wall base to walls, pilasters, casework, and other permanent fixtures in rooms and areas where base is required. Install wall base in lengths as long as practicable. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
 - 1. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient wall base with manufacturer's recommended adhesive filler material.
 - 2. Install preformed corners as per manufacturer's directions.
- C. Place resilient accessories so they are butted to adjacent materials of type indicated and bond to substrates with adhesive. Install reducer strips at edges of flooring that otherwise would be exposed.

3.5 CLEANING AND PROTECTION

- A. Perform the following operations immediately after completing installation:
 - 1. Remove visible adhesive and other surface blemishes using cleaner recommended by manufacturers.
 - 2. Sweep or vacuum floor thoroughly.
 - 3. Do not wash floor until after time period recommended by resilient flooring manufacturer.
 - 4. Damp-mop flooring to remove black marks and soil.
- B. Protect flooring against mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods indicated or recommended by flooring manufacturer.
 - 1. Apply protective floor polish to flooring surfaces that are free from soil, visible adhesive, and surface blemishes. Coordinate selection of floor polish with Owner's maintenance service requirements.
 - 2. Cover flooring with undyed, untreated building paper until inspection for Substantial Completion.

- C. Clean flooring not more than 4 days prior to dates scheduled for inspections intended to establish date of Substantial Completion in each area of Project. Clean flooring using method recommended by manufacturer.
 - 1. Strip protective floor polish that was applied after completing installation prior to cleaning.
 - 2. Reapply floor polish after cleaning.

END OF SECTION 096500

SECTION 096566 - RESILIENT ATHLETIC FLOORING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Padded resilient flooring in Crisis Rooms.

1.2 SUBMITTALS

- A. Product data for each type of product specified.
 - 1. Include certification by adhesive manufacturer that products supplied for resilient sheet goods installation comply with local regulations controlling use of volatile organic compounds (VOC's).
- B. Samples for initial selection purposes in form of actual flooring or section of accessory for each color available.
 - 1. For heat-welding bead, manufacturer's standard-size samples, but not less than 9 inches (230 mm) long, of each color specified.
- C. Heat-Welded Seam Samples: For each flooring product and welding bead color and pattern combination required; with seam running lengthwise and in center of sample applied to a rigid backing and prepared by Installer for this Project.
- D. Shop Drawings: Show installation details including location and layout of each layer of resilient athletic-flooring assembly and accessory. Include the following:
 - 1. Expansion provisions and trim details.
 - 2. Seaming diagram.
- E. Maintenance data for resilient flooring, to include in Operating and Maintenance Manual specified in Division 01.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed resilient athletic flooring similar in material, design, and extent to that indicated for this Project and whose work has resulted in resilient athletic-flooring installations with a record of successful in-service performance. Installer shall be competent in the technique required by sheet flooring manufacturer for heat-welding seams

- B. Single-Source Responsibility for Resilient Sheet and Accessories: Obtain each type, color, and pattern of sheet goods and accessory from a single source and one manufacturer.
- C. Fire Performance Characteristics: Provide resilient flooring with the following fire performance characteristics as determined by testing products per ASTM test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Critical Radiant Flux: 0.45 watts per sq. cm or more per ASTM E 648.
 - 2. Smoke Density: Less than 450 per ASTM E 662.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver resilient-flooring materials in unopened cartons or bundles.
- B. Store resilient materials on flat surface in dry space protected from the weather with ambient temperatures maintained between 65 deg F and 85 deg F.
- C. Move floor coverings and installation accessories into spaces where they will be installed at least 48 hours before installation, unless longer conditioning periods are recommended in writing by manufacturer.

1.5 PROJECT CONDITIONS

- A. Maintain a minimum temperature of 70 deg F (21 deg C) in spaces to receive resilient flooring for at least 48 hours prior to installation, during installation, and for not less than 48 hours after installation. After this period, maintain a temperature of not less than 65 deg F.
- B. Do not install flooring or accessories until they are at the same temperature as the space where they are to be installed.
- C. Close spaces to traffic during flooring installation and for a minimum of 72 hours after completion of installation.
- D. Moisture Testing of Concrete Substrates: Perform moisture tests recommended by manufacturer and as follows. Do not install flooring if subfloor moisture emission rate exceeds indicated amounts.
 - 1. Moisture Meter Testing: Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have relative humidity level measurement acceptable to flooring material manufacturer.

1.6 SEQUENCING AND SCHEDULING

- A. Install flooring and accessories after other finishing operations, including painting, have been completed.

1.7 WARRANTY

- A. Provide resilient flooring manufacturer's standard warranty against wear for a period of fifteen years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Gerfloor
 - 2. Tarkett Sports.

2.2 RESILIENT SHEET FLOORING

- A. Prefabricated Sport Surface: Provide resilient sheet flooring material 7.1mm (0.28") thick with wood flooring design and slightly textured embossed surface. Embossing of wood design and solid colors shall be the same. Printing of wood design shall closely resemble standard wood strip flooring in size, color, board length, and grain appearance. The wood design shall be protected by a clear layer of pure PVC (Polyvinyl Chloride) and Top Clean xp, a factory applied UV cured urethane treatment. Intermediate layers shall be fortified with a non-woven fiberglass grid for increased dimensional stability. The foam force reduction layer shall be high-density closed cell PVC foam with honeycomb embossing, and is applied in one continuous manufacturing process.
 - 1. Color/Pattern: As selected by Architect.
 - 2. Basis of Design Product: Omnisports 7.1 manufactured by Tarkett Sports, or equal.

2.3 ACCESSORY MATERIALS

- A. Wall Base: Resilient wall base specified in Section 096500.
- B. Adhesives (Cements): Products supplied by resilient flooring and accessory manufacturers, of type recommended to suit resilient products and substrate conditions indicated.
 - 1. Provide one of the following Tarket products (Basis of Design) or equal, depending in moisture content of the concrete slab:
 - a. Direct full spread adhering to concrete subfloor; provide HS Sports Spray; use when moisture content is less than 90% RH when tested per ASTM F2170.
 - b. Direct full spread adhering to concrete subfloor; provide Multi-Poxy; use when moisture content is less than 98% RH when tested per ASTM F2170.
 - c. Limited spread of adhesive on only 2% of the surface area, located at the perimeter of the court, doorways, and volleyball sleeves; provide GreenLay; use when moisture content is less than 92% RH when tested per ASTM F2170.

- C. Heat-Welding Bead: Solid-strand product of floor covering manufacturer for heat-welding seams.
 - 1. Color and Pattern: Match color and pattern of sheet floor covering.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. General: Examine areas where installation of flooring will occur, with Installer present, to verify that substrates and conditions are satisfactory for flooring installation and comply with flooring manufacturer's requirements and those specified in this Section.
- B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:
 - 1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials whose presence would interfere with bonding of adhesive. Determine adhesion and dryness characteristics by performing bond tests recommended by flooring manufacturer.
 - 2. Finishes of subfloors comply with tolerances and other requirements specified in Division 03 Section "Cast-In-Place Concrete" for slabs receiving resilient flooring.
 - 3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits of any kind.
 - 4. Installation Tolerances: 1/8 inch in 10 feet (3 mm in 3 m) variance from level.
- C. Concrete Moisture Emission Tests: Perform moisture meter tests as per manufacturer's directions, as follows, and other tests if recommended by resilient athletic flooring and adhesive manufacturer:
 - 1. Perform moisture test at rate of one per 2,000 sq.ft. of floor area to be covered unless otherwise required by manufacturer.
 - 2. Report test results in writing to Architect, and Contractor within 24 hours after tests are completed. Reports of concrete moisture emission tests shall contain the Project identification name and number, date of test location of test within structure.
 - 3. Perform additional moisture emission tests of in-place concrete when test results indicate specified moisture content has been exceeded, as directed by Architect.
 - a. Repeat test one week after initial test minimally and additionally repeat test if required by field conditions to determine moisture levels in area of resilient flooring application.
- D. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with manufacturer's installation specifications to prepare substrates indicated to receive flooring.

- B. Use trowelable leveling and patching compounds per flooring manufacturer's directions to fill cracks, holes, and depressions in substrates and to patch and level floors as required to provide suitable substrate for flooring application.
- C. Remove coatings, including curing compounds, and other substances that are incompatible with flooring adhesives by using a grinder, sander, or polishing machine with a heavy-duty wire brush.
- D. Broom or vacuum clean substrates to be covered by flooring immediately before installation of flooring. Following cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust.
- E. Apply concrete slab primer, if recommended by flooring manufacturer, prior to applying adhesive. Apply according to manufacturer's directions.
- F. Seal concrete substrates as required by moisture test results to ensure proper adhesion of resilient flooring to substrate.

3.3 SHEET FLOORING INSTALLATION

- A. General: Comply with sheet floor covering manufacturer's written installation instructions.
- B. Unroll sheet floor coverings and allow them to stabilize before cutting and fitting, if recommended in writing by manufacturer.
- C. Pattern: Lay resilient athletic flooring parallel with the long dimension of the space to be floored, unless otherwise indicated.
- D. Lay out sheet floor coverings to comply with the following requirements:
 - 1. Maintain uniformity of sheet floor covering direction.
 - 2. Arrange for a minimum number of seams and place them in inconspicuous and low-traffic areas, and not less than 6 inches (150 mm) away from parallel joints in flooring substrates.
 - 3. Match edges of sheet floor coverings for color shading and pattern at seams according to manufacturer's written recommendations.
 - 4. Avoid cross seams.
- E. Scribe, cut, and fit sheet floor coverings to butt neatly and tightly to vertical surfaces and permanent fixtures, including built-in furniture, cabinets, pipes, outlets, edgings, door frames, thresholds, and nosings.
- F. Extend sheet floor coverings into toe spaces, door reveals, closets, and similar openings.
- G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use chalk or other nonpermanent, nonstaining marking device.

- H. Install sheet floor coverings on covers for telephone and electrical ducts, and similar items in finished floor areas. Maintain overall continuity of color and pattern with pieces of flooring installed on covers. Tightly adhere edges to perimeter of floor around covers and to covers.
- I. Adhere sheet floor coverings to flooring substrates to comply with floor covering manufacturer's written instructions, including those for trowel notching, adhesive mixing, and adhesive open and working times.
 - 1. Produce completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
- J. Heat-Welded Seams: Rout joints and heat weld with welding bead, permanently fusing sections into a seamless floor covering. Prepare, weld, and finish seams according to manufacturer's written instructions and ASTM F 1516 to produce surfaces flush with adjoining floor covering surfaces.
- K. Hand roll sheet floor coverings in both directions from center out to embed floor coverings in adhesive and eliminate trapped air. At walls, door casings, and other locations where access by roller is impractical, press floor coverings firmly in place with flat-bladed instrument.

3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after completing installation:
 - 1. Remove visible adhesive and other surface blemishes using cleaner recommended by manufacturers.
 - 2. Sweep or vacuum floor thoroughly.
 - 3. Do not wash floor until after time period recommended by resilient flooring manufacturer.
 - 4. Damp-mop flooring to remove black marks and soil.
- B. Protect flooring against mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods indicated or recommended by flooring manufacturer.
- C. Clean flooring not more than 4 days prior to dates scheduled for inspections intended to establish date of Substantial Completion in each area of Project. Clean flooring using materials and method recommended by manufacturer.

END OF SECTION 096566

SECTION 096813 - TILE CARPETING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes modular carpet tile and modular carpet tile used as walk-off mat.
- B. Related Requirements:
 - 1. Division 09 Section "Resilient Flooring and Accessories" for resilient wall base and accessories installed with carpet tile.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site
 - 1. Review methods and procedures related to carpet tile installation including, but not limited to, the following:
 - a. Review delivery, storage, and handling procedures.
 - b. Review ambient conditions and ventilation procedures.
 - c. Review subfloor preparation procedures.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
 - 2. Include installation recommendations for each type of substrate.
- B. Shop Drawings: Show the following:
 - 1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
 - 2. Carpet tile type, color, and dye lot.
 - 3. Type of subfloor.
 - 4. Type of installation.
 - 5. Pattern of installation.
 - 6. Pattern type, location, and direction.
 - 7. Pile direction.
 - 8. Type, color, and location of insets and borders.
 - 9. Type, color, and location of edge, transition, and other accessory strips.
 - 10. Transition details to other flooring materials.
- C. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.

1. Carpet Tile: Full-size Sample.
 2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch- (300-mm-) long Samples.
- D. Product Schedule: For carpet tile. Use same designations indicated on Drawings.
- E. Maintenance Data: For carpet tile to include in maintenance manuals specified in Division 01. Include the following:
1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
 2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.
- F. Sustainability: Provide the Statement of the Achievement Level the carpet has attained for Gold, 52 to 70 points, based on specific Sustainable Attribute Performance for all product stages according to ANSI/NSF 140.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For carpet tile, for tests performed by a qualified testing agency.
- C. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:
 1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
 2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd. (8.3 sq. m).

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association at the Commercial II certification level.
- B. Performance Characteristics of Carpet Tile: Provide carpet tile identical to that tested for the following performance characteristics, per test methods indicated:
 - 1. Flammability: Passes DOC FF 1-70 Pill Test.
 - 2. Flame Spread: Meets NFPA Class 1 when tested under ASTM E-648 Glue Down.
 - 3. Smoke Density: 450 or less, Flaming Mode when tested under NBS Smoke Chamber NFPA-258.
 - 4. Static: No more than 3.5 KV when tested under AATCC-134.
 - 5. Specific Optical Density: Not more than 300 in first 4 minutes tested in flaming or non-flaming mode when tested under ASTM E662.
 - 6. Critical Radiant Flux: 0.45 watts per sq. cm or more per ASTM E 648 or NFPA 253.
- C. Mockups: Before installing carpet tile, install mockups for each type of carpet tile installation required to demonstrate aesthetic effects and qualities of materials and execution. Install mockups to comply with the following requirements, using materials indicated for the completed Work:
 - 1. Install mockups in the location and of the size indicated or, if not indicated, as directed by Architect.
 - 2. Notify Architect seven days in advance of dates and times when mockups will be installed.
 - 3. Demonstrate the proposed range of aesthetic effects and workmanship.
 - 4. Obtain Architect's approval of mockups before starting work.
 - 5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 - 6. Remove mockups when directed.
 - 7. Approved mockups may become part of the completed Work if undamaged at time of Substantial Completion..

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Comply with CRI Carpet Installation Standard 2011.
- B. Store carpeting per manufacturer's recommendations for allowable temperature and humidity range. Products shall not be allowed to become damp.
- C. Remove carpeting from packaging and store in unoccupied, ventilated areas (100% outside air supply, minimum of 1.5 air changes per hour, no recirculation) for 24-72 hours prior to installation. Carpeting shall not be stored with materials which have high emissions of VOCs or other contaminants. Materials with high short-term emissions include, but are not limited to: adhesives, sealants and glazing compounds (specifically those with petrochemical vehicles or carriers); paint, wood preservatives, and finishes;

control and/or expansion joint fillers; hard finishes requiring adhesive installation; gypsum board (with associated finish processes and products); and composite or engineered wood products with formaldehyde binders

1.9 FIELD CONDITIONS

- A. Comply with CRI Carpet Installation Standard 2011 for temperature, humidity, and ventilation limitations.
- B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at occupancy levels during the remainder of the construction period.
- C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.
- D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.10 WARRANTY

- A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.
 - 1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
 - 2. Failures include, but are not limited to, more than 10 percent edge raveling, snags, runs, dimensional stability, excess static discharge, loss of tuft bind strength, loss of face fiber, and delamination.
 - 3. Warranty Period: Lifetime.

PART 2 - PRODUCTS

2.1 CARPET TILE

- A. Manufacturers: Provide specified Basis of Design products or equal manufactured by one of the following manufacturers:
 - 1. Interface
 - 2. Mannington
 - 3. Milikin
 - 4. Mohawk Commercial Carpet
 - 5. Shaw
 - 6. Tandus Centiva

- B. Sustainable Carpet Certification: Provide carpet tile that has a NSF/ANSI 140 rating of Gold or better.
- C. Emissions: Provide carpet tile that complies with testing and product requirements of Carpet and Rug Institute's "Green Label Plus" program.
- D. Carpet Tile CPT1:
 - 1. Construction: Textured patterned loop
 - 2. Fiber Content: Antron Legacy Type 6,6 Nylon
 - 3. Dye Method: Solution/yarn dyed
 - 4. Face Weight: 21 oz. per square yard.
 - 5. Machine Gage: 5/64 in.
 - 6. Pile Height: 0.104 in.
 - 7. Average Density: 7269
 - 8. Stitches per Inch: 10.33
 - 9. Primary Backing: Synthetic
 - 10. Secondary Backing: Infinity 2 Modular tile
 - 11. Size: 24 in x 24 in
 - 12. Guarantees: Lifetime for wear, static, edge ravel, delamination, tuft bind, stain, backing material.
 - 13. Basis of Design Product: Mannington Commercial "Quadrant" Collection, "Align" tile.
 - 14. Color: Geometry 32583
 - 15. Installation: Horizontal brick ashlar.
 - 16. Location: Offices, Library.
- E. Carpet Tile/Walk-Off Mat WOM:
 - 1. Construction: Textured patterned loop
 - 2. Fiber Content: Type 6,6 Nylon
 - 3. Dye Method: Solution
 - 4. Face Weight: 36 oz. per square yard.
 - 5. Machine Gage: 1/12 in.
 - 6. Pile Height: 0.185 in.
 - 7. Average Density: 7005
 - 8. Stitches per Inch: 10
 - 9. Primary Backing: Synthetic
 - 10. Secondary Backing: Infinity Modular Reinforced Composite Closed Cell Polymer with Recycled Content
 - 11. Size: 18 in x 36 in
 - 12. Guarantees: Lifetime for wear, static, edge ravel, delamination, tuft bind, stain, backing material.
 - 13. Basis of Design Product: Mannington Commercial "Frixion" Collection, "Charge" tile.
 - 14. Color: Kinetic 11360
 - 15. Installation: Horizontal brick ashlar.
 - 16. Location: Entry LL28, Vestibule 145.

- F. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.
- G. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.
 - 1. Adhesives shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- H. Metal Edge/Transition Strips: Extruded aluminum with mill finish of profile and width shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints.
- I. Carpet Edge Guard: Refer to Division 09 Section "Resilient Flooring and Accessories."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Examine carpet tile for type, color, pattern, and potential defects.
- B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:
 - 1. Slab substrates 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 carpet tile manufacturer. Do not install flooring if subfloor moisture emission rate exceeds indicated amounts.
 - a. Calcium Chloride Testing: Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates do not exceed the maximum moisture-vapor-emission rate acceptable to flooring manufacturer.
 - b. Moisture Meter Testing: Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have relative humidity level measurement acceptable to flooring material manufacturer.
 - c. Testing Procedures
 - 1) Where flooring is indicated to be applied to structural concrete topping or concrete slab-on-grade substrates, perform moisture meter tests.
 - 2) Where flooring is indicated to be applied to areas where hydraulic cement topping is installed, perform calcium chloride or moisture meter tests as required by topping manufacturer.

2. Subfloor finishes comply with requirements specified in Section 033000 "Cast-in-Place Concrete" for slabs receiving carpet tile.
3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with CRI Carpet Installation Standard 2011, Section 7, "Site Conditions; All Installations," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation.
- B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch (3 mm) wide or wider and protrusions more than 1/32 inch (0.8 mm) unless more stringent requirements are required by manufacturer's written instructions.
- C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet tile manufacturer.
- D. Clean metal substrates of grease, oil, soil and rust, and prime if directed by adhesive manufacturer. Rough sand painted metal surfaces and remove loose paint. Sand aluminum surfaces, to remove metal oxides, immediately before applying adhesive.
- E. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

- A. General: Comply with CRI Carpet Installation Standard 2011, Section 18, "Modular Carpet," and with carpet tile manufacturer's written installation instructions.
- B. Installation Method: As recommended in writing by carpet tile manufacturer.
- C. Maintain dye lot integrity. Do not mix dye lots in same area.
- D. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.
- E. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.

- G. Install pattern parallel to walls and borders, unless otherwise indicated.

3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after installing carpet tile:
 - 1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet tile manufacturer.
 - 2. Remove yarns that protrude from carpet tile surface.
 - 3. Vacuum carpet tile using commercial machine with face-beater element.
- B. Protect installed carpet tile to comply with CRI Carpet Installation Standard 2011, Section 20, "Protecting Indoor Installations."
 - 1. Restrict traffic over adhesive installations for a minimum of 48 hours to allow proper adhesive cure.
 - 2. Restrict exposure to water from cleaning or other sources for a minimum of 30 days.
 - 3. If required to protect the finished floor covering from dirt or paint, or if additional work is to be done after the installation, cover carpeting with a non-staining building material paper.
 - 4. Protect the installation from rolling traffic by using sheets of hardboard or plywood in affected areas.
- C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 096813

SECTION 099100 - PAINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes surface preparation and the application of paint systems on the following interior and exterior substrates:
 - 1. Concrete masonry units (CMU).
 - 2. Concrete
 - 3. Steel and iron.
 - 4. Galvanized metal.
 - 5. Gypsum board.
 - 6. Wood
- B. Related Sections include the following:
 - 1. Division 05 Sections for shop priming of metal substrates with primers specified in this Section.
 - 2. Division 07 Section "Intumescent Mastic Fireproofing" for primer/sealer coat applied over intumescent mastic prior to field topcoating with finish paint specified in this Section.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For each type of topcoat product indicated.
- C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat indicated.
 - 1. Submit Samples on rigid backing, 8 inches (200 mm) square.
 - 2. Step coats on Samples to show each coat required for system.
 - 3. Label each coat of each Sample.
 - 4. Label each Sample for location and application area.
- D. Product List: For each product indicated, include the following:
 - 1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
 - 2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.

1.3 QUALITY ASSURANCE

- A. MPI Standards: Maintain copy of this standard at the Project site at all times.
 - 1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
 - 2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.
- B. Mockups: Apply benchmark samples of each paint system indicated and each color and finish selected to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.
 - a. Wall and Ceiling Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
 - b. Other Items: Architect will designate items or areas required.
 - 2. Apply benchmark samples after permanent lighting and other environmental services have been activated.
 - 3. Final approval of color selections will be based on benchmark samples.
 - a. If preliminary color selections are not approved, apply additional benchmark samples of additional colors selected by Architect at no added cost to Owner.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.

1.5 PROJECT CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.
- C. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.
- D. Field applied topcoats over intumescent fireproofing shall be compatible with intumescent fireproofing and approved for use over the fireproofing by intumescent fireproofing manufacturer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Benjamin Moore & Co.
 2. PPG Architectural Finishes, Inc.
 3. Sherwin-Williams Company (The).
 4. Tnemec
 5. Scuffmaster Paints, ICP Building Solutions Group; distributed by Wolf-Gordon

2.2 PAINT, GENERAL

- A. Material Compatibility:
1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- B. VOC Content of Field-Applied Interior Paints and Coatings: Provide products that comply with the following limits for VOC content, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and the OTC (Ozone Transport Commission) restrictions; these requirements do not apply to paints and coatings that are applied in a fabrication or finishing shop:
1. Flat Paints, Coatings, and Primers: VOC content of not more than 50 g/L.
 2. Nonflat Paints, Coatings, and Primers: VOC content of not more than 150 g/L.
 3. Anti-Corrosive and Anti-Rust Paints Applied to Ferrous Metals: VOC not more than 250 g/L.
 4. Floor Coatings: VOC not more than 100 g/L.
 5. Shellacs, Clear: VOC not more than 730 g/L.
 6. Shellacs, Pigmented: VOC not more than 550 g/L.
 7. Flat Topcoat Paints: VOC content of not more than 50 g/L.
 8. Nonflat Topcoat Paints: VOC content of not more than 150 g/L.
 9. Anti-Corrosive and Anti-Rust Paints Applied to Ferrous Metals: VOC not more than 250 g/L.
 10. Floor Coatings: VOC not more than 100 g/L.
 11. Shellacs, Clear: VOC not more than 730 g/L.
 12. Shellacs, Pigmented: VOC not more than 550 g/L.
 13. Primers, Sealers, and Undercoaters: VOC content of not more than 200 g/L.
 14. Dry-Fog Coatings: VOC content of not more than 400 g/L.
 15. Zinc-Rich Industrial Maintenance Primers: VOC content of not more than 340 g/L.
 16. Pre-Treatment Wash Primers: VOC content of not more than 420 g/L.
 17. Fire Retardant Paint: VOC content of not more than 60 g/L.
- C. Colors: As selected by Architect; allow for 12 colors plus black and white.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Concrete: 12 percent.
 - 2. Masonry: 12 percent.
 - 3. Gypsum Board: 12 percent.
 - 4. Wood: 15 percent
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
 - 1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.
- B. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
 - 2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.

- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- E. Concrete Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- F. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.
- G. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- H. Gypsum Board Substrates: Do not begin paint application until finishing compound is dry and sanded smooth.
- I. 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.
 - 1. 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.
 - 2. 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.
 - 3. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately on delivery.
 - 4. When transparent finish is required, backprime with spar varnish or polyurethane.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions.
 - 1. Use applicators and techniques suited for paint and substrate indicated.
 - 2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 - 3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
- B. Application Procedures: Apply paints and coatings by brush or roller according to the manufacturer's directions, except as noted below. Spray application is not permitted for trim, ceilings and walls, unless specifically approved by Architect in advance for each individual situation. Roller application on woodwork is not permitted.

1. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
 2. Brushes: Use brushes best suited for the type of material applied. Use brush of appropriate size for the surface or item being painted.
 3. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.
- C. 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.
- D. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- E. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- F. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- G. Painting Mechanical and Electrical Work: Paint items exposed in equipment rooms and occupied spaces including, but not limited to, the following:
1. Mechanical Work:
 - a. Uninsulated metal piping.
 - b. Uninsulated plastic piping.
 - c. Pipe hangers and supports.
 - d. Tanks that do not have factory-applied final finishes.
 - e. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
 - f. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
 - g. Mechanical equipment that is indicated to have a factory-primed finish for field painting.
 2. Electrical Work:
 - a. Switchgear.
 - b. Panelboards.
 - c. Electrical equipment that is indicated to have a factory-primed finish for field painting.

3.4 FIELD QUALITY CONTROL

- A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when paints are being applied:

1. Owner will engage the services of a qualified testing agency to sample paint materials being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
2. Testing agency will perform tests for compliance with product requirements.
3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying-paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 EXTERIOR PAINTING SCHEDULE

- A. General: Provide listed products or equal products of other named manufacturers in Part 2.
- B. Structural Steel Framing and Decking at Canopy, to Receive Intumescent Coating:
 1. Primer: Material compatible with intumescent coating and specifically approved by the intumescent fireproofing manufacturer for use as a primer for the specific intumescent coating to be applied. Primer shall be fully cured prior to application of intumescent coating.
 2. Intumescent Coating and Topcoat: As specified in Section 078123.
 3. Field Applied Topcoat/Finish Coat: (Semi-Gloss): Aliphatic Acrylic Polyurethane, Two-Component, Pigmented, Semi-Gloss: Tnemec Endura-Shield II Series 1075
- C. Steel and Iron Substrates: Polyurethane, Pigmented, Epoxy Zinc Rich Primer and High-Build Epoxy Coating System: Gloss or Semi-Gloss as selected by the Architect.
 1. Prime Coat: Epoxy Zinc Rich Primer. Tnemec: Tneme-Zinc Series 90-97 or equal.

2. Intermediate Coat: High-performance, polyamide-epoxy coating; High-Build Epoxy Marine Coating, Low Gloss: Tnemec: Hi-Build Epoxoline, Series 66, tinted slightly lighter than top coat., or equal
 3. Topcoat (Gloss): Aliphatic Acrylic Polyurethane, Two-Component, Pigmented, Gloss: Tnemec Endura-Shield II Series 1074.
 4. Topcoat (Semi-Gloss): Aliphatic Acrylic Polyurethane, Two-Component, Pigmented, Semi-Gloss: Tnemec Endura-Shield II Series 1075.
- D. Zinc-Coated (Galvanized) Metal (HM Doors and Frames, Handrails, Guards and Railings, Other Items Indicated): Full-gloss, acrylic latex enamel finish - 2 coats - self-priming.
1. Prime Coat: Gloss acrylic latex enamel paint; MPI # 114, X-Green 114, 154, X-Green 154, 164, LEED 2009, LEED V4.
 - a. Benjamin Moore Ultra Spec D.T.M. Acrylic Gloss Enamel HP28
 2. Top Coat: Gloss acrylic latex enamel paint; MPI # 114, X-Green 114, 154, X-Green 154, 164, LEED 2009, LEED V4.
 - a. Benjamin Moore Ultra Spec D.T.M. Acrylic Gloss Enamel HP28

3.7 INTERIOR PAINTING SCHEDULE

- A. General: Provide listed products or equal products of other named manufacturers in Part 2.
- B. Gypsum Board Ceilings: Flat acrylic finish.
1. Prime Coat: Latex-based, interior primer; MPI # 50, X-Green 50, 149, X-Green 149, LEED 2009, LEED V4, CHPS Certified.
 - a. Benjamin Moore; Ultra Spec 500 Interior Latex Primer N534
 2. Intermediate Coat and Topcoat: Factory-formulated flat acrylic latex paint for interior application; MPI # 53, X-Green 53, 143, X-Green 143, LEED 2009, LEED V4, CHPS Certified.
 - a. Benjamin Moore; Ultra Spec 500 Interior Latex Flat N536
- C. Gypsum Board Ceilings in Bathrooms (Where Scheduled): Semi-Gloss, waterborne acrylic epoxy finish.
1. Prime Coat: Latex or two component epoxy-based, interior primer; MPI # 6, 17, X-Green 17, 39, 137, X-Green 137, LEED Credit, CHPS Certified.
 - a. Benjamin Moore; Fresh Start Multi-Purpose Primer N023.
 2. Intermediate Coat and Topcoat: Two component semi-gloss acrylic-epoxy; Interior/Exterior Epoxy (water based), LEED 2009.
 - a. Benjamin Moore; Corotech Pre-Catalyzed Waterborne Epoxy Semi-Gloss V341.
- D. Gypsum Drywall Walls in Classrooms: Low-luster (eggshell), waterbased polyurethane acrylic coating; eggshell base with textured pattern coat. Base coat shall be rolled or

sprayed. Pattern coat shall be spray-applied using proprietary equipment. NO SUBSTITUTIONS.

1. Product: Scuffmaster Armor.
 2. Prime Coat: One coat Scuffmaster Primemaster Primer/Sealer.
 3. Base Coat: 2 coats of Scuffmaster Premium-Coat 200
 4. Pattern Coat: Scuffmaster Armor-Coat 1200 applied to match finish standard, and approved mock-up.
- E. Gypsum Drywall Walls in Offices, Library and Other Rooms (Except Classrooms): Low-luster (eggshell), waterbased polyurethane acrylic coating. NO SUBSTITUTIONS.
1. Product: Scuffmaster ScrubTough Performance Paint with Microban.
 2. Prime Coat: One coat Scuffmaster Primemaster Primer/Sealer.
 3. Top Coat: 2 coats of Scuffmaster ScrubTough Performance Paint with Microban.
- F. Hollow Metal Doors, Frames, and Sidelights, and Ferrous Metals: Semigloss, acrylic-enamel finish.
1. Prime Coat: Rust-Inhibitive Primer (Water Based), MPI #107, X-Green 107, 134, LEED 2009, CHPS Certified.
 - a. Benjamin Moore; Super Spec HP Acrylic Metal Primer P04.
 2. Intermediate Coat and Topcoat: Factory-formulated semigloss acrylic-latex enamel for interior application; MPI # 141, X-Green 141, 153, X-Green 153, LEED 2009, LEED V4.
 - a. Benjamin Moore; Ultra Spec HP D.T.M. Acrylic Semi-Gloss Enamel, HP29
- G. Concrete Masonry Units (CMU) Walls in Classrooms: Low-luster (eggshell), waterbased polyurethane acrylic coating; eggshell base with textured pattern coat. Base coat shall be rolled or sprayed. Pattern coat shall be spray-applied using proprietary equipment. NO SUBSTITUTIONS.
1. Product: Scuffmaster Armor.
 2. Prime Coat/Block Filler (required at teaching wall only): One coat 100% latex acrylic block filler.
 3. Base Coat: 2 coats of Scuffmaster Premium-Coat 200
 4. Pattern Coat: Scuffmaster Armor-Coat 1200 applied to match finish standard, and approved mock-up.
- H. Concrete Masonry Units (CMU) Walls in Offices, Library and Other Rooms (Except Classrooms): Low-luster (eggshell), waterbased polyurethane acrylic coating. NO SUBSTITUTIONS.
1. Product: Scuffmaster ScrubTough Performance Paint with Microban.
 2. Prime Coat, (required at new surfaces only): One coat Scuffmaster Primemaster Primer/Sealer.
 3. Top Coat: 2 coats of Scuffmaster ScrubTough Performance Paint with Microban.

- I. Stained Wood and Woodwork: Satin, waterborne clear acrylic urethane over stain.
 - 1. Stain Coat: Penetrating wood stain, water-based; MPI # 186 LEED Credit.
 - a. Lenmar (Benjamin Moore); Waterborne Interior Wiping Stain 1WB.1300 (240 g/L)
 - 2. Intermediate Coat and Topcoat: Satin, interior waterborne clear acrylic urethane varnish; MPI # 121, 128.
 - a. Lenmar (Benjamin Moore); Waterborne Aqua-Plastic Urethane Satin, 1WB.1427 (335 g/L)

END OF SECTION 099100

SECTION 101000 - VISUAL DISPLAY SURFACES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following types of visual display boards:

1. Porcelain enamel markerboards.
2. Cork tackboards

1.2 SUBMITTALS

- A. Product Data: Provide manufacturer's product data for each type of visual display board specified.
- B. Shop Drawings: For each type of visual display board required, including dimensioned elevations. Show location of joints between individual panels where unit dimensions exceed maximum panel length. Include sections of typical trim members. Show anchors, grounds, reinforcement, accessories, layout, and installation details.
- C. Samples for initial selection purposes in form of manufacturer's color charts showing full range of colors available for tackboards.
- D. Samples for Verification: Of the following products, showing color and texture or finish selected. Where finishes involve normal color and texture variations, include Sample sets showing the full range of variations expected. Prepare Samples from the same material to be used for the Work.
1. Markerboards: Actual sections of porcelain enamel finish for each type of markerboard required not less than 8-1/2 by 11 inches, mounted on the substrate indicated for the final Work. Include a panel for each type, color, and texture required.
 2. Tackboards: Sample panels of actual materials to be supplied in the finished Work, not less than 8-1/2 by 11 inches (215 by 280 mm), mounted on the substrate indicated for the final Work. Include a panel for each type, color, and texture required.

1.3 QUALITY ASSURANCE

- A. Source Limitations: Obtain visual display boards through one source from a single manufacturer.
- B. Fire-Test-Response Characteristics: Provide materials with the surface-burning characteristics indicated, as determined by testing identical products per ASTM E 84 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. Class A

- C. Provide GREENGUARD certified products.

1.4 PROJECT CONDITIONS

- A. Field Measurements: Verify field measurements before preparation of Shop Drawings and before fabrication to ensure proper fitting. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 1. Allow for trimming and fitting where taking field measurements before fabrication might delay the Work.
 2. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating markerboards without field measurements. Coordinate wall construction to ensure actual dimensions correspond to established dimensions.

1.5 WARRANTY

- A. General Warranty: The special porcelain enamel warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. Porcelain Enamel Warranty: Furnish the manufacturer's written warranty, agreeing to replace porcelain enamel markerboards that do not retain their original writing and erasing qualities, become slick and shiny, or exhibit crazing, cracking, or flaking, provided the manufacturer's instructions with regard to handling, installation, protection, and maintenance have been followed.
 1. Warranty Period: 50 years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. Porcelain Enamel Markerboards:
 - a. Claridge Products and Equipment, Inc.
 - b. Greensteel, Inc.
 - c. Lemco, Inc.
 2. Tackboards:
 - a. Best-Rite Chalkboard Co.

- b. Carolina Chalkboard Co.
- c. Claridge Products and Equipment, Inc.
- d. Ghent Manufacturing, Inc.
- e. Greensteel, Inc.
- f. Lemco, Inc.
- g. Marsh Chalkboard Company.

2.2 MATERIALS, GENERAL

- A. Low-Emitting Materials: All composite wood, engineered wood, or agrifiber products (e.g., plywood, particleboard, medium density fiberboard) shall contain no added urea-formaldehyde resins. Laminating adhesives used to fabricate on-site and shop-applied composite wood and agrifiber assemblies shall contain no added urea-formaldehyde resins. Acceptable resins and binders include, but are not limited to, phenol formaldehyde and methyl diisocyanate (MDI)
- B. VOC Limits for Installation Adhesives and Glues: Use installation adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - 1. Wood Glues: 30 g/L.
 - 2. Contact Adhesive: 80 g/L

2.3 TACKBOARDS

- A. Cork Tackboards: Color impregnated cork board composed of 1/4" thick self-healing, burlap backed cork laminated to a 1/4" hardboard backing, surrounded by 5/8" wide aluminum face trim.
 - 1. Color(s): As selected by Architect.
 - 2. Size(s): As scheduled.
 - 3. Frame Style: 5/8" face, mitered corners, clear satin anodized aluminum finish.
 - 4. Corkboard Material: Claridge Cork
 - 5. Basis of Design Product: 800 Series Type CO by Claridge or equal.

2.4 MARKERBOARDS

- A. Porcelain Enamel Markerboards: Provide balanced, high-pressure-laminated porcelain enamel boards of 3-ply construction consisting of face sheet, core material, and backing.
- B. Face Sheet: 0.024-inch (0.61-mm) enameling grade steel especially processed for temperatures used in coating porcelain on steel. Coat exposed face and edges with a 3-coat process consisting of primer, ground coat, and color cover coat. Coat concealed face with a 2-coat process consisting of primer and ground coat. Fuse cover and ground coats to steel at manufacturer's standard firing temperatures, but not less than 1200 deg F (649 deg C).
 - 1. Cover Coat (Markerboards): Provide manufacturer's standard, light-colored, special writing surface with gloss finish intended for use with erasable dry markers.

- C. Core: Core: 3/8-inch- (9.5-mm-) thick, particleboard core material complying with requirements of ANSI A208.1, Grade 1-M-1.
- D. Backing Sheet: Backing Sheet: 0.015-inch- (0.38-mm-) thick, aluminum-sheet backing.
- E. Laminating Adhesive: Provide the manufacturer's standard moisture-resistant thermoplastic-type adhesive.
- F. Markerboard Color: #100 White.
- G. Basis of Design Product: LCS 3 Markerboard by Claridge, or equivalent.
- H. Unit Markerboards: Basis of Design is Claridge 800 Series with 5/8" Face Trim, or equal.
 - 1. Accessories: Full length marker tray and map rail with two map hooks.
 - 2. Frame Style: 5/8" face, mitered corners, clear satin anodized aluminum finish.
 - 3. Sizes: As scheduled.

2.5 ACCESSORIES

- A. Metal Trim and Accessories: Fabricate frames and trim of not less than 0.062-inch- (1.57-mm-) thick, extruded-aluminum alloy, size and shape as indicated, to suit type of installation. Provide straight, single-length units. Keep joints to a minimum. Miter corners to a neat, hairline closure.
 - 1. Where size of visual display boards or other conditions require support in addition to normal trim, provide structural supports or modify trim as indicated or as selected by the Architect from manufacturer's standard structural support accessories to suit conditions indicated.
- B. Mounting Accessories: Provide angle clip hangers and mounting adhesive supplied by manufacturer.

2.6 FABRICATION

- A. Assembly: Provide factory-assembled tackboards and markerboard units in single units without joints.

2.7 FINISHES

- A. General: Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.
- B. Finish designations prefixed by "AA" conform to the system established by the Aluminum Association for designating aluminum finishes.

- C. Class II Clear Anodized Finish: AA-M12C22A31 (Mechanical Finish: as fabricated, nonspecular; Chemical Finish: etched, medium matte; Anodic Coating: Class II Architectural, clear film thicker than 0.4 mil).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine wall surfaces, with Installer present, for compliance with requirements and other conditions affecting installation of visual display boards.
 - 1. Surfaces to receive markerboards shall be free of dirt, scaling paint, and projections or depressions that would affect smooth, finished surfaces of markerboards.
 - 2. Surfaces to receive tackboards shall be dry and free of substances that would impair the bond between tackboards and substrate
 - 3. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Deliver factory-built visual display boards completely assembled in one piece without joints, where possible. If dimensions exceed panel size, provide 2 or more pieces of equal length as acceptable to the Architect. When overall dimensions require delivery in separate units, prefit components at the factory, disassemble for delivery, and make final joints at the site. Use splines at joints to maintain surface alignment.
- B. Install units in locations and at mounting heights as indicated on drawings; comply with manufacturer's installation instructions. Keep perimeter lines straight, plumb, and level. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for a complete installation.
- C. Coordinate Project-site-assembled units with grounds, trim, and accessories. Join parts with a neat, precision fit.

3.3 ADJUST AND CLEAN

- A. Verify that accessories required for each unit have been properly installed
- B. Clean units in accordance with the manufacturer's instructions. Break in markerboards only as recommended by the manufacturer.

END OF SECTION 101000

SECTION 101400 - SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Panel signs with and without paper inserts.
 - 2. Signage accessories

1.2 ACTION SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of sign.
- B. Shop Drawings: Include plans, elevations, and large-scale sections of typical members and other components. Show mounting methods, grounds, mounting heights, layout, spacing, reinforcement, accessories, and installation details.
 - 1. Provide message list for each sign, including large-scale details of wording, lettering, and braille layout.
- C. Samples for Initial Selection: For each type of sign material indicated that involves color selection.
 - 1. Panel Signs: Samples of each finish type and color, on not less than 4-inch squares of plastic material, showing the full range of colors available
- D. Samples for Verification: For each type of sign, include the following Samples to verify color selected:
 - 1. Panel Signs: Full-size Samples of each type of sign required.
 - 2. Approved samples will be returned for installation into Project.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Maintenance Data: For signage cleaning and maintenance requirements to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by signage manufacturer.

- B. Source Limitations: Obtain each sign type through one source from a single manufacturer.
- C. Regulatory Requirements: Comply with ANSI A.117.1 - 2017 and with code provisions as adopted by authorities having jurisdiction.
 - 1. Interior Code Signage: Provide signage as required by accessibility regulations and requirements of authorities having jurisdiction. These include, but are not limited to, the following:
 - a. Room Capacity.
 - b. Elevator Signs.
 - c. Stairway Identification.
 - d. Signs for Accessible Spaces.

1.5 COORDINATION

- A. For signs supported by or anchored to permanent construction, furnish templates for installation of anchorage devices and advise installers of anchorage devices about specific requirements for placement of anchorage devices and similar items to be used for attaching signs.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
 - 1. ASI Sign Systems Inc.
 - 2. Innerface Sign Systems, Inc.
 - 3. InPro Corp.
 - 4. Mohawk Sign Systems.

2.2 PLASTICS

- A. Acrylic Sheet: ASTM D 4802, Category A-1 (cell-cast sheet), Type UVA (UV absorbing); 0.125 inch thick.
 - 1. Colored Coatings for Acrylic Sheet: For copy and background colors, provide colored coatings, including inks, dyes, and paints, that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and are UV and water resistant for five (5) years for application intended. Provide colors indicated on Drawings.

2.3 PANEL SIGNS

- A. General: Provide signs that comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction.
 - 1. Produce sign surfaces constructed to remain flat under installed conditions within tolerance of plus or minus 1/16 inch (1.5 mm) measured diagonally.
 - 2. Sign materials shall meet a Class A finish.
- B. Interior Panel Signs: Unframed signs, with individual cut tactile lettering and raster Braille on 1/8" thick PET acrylic face with matte finish, subsurface painted, for interior applications. Provide lettering, graphics and background materials in custom colors to match Owner's samples, as approved by Architect.
 - 1. Produce smooth, even, level sign surfaces, constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch (1.58 mm) measured diagonally.
 - 2. Lettering and Braille Content: Provide uppercase letters raised 1/32 inch (.79 mm), and grade 2 braille for each specific location. Minimum text height: 5/8 inch (15.8 mm).
 - 3. Pictograms: Provide graphics raised 1/32 inch (.79 mm), with minimum 6 inch (152.4 mm) high background field, and lettering and braille written description directly below.
 - 4. Lettering Style: As indicated on Drawings.
 - 5. Copy Location: As indicated on Drawings.
 - 6. Corners and Edges: As indicated on Drawings.
 - 7. Paper Graphic Inserts: Provide changeable paper graphic insert frames with clear non-glare acrylic covers where indicated on Drawings.
 - 8. Basis of Design Product: InTac System by ASI Signs, or equal.
 - 9. Provide specified signage as scheduled on the Drawings.
- C. Card Stock for Paper Inserts: Manufacturer's standard white card stock for paper sign inserts
 - 1. Paper Insert: Provide paper insert for panels signs, printed to produce indicated message content

2.4 PANEL ACCESSORIES

- A. Mounting Methods:
 - 1. Mechanical Fasteners: Stainless steel screws.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
- B. Verify that items, including anchor inserts, provided under other sections of Work are sized and located to accommodate signs.
- C. Examine supporting members to ensure that surfaces are at elevations indicated or required to comply with authorities having jurisdiction and are free from dirt and other deleterious matter.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Locate interior wall signs and accessories where indicated, in accordance with ANSI A.117.1 - 2017 and with code provisions as adopted by authorities having jurisdiction, using mounting methods of the type described and in compliance with the manufacturer's instructions.
 - 1. Install signs level, plumb, and at the height indicated, with sign surfaces free from distortion or other defects in appearance.
 - 2. Mount signs on wall adjacent to the latch side of door, unless otherwise indicated. Where there is no wall space to the latch side of the door, including at double leaf doors, mount sign on the nearest adjacent wall as approved by the Architect. Mount signs at 48-inches (1219 mm) from the baseline of the lowest characters to the finished floor.
 - 3. Locate signs to allow approach within 3-inches (75 mm) of sign without encountering protruding objects or standing within swing of door.
- B. Wall-Mounted Panel Signs: Attach signs to wall surfaces using methods indicated below:
 - 1. Mechanical Fasteners: Use nonremovable mechanical fasteners placed through predrilled holes. Attach signs with fasteners and anchors suitable for secure attachment to substrate as recommended in writing by sign manufacturer.

3.3 CLEANING AND PROTECTION

- A. After installation, clean soiled sign surfaces according to manufacturer's written instructions. Protect signs from damage until acceptance by Owner.

3.4 INTERIOR SIGN SCHEDULE

- A. Refer to Drawings.

END OF SECTION 101400

SECTION 102113 - TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes solid-plastic polymer resin units as follows:
 - 1. Toilet Enclosures: Floor-mounted, overhead braced.
 - 2. Urinal Screens: Wall hung
- B. Related Requirements:
 - 1. Section 102800 "Toilet and Bath Accessories" for toilet tissue dispensers, grab bars, and similar accessories mounted on toilet compartments.

1.2 ACTION SUBMITTALS

- A. Product data for each type and style of toilet compartment and screen specified. Include details of construction relative to materials, fabrication, and installation. Include details of anchors, hardware, and fastenings.
- B. Shop drawings for fabrication and erection of toilet compartment assemblies not fully described by product drawings, templates, and instructions for installation of anchorage devices built into other work.
 - 1. Show locations of reinforcement and cutouts for compartment-mounted toilet accessories.
- C. Samples for Verification: Of each type of color and finish required for units, prepared on 6-inch- (150-mm-) square samples of same thickness and material indicated for Work

1.3 QUALITY ASSURANCE

- A. Coordination: Furnish inserts and anchorages which must be built into other work for installation of toilet compartments and related items. Coordinate delivery with other work to avoid delay.
- B. Fire-Test-Response Characteristics: Provide toilet compartment materials with surface-burning characteristics as indicated below, as determined by testing identical to those required in this Section, per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Identify toilet compartments with appropriate markings of applicable testing and inspecting agency.
 - 1. Flame Spread: 200 or less.
 - 2. Smoke Developed: Less than 450, or Smoke Density: less than 75 per ASTM D 2843

- C. Flammability of Self-Supporting Plastics: 1.2 inches (30.5-mm) per minute or less per ASTM D 635.
- D. Ignition Properties of Plastic: Not less than 650 Deg. F (343.3 Deg. C) per ASTM D 1929.

1.4 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions in areas of installation by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.5 WARRANTY

- A. Warranty shall not deprive the Owner of other rights or remedies that the Owner may have under other provisions of the Contract Documents and is in addition to and runs concurrent with other warranties made by the Contractor under requirements of the Contract Documents.
- B. Provide a manufacturer's warranty covering the material and workmanship for a period of ten years from the date of final acceptance.
- C. Repair or replace any part which becomes defective or breaks during the warranty period.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Bradley
 - 2. General Partitions Mfg. Corp.
 - 3. Global Partitions
 - 4. Metpar Corp.
 - 5. Scranton Products (Santana/Comtec/Capital)

2.2 MATERIALS

- A. General: Provide materials which have been selected for surface flatness and smoothness. Exposed surfaces which exhibit pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections on finished units are not acceptable.
- B. Solid-Plastic, Polymer Resin: High-density polyethylene (HDPE) with homogenous color throughout. Provide material not less than 1 inch (25 mm) thick with seamless construction and eased edges in color and pattern as follows:

1. Texture: Orange peel.
 2. Color: As selected by Architect.
 3. Basis of Design Product: Hiney Hiders Partitions manufactured by Scranton Products, or equal.
- C. Pilaster Shoes and Sleeves (Caps): ASTM A 666, Type 302 or 304 stainless steel, not less than 0.0312 inch (0.8 mm) thick and 3 inches (75 mm) high, finished to match hardware.
- D. Full-Height (Continuous) Brackets: Manufacturer's standard design for attaching panels and screens to walls and pilasters of the following material:
1. Material: Clear-anodized aluminum.
- E. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories of the following material:
1. Material: Stainless steel.
- F. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile in manufacturer's standard finish.
- G. Heat-Sink Strip: Manufacturer's standard continuous, extruded-aluminum strip fastened to exposed bottom edges of solid-polymer components to prevent burning .
- H. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel or chrome-plated steel or brass, finished to match hardware, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use hot-dip galvanized or other rust-resistant, protective-coated steel.

2.3 FABRICATION

- A. General: Provide standard doors, panels, screens, and pilasters fabricated for compartment system. Provide units with cutouts and drilled holes to receive compartment-mounted hardware, accessories, and grab bars, as indicated.
- B. Overhead-Braced Compartments: Provide anodized aluminum angle supports and leveling bolts at pilasters as recommended by manufacturer to suit floor conditions. Make provisions for setting and securing continuous, extruded, aluminum, antigrip, overhead bracing at top of each pilaster. Provide shoe at each pilaster to conceal supports and leveling mechanism.
- C. Screens: Attach with anchoring devices as recommended by manufacturer to suit supporting structure. Set units to provide support and to resist lateral impact.
- D. Doors: Unless otherwise indicated, provide 24-inch- (610-mm-) wide in-swinging doors for standard toilet compartments and 36-inch- (914-mm-) wide out-swinging doors with a minimum 32-inch- (813-mm-) wide clear opening for compartments indicated to be handicapped accessible.

1. Hinges: Continuous spring-loaded type fabricated from extruded aluminum with nylon separators at knuckles and stainless pivot pins, that can be adjusted to hold door open at any angle up to 90 degrees. Provide theft proof fasteners concealed under a snap-on cover.
2. Latch and Keeper: Manufacturer's standard surface-mounted latch unit with combination rubber-faced door strike and keeper designed for emergency access. Provide units that comply with accessibility requirements of authorities having jurisdiction at compartments indicated to be handicapped accessible.
3. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent door from hitting compartment-mounted accessories.
4. Door Bumper: Manufacturer's standard rubber-tipped bumpers at out-swinging doors or entrance screen doors.
5. Door Pull: Manufacturer's standard unit that complies with accessibility requirements of authorities having jurisdiction at out-swinging doors. Provide units on both sides of doors at compartments indicated to be handicapped accessible.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the Work.
 1. Confirm location and adequacy of blocking and supports required for installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, plumb, and level. Provide clearances of not more than 1/2 inch (13 mm) between pilasters and panels and not more than 1 inch (25 mm) between panels and walls. Secure units in position with manufacturer's recommended anchoring devices.
 1. Secure panels to walls and panels with continuous brackets attached to the panel. Locate wall bracket fasteners so holes for wall anchors occur in masonry or tile joints. Secure panels in position with manufacturer's recommended anchoring devices.
- B. Overhead-Braced Compartments: Secure pilasters to floor and level, plumb, and tighten installation with devices furnished. Secure overhead brace to each pilaster with not less than two fasteners. Hang doors and adjust so that tops of doors are parallel with overhead brace when doors are in closed position.
- C. Screens: Attach with anchoring devices according to manufacturer's written instructions and to suit supporting structure. Set units level and plumb and to resist lateral impact.

3.3 ADJUST AND CLEAN

- A. Hardware Adjustment: Adjust and lubricate hardware according to manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors and swing doors in entrance screens to return to fully closed position.
- B. Provide final protection and maintain conditions that ensure toilet compartments and screens are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 102113

SECTION 102800 - TOILET AND BATH ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Washroom accessories.
 - 2. Mirrors.
 - 3. Hand dryers
 - 4. Installation of Owner furnished washroom accessories

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated. Include the following:
 - 1. Construction details and dimensions.
 - 2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
 - 3. Material and finish descriptions.
 - 4. Features that will be included for Project.
 - 5. Manufacturer's warranty.
- B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
 - 1. Identify locations using room designations indicated on Contract Drawings.
 - 2. Identify products using designations indicated on Contract Drawings.
- C. Maintenance Data: For toilet and bath accessories to include in maintenance manuals, including replaceable parts and service recommendations.

1.3 QUALITY ASSURANCE

- A. Source Limitations: For products listed together in the same articles in Part 2, provide products of same manufacturer unless otherwise approved by Architect.
- B. Inserts and Anchorages: Furnish accessory manufacturer's standard inserts and anchoring devices that must be set in concrete or built into masonry. Coordinate delivery with other work to avoid delay.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.4 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.5 WARRANTY

- A. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Fifteen (15) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Products: The design for toilet accessories is based on certain named equipment. Subject to compliance with requirements, provide the named product or an equivalent product by one of the following:
 - 1. A & J Washroom Accessories, Inc.
 - 2. American Dryer, Inc.
 - 3. American Specialties, Inc.
 - 4. Bradley Corporation.
 - 5. Bobrick Washroom Equipment
 - 6. Dyson
 - 7. Excel Dryer Corporation.
 - 8. World Dryer Corporation

2.2 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, 0.0312-inch (0.8-mm) (22-gage) minimum nominal thickness, unless otherwise indicated.
- B. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.0359-inch (0.9-mm) (20-gage) minimum nominal thickness.
- C. Galvanized Steel Sheet: ASTM A 653/A 653M, with G60 (Z180) hot-dip zinc coating.
- D. Galvanized Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.

- E. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.
- F. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).
- G. ABS Plastic: Acrylonitrile-butadiene-styrene resin formulation.

2.3 GRAB BARS

- A. Grab Bars; Stainless Steel Type: Provide grab bars with wall thickness not less than 18 gage (1.27 mm thick), concealed mounting with snap lock covers, satin finish, 1-1/2-inch (38.1 mm) clearance between wall surface and inside face of bar, outside diameter of 1-1/4 inches (32 mm).
 - 1. Basis of Design Product: Bobrick Series B-5806, or equal, in dimensions and configurations as indicated on Contract Drawings.

2.4 COMBINATION PAPER TOWEL DISPENSER AND WASTE RECEPTACLE

- A. Recessed convertible paper towel dispenser and waste receptacle shall be Type-304 stainless steel with welded construction; exposed surfaces shall have satin finish. Flange shall be drawn and beveled, one-piece, seamless construction. Door shall be secured to cabinet with a full-length stainless steel piano-hinge and equipped with a semi-concealed tumbler lock keyed like the other washroom accessories. Paper towel dispenser shall dispense 600 C-fold or 800 multifold paper towels. Removable waste receptacle shall be secured to cabinet with a tumbler lock, have front and side edges of bottom and all top edges hemmed for safe handling, and shall have a minimum capacity of 12-gal.
 - 1. Basis of Design Product: Bobrick B-3944, or equal.

2.5 HAND DRYERS

- A. Warm-Air Hand Dryer: Surface mounted type; infrared optical sensor activation; one piece stainless steel cover; stainless steel wall mounting plate; automatic shutoff after 35 seconds if hands are not removed, motor/blower (5/8 hp / 20,000 rpm) provides air velocity of 19,000lfm at the outlet and 16,000 lfm at the hands. Voltage required: 277 VAC, 9-10 amp, 1500 watt, 60 Hz, single phase; UL/c-UL listed and/or VDE approved and CE marked.
 - 1. Color: Brushed stainless steel cover.
 - 2. Basis of Design Product: XLERATOR Model XL-SB, or equal.
 - 3. Provide Recess Kit to meet ADA special requirements.

2.6 MIRROR UNITS

- A. Stainless Steel Frameless Mirror Units: Frameless stainless steel mirror shall be 18-8, type-304, 20-gauge (0.9mm) stainless steel polished to a No. 8 mirror finish. Mirror shall

have 1/4" (6mm) return concealing 1/4" (6mm) tempered masonite backing. Four corner countersunk holes provide flush fit of mounting screws with mirror surface.

1. Basis of Design Product: Bobrick Model B-1556 or equal.
2. Sizes: As indicated on Drawings.

2.7 OTHER WASHROOM ACCESSORIES

- A. All other washroom accessories indicated on Drawings shall be furnished by Owner. Install all Owner-furnished washroom accessories.

2.8 FABRICATION

- A. General: No names or labels are permitted on exposed faces of toilet and bath accessory units. On either interior surface not exposed to view or on back surface, provide identification of each accessory item either by a printed, waterproof label or a stamped nameplate indicating manufacturer's name and product number
- B. Surface-Mounted Toilet Accessories, General: Except where otherwise indicated, fabricate units with tight seams and joints, exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
- C. Recessed Toilet Accessories, General: Except where otherwise indicated, fabricate units of all-welded construction, without mitered corners. Hang doors or access panels with full-length, stainless steel piano hinge. Provide anchorage that is fully concealed when unit is closed.
- D. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six (6) keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Secure mirrors to walls in tamperproof manner with special hangers, toggle bolts, or screws. Set units plumb, level, and square at locations indicated, according to manufacturer's written instructions for type of substrate involved.
- C. Grab Bars: Install to withstand a downward load of at least 250 lbf (1112 N), when tested according to method in ASTM F 446, and in compliance with ADA Regulations.

3.2 ADJUSTING AND CLEANING

- A. Adjust toilet accessories for unencumbered, smooth operation. Verify that mechanisms function smoothly. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written recommendations after removing temporary labels and protective coatings.

END OF SECTION 102800

SECTION 122413 - ROLLER WINDOW SHADES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes
 - 1. Manual operation light filtering shades

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions.
- B. Shop Drawings: Show location and extent of roller shades. Include elevations, sections, details, and dimensions not shown in Product Data. Show installation details, mountings, attachments to other Work, operational clearances, and relationship to adjoining work.
- C. Samples for Verification:
 - 1. Shade Material: Not less than 12-inch- (300-mm-) square section of fabric, from dye lot used for the Work, with specified treatments applied. Show complete pattern repeat. Mark top and face of material.
- D. Window Treatment Schedule: Include roller shades in schedule using same room designations indicated on Drawings.

1.3 INFORMATIONAL SUBMITTALS

- A. Maintenance Data: For roller shades to include in maintenance manuals. Include the following:
 - 1. Methods for maintaining roller shades and finishes.
 - 2. Precautions about cleaning materials and methods that could be detrimental to fabrics, finishes, and performance.
 - 3. Operating hardware.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed installation of roller shades similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance
- B. Source Limitations: Obtain roller shades through one source from a single manufacturer.

- C. Fire-Test-Response Characteristics: Provide roller shade band materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. Flame-Resistance Ratings: Passes NFPA 701.

- D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and qualities of materials and execution.

1. Build mockups of in-place full-size window shade unit in the location as directed by Architect.
2. Provide one mock-up for each type of window shade fabric provided in the Work.
3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver shades in factory packages, marked with manufacturer and product name, fire-test-response characteristics, and location of installation using same room designations indicated on Drawings and in a window treatment schedule.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install roller shades until construction and wet and dirty finish work in spaces, including painting, is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operable glazed units' operation hardware throughout the entire operating range.

1.7 WARRANTY

- A. Roller Shade Hardware, and Shadecloth: Manufacturer's standard non-depreciating twenty-five year limited warranty.

PART 2 - PRODUCTS MANUFACTURERS

- A. Basis of Design Manufacturer: Provide specified shade systems by MechoShade System, Inc. or equivalent by one of the following:
1. Draper Shade & Screen Co., Inc.
 2. Hunter Douglas Window Fashions.

3. Levolor Contract; a Newell Company; Joanna
4. Silent Gliss USA, Inc

2.2 BASIS OF DESIGN PRODUCTS

- A. Manual Single-Roll Shades: Provide Classic Mecho/5 Manual System by MechoShade or equal.

2.3 MATERIALS

- A. Glare Control Fabric, 2-3% Open Mesh Type: 75% PVC and 25% polyester; dense vertical weave, 1000 Series Thermoveil by MechoShade, or equal.
 1. Color: 1010 Light Grey.
- B. Brackets: Plated steel, with adequate projection to clear all window fixtures
- C. Aluminum Extrusions: Alloy and temper recommended by manufacturer for use intended and as required for proper application of finish indicated but not less than the strength and durability properties specified in ASTM B 221 for 6063-T5.

2.4 FABRICATION

- A. Product Description: Roller shade consisting of a roller, a means of supporting the roller, a flexible sheet or band of material carried by the roller, a means of attaching the material to the roller, a bottom bar, and an operating mechanism that lifts and lowers the shade
- B. Components: Noncorrosive, self-lubricating materials.
- C. Rollers: Electrogalvanized or epoxy primed steel or extruded-aluminum tube of diameter and wall thickness required to support and fit internal components of operating system and the weight and width of shade band material without sagging; designed to be easily removable from support brackets; with manufacturer's standard method for attaching shade material.
- D. Direction of Roll: Regular, from back of roller.
- E. Mounting Brackets:
 1. Single Roll Shades: Galvanized or zinc-plated steel, style for between jamb mounting unless otherwise indicated.
- F. Fascia: L-shaped, formed-steel sheet or extruded aluminum; long edges returned or rolled; continuous panel concealing front and bottom of shade roller, brackets, and operating hardware and operators; length as required for between the jambs mounting; removable design for access

- G. Bottom Bar: Steel or extruded aluminum, with plastic or metal capped ends. Provide concealed, by pocket of shade material, internal-type bottom bar with concealed weight bar as required for smooth, properly balanced shade operation.
- H. Manual Shade Operation: Bead chain clutch operator.
 - 1. Bead Chain Material: #10 stainless steel chain with 120 lb. breaking strength.
 - 2. Operator Location: On left or right side of shade as directed by Architect for each location.
- I. Shade Units: Obtain units fabricated in sizes to fill window and other openings as follows, measured at 74 deg F (23 deg C):
 - 1. Shade Units Installed between (Inside) Jambs: Edge of shade not more than 1/4 inch (6 mm) from face of jamb. Length equal to head to sill dimension of opening in which each shade is installed.
 - 2. Shade Units Installed Outside Jambs: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.
- J. Installation Fasteners: Fabricated from metal that is noncorrosive to shade hardware and adjoining construction and to support shades as required by manufacturer's written instructions.
- K. Color-Coated Finish: For metal components exposed to view, apply manufacturer's standard baked finish complying with manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness.
- L. Colors of Metal and Plastic Components Exposed to View: As selected by Architect from manufacturer's full range unless otherwise indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, accurate locations of connections to building electrical system, and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected

3.2 ROLLER SHADE INSTALLATION

- A. Install roller shades level, plumb, square, and true according to manufacturer's written instructions, and located so shade band is not closer than 2 inches (50 mm) to interior face of glass. Allow clearances for window operation hardware.
- B. Install metal parts isolated from concrete or mortar to prevent corrosion.

- C. Install mounting brackets with not less than 2 fasteners per bracket.

3.3 ADJUSTING

- A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

- A. Clean roller shade surfaces after installation, according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.
- C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

3.5 SHADE SCHEDULE

- A. Manual Operated Single Shade: Provide in all renovated areas with windows.
- B. Existing spaces undisturbed do not receive shades.

END OF SECTION 122413

SECTION 220100 - GENERAL CONDITIONS

PART 1 - GENERAL

Applicable Provisions of the Conditions of the Contract and Division 1 General Requirements govern the work in this section.

1.1 GENERAL CONDITIONS

- A. Before submitting a proposal, Bidders shall examine all Drawings related to this work and shall become fully informed as to the extent and character of the work required and its relation to the other work in the building.
- B. Before commencing work, the Contractor will examine all conditions of the project upon which his work is in any way dependent for perfect workmanship according to the intent of this Specification. No "waiver of responsibility" for incomplete, inadequate or defective adjoining work will be considered unless notice has been filed by this Contractor and acceded to by the Owner's representative in writing before the Contractor begins any part of the work.
- C. The Contractor will pay for all licenses, permits and inspection fees required by civil authorities having jurisdiction. Comply with all laws, ordinances, regulations, fire underwriters requirements applicable to work herein specified without additional expense to the Owner. (Also, local building code requirements.).
- D. It is specifically intended that anything (whether material or labor) which is usually furnished as a part of such equipment as is hereinafter called for (and which is necessary for the completion and proper operation) shall be furnished as part of this Contract without additional cost the Owner, whether or not shown in detail on the Drawings or described in the Specifications.
- E. When Drawings and Specifications conflict or there is a question as to the proper intent of this Contract, the Contractor shall assume the more expensive method in his pricing. All questions shall be directed to the Architect/Engineer in writing only and only up to ten (10) days prior to bidding.
- F. The Drawings indicate the general runs of the piping, ductwork, etc. systems and the location of equipment and apparatus, but it shall be understood that the right is reserved by the Architect/Engineer to change the location of piping work, ductwork, equipment and apparatus to a reasonable extent as building conditions may dictate, prior to their installation without extra cost to the Owner.
- G. Small scale drilling through walls and floors which may contain asbestos shall be performed by a person with a "restricted asbestos handler allied trades certificate" and shall have a copy of it in his possession at all times while working on the project.

- H. Any changes from the Drawings and Specifications and any interpretation thereof shall have the prior approval of the Architect/Engineer. The Contractor shall submit in writing, at the time of signing the Contract, any items of necessary labor and materials, which, in his opinion, are lacking in requirements of the Drawings and Specifications to insure a complete job in all respects. No consideration will be granted to alleged misunderstanding of materials to be furnished, work to be done, or conditions to be complied with, it being understood that the tender of a proposal carries with it the agreement to all items and conditions referred to herein, or indicated on the accompanying Drawings.

END OF SECTION 220100

SECTION 220125 - SCOPE OF WORK

PART 1 - GENERAL

Applicable Provisions of the Conditions of the Contract and Division 1 General Requirements govern the work in this section.

1.1 SCOPE OF WORK

- A. The work under this section includes all labor, materials, equipment, tools, transportation, cutting and patching, excavation and backfill and the performance of all work necessary and required for the furnishing and installation complete of all Plumbing and Drainage work as shown on Contract Drawings, as specified herein and as otherwise required by job conditions or reasonably implied, including but not necessarily limited to the following:
1. Provide complete new and altered sanitary, storm and vent piping from all new plumbing fixtures connecting to existing sanitary and vent system.
 2. Provide complete new and altered hot and cold water piping to all new plumbing fixtures, equipment, etc. as indicated.
 3. Provide all new plumbing fixtures where indicated, complete including traps, stops, drains, strainers, tailpieces, faucets, escutcheons, etc.
 4. Provide complete new piping and final connections to equipment furnished under other Divisions.
 5. Provide all demolition, removal disconnecting, capping, sealing of all existing plumbing piping, apparatus, equipment, fixtures, specialties, accessories, etc. which are not included or incorporated in the new layout.
 6. Provide all required temporary connections to maintain all plumbing services without interruption.
 7. Pipe insulation.
 8. Tests and adjustments.
 9. This Contractor shall obtain all permits, bonds, approvals, etc. at no additional cost to the Owner.
 10. This Contractor shall provide all required sprinkler hydraulic calculations and corresponding drawings per all authorities having jurisdiction. Any deviation from Contract Documents will require calculations and drawings to be stamped and signed by a New York State Licensed Engineer.
 11. This Contractor shall provide shop drawings for all plumbing fixtures, piping, valves, insulation, equipment, etc.
 12. Cutting and Patching: See Front End Specifications for Trade Responsibilities.

13. Excavation and Backfill: See Front End Specifications for Trade Responsibilities.
 14. Furnish minimum 18" x 18" access doors for all valves, cleanouts, etc. in all inaccessible walls, ceilings, etc. Installation by General Contractor.
 15. Fire stopping per FM/UL and NFPA. Refer to Division 1.
- B. Coordination Drawings (if applicable): Attention is directed to Division 1 for coordination drawing requirements for this project. These drawings are critical to the proper execution of the work and failure to honor these requirements may become the basis for denial of any and all claims for either or both "time" and "money".

1.2 ALTERATION WORK

- A. All equipment, piping, plumbing, fixtures, etc. to be removed, shall be disposed of or salvaged as directed by the Owner. They shall not be removed from the premises without Owners approval.
- B. All piping to be removed shall be properly plugged or capped so that upon completion of all new work, all abandoned piping shall be concealed in finished areas.
- C. No dead ends shall be left on any piping upon completion of job.
- D. The existing systems shall be left in perfect working order upon completion of all new work.
- E. Location and sizes of existing piping are approximate. Exact sizes and locations of all existing piping shall be verified on the job.
- F. All removals shall be removed from the site.

END OF SECTION 220125

SECTION 220130 - WATER SUPPLY SYSTEM

PART 1 - GENERAL

Applicable Provisions of the Conditions of the Contract and Division 1 General Requirements govern the work in this section. Submit shop drawings for checking and approval.

1.1 DESCRIPTION OF WORK

- A. Furnish and install a complete cold-water distribution system to supply water to all new fixtures, water consuming equipment, and valved outlets for the use of other trades and connect to existing piping.
- B. The water supply system shall be complete with all pipe, fittings, valves, mains, risers, branches, shock absorbers, air chambers, hangers, anchors, expansion loops, connections to existing piping, covering, tests, etc. all as shown on the Drawings, as hereinafter specified.
- C. Furnish and install a complete hot water distribution system to supply water to all new fixtures and equipment requiring heated water.

PART 2 - PRODUCTS

2.1 PIPING, FITTINGS AND MATERIALS

- A. All components of water supply system shall confirm to all "No Lead" requirements including NSF/ANSI-372.
- B. The domestic water systems shall be of the following material and shall be in accordance with the latest ASTM and ASME Standards.
- C. Domestic water piping within the buildings shall be seamless drawn or extruded tubing type "L" copper. Both shall be of Chase, Anaconda, Revere, and approved equal, hard temper ASTM B88 with solder joint sweat end fittings. Fittings for use with copper tubing shall be cast brass of Muellers "Streamlin" pattern or approved equal.
- D. Joints for copper tubing shall be made with 95-5 (lead and antimony free) solder. Flanges where required shall be cast brass. Provide dielectric adapters between ferrous and non-ferrous pipe joints.

2.2 VALVES

- A. All shut-off valves 2" and smaller shall be ball valves equal to Apollo 70 Series or Milwaukee BA100 Series Valve. Bronze body with chrome plated trim
- B. This Contractor shall furnish all valves as indicated on the Drawings, or as may be required for the proper control of the pipe lines installed under this Specification, so that any fixture, line or piece of apparatus may be cut out for repair without interference or interruption of the service to the rest of the Facility.

- C. All domestic water valves shall have a minimum working pressure of 125 psig, steam rated unless otherwise noted on the Drawings or specified herein. All valves shall be of one manufacture as manufactured by Milwaukee Valve or Hammond.
- D. All gate valves within the buildings shall be wedge gauge valves with painted iron wheel handles, shall have gland followers in stuffing boxes, and shall be so constructed that they may be repacked while open and under pressure. All valves shall have the name of the manufacturer and working pressure cast or stamped thereon.
- E. All gate valves shall be all bronze with sweat or screwed joint ends as required by the piping system in which they are installed.
- F. Globe valves shall be of all bronze with composition disc, threaded or sweat joint ends as required by piping system in which they are installed.
- G. Check valves shall be all bronze swing check type with threaded or sweat joint ends. Check valves 4 inch and larger shall be iron body bronze mountings and shall be provided with screwed or flanged joint ends as required by piping system in which they are installed.
- H. Drain valves, at risers and at low points, shall be 3/4 inch heavy cast brass with composition washers with male thread for hose connections.

2.3 SHOCK ABSORBERS

- A. Shock absorbers shall be similar and equal to J.R. Smith 5000 series or Zurn Z1700 series with stainless steel pressurized shell sized in accordance with P.D.I. Bulletin WH-201.
- B. Provide shock absorbers on all fixtures and equipment having quick closing valves whether or not indicated on the Drawings.
- C. Provide access doors where shock absorbers are concealed.

2.4 VACUUM BREAKERS

- A. Provide vacuum breakers on water supply piping to each fixture and equipment with submerged inlets, and on faucets and outlets, within the facility to which hose can be, or is attached forming a submerged inlet.
- B. Set vacuum breakers in exposed readily accessible locations at least four inches above floor rim level of fixture, or high point of equipment.
- C. Vacuum breakers shall be chrome-plated brass. "Watts" or other approved.
- D. Vacuum breakers under constant pressure shall be of the continuous pressure type No. 9 "Watts" or Wilkins BFP-8CH or approved equal.

2.5 EXPANSION JOINTS, ANCHORS AND GUIDES

- A. The entire piping installation shall be installed with adequate provision for expansion. No rigid connections will be permitted. Refer to Drawings for locations of expansion joints and related guides and anchors. The joints, guides and anchors shall be as manufactured by Flexonics Products, Metraflex or Flex-weld.
- B. Branches shall be of sufficient length and have three elbow swings to allow for pipe expansion.
- C. Any breaks in the piping within the guarantee period due to improper provision for expansion must be replaced at the expense of this Contractor, and the conditions corrected to prevent future recurrence.
- D. Any damages to surrounding areas and equipment due to this failure shall also be repaired and paid for at the expense of this Contractor.
- E. Joints to have 150 psi rating, ANSI-B16.5 with liner and cover.

2.6 STERILIZATION

- A. The entire domestic water piping system shall be thoroughly sterilized with chlorine before acceptance for domestic operation.
- B. The amount of chlorine applied shall be such as to provide a dosage of not less than 50 parts per million for 24 hours or 200 p.p.m. for one hour. The chlorinating material shall be either liquid chlorine or sodium hypochlorite solution and shall be introduced into the system and drawn to all points of the system. If possible to do so, the lines shall be thoroughly flushed before introduction of the chlorinating material. After a contact period of not less than 24 hours, the system shall be flushed with clean water until the residual content is not greater than 0.2 parts per million. All valves in the lines being sterilized shall be opened and closed several times during the contact period.
- C. Sterilization and tests for purity of water in the entire piping system shall be performed by the Contractor through an approved independent testing laboratory and a certificate shall be furnished to the Architect certifying the quality of purity.
- D. Per ANSI/AWWA Standard C651-05.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. It is the intent that each part of the plumbing system shall be complete in all details and water lines provided with all control valves as indicated on Drawings, or as may be required for the proper control of the pipe lines under this Specification so that any fixture, line or piece of apparatus may be cut out for repair without interference or interruption of the service to the rest of the facility.
- B. This Contractor shall examine carefully the Architectural Drawings in detail and familiarize himself with all conditions relative to the installation of piping, particularly where same is concealed behind furring or in hung ceilings.

- C. In no case shall this Contractor permit his pipes to be exposed beyond finished walls or ceilings unless specifically shown on Drawings. He shall consult with the Contractors of other trades in the building and install his piping in such a way as to least interfere with the installation of other trades.
- D. The water piping shall all be installed so as to drain to a valve provided by this Contractor and branches shall not be trapped but shall have continuous pitch. Where necessary to raise or lower mains, the same shall be provided with a drip and shall be properly valved.
- E. Piping shall be installed, whether indicated or not, so as to rise and/or drop to clear any and all conduits, lighting fixtures, ductwork and heating mains to maintain the desired clear heights. This Contractor shall consult with the Contractors of other trades and facilitate the erection of the equipment and piping.
- F. Run piping straight and as direct as possible, in general forming right angles with or parallel to walls or other piping. Risers shall be erected plumb and true.
- G. After cutting, all pipes shall be reamed out to full bore and before erection the inside of all pipes shall be thoroughly cleaned.
- H. No piping or work shall be concealed or covered until all required tests have been satisfactorily completed and work has been approved by the Architect.
- I. All materials shall be new and installed in a first class manner.
- J. In erecting pipe, friction wrenches and vises shall be used exclusively, and any pipe cut, dented or otherwise damaged shall be replaced by this Contractor.
- K. All ferrous to non-ferrous pipe connections shall be made with approved dielectric pipe or flange unions isolating joints to prevent any electrolytic action between dissimilar materials.
- L. Any piece of pipe 6 inches in length or less shall be considered a nipple. All nipples with unthreaded portion 1-1/2 inch and less shall be of weight corresponding to fitting connected. Only shoulder nipples shall be used, close nipples will not be accepted.
- M. Revised water service shall be in accordance with the local water supply department requirements. All water lines are to be protected from freezing. Install new piping for water service below frost line and provide concrete separations when crossing other utilities. Provide concrete thrust mass at changes of pipe direction conforming to authorities having jurisdiction.

END OF SECTION 220130

SECTION 220160 - SANITARY AND STORM DRAINAGE SYSTEMS

PART 1 - GENERAL

Applicable Provisions of the Conditions of the Contract and Division 1 General Requirements govern the work in this section. Submit shop drawings for checking and approval.

1.1 DESCRIPTION OF WORK

- A. The work under this section includes all labor, materials, equipment and appliances necessary and required to completely install all drainage systems as required by the Drawings; code and as specified herein, including but not limited to the following:
- B. Complete sanitary drainage and venting systems including connections to the existing sanitary drainage and venting systems.
- C. Piping and final connections for equipment furnished under other Divisions.
- D. Alterations and removals to existing sanitary and vent systems.
- E. Tests.

PART 2 - PRODUCTS

2.1 PIPING AND FITTING MATERIALS

- A. All indoor underground storm soil, waste and vent piping shall be service weight cast iron with fittings of bell and spigot type. All exterior underground storm soil and waste piping shall be extra heavy cast iron. Each length shall have the size, weight per foot and the manufacturer's name clearly cast or stamped thereon. Weight shall be as defined by the Plumbing Code. Fittings and traps shall be similarly marked and of corresponding weights.
- B. All aboveground storm, soil, waste and vent piping and fittings 3" and larger shall be service weight and fittings of bell and spigot type as specified in paragraph above. Above ground waste and vent piping 2" and smaller shall be galvanized steel, fittings on waste piping shall be galvanized cast iron, recessed drainage pattern, fitting on vent piping shall be galvanized cast iron, beaded pattern, screwed joints shall be made up to be perfectly tight without the use of lead or filler of any kind, except oil or graphite. Nipples for galvanized pipe shall be shoulder type. No close nipples shall be permitted.
- C. Joints shall be made with gasket or hemp or picked oakum and lead, at least 12 oz. of fine soft pig lead shall be used for each inch of diameter pipe used. Lead shall be run in one (1) pouring. All lead shall be pure and soft and of the best quality, and shall be sufficiently heated to run joint full at one pouring without hardening. Dross shall not be allowed to accumulate in the melting pot. See 2.1, E. for joint options where permitted.
- D. All galvanized pipe and fittings shall be galvanized with prime western spelter by hot drip process.

- E. The Contractor has the option of using the following types of joints with hubbless cast iron pipe only if approved by the governing agencies. These joints shall be used throughout the project. No mixing of joints shall be permitted.
1. Neoprene gasketed joints similar to Ty-Seal (for above and underground application).
 2. Hubless cast iron pipe with neoprene gaskets and stainless steel clamps (by Clamp-All or equal) above ground only. All in accordance with Cast Iron Soil and Pipe Institute Standard 301 latest edition. Hangers and supports shall be in accordance with manufacturer's recommendations.
 3. Copper DWV system with 50-50 tin antimony solder, DWV with solvent welded or screwed joints meeting CS-270-65.

2.2 CLEANOUTS

- A. Provide easily accessible cleanouts where indicated at base of vertical stacks at ends of horizontal drainage lines and at intervals not exceeding 50 ft.; at each change of direction; on handholes of running traps, and where necessary to make entire drainage system accessible for rodding. Provide at least 18" clearance to permit access to cleanout plugs.
- B. Cleanouts for cast iron pipe shall consist of tarped extra heavy cast iron ferrule caulked into cast iron fittings and extra heavy brass tapered screw plug with solid hexagonal unit. Cleanouts for wrought iron pipe shall consist of extra heavy brass screw plug in drainage fitting.
- C. Cleanouts turning out through walls and up through floors shall be made by long sweep ells or "Y" and 1/8 bends with plugs and face or deck plates to conform to Architectural finish in the room. Where no definite finish is indicated on the Architectural and/or Mechanical Drawings, wall plates shall be chrome plated cast brass and floor plates shall be nickel bronze.
- D. Cleanouts shall be full size at the pipe up to 6" inclusive. On larger size piping 6" size plugs shall be used.
- E. Cleanout fittings in vertical stacks shall consist of tapped tees capable of receiving a rough brass raised head cleanout plug, J.R. Smith S-4730, Zurn Z1445-A-BP or approved equal.
- F. All cleanout plugs shall be brass lubricated with graphite before installation.
- G. Cleanouts occurring in cast iron soil pipe above floor at change of direction of pipe run and at ends of horizontal runs shall be J.R. Smith S-4425, Zurn Z1441-A-BP or approved equal with cast iron ferrule for caulk connection and fitted with a straight threaded tapered bronze plug with raised hex head.
- H. Cleanout deck plates for finished areas shall be similar and equal to J.R. Smith 4020 series, Zurn ZB1400-X or approved equal with cast iron ferrule, scoriated cutoff sections, brass cleanout plus collar with brass bolts for waterproofed slabs. In tile floor areas the cleanout deck plates shall be recessed to tile.

2.3 FLASHING

- A. Provide 6 lb. lead flashing extending at least 10" beyond edge of all floor drains and vents through roof and all floor sleeves in floors with waterproofing or vapor barriers. Flashing shall be held securely in by clamping devices.
- B. All floor drains shall be provided with flashing rings and 24" square 6 lb. sheet lead flashing, properly flashed into flashing ring of the drain.

2.4 SANITARY DRAINAGE

- A. A complete system of drainage shall be provided as shown on the Drawings. The system shall include all drains, leaders, branches, house drains with all pipe fittings, hangers, anchors, etc. to make a complete sanitary drainage system. The systems shall extend through house drains and terminate as indicated on the Drawings.
- B. Piping shall be sizes as indicated on the Drawings. The sanitary drains shall have a pitch of 1/8" per ft. minimum unless otherwise noted. Branch connections to stacks and house drains shall pitch a minimum of 1/8" per ft.

2.5 PIPING AND FITTINGS

- A. Provide piping of one of the following materials, of weight/class indicated. Provide pipe fittings and accessories of same material and weight/class as pipes, with joining method as indicated.

PART 3 - EXECUTION

3.1 INSTALLATION OF PIPING

- A. The size of soil, waste and vent piping shall be as determined by the State codes, rules and regulations for plumbing and drainage, except where specifically noted to be larger by the Specifications or Drawings and all fixed rules of installation, as set forth in the codes, rules and regulations, shall be followed as part of the Specifications.
- B. This Contractor shall examine carefully the Architectural plans in detail and familiarize himself with all conditions relative to the installation of piping, particularly where same is concealed behind furring or in hung ceilings.
- C. In no case shall this Contractor permit his pipes to be exposed beyond finished plaster lines unless specifically shown on Drawings. He shall consult with the Contractors of other trades in the building and install his piping in such a way as to least interfere with the installation of other trades.
- D. Piping shall be installed, whether indicated or not, so to rise and/or drop to clear any and all conduits, lighting fixtures, ductwork and heating mains to maintain the desired clear heights. This Contractor shall consult with the Contractors of other trades and facilitate the erection of the equipment and piping.

- E. Run piping straight and as direct as possible in general forming right angles with or parallel to walls or other piping. Risers and stacks shall be erected plumb and true. After cutting, all pipes shall be reamed out to full bore and before erection the inside of all pipes shall be thoroughly cleaned.
- F. No piping or work shall be concealed or covered until all required tests have been satisfactorily completed and work had been approved by the Architect and all other authorities having jurisdiction.
- G. Branch connections shall be made with "Wye" and long "Tee-Wye" fittings, short 1/4 bends, common offsets and double hubs will not be permitted. Short "Tee-Wye" fittings are to be used in vertical piping only. All fittings shall conform to code requirements.
- H. Cleanouts shall be provided at foot of all stacks, at changes of directions, at the ends of branch runs where shown and as required by code, and shall be terminated as described under cleanouts.
- I. The house drains must be run at a minimum grade of 1/8" per ft. downward in the direction of flow. Wherever possible, a 1/4" per ft. pitch shall be maintained. Branch connections to stacks from fixtures shall pitch 1/4" per ft. where possible. Attention is again called to the necessity of maintaining the ceiling heights established.
- J. Furnish and install complete systems of vent pipes from the various plumbing fixtures and other equipment to which drainage connections are made. Vent pipes shall be connected to the discharge of each trap and shall be carried to a point above the ultimate overflow level of the fixture before connecting with any other vent pipe; in general, this will be approximately 3'-6" above the finished floor. Branches shall be arranged to pitch back to fixtures.
- K. The individual vent pipes shall be collected together in branch vent lines and connected to existing vent connections through roof.
- L. Any existing vents through roof, damaged, or if flashing on roof comes loose while connecting new vent to them shall be repaired and reflashed to the roof as required to maintain waterproofing the satisfaction of the Architect.

END OF SECTION 220160

SECTION 220300 - PLUMBING FIXTURES AND EQUIPMENT

PART 1 - GENERAL

Applicable Provisions of the Conditions of the Contract and Division 1 General Requirements govern the work in this section. Submit shop drawings for checking and approval.

1.1 DESCRIPTION OF WORK

- A. The work under this section shall consist of furnishing all labor, materials, equipment and appliances necessary and required to completely do all plumbing fixture work, as required by the Drawings and as specified herein, including but not limited to the following: plumbing fixtures, traps, fittings, trimmings, brackets, plates, anchor, chair carriers and supports.
- B. Just before the Owner's taking over the work in the building, this Contractor shall thoroughly clean all fixtures furnished and set under this Contract, leaving every fixture in perfect condition and ready for use.
- C. Submit shop drawings and roughing sheets for all equipment for checking and approval.

PART 2 - PRODUCTS

2.1 PLUMBING FIXTURES AND EQUIPMENT

- A. All fixtures shall be free from imperfections, true as to line angles, curves and color, smooth, watertight, complete in every respect and practically noiseless in operation, Fixtures specified are given as the typical standard required as manufactured by American Standard and they or other similar approved fixtures as made by Kohler or Eljer Companies shall be furnished, set and connected in good substantial, neat workmanlike manner.
- B. The letter designations hereinafter correspond with the schedule on the Drawings.
 - 1. Water Closet - Type A1
Flush valve type, wall mounted 2257.103 "Afwall" vitreous china, siphon jet action, elongated bowl, 1-1/2" top spud, Sloan Royal 115-1.6 or Zurn Z6000AV-2-WS1 low consumption flush valve, Olsonite #95 open front seat cover. Provide floor mounted carrier equal to Zurn Z1203 series or Z1204 series.
 - 2. Water Closet - Type A2 (Handicapped) Same as above except Handicapped.
 - 3. Lavatory - Type B1 (Handicapped)
0356.015 "Lucerne" white vitreous china lavatory with 8" centers, concealed arm support, 7723.018 offset grid drain, adjustable trap, loose key stops and all required trim. Chicago Faucet model 404-V665-E12 self-closing adjustable palm button faucet with vandal-proof aerator. Mount lavatory 34" above finished floor. Cover "P" trap and supplies and stops with Truebro "Handi-Lav-Guard" insulation kits.

4. Double Bowl Stainless Steel Sink - Type B2
JUST model no. DLN-2243-A-GR, 18 gauge stainless steel type 302, self-rimming single bowl, Chicago Faucet model no. 404A-317, 8-inch center, 5-inch spout, 317 4-inch blade handles, E12 aerator.
5. Classroom Countertop Double Sink - Type B3
Equal to Elkay model no. DRKAD-3717-R-C, 18 gauge, type 302 self-rimming, two bowls 6" apart, LK-1141-A, no lead Flexi-Guard Bubbler, LK-35 strainer in sink, LK-8 grid strainer n fountain, LK-2439 concealed mounting mixing faucet, 45 degree restricted swing faucet with aerator.
7. Urinal - Type C
6501.010 "Washbrook" white vitreous china, siphon jet urinal, wall hanger, 3/4" top spud, outlet connection threaded 2" inside, Sloan Royal 186-1 or Zurn Z-6003AV-WS1 low consumption flush valve with vacuum breaker and angle stop, Josam series 17800 or Zurn Z-1222 concealed chair carrier.
8. Type D – NOT USED
9. Electric Water Cooler - Type E (Handicapped)
Elkay ERFPMVR28RAK, Bi-Level.
10. Floor Drains:
Josam series 30000A or Zurn Z415 type "B" coated cast iron, two piece body with double drainage flange, flashing collar, weepholes, bottom outlet and adjustable strainer.
11. Wall Hydrants (Interior): J.R. Smith 5609 QT bronze nickel plated quarter turn with 3/4" hose connection, integral vacuum breaker with vandal resistant cap and T-handle key. Install under lavatories in all toilet rooms.
12. Water Meter
Water meter shall be furnished and installed on water service main entering the building and shall be set in accordance with the regulations of all authorities having jurisdiction. Meter installations shall be complete including the necessary control valves, check valves, bypass, strainer, test tee, air chambers and approved supports.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. All fixtures shown on Drawings shall be set, connected and tested by the Contractor. He shall also make all water; soil, waste, vent and other service connections to fixtures as shown on Drawings or as directed and shall set, furnish, connect and test all necessary fittings.
- B. All pipes at fixtures passing into walls, floors or partitions shall be provided with heavy cast brass escutcheons and security (tamperproof) set screws finished to match the pipe. No "waiving" of this section will be permitted.

- C. All fittings escutcheons, faucets, traps, exposed piping etc. shall be brass, chrome plated over nickel plate with polished finish. Any visible hanger nuts shall be security (tamperproof) type and shall likewise be chrome plated over nickel plate.
- D. This Contractor shall be responsible for protecting all plumbing fixtures including in these Specifications against injury from the building materials, tools and equipment. Any fixtures damaged during the construction period shall be replaced new. After all fixtures are set, this Contractor shall carefully grout all around fixtures.

END OF SECTION 220300

SECTION 220310 - BACKFLOW PREVENTERS

PART 1 - GENERAL

Applicable Provisions of the Conditions of the Contract and Division 1 General Requirements govern the work in this section. Submit shop drawings for checking and approval.

1.1 SUBMITTALS

- A. Product Data: Manufacturers catalog sheets, specifications, and installation instructions for each type backflow preventer.
- B. Approval: Local water utility company and local department of health.

1.2 QUALITY ASSURANCE

- A. Regulatory Requirements
 - 1. Comply with the State Department of Health Sanitary Code for Cross Connection Control, and the other standards listed in Part 2 of this Section.
 - 2. Where conflicts occur between the referenced standards, the most stringent requirements shall apply.

1.3 MAINTENANCE

- A. Special Tools (as furnished or recommended by the backflow preventer manufacturer). Deliver to the Owner's Representative:
 - 1. Test Kit B: Sight tube, of required length, for testing backflow preventer for proper operation, and printed procedure for conducting test.
 - 2. Test must be performed by a Certified tester.

PART 2 - PRODUCTS

2.1 BACKFLOW PREVENTER

- A. Double Check Valve device on fire protection service equal to Watts series LF709 DCDA, conforming to ASSE Standard 1015, AWWA C-510, USC Specifications manual for Cross Connection control, and listed as acceptable in the New York State Department of Health, Environmental Health manual.
 - 1. Performance: 150 psig and 130 degrees F, maximum working conditions.
 - 2. Assembly: Gate valve on inlet side, gate valve on outlet side, and four test cocks, all as furnished or recommended by the backflow preventer manufacturer.

- B. Reduced pressure backflow preventer on domestic water service and cold water make up line to boilers equal to Watts series LF 009, with removable bronze seats, stainless steel internal parts and resilient wedge shut-off valves. Other acceptable manufacturers are Febco Inc. and Wilkins/Zurn Industries Inc.
- C. RPZ Discharge Funnel:
RPZ discharge funnel with trap J.R. Smith 3812 or approved equal Duco coated cast iron.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install the work of this section in accordance with the manufacturer's printed installation instructions and local water utility co. and department of health.
- B. Anchor piping to structure at each elbow to secure in the event of a pressure surge.

3.2 FIELD QUALITY CONTROL

- A. Operation Test: Test kit as specified under Part 1 of this section may be used. Conduct test in the presence of the Owner's Representative.
 - 1. Type B Backflow Preventer: Test the device with the test kit in accordance with the manufacturer's test procedure.
- B. Re-testing: Repair or replace any device failing the operation test, and repeat the test.

3.3 APPLICATION, FEES AND PERMITS

- A. This Contractor shall be responsible for hiring an engineer, filing all applications, permits and filing fees with the authorities having jurisdiction over the work. Coordinate with the General Conditions of Division 1 for "Design Responsibilities" and "Permit and Fee" requirements.
- B. The following list serves as the minimum filing requirements, failure to list any item does not relieve the Contractor from fulfilling that requirement.
 - 1. Prepare and submit DOH forms with plans, Professional Engineers Report and Specifications with "Seal".
 - 2. Certificate of Resolution of Letter of Authorization from Owner/User to authorize licensed professional to execute design.
 - 3. Filing fees, per device.
 - 4. Evidence of conformance to New York State Sanitary Code, Part 5 and Chapter 873 of the Laws of Westchester County.

END OF SECTION 220310

SECTION 220370 - SPRINKLER SYSTEM

PART 1 - GENERAL

Applicable Provisions of the Conditions of the Contract and Division 1 General Requirements govern the work in this section. Submit shop drawings for checking and approval.

1.1 DESCRIPTION OF WORK

- A. The work covered by this section consists of furnishing all labor, equipment, appliances, materials and performing all operations necessary for the installation of an automatic sprinkler systems all in strict conformance with NFPA, insurance regulatory agency and requirements of all authorities having jurisdiction. Provide approved hydraulically designed Drawings and calculations as required by insurance regulatory agency.

1.2 REFERENCES

- A. NFPA 13 - National Fire Protection Association Standard for the Installation of Sprinkler Systems.

1.3 SYSTEM DESCRIPTION

- A. Type of System: Wet System - Hydraulic.
- B. Occupancy Classification: Ordinary Hazard Occupancy.

1.4 SUBMITTALS

- A. Shop Drawings
 - 1. Complete sprinkler system layout indicating the locations of sprinkler heads, devices, and accessories. Include separate details of special or not easily visualized piping arrangements and inspectors test valves and connections.
 - 2. Hydraulic calculations shall be complete and cross referenced to the appropriate Drawing sheets per all Authorities having jurisdiction. Any deviations from Contract Documents require hydraulic calculations and sprinkler shop drawings to be stamped and signed by a Licensed NYS Professional Engineer.
 - 3. Contractor is responsible for arranging for, performing and paying for Hydrant Flow Test.
 - 4. Submit four (4) copies of Drawings to Owner's Risk Management Group for approval.
- B. Product Data: Catalog sheets, specifications, and installation instructions. Indicate UL or FM approval for each product. Include the following additional information:
 - 1. Electrical Devices: Complete description of intended use, wiring diagrams, data plate information and, in the case of switching devices, whether normally on, or normally off. Include motor test data.

2. Mechanical Devices: Complete description of intended use, including normal operating capacities and working pressures.
3. Enclosures: Dimensions, materials, gauges of metals; type of door hinges and locks, and methods of securing the enclosure members to the building construction.
4. Hose Threads: Verify that hose threads on fire department connections match threads on equipment used by the local or servicing fire department.

C. Quality Control Submittals

1. Design Data: The portions of the sprinkler system not sized on the Contract Drawings shall be sized in accordance with NFPA requirements for Hydraulically Designed Systems. Submit Drawings and hydraulic calculations for approval.
2. Certificates: As required under Quality Assurance Article.
3. Installers Qualification Data
 - a. Name of each person who will be performing the Work.
 - b. Upon request, furnish names and addresses of the required number of similar projects that each person has worked on which meet the experience criteria.

D. Contract Closeout Submittals

1. Operation and Maintenance Data. Deliver 2 copies to the Owner's Representative.
 - a. Instruction manual describing the operation and maintenance of the system.
 - b. Parts list for each mechanical and electrical device.
 - c. Upon completion of the project, Contractor shall inspect and test the existing and new Fire Protection System in accordance with NFPA-25. Contractor shall submit forms documenting inspection in accordance with NFPA-25 Annex B B.2.

1.5 QUALITY ASSURANCE

- A. Qualifications: The persons employed to perform the work of this section and their supervisor shall be personally experienced in sprinkler work and shall have been regularly performing such work for a minimum of 5 years while in the employ of a company or companies engaged in the installation of sprinkler systems. Upon request, furnish to the Owner the names and addresses of five similar projects, which the foregoing people, have worked on during the past 3 years.
- B. Regulatory Requirements: Materials for the work of this section shall be Underwriter's Laboratories listed, and/or Factory Mutual approved.

- C. Certification: NFPA Contractor's Material and Test Certificate.

1.6 MAINTENANCE

- A. Spare Parts: Furnish the following items and deliver to the Owner's Representative for storage in spare sprinkler head cabinets:

1. Spare sprinkler heads of required temperature range as follows:

<u>Quantity</u>	<u>Type</u>
5	standard upright
5	concealed ceiling
1	side wall horizontal
1	dry type

2. One sprinkler head wrench to fit each type sprinkler head listed above.

PART 2 - PRODUCTS

2.1 VALVES AND ACCESSORIES (All Tamper Proof and Monitored)

- A. Gate Valves (175 psig non-shock working pressure)

- 3/4 inch to 2 inch: Bronze body, OS & Y indicating type; double or wedge disc with threaded ends.
- 2-1/2 inch and larger: IBBM, OS & Y indicating type; double or wedge disc with end connections as required to suit the piping system.

- B. Valve Locking Devices

- Chain: 3/16 inch galvanized steel, welded link.
- Padlock: Series 800 by Yale, Eaton Corp., Charlotte, NC: Key all locks alike. Furnish 2 keys for each lock.
- Key Tags: 1-1/2 inch diameter, brass, stamped with valve number and service.
- "S" Hooks: Brass, for securing keys to key tags.

- C. Check Valves: IBBM, single clapper swing check with metal to metal or rubber faced checks, suitable for horizontal and vertical installation; end connections as required to suit the piping system; 175 psig non-shock working pressure. Ball Drip (where shown on Drawings): Brass, automatic; threaded on both ends.

- D. Fire Hose Valve and Cabinet: 2-1/2" Fire Department valve and Crocker 2700 Series cabinet with solid door Style-E. Provide decal "FIRE DEPT. VALVE", finish per Architect. Obtain Local Fire Department approvals for all valves including stairwell valves. Install riser clamps to avoid trip hazard.

- E. Pressure Gauges: Range of 2 times system working pressure at point where installed. Equip with gauge cock and provisions for draining.
- F. Inspector's Test Connection: Cast brass, capped, sprinkler line tester fitting; Elkhart Brass Mfg. Co.'s No. 112, or Seco Mfg., Inc.'s No. 445 or 446.
- G. Dry Valve
 - 1. Reliable Model D with all trim accessories.
 - 2. Provide low air pressure switch and flow switch and connect to fire alarm panel.
 - 3. Air compressor Gast Model 4LCB-21-M450X-20 Gallon, 1/3 H.P., 120/1/60 3.1 CFM @ 40 psi.

2.2 SPRINKLER HEADS AND APPURTENANCES

- A. Sprinkler Heads: Brass or bronze, with standard 1/2 inch orifice, and deflector, as manufactured by Reliable Sprinkler Co., Grinnell, Fire Protection Co., or Elkhart Brass Manufacturing Co.
 - 1. Upright or Pendent Type: (Quick Response) Provide in areas with no ceiling. Deflector designed to distribute water downward in a uniform hemispherical spray pattern. Reliable model GFR.
 - 2. Concealed Type: (Quick Response) Provide in finished areas. All parts of sprinkler body including shank thread mounts above lower plane of finished ceiling, Reliable model G4QR.
 - 3. Sidewall Type: (Quick Response) Equal to Reliable model GFR.
 - 4. Markings: Stamp sprinkler type on deflector in addition to NFPA's color code requirements covering temperature classification.
 - 5. Finish: White.
- B. All sprinkler heads in skylights and boiler rooms shall be high heat type. Contractor may use swing joints to sprinkler heads where applicable.
- C. Spare Sprinkler Head Cabinet: Steel, with hinged cover, constructed of minimum 20 gauge material and fitted with 16 gauge steel racks designed to hold quantities and types of spare sprinkler heads and sprinkler head wrenches. Finish shall be bright red, baked on enamel.

2.3 WATER FLOW ALARM DEVICE

- A. Pressure Type Waterflow Switch - Equal to Reliable's model E having:
 - 1. Corrosion-resistant vane.
 - 2. Splash/dust resistant enclosure with anti-tamper switch.
 - 3. Adjustable pneumatic retard.
 - 4. Screw type wiring terminals.
 - 5. Switch rated minimum 7.0 amps at 125 V ac and 0.25 amps at 125 V dc.

2.4 VALVE SUPERVISORY SWITCHES

- A. Mechanically actuated, designed to close contacts and sound an alarm when supervised valve is closed and when switch cover removed.
 - 1. For Gate Valves: Potter Electric Signal Co.'s OSYSU-A, or Grinnell's F640.
 - 2. For Post Indicator Valves: Potter Electric Signal Co.'s PIVSU-A2, or Potter-Roemer, Inc.'s 6223.

2.5 STEEL PIPE AND FITTINGS

- A. Steel Pipe for Threading: Standard weight, Schedule 40, black or galvanized; ASTM A53 or ASTM A135.
- B. Cast Iron Fittings
 - 1. Drainage Pattern, Threaded: ASME B16.12.
 - 2. Steam Pattern, Threaded: ASME B16.4.
 - a. Standard Weight: Class 125.
 - b. Extra Heavy Weight: Class 250.
 - 3. Flanged Fittings and Threaded Flanges: ASME B16.1.
 - a. Standard Weight: Class 125.
 - b. Extra Heavy: Class 250.
- C. Unions: Malleable iron, 250 lb. class, brass to iron or brass to brass seats.
- D. Couplings: Same material and pressure rating as adjoining pipe, conforming to standards for fittings in such pipe. Use taper tapped threaded type in screwed pipe systems operating in excess of 15 psig.
- E. Nipples: Same material and strength as adjoining pipe, except nipples having a length of less than one inch between threads shall be extra heavy.

2.6 DUCTILE IRON PIPE AND FITTINGS

- A. Water Pipe: Bitumen coated and cement-mortar lined; AWWA C151.
 - 1. 3 and 4 Inch Sizes: Class 51.
 - 2. 6 inch Size and Over: Class 50.
- B. Fittings: Bitumen coated and cement-mortar lined; AWWA C110.

2.7 BOLTED MECHANICAL BRANCH CONNECTION

- A. Victaulic Co.'s "Firelock" rigid coupling.

2.8 JOINING AND SEALANT MATERIALS

- A. Thread Sealant
 - 1. LA-CO Industries' Slic-Tite.
 - 2. Loctite Corp.'s pipe sealant with Teflon.
- B. Joint Packing
 - 1. Oakum: FS A-A-1186.
- C. Gaskets For Use With Ductile Iron Water Pipe: Synthetic rubber rings (molded or tubular): Clow Corp.'s Belltite, Tyler Pipe Industries Inc.'s Ty-Seal, or U.S. Pipe and Foundry Co.'s Tyton.
- D. Flange Gasket Material
 - 1. For Use With Cold Water: 1/16 inch thick rubber.
- E. Gaskets For Use With Grooved End Pipe and Fittings: Type and materials as recommended and furnished by the fitting manufacturer, for the service of piping system in which installed.
- F. Anti-Seize Lubricant: Bostik Inc.'s Never Seez or Dow Corning Corp.'s Molykote 1000.

2.9 PACKING MATERIALS FOR BUILDING CONSTRUCTION PENETRATIONS

- A. Oakum: FS A-A-1186.
- B. Mechanical Modular Seals: Thunderline Corp.'s Link Seal wall and floor seals designed for the service of piping system in which installed.

2.10 PIPE SLEEVES

- A. Type A: Schedule 40 steel pipe.
- B. Type B: No. 16 gauge galvanized sheet steel.
- C. Type C: Schedule 40 steel piping with 1/4 inch steel collar continuously welded to pipe sleeve. Size steel collars as required to span a minimum of one cell or corrugation, on all sides of the rough opening through the metal deck.
- D. Type D: No. 16 gauge galvanized sheet steel with 16 gauge sheet steel metal collar rigidly secured to sleeve. Size metal collars as required to span a minimum of one cell or corrugation, on all sides of the rough opening through the metal deck.

2.11 FLOOR, WALL AND CEILING PLATES

- A. Cast Brass: Polished chrome plated finish, with set screw.
 - 1. Solid Type: Models 5 and 5T by Pegasus Mfg. Inc., Cheshire, CT; and Models 951 - 960 (inclusive) by Bridgeport Plumbing Products, Moutrie, GA.
- B. Cast Iron: Solid type, un-plated, with set screw; Model 395 by Grinnell Corp., Cranston, RI.

2.12 SUPPORTS, HANGERS AND ANCHORS

- A. Pipe hangers, supports anchors, etc. shall be designed and fabricated to comply with NFPA Code No. 13.
- B. Hangers for piping below the roof shall be supported from the roof or the building structural steel. Where hangers cannot be supported directly from the building roof of structural members, any additional steel required to support the hangers shall be furnished and erected. No drilling of or welding to, structural members shall be permitted. All structural attachments shall be beam clamps. Inserts and sleeves for supports shall be provided in concrete where necessary.

2.13 SIGNS

- A. Steel with vitreous enamel finish, lettering on contrasting background to identify and indicate the function of:
 - 1. Control valves.
 - 2. Drain and test valves.
 - 3. Hydraulic Design Nameplate Data: Size approx. 9 x 12 inches, inscribed with the following:
 - a. SPRINKLER SYSTEM HYDRAULICALLY DESIGNED (in block letters).
 - b. Location and area of hydraulically designed section.
 - c. Discharge density over designed area in gallons per minute.
 - d. Residual pressure at base of riser supplying water to designed section.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Unless otherwise shown or specified, install the Work of this section in accordance with NFPA 13, and the item manufacturer's installation instructions.
- B. Before beginning work, Contractor shall obtain all bonds, permits, fees, etc. from all authorities having jurisdiction.

C. Locking Valves

1. Lock gate valves in open position with chain looped through handwheel and around adjacent sprinkler pipe. Secure with padlock.
2. Lock test outlet valve in closed position with padlock.

D. Spare Sprinkler Head Cabinet:

Secure to building wall or other permanent structure in vicinity of main valve controlling sprinkler system, unless otherwise directed.

E. Signs: Install signs identifying the following:

1. Valves: One for each size, type and function.
2. Water Motor Alarm.
3. Hydraulically Designed System.

F. Workmanship

1. All work shall be performed in a practical and workmanlike manner by mechanics skilled in the work they are to do using the best practices of their trade.
2. No work shall be covered or hidden from view until it has been inspected and approved by the Engineer.
3. Any workmanship or materials not meeting with the requirements of the Contract Documents and/or the satisfaction of the Engineer shall be rejected. The Contractor shall immediately replace defective work and materials as required by the Engineer, at no additional cost to the Owner.

G. Cutting and Patching:

Unless otherwise specified, the Contractor shall do all cutting and patching necessary for the installation of work in accordance with Division 1 of Specifications. This cutting and patching shall be done only after having obtained the Engineer's approval as to the location and extent of the cutting.

H. Drain Connections:

Contractor is cautioned to arrange his permanent installation of piping in such a manner to that all or any part of the work may be completely drained. All piping shall be pitched so as to drain to the main drain.

I. As-Built Drawings:

This Contractor shall keep an accurate dimensional record of all mechanical work on marked prints. The Contractor shall furnish one (1) set of as-built drawings at the completion of the project and before final payment shall be made.

3.2 FIELD QUALITY CONTROL

- A. Tests: Unless otherwise shown or specified, perform tests in accordance with NFPA 13.
1. Flushing: In addition to the requirements of the Standard, flush new piping before making final connection to existing systems and before performing hydrostatic test. Flush at rates of flow prescribed in the Contractor's Material and Test Certificate.
 2. After making final connections, flush entire system and assure that debris is removed from piping and there are no stoppages or obstructions in the system.
 3. System Tests
 - a. Test all New Work.
 - b. Notify the Owner's Representative when the work of this section is ready for testing.
 - c. Perform the tests when directed, and in the Owner's Representatives presence.
 4. Furnish Certificate of Approval for completed system to the Owner.

END OF SECTION 220370

SECTION 220420 - SUPPORTS, SLEEVES AND PLATES

PART 1 - GENERAL

Applicable Provisions of the Conditions of the Contract and Division 1 General Requirements govern the work in this section. Submit shop drawings for checking and approval.

1.1 DESCRIPTION OF WORK

- A. This Contractor shall furnish and install all plates, hangers and supports for his piping.
- B. All piping shall be hung or supported from structural members only.

PART 2 - PRODUCTS

2.1 PIPING

- A. All piping shall be supported from building structure in a neat and workmanlike manner wherever possible, parallel runs of horizontal piping shall be grouped together on trapeze hangers. Vertical risers shall be supported at each floor line with steel pipe clamps. Use of wire perforated metal to support pipes will not be permitted. Hanging pipes from other pipes will not be permitted.
- B. Necessary structural members, hangers and supports of approved design to keep piping in proper alignment and prevent transmission of injurious thrusts and vibrations shall be furnished and installed. In all cases where hangers, brackets, etc., are supported from concrete construction, care shall be taken not to weaken concrete or penetrate waterproofing.
- C. All hangers and supports shall be capable of screw adjustment after piping is erected. Hangers supporting piping expanding into loops, bends and offsets shall be secured to the building structure in such a manner that horizontal adjustment perpendicular to the run of piping supported may be made to accommodate displacement due to expansion. All such hangers shall be finally adjusted, both in the vertical and horizontal direction, when the supported piping is hot.
- D. Pipe hangers shall be as manufactured by Grinnell, whose catalog numbers are given herein, or equivalent Carpenter and Paterson, or F&S Mfg. Co.
- E. Piping shall be supported as follows unless otherwise indicated on the Drawings:
 - 1. Piping: 1-1/2 inch and smaller Fig. #260 adjustable clevis hanger. 2 inch and larger Fig. #174 one-rod swivel roll hanger.
 - 2. Two-rod hangers shall be used for piping close to the ceiling slab or where conditions prohibit use of other hanger types.
 - 3. Anchors for hanger rods shall be Phillips "Red Head" self-drilling type. Anchors shall be placed only in vertical surfaces.
 - 4. Spacing of pipe supports shall not exceed 6 feet for pipes up to 1-1/2 inch and 10 feet on all other piping.

5. Hangers shall pass around insulation and a 16 gauge steel protective band, 12 inch long shall be inserted between hangers and insulation.
 6. All piping shall be supported to allow free movement where expanding or contracting. Pipe shall be anchored as required or directed.
 7. All lateral runs of piping shall be securely supported on hangers, rolls, brackets, etc. and in a manner to allow for proper expansion and elimination of vibration.
 8. 2 inch and smaller pipe, where run on walls, shall be supported on wrought iron "J" hook brackets with anchor bolts.
 9. All horizontal pipe, where run overhead or on walls, shall be supported as follows unless otherwise indicated: On adjustable steel clevis type hangers suspended on hanger rods, pipe sizes up to and including 4 inch.
- F. Space limitations in hung ceilings spaces and conditions in other locations may require use of other type of hangers than those specified above. Suitable and approved pipe hangers shall be provided for such job conditions.
- G. All supports shall be fastened to structural members or additional steel supports furnished by this Contractor.
- H. Hanger rods shall be steel, threaded with nuts and lock nuts, sizes in accordance with following schedule:

<u>Pipe Size</u>	<u>Rod Size</u>
3/4" to 2" inclusive	3/8"
2-1/2" and 3" inclusive	1/2"
4" and 5" inclusive	5/8"
6"	3/4"
8" to 12" inclusive	7/8"

- I. Cast iron piping shall be supported at intervals of not more than (5) feet (at each hub) on straight runs.

PART 3 - EXECUTION

3.1 PIPING

- A. Where pipes pass through masonry, concrete walls, foundations, or floors, this Contractor shall set sleeves as are necessary for passage of pipes. These sleeves shall be of sufficient size to permit insulation where required to be provided around pipe passing through. This Contractor shall be responsible for exact location of these sleeves.

- B. Sleeves shall not be used in any portion of building where use of same would impair strength or construction features of the building. Inserts for supporting lateral pipes and equipment shall be placed and secured to form work, and all sleeves inserts locations shall be thoroughly checked with Architect so as not to conflict with other trades.
- C. Where pipes pass through floor or walls, they shall be provided with chromium plated escutcheons.
- D. Anchor horizontal piping where indicated and wherever necessary to localize expansion or prevent undue strain on branches. Anchors shall be heavy forged construction entirely separate from supports.
- E. Anchor vertical piping wherever indicated and wherever necessary to prevent undue strains on offsets and branches. Anchors, unless otherwise noted shall be heavy steel clamps securely bolted and welded to pipes. Extension ends shall bear on building construction.
- F. Auxiliary steel supports that may be required for all mechanical equipment shall be furnished and installed by this Contractor.
- G. All operating equipment including pumps, piping, etc. shall be supported so as to produce minimum amount of noise transmission.

END OF SECTION 220420

SECTION 220430 - INSULATION

PART 1 - GENERAL

Applicable Provisions of the Conditions of the Contract and Division 1 General Requirements govern the work in this section. Submit shop drawings for checking and approval.

1.1 DESCRIPTION OF WORK

- A. The work under this section shall consist of furnishing all labor, materials, equipment and appliances necessary and required to completely do all insulation work as required by the Drawings and as specified herein including but not limited to the following: Insulation, covering, bands, tie wire.

PART 2 - PRODUCTS

2.1 INSULATION

- A. The materials as specified have been selected from the catalogs of Owens-Corning Fiberglass Corp. and Johns-Manville Sales Corporation and are representative of the quality, design and finish desired. Insulation as manufactured by Gustin Bacon Co., or other approved manufacturer may be submitted for approval provided the product meets fully in all respects (such as density, moisture absorption, alkalinity, thermal-conductivity, jackets) to the materials as delineated below.
- B. All insulation shall be UL rated non-combustible type classified flame spread-25, smoke-developed-50.

2.2 PIPING, FITTINGS AND VALVES

- A. All insulation thickness shall be in accordance with the latest edition of the New York State Energy Conservation Construction Code.
- B. Minimum pipe insulation shall be:
 - 1. Hot water piping up to 1-1/4" - 1" insulation and piping 1-1/2" and larger - 1-1/2" insulation.
 - 2. Cold water piping up to 1-1/2" - 1/2" insulation and piping 1-1/2" and larger - 1" insulation.
- C. Domestic cold, hot water hot water return indirect waste, storm and piping aboveground. All piping shall be insulated with sectional glass fiber insulation, Owens-Corning 2 piece ASJ/SSL. Joints between sections shall be sealed with factory supplied 3 inch wide sealing strips. Sealing by means of Owens Corning self-sealing lap will also be acceptable. Install (anti-sweat) vapor barriers on all cold water piping.
- D. Domestic hot and cold water valves and fittings - Fittings, valves, etc. shall be insulated with flexible blanket insulation compressed to 1/2 its thickness, tied on with jute twine over which shall be applied a flood coat of Insul-Coustic IC-102 and 10-20 open weave glass cloth. Glass cloth to be finished within additional coat of IC-102. Insulation blanket shall be Owens-Corning wrap.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. All insulation on pipes running through walls, floors, partitions and beams shall be continuous through sleeves and openings.
- B. Insulation shall be installed only after all tests of the piping system have been completed.
- C. All insulation shall fit snugly.
- D. All surfaces shall be clean and dry when insulation is applied.
- E. Longitudinal joints shall be on least conspicuous side off the pipe.
- F. Valves shall be insulated up to the packing unit.
- G. As specified hereinbefore, all horizontal runs of piping will be supported on adjustable clevis or group trapeze type hangers. Pipe hangers will be installed outside of the insulation. Where hangers occur, prefabricated insulation protective saddles shall be "Insul-Shield-Multi-Purpose-Saddle" as manufactured by Insul-Coustic Corp. or approved equal.
- H. Hot and cold water branch piping extending through slab or knockout panels to serve equipment shall be insulated to a point 4 inch above the top of sleeve provided for pipe.
- I. The use of staples shall not be permitted.
- J. It is the intent of this Specification that all vapor barriers be continuous throughout. Reinstate existing piping at point of new pipe connections.

END OF SECTION 220430

SECTION 220470 - TESTS AND ADJUSTMENTS

PART 1 - GENERAL

Applicable Provisions of the Conditions of the Contract and Division 1 General Requirements govern the work in this section.

1.1 TESTS AND ADJUSTMENTS

- A. The Contractor shall, at his own expense, during the progress of the work or upon its completion as ordered make such tests as are specified or as required by and in the presence of the Architects, Building Inspectors, etc. At least 48 hours' notice shall be given in advance of all tests.
- B. The Contractors shall provide all apparatus, temporary work or other requirements necessary for all tests. He shall take all due precautions to prevent damage to the building, its contents or the work of the other Contractors, that may be incurred by all tests. This Contractors shall also be responsible for the work of other Contractors that may be damaged or disturbed by the tests or the repair or replacement of his work, and he shall without extra charges, restore to its original condition, any work of other Contractors to do the work of restoration.
- C. Tests on the various systems may be conducted in sections as the work progresses or when the systems are completed.
- D. No caulking of pipe joints to remedy leaks will be permitted except where joints are made with lead and oakum.
- E. Each section of the sanitary, storm and vent piping tested shall have all openings tightly closed with screw plugs, or equal device. The drainage and vent systems shall be filled with water and proven tight under a 10'-0" head for a minimum of four (4) hours. Water level must remain constant through test without adding water.
- F. Upon final completion of the sanitary systems and when all fixtures and appurtenances have been set and the systems are in complete working order, all traps in the systems shall be filled with water and a thick penetrating smoke shall be introduced into the entire system.
- G. As smoke appears at the stack openings on the roof, such openings on the roof shall be tightly closed and a pressure equivalent to 1-1/2 inch of water shall be maintained during the test. Oils of peppermint shall be added at the smoke making machines so that any leakage is readily discernible.
- H. Before any covering is applied to the domestic water piping systems, the entire domestic water piping systems shall be hydrostatically tested for eight (8) hours to a hydraulic pressure of 125 psig.
- I. At the completion of the test, Contractor shall furnish the Owner with one (1) copy of test certificates as issued by the insurance company.

- J. Adjustments: Tests and adjustments shall be repeated as often as necessary until the systems are tight and are to the entire satisfaction of the Plumbing Inspector, Engineers and any other authorities having jurisdiction.
1. Contractor is to thoroughly instruct the building custodian in the proper care and operation of the entire system. Contractor shall prepare for use by custodian, detailed brochures of instructions in non-technical terms, describing the maintenance and operation of all fixtures, apparatus, valves, controls etc. furnished by him.
 2. Should any part of the work performed under this Contract fail to function because of cracked piping, obstructions, debris in piping, leaks in piping or any other cause, this Contractor shall disconnect, clean and reconstruct the work at his own expense and pay for any damages to adjoining work.
 3. Water flow is to be balanced and adjusted to all flush valves, faucets, etc.
 4. All parts of the plumbing system are to be thoroughly flushed until cleared of all grease and sediment and all dirt pockets cleaned. Repeat as often as necessary, open all cleanouts and reset in graphite.
 5. All new motors shall be oiled as required.
 6. All new valves are to have stuffing boxes packed and adjusted.

END OF SECTION 220470

SECTION 220480 - TAGS, CHARTS AND IDENTIFICATION

PART 1 - GENERAL

Applicable Provisions of the Conditions of the Contract and Division 1 General Requirements govern the work in this section. Submit shop drawings for checking and approval.

1.1 TAGS, CHARTS AND IDENTIFICATION

- A. Every valve installed under this Contract shall be tagged or labeled as follows: Tag shall be etched brass securely fastened to valve handwheels with heavy brass "S" hooks, soldered closed. At lock shield and similar type valves, tags for same shall be securely wired to valve body.
- B. Charts shall be provided for each piping system, as approved and shall consist of schematic diagrams of piping layouts showing and identifying each valve and piece of equipment etc., and its use. Upon completion one (1) copy of diagrams and valve charts suitably framed under glass, shall be furnished and mounted where directed. One (1) copy of diagrams and valve charts shall be delivered to Owner.
- C. This Contractor shall provide on all piping, semi-rigid, wrap around plastic identification markers equal to Seton Snap-Around and/or Seton Strap-On pipe markers.
- D. Each marker background is to be appropriately color coded with a clearly printed legend to identify the contents of the pipe. Directions of flow arrows are to be included on each marker.
- E. Identification of all piping shall be adjacent to each valve, at each pipe passage through wall, floor and ceiling construction and at each branch and riser take-off.
- F. Identification shall be on all horizontal pipe runs, marked every 15 ft. as well as at each inlet outlet of equipment at changes in direction.

END OF SECTION 220480

SECTION 220490 - GUARANTEE

PART 1 - GENERAL

Applicable Provisions of the Conditions of the Contract and Division 1 General Requirements govern the work in this section.

1.1 GUARANTEE

- A. The Contractor shall remove, replace and/or repair at his own expense and at the convenience of the Owner, any defects in workmanship, materials, ratings, capacities and/or characteristics occurring in the work within one (1) year or within such longer period as may be provided in the Drawings and/or Section of the Specifications, which guarantee period shall commence with the final acceptance of the entire Contract in accordance with provisions stated in the General Conditions, and the Contractor shall pay for all damage to the system resulting from defects in the work and all expenses necessary to remove, replace and/or repair and any other work which may be damaged in removing, replacing and/or repairing the work.

END OF SECTION 220490

SECTION 230100 - GENERAL CONDITIONS

PART 1 - GENERAL

Applicable Provisions of the Conditions of the Contract and Division 1 General Requirements govern work in this section.

1.1 GENERAL CONDITIONS

- A. Before submitting a proposal, Bidders shall examine all related to this work and shall become fully informed as to the extent and character of the work required and its relation to the other work in the building.
- B. Before commencing work, the Contractor will examine all conditions of the project upon which his work is in any way dependent for perfect workmanship according to the intent of this Specification. No "waiver of responsibility" for incomplete, inadequate or defective adjoining work will be considered unless notice has been filed by this Contractor and acceded to by the Owner's representative in writing before the Contractor begins any part of the work.
- C. The Contractor will pay for all licenses, permits and inspection fees required by civil authorities having jurisdiction. Comply with all laws, ordinances, regulations, and fire underwriter's requirements applicable to work herein specified without additional expense to the Owner.
- D. Small scale drilling through walls and floors or cutting of piping insulation which may contain asbestos shall be performed by a person with a "restricted asbestos handler allied trades certificate" and shall have a copy of it in his possession at all times while working of the project. This shall also apply to removal of piping, ductwork, or equipment insulation.
- E. It is specifically intended that anything (whether material or labor), which is usually furnished as a part of such equipment, as is hereinafter called for (and which is necessary for the completion and proper operation) shall be furnished as part of this Contract without additional cost the Owner, whether or not shown in detail or described in the Specifications.
- F. When Drawings and Specifications conflict or there is a question as to the proper intent of this Contract, the Contractor shall assume the greater quantity, the higher quality and/or the more expensive method in his pricing. All questions shall be directed to the Architect/Engineer in writing only and only up to ten (10) days prior to bidding.
- G. The Drawings indicate the general runs of the piping, ductwork, etc. systems and the location of equipment and apparatus, however it shall be understood that the right is reserved by the Architect/Engineer to change the location of piping work, ductwork, equipment and apparatus to a reasonable extent as building conditions may dictate, prior to their installation without extra cost to the Owner.

- H. All components supplied by this Contractor shall be UL listed and/or ETL labeled and shall conform to ASHRAE Standard 15.
- I. Any changes from the Drawings and Specifications and any interpretation thereof shall have the prior approval of the Architect/Engineer. The Contractor shall submit in writing, at the time of signing the Contract, any items of necessary labor and materials, which, in his opinion, are lacking in requirements of the Drawings and Specifications to insure a complete job in all respects. No consideration will be granted to alleged misunderstanding of materials to be furnished, work to be done, or conditions to be complied with, it being understood that the tender of a proposal carries with it the agreement to all items and conditions referred to herein, or indicated on the accompanying Drawings.

END OF SECTION 230100

SECTION 230110 - SCOPE OF WORK

PART 1 - GENERAL

Applicable Provisions of the Conditions of the Contract and Division 1 General Requirements govern work in this section.

1.1 SCOPE OF WORK

- A. The work under this section includes all labor, materials, equipment, tools, transportation, and the performance of all work necessary and required for the furnishing and installation complete of all work as shown on the Contract Documents, including but not necessarily limited to the following:
1. Hot water heating boilers with combination gas/oil burners.
 2. Exhaust, supply fans and related appurtenances.
 3. Rooftop HVAC units and related appurtenances.
 4. Roof mounted condensing units.
 5. Air handling units and related appurtenances.
 6. All required piping, valves, and related specialties.
 7. Variable frequency drives.
 8. Duct mounted VAV boxes, VAV boxes with reheat and reheat coils.
 9. Ceiling fin-tube radiation, convectors and cabinet, unit heaters.
 10. Sheetmetal ductwork and related accessories.
 11. Duct and pipe insulation.
 12. Registers, diffusers, and dampers.
 13. Rigging of equipment.
 14. Furnish all combination motor starter/disconnects for equipment (with the exception of starters and electric items already mounted on equipment or equipment not requiring same). Fan motor starter/disconnects shall have contacts for ATC connection and a terminal block connection for Fire Alarm fan shutdown. Starters per manufacturers recommendations. Underwriters inspection and certificate required. Coordinate with Electrical Contractor.
 15. Air and Water Balancing.

16. Automatic temperature controls with complete wiring (regardless of voltage).
17. Testing, adjusting and start-up of equipment.
18. Painting and identification of all equipment and piping.
19. Firestopping per NFPA requirements (UL approved systems).
20. Operating and maintenance instructions.
21. As-Built Drawings - Refer to Division 1.
22. Cutting and Patching - Refer to Division 1.
23. Excavation and Backfill - Refer to Division 2.

- B. Coordination Drawings (if applicable): Attention is directed to Division 1 for coordination drawing requirements for this project. These drawings are critical to the proper execution of the work and failure to honor these requirements may become the basis for denial of any and all claims for either or both "time" and "money".

1.2 REMOVALS

- A. Removals should be coordinated with other trades affected.
- B. Piping which penetrates the construction may be cut and capped provided capping is done beneath the finished surfaces so that construction over it can be achieved.
- C. All removals shall be removed from the site.

1.3 ALTERATION WORK

- A. All equipment, piping, control components, etc. to be removed, shall be disposed of or salvaged as directed by the Owner. They shall not be removed from the premises without the Owner's approval.
- B. All piping to be removed shall be properly plugged or capped so that upon completion of all new work, all abandoned piping shall be concealed in finished areas.
- C. No dead ends shall be left on any piping upon completion of job. The existing system shall be left in perfect working order upon completion of new work.
- D. Location and sizes of existing piping, ductwork, equipment, etc. are approximate. Exact sizes and locations of all existing work shall be verified on the job.

END OF SECTION 230110

SECTION 230175 - FUEL OIL PIPING

PART 1 - GENERAL

Applicable Provisions of the Conditions of the Contract and Division 1 General Requirements govern work in this section. Submit shop drawings for checking and approval.

1.1 SUMMARY

A. Section Includes:

1. Fuel-oil pipes, tubes, and fittings.
2. Double-containment piping and fittings.
3. Piping specialties.
4. Joining materials.
5. Specialty valves.
6. Mechanical leak-detection valves.
7. Labels and identification.

1.2 DEFINITIONS

- A. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- B. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- C. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

1.3 ACTION SUBMITTALS

A. Product Data - For each type of product.

1. Include construction details, material descriptions, and dimensions of individual components and profiles.
2. Include, where applicable, rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
3. For valves, include pressure rating, capacity, settings, and electrical connection data of selected models.

B. Shop Drawings - For fuel-oil piping.

1. Include plans, elevations sections, hangers, and supports for multiple pipes.
2. Include details of location of anchors, alignment guides, and expansion joints and loops.
3. Scale: 1/4 inch per foot.

- C. Delegated-Design Submittal: For fuel-oil piping indicated to comply with performance requirements and design criteria.
 - 1. Include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 2. Detail fabrication and assembly of anchors and seismic restraints.
 - 3. Design Calculations: Calculate requirements for selecting seismic restraints.
 - 4. Detail fabrication and assembly of pipe anchors, hangers, supports for multiple pipes, and attachments of the same to building structure.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings
 - 1. Plans and details, drawn to scale, on which fuel-oil piping is shown and coordinated with other installations, using input from installers of the items involved.
 - 2. Site Survey: Plans, drawn to scale, on which fuel-oil piping and tanks are shown and coordinated with other services and utilities.
- B. Brazing certificates.
- C. Welding certificates.
- D. Field quality-control reports.
- E. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fuel-oil equipment and accessories to include in emergency, operation, and maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1.7 QUALITY ASSURANCE

- A. Brazing: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX.
- B. Steel Support Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- C. Pipe Welding Qualifications: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Lift and support fuel-oil storage tanks only at designated lifting or supporting points, as shown on Shop Drawings. Do not move or lift tanks unless empty.
- B. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.
- C. Store pipes and tubes with protective PE coating to avoid damaging the coating and to protect from direct sunlight.
- D. Store PE pipes and valves protected from direct sunlight.

1.9 FIELD CONDITIONS

- A. Interruption of Existing Fuel-Oil Service: Do not interrupt fuel-oil service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary fuel-oil supply according to requirements indicated:
 - 1. Notify Architect/ Owner no fewer than two days in advance of proposed interruption of fuel-oil service.
 - 2. Do not proceed with interruption of fuel-oil service without Architect/Owner written permission.

1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of flexible, double-containment piping and related equipment that fail in materials or workmanship within specified warranty period.
 - 1. Failures due to defective materials or workmanship for materials including piping, dispenser sumps, water-tight sump entry boots, terminations, and other end fittings.
 - 2. Warranty Period for Below Ground Installation: 30 years from date of Substantial Completion.
 - 3. Warranty Period for Above Ground Installation: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with ASME B31.9, "Building Services Piping," for fuel-oil piping materials, installation, testing, and inspecting.

- C. Fuel-Oil Valves: Comply with UL 842 and have service mark initials "WOG" permanently marked on valve body.
- D. Comply with requirements of the EPA and of state and local authorities having jurisdiction. Include recording of fuel-oil piping.

2.2 PERFORMANCE REQUIREMENTS

- A. Maximum Operating-Pressure Ratings: 3-psig fuel-oil supply pressure at oil-fired appliances.

2.3 FUEL-OIL PIPES, TUBES AND FITTINGS

- A. See "Outdoor Piping Installation" and "Indoor Piping Installation" articles for where pipes, tubes, fittings, and joining materials are applied in various services.
- B. Steel Pipe: ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.
 - 1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.
Wrought-Steel Welding Fittings: ASTM A 234/A 234M, for butt and socket welding.
 - 2. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.
 - 3. Forged-Steel Flanges and Flanged Fittings: ASME B16.5, minimum Class 150, including bolts, nuts, and gaskets of the following material group, end connections, and facings:
 - a. Material Group: 1.1.
 - b. End Connections: Threaded or butt welding to match pipe.
 - c. Lapped Face: Not permitted underground.
 - d. Gasket Materials: Asbestos free, ASME B16.20 metallic, or ASME B16.21 nonmetallic, gaskets compatible with fuel oil.
 - e. Bolts and Nuts: ASME B18.2.1, cadmium-plated steel.
 - 4. Protective Coating for Underground Piping: Factory-applied, three-layer coating of epoxy, adhesive, and PE.
 - a. Joint Cover Kits: Epoxy paint, adhesive, and heat-shrink PE sleeves.
- C. Drawn-Temper Copper Tube: Comply with ASTM B 88, Type K.
 - 1. Copper Fittings: ASME B16.22, wrought copper, streamlined pattern.
 - 2. Bronze Flanges and Flanged Fittings: ASME B16.24, Class 150.
 - a. Gasket Material: Asbestos free, ASME B16.20 metallic or ASME B16.21 nonmetallic, gaskets compatible with fuel oil.
 - b. Bolts and Nuts: ASME B18.2.1, cadmium-plated steel.

D. Annealed-Temper Copper Tube: Comply with ASTM B 88, Type K

1. Copper Fittings: ASME B16.22, wrought copper, streamlined pattern.
2. Flare Fittings: Comply with ASME B16.26 and SAE J513.
 - a. Copper fittings with long nuts.
 - b. Metal-to-metal compression seal without gasket.
 - c. Dry-seal threads complying with ASME B1.20.3.

2.4 DOUBLE-CONTAINMENT PIPE AND FITTINGS

A. Flexible, Nonmetallic, Double-Containment Piping: Comply with UL 971.

1. Manufacturers subject to compliance with requirements, provide products by the following:
 - a. OPW Fueling Components; Dover Company.
2. Pipe Materials: PVDF complying with ASTM D 3222 for carrier pipe with mechanical couplings to seal carrier, and PE pipe complying with ASTM D 4976 for containment piping.
3. Fiberglass or PE sumps.
4. Watertight sump entry boots, pipe adapters with test ports and tubes, coaxial fittings, and couplings.
5. Minimum Operating Pressure Rating: 10 psig.
6. Plastic to Steel Pipe Transition Fittings: Factory-fabricated fittings with plastic end matching or compatible with carrier piping, and steel pipe end complying with ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.
7. Include design and fabrication of double-containment pipe and fitting assemblies with provision for field installation of cable leak-detection system in annular space between carrier and containment piping.

B. Flexible, Metallic, Double-Containment Piping: Comply with UL 971A.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Omega Flex, Inc.; Double-Trac or comparable product by the following:
 - a. OPW Fueling Components; Dover Company.
2. Pipe Materials: Stainless steel carrier pipe with nylon secondary containment with mechanical couplings to seal carrier.
3. Fiberglass or PE sumps.
4. Watertight sump entry boots, pipe adapters with test ports and tubes, coaxial fittings, and couplings.
5. Minimum Operating Pressure Rating: 50 psig.

C. Rigid, Double-Containment Piping: Comply with UL 971.

1. Manufacturers subject to compliance with requirements, provide products by the following:
 - a. Ameron; a National Oilwell Varco brand.
 - b. Conley Corporation.
 - c. Perma-Pipe, Inc.
 - d. Smith Fiberglass; a National Oilwell Varco brand.
 - e. Tricon Piping Systems, Inc.
2. RTRP: ASTM D 2996 or ASTM D 2997 carrier and containment piping and mechanical couplings to seal carrier and containment piping or individually bonded joints.
 - a. Minimum Operating-Pressure Rating for RTRP NPS 2 and NPS 3: 150 psig.
 - b. Minimum Operating-Pressure Rating for RTRP NPS 4 and NPS 6: 125 psig. Compliance with UL 971 is not required for NPS 6 and larger piping.
 - c. Fittings: RTRF complying with ASTM D 2996 or ASTM D 2997 and made by RTRP manufacturer; watertight sump entry boots, termination, or other end fittings.
3. Leak-Detection System: Include design and fabrication of double-containment pipe and fitting assemblies with provision for field installation of cable leak-detection system in annular space between carrier and containment piping.

2.5 PIPING SPECIALTIES

A. Metallic Flexible Connectors

1. Manufacturers subject to compliance with requirements, provide products by the following:
 - a. American Flexible Hose Co., Inc.
 - b. Flexicraft Industries.
 - c. FLEX-ING, Inc.
 - d. Hose Master, Inc.
 - e. Metraflex Company (The).
 - f. Omega Flex, Inc.
 - g. Proco Products, Inc.
 - h. Tru-Flex Metal Hose Corp.
 - i. Unaflex.
2. Listed and labeled for aboveground and underground applications by an NRTL acceptable to authorities having jurisdiction.

3. Stainless-steel bellows with woven, flexible, bronze or stainless-steel, wire-reinforcing protective jacket.
4. Minimum Operating Pressure: 150 psig.
5. End Connections: Socket, flanged, or threaded end to match connected piping.
6. Maximum Length: 30 inches.
7. Swivel end, 50-psig maximum operating pressure.
8. Factory-furnished anode for connection to cathodic protection.

B. Nonmetallic Flexible Connectors

1. Manufacturers subject to compliance with requirements, provide products by the following:
 - a. American Flexible Hose Co., Inc.
 - b. Flexicraft Industries.
 - c. FLEX-ING, Inc.
 - d. Tru-Flex Metal Hose Corp.
2. Listed and labeled for underground applications by an NRTL acceptable to authorities having jurisdiction.
3. PTFE bellows with woven, flexible, bronze or stainless-steel, wire-reinforcing protective jacket.
4. Minimum Operating Pressure: 150 psig.
5. End Connections: Socket, flanged, or threaded end to match connected piping.
6. Maximum Length: 30 inches.
7. Swivel end, 50-psig maximum operating pressure.
8. Factory-furnished anode.

C. Y-Pattern Strainers

1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.
3. Strainer Screen: 60-mesh startup strainer and perforated stainless-steel basket with 50 percent free area.
4. CWP Rating: 125 psig.

D. Basket Strainers

1. Body: ASTM A 126, Class B, high-tensile cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.
3. Strainer Screen: 60-mesh startup strainer and perforated stainless-steel basket with 50 percent free area.
4. CWP Rating: 125 psig.

E. T-Pattern Strainers

1. Body: Ductile or malleable iron with removable access coupling and end cap for strainer maintenance.
2. End Connections: Grooved ends.
3. Strainer Screen: 60-mesh startup strainer and perforated stainless-steel basket with 57 percent free area.
4. CWP Rating: 750 psig.

F. Manual Air Vents

1. Body: Bronze.
2. Internal Parts: Nonferrous.
3. Operator: Screwdriver or thumbscrew.
4. Inlet Connection: NPS 1/2.
5. Discharge Connection: NPS 1/8.
6. CWP Rating: 150 psig.
7. Maximum Operating Temperature: 225 deg F.

2.6 JOINING MATERIALS

- A. Joint Compound and Tape for Threaded Joints: Suitable for fuel oil.
- B. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- C. Brazing Filler Metals: Alloy with melting point greater than 1000 deg F complying with AWS A5.8/A5.8M. Brazing alloys containing more than 0.05 percent phosphorus are prohibited.
- D. Bonding Adhesive for RTRP and RTRF: As recommended by piping and fitting manufacturer.

2.7 SPECIALTY VALVES

A. Pressure Relief Valves

1. Manufacturers subject to compliance with requirements, provide products by the following:
 - a. Anderson Greenwood; Pentair, Ltd.
 - b. Fulflo Specialties, Inc.
 - c. OPW Engineered Systems; OPW Fluid Transfer Group; a Dover company.
 - d. Webster Fuel Pumps & Valves; a division of Capital City Tool, Inc.
2. Listed and labeled for fuel-oil service by an NRTL acceptable to authorities having jurisdiction.
3. Body: Brass, bronze, or cast steel.
4. Springs: Stainless steel, interchangeable.

5. Seat and Seal: Nitrile rubber.
6. Orifice: Stainless steel, interchangeable.
7. Factory-Applied Finish: Baked enamel.
8. Maximum Inlet Pressure: 150 psig.
9. Relief Pressure Setting: 60 psig.

B. Oil Safety Valves

1. Manufacturers subject to compliance with requirements, provide products by the following:
 - a. Anderson Greenwood; Pentair, Ltd.
 - b. Fulflo Specialties, Inc.
 - c. OPW Engineered Systems; OPW Fluid Transfer Group; a Dover company.
 - d. Webster Fuel Pumps & Valves; a division of Capital City Tool, Inc.
2. Listed and labeled for fuel-oil service by an NRTL acceptable to authorities having jurisdiction.
3. Body: Brass, bronze, or cast steel.
4. Springs: Stainless steel.
5. Seat and Diaphragm: Nitrile rubber.
6. Orifice: Stainless steel, interchangeable.
7. Factory-Applied Finish: Baked enamel.
8. Manual override port.
9. Maximum Inlet Pressure: 60 psig.
10. Maximum Outlet Pressure: 3 psig.

C. Emergency Shutoff Valves

1. Manufacturers subject to compliance with requirements, provide products by the following:
 - a. EMCO Wheaton.
 - b. Franklin Fueling Systems.
 - c. OPW Engineered Systems; OPW Fluid Transfer Group; a Dover company.
2. Listed and labeled for fuel-oil service by an NRTL acceptable to authorities having jurisdiction.
3. Single poppet valve.
4. Body: ASTM A 126, cast iron.
5. Disk: FPM.
6. Poppet Spring: Stainless steel.
7. Stem: Plated brass.
8. O-Ring: FPM.
9. Packing Nut: PTFE-coated brass.
10. Fusible link to close valve at 165 deg F.
11. Thermal relief to vent line pressure buildup due to fire.
12. Air test port.
13. Maximum Operating Pressure: 0.5 psig.

2.8 MECHANICAL LEAK-DETECTION VALVES

- A. Manufacturers subject to compliance with requirements, provide products by the following:
 - 1. Franklin Fueling Systems.
 - 2. Red Jacket Pumps.
- B. Listed and labeled for fuel-oil service by an NRTL acceptable to authorities having jurisdiction.
- C. Body: ASTM A 126, cast iron.
- D. O-Rings: Elastomeric compatible with fuel oil.
- E. Piston and Stem Seals: PTFE.
- F. Stem and Spring: Stainless steel.
- G. Piston Cylinder: Burnished brass.
- H. Indicated Leak Rate: Maximum 3 gph at 10 psig.
- I. Leak Indication: Reduced flow.

2.9 LEAK-DETECTION AND MONITORING SYSTEM

- A. Cable and Sensor System: Comply with UL 1238.
 - 1. Manufacturers subject to compliance with requirements, provide products by the following:
 - a. Omntec Inc. (District/owner preferred vender)
 - b. Containment Solutions, Inc.
 - c. Highland Tank & Manufacturing Company, Inc.
 - d. MSA Instrument Division.
 - e. Pneumercator Inc.
 - f. Veeder-Root Company (The).
 - 2. Calibrated leak-detection and monitoring system with probes and other sensors and remote alarm panel for fuel-oil piping.
 - 3. Include fittings and devices required for testing.

2.10 LABELS AND IDENTIFICATION

- A. Detectable Warning Tape: Acid and alkali-resistant PE film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored yellow.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas for compliance with requirements for installation tolerances and other conditions affecting performance of fuel-oil piping.
- B. Examine installation of fuel-burning equipment and fuel-handling and storage equipment to verify actual locations of piping connections before installing fuel-oil piping.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 EARTHWORK

- A. Comply with requirements in Division 1 and 2 for excavating, trenching, and backfilling.

3.3 PREPARATION

- A. Close equipment shutoff valves before turning off fuel oil to premises or piping section.
- B. Comply with NFPA 30 and NFPA 31 requirements for prevention of accidental ignition.

3.4 OUTDOOR PIPING INSTALLATION

- A. Install Underground Fuel-Oil Piping Buried
 - 1. Under Compacted Backfill: 18 inches below finished grade.
 - 2. Under Asphalt 2 Inches Thick: 8 inches below bottom of asphalt.
 - 3. Under 4 Inches of Reinforced Concrete in Areas Subject to Vehicle Traffic: 4 inches below bottom of concrete.
 - 4. If fuel-oil piping is installed with less than 12 inches of cover to finished grade, install in containment piping.
 - 5. Comply with requirements in Divisions 1 and 2 for excavating, trenching, and backfilling.
- B. Steel Piping with Protective Coating
 - 1. Apply joint cover kits to pipe after joining, to cover, seal, and protect joints.
 - 2. Repair damage to PE coating on pipe as recommended in writing by protective coating manufacturer. Review protective coating damage with Architect prior to repair.
 - 3. Replace pipe having damaged PE coating with new pipe.
- C. Install double-containment, fuel-oil pipe at a minimum slope of 1 percent downward toward fuel-oil storage tank sump.
- D. Install vent pipe at a minimum slope of 2 percent downward toward fuel-oil storage tank sump.

- E. Assemble and install entry boots for pipe penetrations through sump sidewalls for liquid-tight joints.
- F. Install metal pipes and tubes, fittings, valves, and flexible connectors at piping connections to AST and UST.
- G. Install fittings for changes in direction in rigid pipe.
- H. Install system components with pressure rating equal to or greater than system operating pressure.

3.5 INDOOR PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- B. Arrange for pipe spaces, chases, slots, sleeves, and openings in building structure during progress of construction to allow for mechanical installations.
- C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings at a height that allows sufficient space for ceiling panel removal.
- F. Install piping free of sags and bends.
- G. Install fittings for changes in direction and branch connections.
- H. Comply with requirements for equipment specifications for roughing-in requirements.
- I. Conceal pipe installations in walls, pipe spaces, or utility spaces; above ceilings; below grade or floors; and in floor channels unless indicated to be exposed to view.
- J. Prohibited Locations
 - 1. Do not install fuel-oil piping in or through HVAC ducts and plenums, clothes or trash chutes, chimneys, or gas vents (flues), ventilating ducts, or dumbwaiter or elevator shafts.
 - 2. Do not install fuel-oil piping in solid walls or partitions.
- K. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.

- L. Connect branch piping from top or side of horizontal piping.
- M. Install unions in pipes NPS 2 and smaller at final connection to each piece of equipment and elsewhere as indicated. Unions are not required on flanged devices.
- N. Do not use fuel-oil piping as grounding electrode.
- O. Install sleeves and sleeve seals for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230420 "Supports Sleeves and Plates."
- P. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230420 "Supports Sleeves and Plates."

3.6 VALVE INSTALLATION

- A. Install manual fuel-oil shutoff valves on branch connections to fuel-oil appliance.
- B. Install valves in accessible locations.
- C. Install oil safety valves at inlet of each oil-fired appliance.
- D. Install pressure relief valves in distribution piping between the supply and return lines.
- E. Install one-piece, bronze ball valve with hose end connection at low points in fuel-oil piping.
- F. Install manual air vents at high points in fuel-oil piping.
- G. Install emergency shutoff valves at dispensers.

3.7 PIPING JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

- D. Welded Joints: Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators according to "Quality Assurance" Article.
 - 1. Bevel plain ends of steel pipe.
 - 2. Patch factory-applied protective coating as recommended by manufacturer at field welds and where damage to coating occurs during construction.
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tubing" Chapter.
- F. Flanged Joints: Install gasket material, size, type, and thickness for service application. Install gasket concentrically positioned.
- G. Flared Joints: Comply with SAE J513. Tighten finger tight then use wrench according to fitting manufacturer's written instructions. Do not overtighten.
- H. Fiberglass-Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to pipe manufacturer's written instructions.

3.8 HANGER AND SUPPORT INSTALLATION

- A. Pipe hanger and support and equipment support materials and installation requirements are specified in Section 230420 " Supports Sleeves and Plates."
- B. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:
 - 1. NPS 1-1/4 and Smaller: Maximum span, 84 inches; minimum rod size, 3/8 inch.
 - 2. NPS 1-1/2: Maximum span, 108 inches; minimum rod size, 3/8 inch.
 - 3. NPS 2: Maximum span, 10 feet; minimum rod size, 3/8 inch.
 - 4. NPS 2-1/2: Maximum span, 11 feet; minimum rod size, 1/2 inch.
 - 5. NPS 3: Maximum span, 12 feet; minimum rod size, 1/2 inch.
 - 6. NPS 4: Maximum span, 13 feet; minimum rod size, 5/8 inch.
- C. Support vertical steel pipe at each floor and at spacing not greater than 15 feet.
- D. Install hangers for horizontal, drawn-temper copper tubing with the following maximum spacing and minimum rod sizes:
 - 1. NPS 3/4 and Smaller: Maximum span, 60 inches; minimum rod size, 3/8 inch.
 - 2. NPS 1: Maximum span, 72 inches; minimum rod size, 3/8 inch.
 - 3. NPS 1-1/4: Maximum span, 84 inches; minimum rod size, 3/8 inch.
 - 4. NPS 1-1/2 and NPS 2: Maximum span, 96 inches; minimum rod size, 3/8 inch.
 - 5. NPS 2-1/2: Maximum span, 108 inches; minimum rod size, 1/2 inch.
 - 6. NPS 3: Maximum span, 10 feet; minimum rod size, 1/2 inch.
 - 7. NPS 4: Maximum span, 11 feet; minimum rod size, 5/8 inch.
- E. Support vertical copper tube at each floor and at spacing not greater than 10 feet.

3.9 LEAK-DETECTION AND MONITORING SYSTEM INSTALLATION

- A. Install leak-detection and monitoring system. Install alarm panel inside building where indicated.
- B. Double-Containment, Fuel-Oil Piping: Install leak-detection sensor probes at low points in piping.

3.10 CONNECTIONS

- A. Where installing piping adjacent to equipment, allow space for service and maintenance.
- B. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment having threaded pipe connection.
- C. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment having flanged pipe connection.
- D. Connect piping to equipment with shutoff valve and union. Install union between valve and equipment.
- E. Install flexible piping connectors at final connection to burners or oil-fired appliances.

3.11 LABELING AND IDENTIFYING

- A. Nameplates, pipe identification, valve tags, and signs are specified in Section 230480 "General labeling, valve charts and piping identification."
- B. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplates and signs on or near each service regulator, service meter, and earthquake valve.
 - 1. Text: In addition to identifying unit, distinguish between multiple units; inform operator of operational requirements; indicate safety and emergency precautions; and warn of hazards and improper operations.
- C. Install detectable warning tape directly above fuel-oil piping, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs. Terminate tracer wire in an accessible area and identify as "tracer wire" for future use with plastic-laminate sign.
 - 1. Piping: Over underground fuel-oil distribution piping.

3.12 FIELD QUALITY CONTROL

- A. Pressure Test Piping: Minimum hydrostatic or pneumatic test-pressures measured at highest point in system:
 - 1. Fuel-Oil Distribution Piping: Minimum 5 psig for minimum 30 minutes.

2. Fuel-Oil, Double-Containment Piping:
 - a. Carrier Pipe: Minimum 50 psig for minimum 30 minutes.
 - b. Containment Conduit: Minimum 25 psig for minimum 60 minutes.
 3. Suction Piping: Minimum 20-in. Hg for minimum 30 minutes.
 4. Isolate storage tanks if test pressure in piping will cause pressure in storage tanks to exceed 10 psig.
- B. Inspect and test fuel-oil piping according to NFPA 31, "Tests of Piping" Paragraph; and according to requirements of authorities having jurisdiction.
- C. Test leak-detection and monitoring system for accuracy by manually operating sensors and checking against alarm panel indication.
- D. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- E. Bleed air from fuel-oil piping using manual air vents.
- F. Fuel-oil piping and equipment will be considered defective if it does not pass tests and inspections.
- G. Prepare test and inspection reports.

3.13 OUTDOOR PIPING SCHEDULE

- A. Underground Fuel-Oil Piping: Flexible or Rigid, double-containment piping. Size indicated is carrier-pipe size.
- B. Underground fuel-oil-tank fill and vent piping shall be the following:
1. NPS 2 and Smaller: Steel pipe, steel or malleable-iron threaded fittings, and threaded joints. Coat pipe and fittings with protective coating for steel piping.
 2. NPS 2-1/2 and Larger: Steel pipe, steel welding fittings, and welded joints. Coat pipe and fittings with protective coating for steel piping.
 3. Flexible, Double-Containment Piping: Comply with UL 971.
- C. Containment Conduit: Steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.
- D. Aboveground fuel-oil piping shall be the following:
1. NPS 2 and Smaller: Steel pipe, steel or malleable-iron threaded fittings, and threaded joints.
 2. NPS 2-1/2 and Larger: Steel pipe, steel welding fittings, and welded joints.
 3. Flexible, Double-Containment Piping: Comply with UL 971.
 4. Annealed-temper copper tube with wrought-copper fittings and brazed joints.

3.14 INDOOR PIPING SCHEDULE

- A. Aboveground fuel-oil piping shall be the following:
1. NPS 1/2 and Smaller: Annealed-temper copper pipe, wrought copper fittings, and brazed or flared joints.
 2. NPS 5/8 to NPS 2 Steel pipe, steel or malleable-iron threaded fittings, and threaded joints
 3. Flexible, Double-Containment Piping: Comply with UL 971.
 4. NPS 2-1/2 and Larger: Steel pipe, steel fittings, and welded or flanged joints.

3.15 SHUTOFF VALVE SCHEDULE

- A. Valves for aboveground distribution piping NPS 2 and smaller shall be the following:
1. One-piece, bronze ball valve with bronze trim.
 2. Two-piece, full-port, bronze ball valves with bronze trim.
- B. Distribution piping valves for pipe NPS 2-1/2 and larger shall be the following:
1. Two-piece, full-port, bronze ball valves with bronze trim.
 2. Bronze, nonlubricated plug valve.
- C. Valves in branch piping for single appliance shall be the following:
1. One-piece, bronze ball valve with bronze trim.
 2. Two-piece, full-port, bronze ball valves with bronze trim.

END OF SECTION 230175

SECTION 230240 – CONDENSING UNITS

PART 1 - GENERAL

Applicable provisions of the Conditions of the Contract and Division 1 General Requirements govern the work in this section. Submit shop drawings for checking and approval.

1.1 SYSTEM DESCRIPTION

- A. Indoor units are matched with heat pump or heat recovery VRF (variable refrigerant flow) outdoor unit.

1.2 DELIVERY, STORAGE AND HANDLING

- A. Units shall be stored and handled per unit manufacturer's recommendations.

PART 2 – PRODUCTS

2.1 MULTI V™ 5 HEAT RECOVERY AND HEAT PUMP SYSTEM(S) – (6 to 42 tons nominal)

MULTI V™ S HEAT PUMP AND HEAT RECOVERY SYSTEM(S) – (2 to 5 tons nominal)

A. Product Design

1. LG Multi V heating and cooling system shall be an air cooled system allowing user to configure in the field a heat pump or a heat recovery system consisting of one to three outdoor unit modules, conjoined to make a 2-5 ton single refrigerant circuit for the Multi V S system, and 6-42 single refrigerant circuit for the Multi V 5 system.
 - a. Heat recovery systems, employing three pipes, shall be connected to Heat recovery (heat recovery) unit(s) and indoor unit(s). Multi-port heat recovery units shall allow simultaneous heating and cooling of individual zone(s) at various capacities as required to satisfy their zone requirements.
 - b. Heat pump systems shall require two pipes, simultaneous heating and cooling shall not be supported. The heat recovery system shall consist of three pipes, liquid, suction, and hot gas pipes. Heat recovery systems operating at 0°F that cannot deliver single phase superheated refrigerant vapor at a minimum of 162°F while operating in the heating mode shall not be acceptable.
2. All three-phase VRF heat pump and heat recovery outdoor units shall be from the same product development generation. Mixing of outdoor units from different development generations is not acceptable.

B. Operating Conditions

1. Outdoor Unit shall be capable of continuous compressor operation between the following operating ambient air conditions, operation outside of these conditions are possible and may involve non-continuous operations.
2. Operating Ambient Air Conditions
 - a. Cooling: 5°F DB to 122°F DB (With optional low ambient kit from -9.9°F DB to 122°F DB)
 - b. Heating: -22°F WB to 61°F WB
 - c. Cooling Based (ODU reversing valve in cooling position) Synchronous: 14°F DB to 81°F DB (Heat Recovery Operation Only)
 - d. Heating Based (ODU reversing valve in heating position) Synchronous: 14°F WB to 61°F WB (Heat Recovery Operation Only)

C. Electrical

1. All air source heat pump and heat recovery frame(s) shall be designed and electrically protected to maintain stable continuous compressor operation when provided with 460/60/3 or 208-230/60/3 power with the following specifications:
 - a. 460/60/3
 - i. Voltage tolerance 414V
 - b. 208-230/60/3 power and can withstand a voltage fluctuation of $\pm 10\%$
 - i. Voltage tolerance between 187V to 253V
 - c. Voltage imbalance of up to two percent;
 - d. Power surge of up to 5kA RMS Symmetrical.

D. General Features

1. The air-conditioning system shall use R410A refrigerant.
2. Each system shall consist of one, two or three air source outdoor unit modules conjoined together in the field to result in the capacity specified elsewhere in these documents.
3. Dual and triple frame configurations shall be field piped together using manufacturer's designed and supplied Y-branch kits and field provided interconnecting pipe to form a common refrigerant circuit.
4. System shall have following frame configurations vs. capacity.
2 to 20 ton units shall be a single frame only.
22 to 34 ton units shall be dual frame only.
36 to 42 ton heat recovery units shall be triple frame only
5. System shall employ self-diagnostics function to identify any malfunctions and provide type and location of malfunctions via fault alarms.
6. All outdoor units, regardless of the Heat Pump or Heat Recovery models, shall be the same generation and provide with most up to date firmware version at the time of delivery. Manufacturers commissioning agents shall assure the owner in the commissioning report that the latest software version.

7. If the specifications include both heat pump and heat recovery outdoor models, the manufacturer shall provide the most recent generation equipment only. Old stock or obsolete models will not be accepted. Products purchased over the internet and not from the manufacturer's authorized local mechanical representative or authorized distributor will not be accepted.
8. Field Provided Refrigerant Piping:
 - a. The refrigerant circuit shall be constructed using field provided ACR copper, de-hydrated, refrigerant rated copper pipe, piped together with manufacturer supplied Heat recovery unit(s) and Y- branches, as may be required, connected to multiple (ducted, non-ducted or mixed combination) indoor units to effectively and efficiently control the heat pump operation or simultaneous heating and cooling operation of the heat recovery VRF system. Other pipe materials, if used, shall perform, at a minimum, as well as that specified above, shall not have any adverse reactions, for example galvanic corrosion, to any other components or materials also in use in the system and shall be installed per manufacturer's instructions.
 - b. The unit shall be shipped from the factory fully assembled including internal refrigerant piping, inverter driven compressor(s), controls, temperature sensor, humidity sensor, contacts, relay(s), fans, power and communications wiring as necessary to perform both Heat Pump and Heat recovery operations.
 - c. Each outdoor unit refrigeration circuit shall include, but not limited to, the following components:
 - i. Refrigerant strainer(s)
 - ii. Check valve(s)
 - iii. Inverter driven, medium pressure vapor injection, high pressure shell compressors
 - iv. Liquid refrigerant cooled inverter PCB
 - v. Oil separator(s)
 - vi. Accumulator /controlled volume receiver(s)
 - vii. 4-way reversing valve(s)
 - viii. Vapor injection valve(s)
 - ix. Variable path heat exchanger control valve(s)
 - x. Oil balancing control
 - xi. Oil Level sensor(s)
 - xii. Electronic expansion valve(s)
 - xiii. Double spiral tube sub-cooler (s) and EEV
 - xiv. Vapor Injection Valve(s)
 - xv. High and low side Schrader valve service ports with caps
 - xvi. High/low Service valves
 - xvii. Threaded fusible plug
 - xviii. High pressure switch

9. Field Insulation:
 - a. All refrigerant pipe, y-branches, elbows and valves shall be individually insulated with no air gaps. Insulation R-value (thickness) shall not be less than the minimum called for by the local building code, local energy code or as a minimum per manufacture installation requirements. In no case shall the insulation be allowed to be compressed at any point in the system.
 - i. All joints shall be glued and sealed per insulation manufactures instructions to make an air-tight assembly.
10. Microprocessor:
 - a. Factory installed microprocessor controls in the outdoor unit(s), heat recovery unit(s), and indoor unit(s) shall perform functions to optimize the operation of the VRF system and communicate in a daisy chain configuration between outdoor unit and heat recovery unit(s) and indoor unit(s) via RS485 network. Controls shall also be available to control other building systems as required from the VRF control system. DIO/AIO capabilities shall be available as well as a central controller to perform operation changes, schedules and other duties as required by this specification. Addition of separate building control system shall not be required. Other control devices and sequences shall be as specified in other sections of this project specification
11. Inverter PCB Cooling:
 - a. Cooling of the inverter PCB shall be conducted by way of high pressure, sub-cooled liquid refrigerant via heat exchanger attached to the inverter PCB. The full capacity flow of refrigerant shall pass through the heat exchangers to maximize the cooling effect of the PCBs and to aid in the evaporation process and capacity of the outdoor coil during the heating mode. The recovered heat of the PCBs must be used to enhance the overall heating process, other uses or dissipation of heat to ambient shall not be permitted.
12. Compressor Control:
 - a. Fuzzy control logic shall establish and maintain target evaporating temperature (Te) to be constant on cooling mode and condensing temperature (Tc) constant on heating mode by Fuzzy control logic to ensure the stable system performance.
13. Initial Test Run (ITR) (Heating or Cooling) / Fault Detection Diagnosis (FDD) Code:
 - a. This control mode shall monitor and display positive or negative results of system initial startup and commissioning. Heating or Cooling ITR mode will be automatically selected. It shall monitor and provide performance metrics for the following, but not be limited to, refrigerant quantity charge, auto-charge, stable operations, connection ratios, indoor unit status, error status, and number of indoor units connected. This control mode shall not replace the system error monitoring control system.

14. BMS Integration:
 - a. The VRF system shall be able to integrate with Building Management Systems via BACnet™ IP gateway. This gateway converts between BACnet™ IP or Modbus TCP protocol, and RS-485 LGAP (LG Aircon protocol) allowing third party control and monitoring of the LG A/C system, or LonWorks™ gateways. See controls specification for points list.
15. Wi-Fi Communication:
 - a. The outdoor unit shall be Wi-Fi enabled and capable. Wi-Fi shall allow service or maintenance personal access to the complete operating system, via LGMV mobile, without need of tools other than smart phone or tablet. Active live system review, collection of all system data for a field determined duration presented in a .csv file format or collection of all operating conditions, including all indoor units, valves, sensors, compressor speeds, refrigerant pressures, etc., by snapshot of conditions and placing that snapshot into a power point slide to be reviewed at another time. Systems that require computers, hard wire only connection or other devices to collect, review or record operating conditions shall not be allowed.
16. Indoor Unit Connectivity:
 - a. The system shall be designed to accept connection up to 64 indoor units of various configuration and capacity, depending on the capacity of the system.
17. Power and Communication Interruption:
 - a. The system shall be capable of performing continuous operation when an individual or several indoor units are being serviced; communication wire cut or power to indoor unit is disconnected. Systems that alarm and/or shut down because of a lack of power to any number of indoor units shall not be acceptable.
18. Connection Ratios:
 - a. The maximum allowable system combination ratio for all VRF systems shall be 130% and the minimum combination ratio shall be 50%.
19. Comfort Cooling Mode:
 - a. Comfort cooling shall be initiated via a field setting at the outdoor unit during commissioning or anytime thereafter. Comfort cooling shall allow user to select all or some of the zones on a system to adjust automatically their evaporator temperatures, independent of other zones, based on the impending total loads of that zone determined by using the zone controller temperature sensor.
20. The outdoor unit refrigerant circuit shall employ for safety a threaded fusible plug.

21. Refrigerant Flow Control

- a. An active refrigerant control and multi section accumulator-receiver that dynamically changes the volume of refrigerant circulating in the system based on operating mode and operating conditions to ensure maximum system performance and efficiency.
- b. Subcooler: The VRF outdoor unit shall include a factory provided and mounted sub-cooler assembly consisting of a shell and tube-type sub-cooling heat exchanger and EEV providing refrigerant sub-cooling modulation control by fuzzy logic of EEV and by mode of operation to provide capacity and efficiency as required. Braze plate heat exchangers shall not be allowed for this function.
- c. Smart Load Control: The air source unit shall be provided with Smart Load Control (SLC) enhanced energy saving algorithm that reduces compressor lift during off peak operation. Smart load control operation shall enhance energy savings and increase indoor comfort by monitoring the real time ambient temperature, real time weighted mean average building load, and the outdoor relative humidity (if enabled).
 - i. The SLC algorithm shall be monitoring in real time, the rate of change of the outdoor ambient air temperature, either the outdoor ambient air relative humidity or the indoor air relative humidity [field selectable], and the rate of change of the building load.
 - ii. The SLC algorithm shall foresee pending changes in the building load, outdoor temperature and humidity (or indoor humidity) and proactively reset head and/or suction pressure targets in anticipation of the reduction/increase in building load.
 - iii. The SLC algorithm shall provide no fewer than 3 field selection options to maximize the control of the VRF system operation during morning warm-up or cool-down following night-setback reset. The selection shall be set by the commissioning agent (or at any other time thereafter). Selectable algorithm choices include:
 - 1. Maximize energy savings
 - 2. Balance the rate of temperature change with energy consumed.
 - 3. Quickly cool/heat the building.

22. Refrigerant Volume Management

- a. Active Refrigerant Charge
 - i. The VRF system shall be able to operate at any and all published conditions year round in cooling or heating mode without the need of adding or removing refrigerant from the system.
 - ii. The air source unit shall be provided with an isolated vessel to store spare refrigerant and actively pass refrigerant to (or from) the accumulator in real time as necessary to maintain stable refrigeration cycle operation.
 - iii. The air source unit microprocessor shall be provided with an algorithm that monitors the VRF system head pressure, suction pressure, subcooling, superheat, compressor speed, high and low side temperatures and the load on the system to adjust the volume of refrigerant actively circulating.

- b. Manual Seasonal Refrigerant Charge Adjustments
(Applicable for VRF systems without Active Refrigerant Charge)
 - i. Alternates: Systems that CANNOT passively and automatically modify the active refrigerant charge using the method(s) stated to maintain stable cycle operation shall clearly state so in bold capital letters in the proposal. VRF systems that cannot perform active refrigerant control may submit a proposal as an Alternate and must include as part of the equipment price the cost of to provide bi-annual refrigerant charging services for 15 years. Service shall be performed by the factory authorized agent only. Service shall include refrigerant, parts, labor, and fees necessary to analyze the current state of the system and perform the refrigerant charge adjustment. Service must occur one month before the winter season and one month before the summer season.
 - ii. If the VRF system requires a charge adjustment more frequently to maintain stable operation, the VRF manufacturer shall provide additional services at no additional charge.
 - iii. The 15 year period shall begin on the date the equipment is commissioned or the date the building occupancy permit was issued for the area(s) served by the system – whichever date is later.
 - iv. This service shall be underwritten, warranted, and administered by the VRF equipment manufacturer – not the local distributor or applied representative.
 - v. The selected service provider shall be mutually agreeable between the building owner (or owners agent) and must be licensed, insured, and trained to work on the VRF system. No third party service (subcontracted service) providers will be acceptable.
 - vi. If the service provider is not an employee of the VRF manufacturer, the service provider shall be reimbursed for services rendered directly from the manufacturer. Labor rate for services shall be paid at the prevailing wage rate in place at the time of service.
- 23. VRF Systems with Onboard Alternate Operating Mode Selection Capability
 - a. All VRF systems which provide field selectable Alternate Operating Modes, for example, High Heat or High Ambient Cooling, published data tables must be available to the public for all modes offered.
 - b. Acceptable Alternate Operating Modes must ship with all models of the VRF product offering and must be factory embedded. Custom factory or field modifications to factory provided algorithms created to meet scheduled requirements are not acceptable.
 - c. Provide a copy of instructions required to set the Alternate Operation Mode with the initial submittal.

- d. For systems that provide field selectable Alternate Operating Modes, ALL technical data provided in the submittal data sheets showing product rated condition performance data, must also provide separate data sheets that show product performance data at each of the field selectable Alternate Operating Modes available. Capacity, power input, and acoustic performance data for each mode offered shall be reported separately. Mixing of ODU, IDU, or VRF system performance capability operating in one mode with for example the power consumption, sound power rating, or electrical requirements of the same system operating in another mode is not acceptable.

E. Field Supplied Refrigerant Piping Design Parameters

1. The outdoor unit shall be capable of operating at an elevation difference of up to 360 feet above or below the lowest or highest indoor unit respectively without the requirement of field installed subcooler or other forms of performance enhancing booster devices for the Multi V 5 Series, and 164 feet above or 131 feet below for Multi V S Series.
2. The outdoor unit shall be capable of operating with up to 3280 for the Multi V 5 Series and 984 for the Multi V S Series equivalent length feet of interconnecting liquid line refrigerant pipe in the network.
3. The outdoor unit shall be capable of operating with up to 656 actual feet for the Multi V 5 Series and 592 actual feet for the Multi V S Series or 738 equivalent length feet for the Multi V 5 Series and 574 equivalent length feet for the Multi V S Series of liquid line refrigerant pipe spanning between outdoor unit and farthest indoor unit.
4. The piping system shall be designed with pipe expansion and contraction possibilities in mind. Required expansion devices shall be field designed, supplied and installed based on proper evaluation of the proposed piping design. In addition to these requirements, the piping system installation must conform to the VRF equipment manufacturer's published guidelines.
5. The installation of pipe hangers, supports, insulation, and in general the methods chosen to attach the pipe system to the structure must allow for expansion and contraction of the piping system and shall not interfere with that movement.
6. The elevation difference between indoor units on heat pump systems shall be 131 feet for the Multi V 5 Series and 49 feet for the Multi V S Series.
7. The elevation differences for heat pump systems shall be:
 - a. Heat recovery unit to connected indoor unit shall be 49 feet
 - b. Heat recovery unit to heat recovery unit shall be 98 feet
 - c. Indoor unit to indoor unit connected to same heat recovery unit shall be 49 feet
 - d. Indoor unit to indoor unit connected to separate parallel piped heat recovery units shall be 131 feet.
8. The acceptable elevation difference between two series connected heat recovery units shall be 16 feet.

F. Defrost Operations

1. The outdoor unit(s) shall be provided with a minimum of 4 independent field adjustable defrost cycle algorithms to maximize the effectiveness of the defrost cycle to the local weather conditions. Intelligent Defrost shall melt accumulated frost, snow and ice from the outdoor unit heat exchanger. The defrost cycle length and sequence shall be based on outdoor ambient temperatures, outdoor unit heat exchanger temperature, and various differential pressure variables. Intelligent Heating Mode, when outdoor unit humidistat is engaged, shall extend the normal heating sequences by adjusting the outdoor unit coil target temperature to be above the ambient dew point temperature delaying the need for defrost operations, so long as heating demand is being met.
2. Smart Heating: This feature shall be capable of eliminating several defrost actions per day based on outdoor air temperature and humidity conditions. Smart heating shall extend the heating operation cycle by delaying the frost formation on the outdoor coil by adjusting the surface temperature to keep it above the current outdoor ambient dew point. The algorithm shall delay while maintaining indoor space temperature.
3. Defrost Mode Selection: The outdoor unit shall be provided with a minimum of three field selectable defrost operation modes: Normal, Fast, or Forced.
 - a. Normal Defrost: Operation intended for use in areas of the country that experience adverse winter weather with periods of heavy winter precipitation and extremely low temperatures. This strategy shall maximize the systems heating performance and maintain operational efficiency. When the ambient temperature is either: a) above 32°F or b) below 32°F with the humidity level below 60% RH, Intelligent Defrost shall continue heating regardless of ice build-up on the coil until the quality of the heated air (i.e. discharge air temperature) decreases. At temperatures below 4°F, a defrost cycle shall occur every two hours to optimize system heating efficiency.
 - b. Fast Defrost: Operation intended for use in areas of the country with mild winter temperatures and light to moderate humidity levels. The strategy minimizes defrost cycle frequency allowing frozen precipitation to build longer in between cycles. Minimum time between defrost cycles shall be 20 minutes. Intelligent Defrost shall choose between split coil/frame and full system methods based on current weather conditions to minimize energy consumption and maximize heating cycle time.
 - c. Forced Defrost: Operation shall be available for the service provider to test defrost operations at any weather condition and to manually clear frozen water from the outdoor coil surfaces.
4. Defrost Method Selection: The outdoor unit shall be provided with two field selectable defrost operation methods: Split Coil/Frame and Full System. Split Coil/Frame option provides continuous heating of the occupied space during defrost operation.
 - a. Split Coil/Frame method shall be available when Normal Defrost mode is selected. Split Coil method shall be available on all Heat Pump and Heat recovery single-frame VRF systems. Split Frame defrost shall be available on all Heat Pump and Heat recovery multi-frame outdoor units.

- b. Split Coil method shall remove ice from the bottom half of the outdoor unit coil first for a maximum time of six minutes, then the top half for a maximum of six minutes. Next the bottom coil shall be heated again for an additional three minutes to remove any frozen water that may have dripped onto the lower coil during the top coil defrost operation.
 - c. When Split Coil/Frame method is selected, a Full System defrost shall occur every 1-9 (field selectable) defrost cycles to assure 100% of the frozen precipitation has been removed to maintain efficient performance.
 - d. Full System method shall be available as a field selectable option. All outdoor units located in areas of the country where large volumes of frozen precipitation are common, the commissioning agent shall be able to select the Full System only defrost method.
- 5. Indoor Unit Fan Operation During Defrost
 - a. During partial defrost operation indoor units operating in cooling or dry mode shall continue normal operation.
 - b. During partial defrost operation, indoor units that are commissioned with fans set for continuous operation shall maintain normal fan speed unless the leaving air temperature drops, then the fan speed will be reduced to low speed for the remainder of the defrost cycle.
 - c. During full system defrost operation indoor unit fans will cycle off and remain off during the remainder of the defrost cycle.

G. Oil Management

- 1. The system shall utilize a high pressure oil return system to ensure a consistent film of oil on all moving compressor parts at all points of operation. Oil is returned to compressor through a separate high pressure oil injection pipe directly into the oil sump. Oil returned to the compressor via the suction port of the compressor shall not be allowed.
- 2. Each compressor shall be provided with a high efficiency independent centrifugal cyclone type oil separator, designed to extract oil from the oil/refrigerant gas stream leaving the compressor.
- 3. The system shall have an oil level sensor in the compressor to provide direct oil level sensing data to the main controller. The sensor shall provide data to main outdoor unit PCB to start oil return mode and balance oil levels between multiple compressors.
- 4. The system shall only initiate an oil return cycle if the sensed oil level is below oil level target values as determined by the microprocessor. The system shall display an error if the oil sensor signals low oil level for a period of 130 minutes or longer.
- 5. A default oil return algorithm shall automatically initiate the oil return mode if the system detects a failure of the oil sump sensor. A fault code shall be reported by the system.
- 6. Timed oil return operations or systems that do not directly monitor compressor oil level shall not be permitted.
- 7. Indoor Unit Fan Operation during Oil Return Cycle
 - a. During oil return cycle indoor units operating in cooling or dry mode shall continue normal operation.

- b. During oil return, indoor units that are commissioned with fans set for continuous operation shall maintain normal fan speed unless the leaving air temperature drops, then the fan speed will be reduced to low speed for the remainder of the oil return cycle.
- c. During oil return cycle indoor unit fans will cycle off and remain off during oil return cycle while operating in all modes.

H. Fan and Motor Assembly

- 1. 6 ton frames shall be equipped with one direct drive variable speed propeller fan with Brushless Digitally Controlled (BLDC) motor with a vertical air discharge. Heat Pump ARUN024GSS4 unit shall be equipped with one direct drive, variable speed, and axial flow fan with a horizontal air discharge. The motors shall be Brushless Digitally Controlled (BLDC), variable speed, inverter driven motors.
- 2. 8 to 20 ton frames shall be equipped with two direct drive variable speed propeller fan(s) with BLDC motor(s) with a vertical air discharge. Heat Pump ARUN038GSS4~ARUN060GSS4 and Heat Recovery unit ARUB060GSS4 shall be equipped with two direct drive variable speed axial flow fan(s) with a horizontal air discharge. Each fan shall be provided with an independent dedicated Brushless Digitally Controlled (BLDC), variable speed, inverter driven motors.
- 3. The fan(s) blades shall be made of Acrylonitrile Butadiene Styrene (ABS) material and incorporate biomimetic technology to enhance fan performance and reduce fan generated noise.
- 4. The fan(s) motor shall be equipped with permanently lubricated bearings.
- 5. The fan motor shall be variable speed with an operating speed range of 0-1150 RPM cooling mode and 0-1150 RPM heating mode. The fan assembly(s) shall have a minimum operating speed range from 0 RPM to 850 RPM in cooling mode and heating mode.
- 6. The fan shall have a guard to help prevent contact with moving parts.
- 7. The cabinet shall have option to redirect the discharge air direction from vertical to
- 8. The fan controller shall have a DIP switch setting to raise external static pressure of the fan up to 0.32 inch of W.C. to accommodate ducted installations.
- 9. The fan control shall have a function setting to remove excess snow automatically.
- 10. The fan control shall have a function setting to remove access dust and light debris from the outdoor unit and coil.

I. Cabinet

- 1. Outdoor unit cabinet shall be made of 20 gauge galvanized steel with a weather and corrosion resistant enamel finish. Outdoor unit cabinet finish shall be tested in accordance with ASTM B-117 salt spray surface scratch test (SST) procedure for a minimum of 1000 hours.
- 2. Cabinet weights and foot prints shall vary between 430 lbs., 7.61 sq. ft. (1.27 sq. ft. per ton), for 6 ton cabinet to 666 lbs., 10.14 sq. ft. (.51 sq. ft. per ton), for 20 ton cabinet for single cabinet configurations. The front panels of the outdoor units shall be removable type for access to internal components.

3. A smaller service access panel, not larger than 7" x 7" and secured by a maximum of (2) screws, shall be provided to access the following
 - a. Service tool connection
 - b. DIP switches
 - c. Auto addressing
 - d. Error codes
 - e. Main microprocessor
 - f. Inverter PCB
4. The cabinet shall have piping knockouts to allow refrigerant piping to be connected at the front, right side, or through the bottom of the unit.
5. The cabinet shall have a factory installed coil guard and shall have a baked enamel finish.

J. Outdoor Unit Coil

1. Outdoor unit coil shall be designed, built and provided by the VRF outdoor unit manufacturer.
2. The outdoor unit coil for each cabinet shall have lanced aluminum fins with a maximum fin spacing of no more than 17 Fins per Inch (FPI). All the outdoor unit coils shall be a 2 or 3 rows consisting of staggered tubes for efficient air flow across the heat exchanger.
3. Outdoor unit coil shall be comprised of aluminum fins mechanically bonded to copper tubing with inner surfaces having a riffling treatment to expand the total surface of the tube interior
4. The aluminum fin heat transfer surfaces shall have factory applied corrosion resistant Black Fin coating. The copper tubes shall have inner riffling to expand the total surface of the tube interior.
 - a. ISO 21207 Salt Spray Test Method B – 1500 hours
 - b. ASTM B-117 Acid Salt Test – 900 hours
 - c. The Black Fin coating shall be certified by Underwriters Laboratories and per ISO 21207. The above conditions shall establish the minimum allowable performance which all alternates must comply.
5. Variable Path Heat Exchanger: System shall have a variable flow and path outdoor heat exchanger function to vary the refrigerant flow and volume and path. Control of the variable path circuits shall be based on system operating mode and operating conditions as targeted to manage the efficiency and minimize or maximize the circulating volume of the operating fluids of the system. This feature allows MV 5 to maintain system head pressure that delivers "gas-furnace leaving air temperature" from the indoor unit at moderate and low ambient outdoor air temperatures. The outdoor unit coil, all indoor units and pipe network shall be field tested to a minimum pressure of 550 psig.

K. Compressor(s)

1. Compressor shall be designed and assembled by the VRF manufacturer specifically for use in the air source VRF product line. Third party manufactured, branded, or designed to the VRF system's OEM specifications by a third party manufacturer shall not be acceptable.
2. Compressor shall be a hermetic, high-side shell (HSS), commercial grade, compliant scroll direct-drive design.
 - a. Compressor Design: The compressor design shall be of the high pressure shell scroll type where the internal pressure below the suction valves of the compressor shall be at the same high pressure and high temperature. The motor shall be cooled by high pressure gas at temperatures above saturation conditions and minimize the mixing of refrigerant liquid with oil in the sump. The system shall employ a high pressure oil return method returning recovered oil from the oil separator directly into the oil sump of the compressor; oil shall not be allowed to return via the suction line. Bearing surfaces are continually coated with oil. The compressor shall employ an Aero-bearing constructed with high lubricity materials increasing operation time in case of low sump oil level. Compressor shall have a nominal operating range from 12Hz to 150 Hz.
3. The fixed and oscillating compressor scroll components shall be made of high grade (GC25) or denser steel material. All scrolls shall be heat treated and tempered.
4. The oscillating scroll shall be finely machined and polished. PVE refrigerant oil shall be used as the sole liquid used to maintain a seal between the high and low sides of the compression chamber. Compressors that requires the use of any type of mechanical or wearable sealant material between the moving surfaces of the compression chamber is NOT ACCEPTABLE.
5. Vapor Injection: System shall have a medium pressure gas vapor injection function employed in the heating and cooling modes to increase system capacity when the outdoor ambient temperatures are low and lower compressor lift when temperatures are high. The compressor vapor injection flow amount shall be controlled by the vapor injection sub-cooling algorithm reset by discharge gas temperatures of the compressor.
6. Bearing surfaces shall be coated with Teflon® equal. Bearings shall be lubricated using a constant flow of PVE refrigerant oil to the bearing surfaces The film of oil separating the crankshaft journals and bearing surfaces shall be consistent at all times the crankshaft is in motion and shall be maintained irrelevant of crankshaft rotational speed.
7. An internal, integrated, mechanically driven gear pump shall draw oil from the compressor sump reservoir, pressurize the oil and inject the oil directly to the crankshaft journals maintaining a consistent film of oil between all moving parts. Auxiliary, indirect, or electronically driven pumps are not acceptable.

8. The viscosity property of the PVE oil in the compressor sump shall be maintained irrelevant of compressor operation and the surrounding ambient temperature.
 - a. The compressor shall be equipped with an external thermally protected electric crankcase heater that is automatically activated only when the ambient temperature is below freezing and the compressor is not running to maintain the temperature of the oil in the sump above the refrigerant boiling point.
 - b. During stable operation, irrelevant of ambient air temperature outside the water source unit, the temperature of refrigerant vapor in contact with the surface of the oil in the compressor sump shall be maintained above 140°F to prevent foaming and to eliminate refrigerant from mixing with the oil degrading the viscosity of the oil in the sump.
 - c. Low side shell (LSS) type compressors that use suction vapor to cool the compressor motor shall not be acceptable.
9. The compressor motor shall be designed to operate at high temperatures.
 - a. The motor winding insulation shall be designed to operate continuously at a minimum temperature of 180°F without deterioration.
 - b. The motor cooling system shall be designed to maintain acceptable operational temperature at all times and in all conditions using high pressure, hot refrigerant vapor as motor coolant.
 - c. Low side shell and compressors that use low pressure, low temperature refrigerant gas to cool the motor are not acceptable.
10. Inverter Compressor Controller(s)
 - a. Each compressor shall be equipped with a dedicated inverter compressor drive. The control of multiple compressors using a single drive is not acceptable.
 - b. The inverter drive shall vary the speed of the compressor crankshaft between zero (0) Hz and 140 Hz.
 - c. The inverter driver controller shall be matched with the physical properties of the compressor. The drive shall be manufactured by the VRF air source unit manufacturer. The inverter drive and matching compressor shall have been thoroughly tested as a matched pair. The inverter drive shall be programmed to avoid operating the compressor at any speed that results in harmonic vibration, nuisance noise, or mechanical damage to either the driver or the compressor with power provided that is within the tolerance specification.
 - d. The compressor inverter drive assembly and software must be designed, manufactured, and supplied by the VRF product manufacturer. Third party branded inverter driver hardware and/or driver software or inverter driver hardware and/or software provided by a third party manufacturer to meet OEM specifications of the VRF water source manufacturer will not acceptable.
 - e. All inverter drive hardware or software manufactured in, is a product of, or sourced from China, or using a broker or third party provider as an intermediary that obtains the product from CHINA shall not be acceptable.

11. Compressor(s)
 - a. Each 6, 8, 10 ton frames shall be equipped with a single hermetically sealed, inverter driven, High Side Shell (HSS) scroll compressor.
 - b. 12, 14, 16, 18 and 20 ton frames shall be equipped with dual hermetically sealed, inverter driven, High Side Shell (HSS) scroll compressors.
 - c. Each inverter driven, HSS scroll compressor shall be capable of operating from 12 Hz up to 150 Hz in any and all modes (cooling, heating or simultaneous modes).
 - d. The compressor shall be designed for a separate port for oil to be directly returned to the compressor oil sump.
 - e. The compressor bearing(s) shall have Teflon™ coating and shall be an aero type design using High lubricity materials.
 - f. The compressor(s) shall be protected with:
 - i. High Pressure switch
 - ii. Over-current /under current protection
 - iii. Oil sump sensor
 - iv. Phase failure
 - v. Phase reversal
 - vi. Compressor shall be capable of receiving injection of medium pressure gas at a point in the compression cycle where such injection shall allow a greater mass flow of refrigerant at lower outdoor ambient and achieving a higher heating capability. The VRF outdoor unit shall have published performance data for heating mode operation down to -13°F on both heat pump and heat recovery systems.
 - g. Standard, non-inverter driven compressors shall not be permitted nor shall a compressor without vapor injection or direct sump oil return capabilities.
12. Heat Pump models ARUN024GSS4 ~ ARUN053GSS4:
 - a. The compressor shall be a high efficiency high-side shell rotary hermetic design. Bearing shall be manufactured using high lubricity material. Compressor shall be factory charged with Polyvinyl Ether (PVE) oil. Single or dual speed compressors charged with Polyolester oil (POE) shall not be acceptable. Compressor inverter drive shall allow modulation from 20Hz to 90Hz with control in 1.0 Hz increments depending on the nominal capacity. (ARUN060GSS4) The compressor shall be a high-side shell hermetic scroll design. Oil sump area and chamber housing the motor shall be operated at the same temperature and pressure of the gas leaving the compressor chamber to ensure that the low temperature low pressure refrigerant returning to the compressor does not mix with the oil in the sump. Bearing shall be manufactured using high lubricity material. Compressor shall be factory charged with Polyvinyl Ether (PVE) oil. Single or dual speed compressors charged with Polyolester oil (POE) oil shall not be acceptable. Compressor motor shall be designed to operate at a frequency range of 0Hz to 160Hz. Compressor inverter drive shall allow modulation from 12Hz to 110Hz.

13. Heat Recovery model ARUB060GSS4:

- a. The compressor design shall be of the high pressure shell scroll type where the internal pressure below the suction valves of the compressor shall be at the same high pressure and high temperature. The motor shall be cooled by high pressure gas at temperatures above saturation conditions and minimize the mixing of refrigerant liquid with oil in the sump. The system shall employ a high pressure oil return method returning recovered oil from the oil separator directly into the oil sump of the compressor; oil shall not be allowed to return via the suction line. Bearing surfaces are continually coated with oil. The compressor shall employ an Aero-bearing constructed with high lubricity materials increasing operation time in case of low sump oil level. Compressor shall have a nominal operating range from 12Hz to 110 Hz.

L. Operational Sound Levels

1. Each single frame outdoor unit shall be rated with an operational sound pressure level not to exceed as listed on below chart when tested in an anechoic chamber under ISO 3745 standard at the highest field selectable heating operating modes available. Such documentation shall be presented in all submittals, manufactures who elect to rate their equipment at other than tested in an anechoic chamber under ISO 3745 standard at the highest field selectable heating operating modes available and the highest field selectable conditions shall not be allowed.
2. A field setting shall be available to program the outdoor unit to reduce sound levels at night, when desired, to a selectable level while still able to meet building load requirement. This mode is available in both cooling and heating modes.

M. Sensors

1. Each outdoor unit module shall have:
 - a. Suction temperature sensor
 - b. Discharge temperature sensor
 - c. Oil level sensor
 - d. High Pressure sensor
 - e. Low Pressure sensor
 - f. Outdoor temperature sensor
 - g. Outdoor humidity sensor
 - h. Outdoor unit heat exchanger temperature sensors

N. Wind Load Installations for Outdoor Units

1. LG FL Wind load Installation Drawings meet the requirements of the 2017 Florida Building Code, 6th Edition and ASCE Standard 7-2010.

O. Seismic Installations

1. Provide OSHPD Special Seismic Certification Preapproval (OSP) documents for certified product list of VRF equipment to be installed in high seismic risk areas. Provide LG supplemental installation documents in conformance with CBC 2013, 2016 and 2019 California Building Code and IBC 2012, 2015 and 2018 International Building Code.

P. Warranty

1. Limited Warranty Period
 - a. STANDARD ONE-YEAR PARTS WARRANTY FOR A QUALIFIED SYSTEM - The Part(s) of a qualified System, including the compressor, are warranted for a period (the "Standard Parts Warranty Period") ending on the earlier to occur of one (1) year after the date of original installation, or eighteen (18) months from the date of manufacture.
 - b. ADDITIONAL SIX (6) YEAR COMPRESSOR PART WARRANTY - The Compressor is warranted for an additional six (6) year period after the end of the applicable Standard Part Warranty Period (the "Compressor Warranty Period").
2. Extended Warranty
 - a. The Standard Warranty Period and the Compressor Warranty Period are extended to a total of ten (10) years (the "Extended Warranty Period") for qualified Systems that have been (a) commissioned by a party that has completed the current Training Requirements, (b) such commissioning is pursuant to LG's current published instructions, and (c) the System commissioning results and supporting documents are entered correctly into LG's online commissioning system. Commissioning of a System requires one (1) hour of LG Monitoring View (LGMV) data. Commissioning results must be entered into LG's online commissioning system within sixty (60) days of System startup.

END OF SECTION 230240

SECTION 230250 - PACKAGED ROOFTOP COOLING UNIT

PART 1 - GENERAL

Applicable provisions of the Conditions of the Contract and Division 1 General Requirements govern the work in this section. Submit shop drawings for checking and approval.

1.1 SYSTEM DESCRIPTION

- A. Outdoor, rooftop mounted, electrically controlled, cooling unit utilizing a fully hermetic, suction gas cooled, direct drive compressor(s) for cooling.
- B. Factory assembled, single- piece cooling rooftop unit. Contained within the unit enclosure shall be all factory wiring, piping, controls, and special features required prior to field start- up.
- C. Unit shall use environmentally sound, R-410A refrigerant.
- D. Unit shall be installed in accordance with the manufacturer's instructions.
- E. Unit must be selected and installed in compliance with local, state, and federal codes.

1.2 QUALITY ASSURANCE

- A. Unit meets ASHRAE 90.1 minimum efficiency requirements.
- B. Unit shall be rated in accordance with AHRI Standards 210/240 or 340/360.
- C. Unit shall be designed to conform to ASHRAE 15.
- D. Unit shall be CSA tested and certified in accordance with ANSI Z21.47 -2016/CSA 2.3-2016, and CSA C22.2 No. 60335-2-40.
- E. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation
- F. Unit casing shall be capable of withstanding 750- hour salt spray exposure per ASTM B117 (scribed specimen).
- G. Roof curb shall be designed to conform to NRCA Standards.
- H. Unit shall be subjected to a completely automated run test on the assembly line. The data for each unit will be stored at the factory and must be available upon request.
- I. Unit shall be designed in accordance with CSA C.22.2 NO.60335-2-40, including tested to withstand rain.
- J. Unit shall be constructed to prevent intrusion of snow into the control box.

1.3 DELIVERY, STORAGE AND HANDLING

- A. Unit shall be stored and handled per manufacturer's recommendations.
- B. Overhead crane can be used to place the units on a roof using rigging holes built into the unit base rails without any additions to the unit.
- C. Unit shall be stored or positioned in the upright position.

PART 2 - PRODUCTS

2.1 EQUIPMENT

A. Unit Cabinet

- 1. Unit cabinet shall be constructed of galvanized steel with exterior surfaces coated with a non-chalking, powder paint finish, certified at 750 hour salt spray test per ASTM-B117 standards.
- 2. Unit cabinet exterior paint shall be: film thickness, (dry) 3.0 MILS minimum, gloss (per ASTM D523, 60°F / 16°C): 80+/- 5, Hardness: H- 2H Pencil hardness.
- 3. Unit cabinet shall have gas utility entry holes in the side of the unit and in the unit underside. Entry holes shall not require field setup and shall be capped from the factory to prevent water intrusion when not in use.
- 4. Unit cabinet shall have electric utility entry locations marked from the factory with a dimple for accuracy of field drilling. Entry locations shall be available for entry through the side of the unit or from the unit underside.
- 5. Base Rail
 - a. Unit shall have base rails on all 4 sides.
 - b. Holes shall be provided in the base rails for rigging shackles to facilitate maneuvering and overhead rigging.
 - c. Holes shall be provided in the base rail for moving the unit by fork truck.
 - d. Base rail shall be a minimum of 15 gauge thickness.
- 6. Condensate Pan and Connections
 - a. Shall be a multidirectional internally sloped condensate drain pan made of a non- corrosive material.
 - b. Shall comply with ASHRAE Standard 62.
 - c. Shall use a 1" NPT female drain connection through the side of the drain pan. Connection shall be made per manufacturer's recommendations.
 - d. Shall include intentional "overflow notch" and water containment path to guide flow of water where desired in the event of a drain pan overflow.

7. Top Panel

- a. Shall be a multi piece top panel.

8. Electrical Connection

- a. All unit power wiring shall enter unit cabinet through a field drilled hole located by a factory provided dimple.
- b. Through- the- base capability. Standard unit shall have a through- the- base electrical location(s) using a raised, embossed portion of the unit base-pan. No base-pan penetration, other than those authorized by the manufacturer, is permitted

C. Fans

1. Evaporator Fan Motor

- a. Shall have permanently lubricated ball-bearings.
- b. Shall have inherent automatic- reset thermal overload protection.
- c. The job site selected brake horsepower shall be required to not exceed the motor's nameplate horsepower rating plus the service factor.

2. Evaporator Fan

- a. Fan shall be a belt drive assembly with an adjustable pitch motor pulley.
- b. Blower bearings shall have an L10 life of 100,000 hrs.
- c. Shall use sealed, permanently lubricated ball-bearing type
- d. Shall use dual blower design consisting of two balanced blower fans on a single shaft.
- e. Blower fan shall be double- inlet type with forward- curved blades.
- f. Shall be constructed from steel with a corrosion resistant finish and dynamically balanced.

3. Condenser Fan Motors:

- a. Shall be totally enclosed motor.
- b. Shall use permanently lubricated ball bearings.
- c. Shall have inherent thermal overload protection with an automatic reset feature.
- d. Shall use a shaft- down design

4. Condenser Fans:

- a. Shall be direct-driven propeller fan type.

D. Compressors

1. Unit shall use fully hermetic scroll compressors for each independent refrigeration circuit.
2. Four stage models shall use a tandem compressor set on circuit one and a fixed speed compressor on circuit two.
3. Compressor motors shall be cooled by refrigerant gas passing through motor windings.
4. Compressors shall be internally protected from high discharge temperature conditions.
5. Compressors shall be protected from an over- temperature and over- amperage conditions by an internal, motor overload device.
6. Compressor shall be factory mounted on rubber grommets.
7. Crankcase heaters shall be installed in the factory as needed on tandem compressor sets

E. Coils

1. Evaporator Coils, Aluminum Fin – Copper Tube
 - a. Standard evaporator coils shall have aluminum plate fins mechanically bonded to seamless internally grooved copper tubes with all joints brazed.
 - b. Shall be leak tested to 150 psig, pressure tested to 250 psig, and burst qualified to CSA C22.2 No. 60335-2- 40.th edition burst test at 1775 psig.
 - c. Assembled unit shall be pressure tested to 450 psig.
2. Condenser Coils, All Aluminum Microchannel
 - a. Condenser coils shall have all aluminum microchannel design consisting of aluminum multiport flat tube design and aluminum fin. Coils shall be a furnace brazed design and contain epoxy lined shrink wrap on all aluminum to copper connections.
 - b. Microchannel condenser coils shall be leak tested to 150 psig, pressure tested by supplier to 600 psig, and burst qualified to CSA C22.2 No. 60335-2-40.
 - c. Assembled unit shall be pressure tested to 450 psig

F. Refrigerant Circuits

- a. 4 speed IntelliSpeed and Variable Air Volume airflow options shall have 2 independent refrigerant circuits with 4 stages of cooling.
- b. Refrigerant circuit shall include the following control, safety, and maintenance features:
 - Thermostatic Expansion Valve (TXV) shall help provide optimum performance across the entire operating range.
 - Refrigerant filter drier - Solid core design.
 - Service gauge connections on suction and discharge lines.

G. Filter Section: Filters access is specified in the unit cabinet section of this specification.

H. Controls and Safeties and Diagnostics

1. General

- a. Shall be complete with self- contained low- voltage control circuit protected by a resettable circuit breaker on the 24- v transformer side. Transformer shall have minimum 75VA capability
- b. Shall utilize color- coded wiring.
- c. Shall include a central control terminal board to conveniently and safely provide connection points for vital control functions such as: smoke detectors, phase monitor, gas controller, economizer, thermostat, DDC control options, and low and high pressure switches.
- d. The gas furnace shall be controlled by an integrated gas controller (IGC) microprocessor. See heat exchanger section of this specification.

2. Safeties

- a. Compressor over- temperature and over- current.
- b. Low pressure switch and high pressure switch. Low pressure switch shall use different color wire than the high pressure switch. The purpose is to assist the installer and service technician to correctly wire and or troubleshoot the rooftop unit.
- c. Automatic reset, motor thermal overload protector.

I. Operating Characteristics

- 1. Shall have an operating temperature range from -40°F to 158°F; 10-90% RH (non-condensing UI), and -4°F to 158°F; 10-90% RH (non-condensing), with a storage temperature range from -40°F to 194°F; 5-95% RH (non-condensing).
- 2. Shall include an option of an Economizer microprocessor controller which communicates directly with the Unit Control Board and has 8 Analog outputs, 2 Analog inputs, 2 Binary outputs, 3 Binary inputs.
- 3. Unit shall be capable of starting and running at 115 F ambient outdoor temperature per maximum load criteria of ARI Standard 360.
- 4. Controller shall accept the following inputs: space temperature, return air temperature sensor, set point adjustment, outdoor air temperature, indoor air quality, outdoor air quality, indoor relative humidity, compressor lock- out, fire/smoke shutdown, single and dual enthalpy, fan status, remote time clock, Sensor Actuator (SA) Bus communicated temperature/humidity/CO2 values from Network sensors, Field Controller (FC) Bus Network Overrides for space temperature, outdoor air temperature, space humidity, outdoor air quality, Indoor air quality, System purge.

5. Shall accept a CO2 sensor or multiple CO2 sensors networked together in the conditioned space, and be Demand Control Ventilation (DCV) ready.
6. Shall provide compressor short-cycle protection with minimum compressor runtime set at 3 minutes standard and adjustable from 2 to 7 minutes.
7. Unit shall provide surge protection for the controller through a circuit breaker.
8. Shall have open communication protocols with all required points exposed. Protocols supported include: BACnet®, MS/TP, Modbus®, and N2 communication.
9. Shall have an LCD display on the Unit Control Board to display fault messages as well as navigate the menu structure to review and change set points.
10. Shall utilize a USB connection to allow for uploading and downloading of data.
 - a. USB shall allow for downloading of “trending data” for analysis of inputs and values on other device such as a PC.
 - b. USB shall allow for uploading of new firmware to the UCB.
 - c. USB shall allow for backing up controller set points and parameters and for uploading of these same parameters to the UCB.
11. Shall include an RJ-12 port to be used with a Wi-Fi signal transmitting device and allow unit(s) access via any non- proprietary smart device.
 - a. Unit access shall include ability to view and change all adjustable parameters and set points using the same characteristics and values available directly through the UCB joystick and LCD display.
 - b. Unit access shall be configurable at 3 different levels to allow control over parameter and set point changes.
 - c. Wi-Fi transmitting device can be connected by 3 means: an RJ-12 port connected directly to UCB, an optional connection port mounted in operating space, an optional connection to building network allowing unit access from any internet browser worldwide.
12. Shall have the capability to integrate with Verasys zoning controls system.
13. Shall not require any proprietary software or contractor tool to start-up, commission and troubleshoot unit operation.
14. Software upgrades will be accomplished by local download via USB port on main Unit Control Board.
15. Shall be UL Recognized, File E107041, UL 916, Energy management Equipment, UL 60335-2-40, Heating and Cooling Equipment; FCC Compliant to CFR47, Part 15, Subpart B, Class B, CSA 22.2 No. 236, Signal Equipment Industry Canada, ICES-003 Recognized, and BTL certified.

J. Electrical Requirements: All unit power wiring shall enter unit cabinet at a single location.

F. Special Features

1. Variable Frequency Drive (VFD). Available on multi-speed (IntelliSpeed) and VAV indoor fan motor options:
 - a. Shall be installed inside the unit cabinet, mounted, wired, and tested.
 - b. Shall contain Electromagnetic Interference (EMI) frequency protection.
 - c. Insulated Gate Bi- Polar Transistors (IGBT) used to produce the output pulse width modulated (PWM) waveform.
 - d. Built in LED display and controls. Does not require additional kit or options.
 - e. RS485 capability standard.
 - f. Electronic thermal overload protection.
 - g. All printed circuit boards shall be conformal coated.
2. Low Leak Economizer:
 - a. Integrated, tie-bar for parallel modulating blade design type capable of simultaneous economizer and compressor operation for the smallest unit. Linkage driven opposing modulating blade design type capable of simultaneous economizer and compressor operation for the others.
 - b. Damper blades shall be galvanized steel with tie-bar metal linkages for the smallest unit and galvanized steel with metal gears for the others. Plastic or composite blades on intake or return shall not be acceptable.
 - c. Damper blades shall be class 1A dampers.
 - d. Shall include all hardware and controls to provide free cooling with outdoor air when temperature and/or humidity are below set points.
 - e. Shall be equipped with tie-bar driven dampers for the smallest unit and gear driven dampers for the others, for both the outdoor ventilation air and the return air for positive air stream control.
 - f. Economizer shall comply with, and be certified to, the AMCA 511 standard.
 - g. Standard leak rate shall be equipped with dampers not to exceed 3 cfm/ft² leakage at 1 in. wg pressure differential.
 - h. Economizer controller shall be the Johnson Controls SE Economizer Controller.
 1. On- board Fault Detection and Diagnostics (FDD) that senses and alerts when the economizer is not operating properly, meets the requirements for California Title 24, IECC 2015, and ASHRAE 90.1.
 2. Display alarms if the following occur.
 - i. Economizer is economizing when conditions do not support.
 - ii. Economizer is not economizing when conditions do support.
 - iii. Damper Stuck
 - iv. Excess Outdoor Air
 - v. Failed Sensor

3. Automatic sensor detection.
 4. Capabilities for use with multiple-speed indoor fan systems.
 5. Utilize digital sensors: Dry bulb and Enthalpy.
 6. UL, CSA, and ICES-003 recognized and FCC compliant to CFR47.
 - i. Shall be capable of introducing up to 100% outdoor air.
 - j. Shall be equipped with a barometric relief damper capable of relieving up to 100% return air and contain seals that meet ASHRAE 90.1 requirements. Barometric relief can be replaced by optional power exhaust.
 - k. Shall be designed to close damper(s) during loss- of- power situations with spring return built into motor.
 - l. Dry bulb outdoor air temperature sensor shall be provided as standard. Enthalpy sensor is available as a factory or field installed sensing option. Outdoor air sensor set point shall be adjustable and shall range from 40° to 80°F / 4° to 27°C. Additional sensor options shall be available as accessories.
 - m. The economizer controller shall also provide control of an accessory power exhaust unit function. Factory set at 100%, with a range of 0% to 100%.
 - o. The economizer shall maintain minimum airflow into the building during occupied period and provide design ventilation rate for full occupancy.
 - p. Dampers shall be completely closed when the unit is in the unoccupied mode.
 - q. Economizer controller shall accept a 2- 10 Vdc CO2 sensor input for IAQ/DCV control. In this mode, dampers shall modulate the outdoor air damper to provide ventilation based on the sensor input.
 - r. Economizer controller shall provide indications when in free cooling mode, in the DCV mode, or the exhaust fan contact is closed.
3. Barometric Relief Damper.
 - a. Shall contain all materials necessary to install a barometric relief damper capable of relieving up to 100% return air and contains seals that meet ASHRAE 90.1 requirements.
4. Unit-Mounted, Non-Fused Disconnect Switch:
 - a. Switch shall be factory installed, internally mounted.
 - b. National Electric Code (NEC) and UL approved non- fused switch shall provide unit power shutoff.
 - c. Shall be accessible from outside the unit.
 - d. Shall provide local shutdown and lockout capability.
5. Modulating Power Exhaust:
 - a. Power exhaust shall be used in conjunction with an integrated economizer.
 - b. Exhaust fans shall be of centrifugal blower design with dual exhaust fans.

- c. Exhaust shall achieve modulation of airflow from the use of ECM fan motors or a Variable Frequency Drive in conjunction with monitoring the static pressure differential between the building duct.
- d. Shall be controlled by economizer controller operation. Exhaust fans shall be energized when dampers open past the 0- 100% adjustable set point on the economizer control.
- e. Exhaust shall have built in fold out rain hood design to reduce installation time.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Inspect equipment space locations before beginning installation. Verify that the space is correct for entry and access. Do not proceed with installation of the equipment until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's instructions and recommendations for installation of equipment, accessories and components.
- B. All heating, ventilating and air conditioning equipment shall be carefully designed, constructed and installed so as to prevent any objectionable noise or vibration reaching any part of the building outside of the mechanical equipment room. Care shall also be taken to prevent transmission of noise or odor through ductwork into other spaces. The Contractor shall be required to rectify or replace at his own expense, any equipment not complying with the foregoing requirements.

3.3 CLEANING

- A. Clean interior and exterior surfaces promptly after installation of equipment and components. Take care to avoid damage to protective coatings and finishes. Remove excess sealants, lubrication, dirt and other foreign substances.

END OF SECTION 230250

SECTION 230270 - VARIABLE AIR VOLUME TERMINAL UNITS

PART 1 - GENERAL

Applicable provisions of the Conditions of the Contract and Division 1 General Requirements govern the work in this section. Submit shop drawings for checking and approval.

PART 2 - PRODUCTS

2.1 EQUIPMENT

A. Variable Air Volume Terminal Units

1. Furnish and install Anemostat EZTS Single Duct Variable Air Volume Terminals Units of size and capacity and performance as shown on the Drawings. The performance of all Single Duct Terminals shall be certified under AHRI Standard 880 and must display the required AHRI 880 Certification Seal. Discharge and radiated sound power levels shall not exceed the values as shown on the terminal unit schedule.
2. The unit casing shall be fabricated from zinc coated steel and use mechanical locking seams to form a leak resistant assembly. Any sealant used in the unit's construction must be approved for duct use and conform to NFPA 90A. Leakage through the Air Terminal casing shall be less than 1% of the maximum rated air flow @ 3" w.g. static pressure. (Optional Lo-Leak casing spec: Leakage through the Air Terminal casing shall be no more than 3 CFM @ 1" w.g. static pressure). The terminal discharge connection shall be Slip & Drive type integral to the casing. The casing shall be 22 gauge and be provided with 6"x6" side access plate, unit mounting brackets, manual damper locking quadrant, standard control enclosure, and a hinged front cover for the control enclosure.
3. The unit casing shall be internally lined with 1/2" thick matte-faced dual density glass fiber insulation that conforms to NFPA-90A and UL 181.
4. The damper assembly shall consist of a round blade that requires nominal 90-degree rotation from fully opened to fully closed positions on sizes 05 through 16. The damper blade shall be mechanically attached to the die-cast metal damper shaft with through the shaft machine-applied rivets. The low leakage damper shall be constructed of a gasket material sandwiched between two 22-gauge zinc coated steel plates. Leakage through the damper shall be less than 1% of the maximum rated airflow at 3" w.g. inlet static pressure. The damper gasket material is securely fastened between the two damper plates using machine applied rivets. The damper assembly shall rotate freely in self-lubricating bearings. Damper position shall be indicated on the end of the shaft on the outside of the casing. Inlet connection and damper on size 24 x 16 shall be rectangular.

5. A multi-point airflow sensor (Velocity Wing) of the center averaging type shall be located in the terminal inlet. The airflow sensor shall be aerodynamically designed to provide low pressure loss, quiet operation and have not less than 20 sensing points on any given size unit. The sensor shall amplify the velocity pressure signal and provide feedback of actual flow to the controller. An identification label with piping/wiring diagram and airflow calibration chart shall be affixed to each unit. Flow taps with caps, separate from the airflow sensor or controller taps shall be provided for flow readjustment.
6. Terminal manufacturer shall mount DDC controls provided by others. All mounting hardware should be provided by the DDC control supplier. It shall be the responsibility of the DDC supplier to coordinate and provide job specific wiring diagrams to the terminal manufacturer.
7. Where shown on the plans, hot water heating coils shall be provided and mounted by the terminal manufacturer. The hot water coils shall be mounted at the discharge of the terminal unit, and the coil shall have a Slip & Drive type connection for attachment to the downstream ductwork. Coils shall be 1/2" copper tubing mechanically expanded in aluminum fins. Coils shall be leak tested with dry nitrogen to 500 psi for tubing with a rated burst pressure of 2500 psi. The performance of all hot water coils shall be rated in accordance with AHRI standard 410. Refer to the terminal schedule on the plans for capacities and performance requirements. The water control valves shall be furnished and installed by others and not by the terminal manufacturer.

END OF SECTION 230270

SECTION 230300 - FANS

PART 1 - GENERAL

Applicable Provisions of the Conditions of the Contract and Division 1 General Requirements govern the work in this section. Submit shop drawings for checking and approval.

PART 2 - PRODUCTS

2.1 FANS

- A. Furnish and install fans of the type, models, size and capacity indicated on the Drawings. Models indicated are as manufactured by Carnes Company. ACME or Greenheck, with equivalent characteristics will be considered.
- B. Refer to Drawing schedule for required accessories and related appurtenances.

2.2 CEILING MOUNTED EXHAUST FANS

- A. Ceiling mounted exhaust fans shall be of the centrifugal direct driven type. The wheel shall be of the forward curved design, balanced for extremely low sound levels. The motor shall be a low r.p.m. and permanently lubricated for continuous operation. The motor shall be resilient mount to help reduce vibration.
- B. Duct connectors shall be provided and will include built-in automatic backdraft dampers. Grilles shall be of a durable, low profile design with a white finish. 8-way adjustable mounting brackets will be provided to permit a variety of mounting options. Cabinets shall be constructed of heavy gauge galvanized steel and shall include an acoustic lining.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Inspect equipment space locations before beginning installation. Verify that the space is correct for entry and access. Do not proceed with installation of the equipment until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's instructions and recommendations for installation of equipment, accessories and components.
- B. All heating, ventilating and air conditioning equipment shall be carefully designed, constructed and installed so as to prevent any objectionable noise or vibration reaching any part of the building outside of the mechanical equipment room. Care shall also be taken to prevent transmission of noise or odor through ductwork into other spaces. The Contractor shall be required to rectify or replace at his own expense, any equipment not complying with the foregoing requirements.

3.3 CLEANING

- A. Clean interior and exterior surfaces promptly after installation of equipment and components. Take care to avoid damage to protective coatings and finishes. Remove excess sealants, lubrication, dirt and other foreign substances.

END OF SECTION 230300

SECTION 230400 - SHEETMETAL WORK AND RELATED ACCESSORIES

PART 1 - GENERAL

Applicable Provisions of the Conditions of the Contract and Division 1 General Requirements shall govern work in this section. Submit shop drawings for checking and approval.

PART 2 - PRODUCTS

2.1 SHEETMETAL DUCTWORK

- A. Contractor shall furnish and install all sheet metal ducts as shown on the Drawings. While the Drawings shall be adhered to as closely as possible, the Engineer reserves the right to vary the run and size to meet the field conditions. Any duct size not shown shall be sized in proportion to the air carried at the same resistance in similar ductwork, or of size as directed.
- B. All ductwork shall be constructed of galvanized steel gauges in accordance with the latest edition of the ASHRAE/SMACNA Guide. Bracing angles for ductwork shall be hot dipped galvanized for steel ductwork and appropriate gauge for aluminum ductwork. All ducts 18" and over in width shall be cross broken to prevent flutter.
- C. Round ductwork shall be galvanized steel, spiral lock seam construction of gauges in accordance with the latest edition of ASHRAE/SMACNA guide. Fittings shall be constructed in standing seam manner. All seams, joints and collars shall be sealed in accordance with SMACNA guidelines for medium pressure ductwork to minimize noise and streaking. Ductwork and fittings shall be connected with sheet metal couplings and sealed as to allow no leakage.
- D. Ducts shall be braced as follows:
 - 1. All ducts not exceeding 24" on one side shall be assembled with airtight slip joints.
 - 2. 25" to 40" larger dimension 1" x 1" x 1/8" angles.
 - 3. 41" to 60" larger dimension 1-1/2" x 1-1/2" x 1/8" angles.
 - 4. All bracing angles shall be a minimum of 4' apart along the length of the duct.
 - 5. Furnish and install all angles and frames for all registers, diffusers, grilles, and louvers.
 - 6. Support horizontal ducts with hangers spaced not more than 8' apart. Place hangers at all changes in direction. Use strap hangers for cuts up to 30" wide.
- E. Comply with all State and Local regulations regarding fire stopping and fireproofing. Provide fusible link fire dampers as required by State, local and Underwriter authorities and where indicated on the Drawings. Each fire damper shall be installed in such a manner as to permit ready access for inspection and maintenance purposes.

- F. Provide splitter and butterfly dampers, deflecting vanes for control of air volume and direction and for balancing systems, where indicated, specified, directed and as required for the proper operation of the systems. Dampers shall be of the same material as the duct, at least one gauge heavier than the duct, reinforced where indicating quadrant and locking device for adjusting damper and locking in position.
- G. Where ducts fewer than 100 square inches penetrate a rated wall, steel ductwork system of a minimum 0.0127 inch thickness shall be used.
- H. All elbows shall have a minimum center line radius of 150% of duct width. If the radius is smaller, turning vanes shall be used: Turning vanes shall be double thickness, fitted into slide strips and screwed or riveted to duct below.
- I. Contractor shall furnish and install all access doors in ducts as required. Access doors shall be of the pan type 1" thick and shall be provided with two galvanized hinges and suitable latched. Access doors insulated with same thickness material as duct and shall be double casing construction.

2.2 REGISTERS AND DIFFUSERS

- A. Registers and diffusers shall be installed where shown on the Drawings and shall be of the sizes specified and the type indicated on the drawing schedule.
- B. All registers and diffusers shall be installed in accordance with manufacturer's recommendations.
- C. Registers and diffusers shall be as manufactured by Carnes, Hart and Cooley or Anemostat Co.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Inspect equipment space locations before beginning installation. Verify that the space is correct for entry and access. Do not proceed with installation of the equipment until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's instructions and recommendations for installation of equipment, accessories and components.
- B. All heating, ventilating and air conditioning equipment shall be carefully designed, constructed and installed so as to prevent any objectionable noise or vibration reaching any part of the building outside of the mechanical equipment room. Care shall also be taken to prevent transmission of noise or odor through ductwork into other spaces. The Contractor shall be required to rectify or replace at his own expense, any equipment not complying with the foregoing requirements.

3.3 CLEANING

- A. Clean interior and exterior surfaces promptly after installation of equipment and components. Take care to avoid damage to protective coatings and finishes. Remove excess sealants, lubrication, dirt and other foreign substances.

END OF SECTION 230400

SECTION 230410 - PIPING, FITTINGS, VALVES AND NOTES (HOT WATER)

PART 1 - GENERAL

Applicable Provisions of the Conditions of the Contract and Division 1 General Requirements shall govern work in this section. Submit shop drawings for checking and approval.

1.1 PIPING NOTES

- A. The Contractor shall erect all pipe, fittings, valves, hangers, anchors, expansion joints and all accessories specified, indicated on the Drawings or required to assure proper operation of all piping systems installed under this Contract. All piping shall be maintained at a proper level to assure satisfactory operation, venting and drainage. Piping and valves in any locality where possible shall be grouped neatly and shall be run so as to avoid reducing headroom or passage clearance.
- B. All piping shall be new and of the material and weight specified under various services. Steel and wrought iron pipe 2" and larger shall be seamless or lap welded. All piping shall have the maker's name and brand rolled on each length of pipe.
- C. All piping, fittings, valves and strainers shall be cleaned of grease, dirt and scale before installation. All temporary pipe openings shall be kept closed during the performance of the work. The ends of all piping shall be reamed smooth and all burrs removed before installation.
- D. All piping shall be cut accurately to measurements taken on the job. Offset connections shall be installed alignment of vertical to horizontal piping and where required to make a true connection and to provide for expansion. Bent or sprung pipe shall not be installed where shown on Drawings and where necessary to provide for expansion of piping. Cold spring hot lines one-half estimated distance of maximum expansion. Suitable pipe anchors shall be installed where shown or required.
- E. Piping connections shall have unions where necessary for replacement and repair of equipment. Gate valves and controls valves shall be installed where shown and where necessary for proper operation and service.
- F. Vertical piping shall be plumb and horizontal piping shall be parallel to walls and partitions. Piping shall be supported as required to prevent the transmission of noise and vibration.
- G. Work shall include all pipe, fittings, offsets and requirements for the installation of piping of other work including ducts and conduit. Reducing fittings shall be used where pipe changes size. All piping shall be installed with ample clearance to center accurately in sleeves through floors, and walls and partitions.
- H. Piping shall be downgraded to drain connections at low points and upgraded to vent connections at high points unless otherwise noted. Drain connections shall be valved and piped to a floor drain. Vent connections on mains shall be equipped with air vent valves fitted with a copper tube drip line extended to a drain outlet. Vent connections on branches and equipment shall be fitted with key type manual vent cocks.

- I. Drain piping shall be installed from all equipment as required. The Contractor shall extend drain piping and turn down over floor drains.

PART 2 - PRODUCTS

2.1 PIPING (ABOVEGROUND)

- A. All piping installed under this Section of the Specifications shall be in accordance with the following schedule.
 1. All piping, except where indicated differently, (i.e. underground piping) shall be standard weight black steel pipe Schedule 40, Grade A53, black steel. Pipe 2" and smaller, cast iron screwed fittings. Pipe 2-1/2" and larger, steel welding fittings. Pipe and fittings as manufactured by National, Wheeling, Bethlehem or equal, manufactured in accordance with ASTM current edition. All pipes must be reamed before installation.
 2. Where the Contractor elects to use copper piping, it shall be rigid Type "L" copper, Chase, Anaconda or approved equal. Fittings shall be wrought copper, Nibco, Anaconda, Mueller or approved equal. Where copper piping is used, make all additional provisions for expansion. All condensate piping shall be Type "M" copper, rigid, full size of unit drain tapping, or larger as shown on Drawings.
 3. All drainage pipe lines, 2" larger except where galvanized screw pipe is shown on the Drawings or specified hereafter, shall be extra heavy cast iron soil pipe and fittings.
- B. Piping installation shall be arranged for draining through accessible valves at low points.
- C. Threaded short and close nipples shall be Schedule 80, extra heavy weight of the same material as pipe in system in which they are installed.
- D. All bare copper pipe, tubing and fittings shall be cleaned with steel wool and all excess solder shall be removed.

2.2 VALVES

- A. All valves, unless specified or noted otherwise, shall be designed for a working pressure of not less than 200 p.s.i. water or 125 p.s.i. steam with name and pressure rating of valve cast in body. All valves shall be of the same manufacturer, unless specified otherwise. Valves for cut-off shall be gate valves, unless otherwise specified.
- B. All valves of same manufacturer: similar to Jenkins Bros., Walworth, Kennedy or approved equal.
- C. Four inch and larger, flanged; smaller sizes, screwed.
- D. All Gate and Globe valves shall be installed with handle in an upright position.

- E. The Contractor shall furnish and install all valves shown on Drawings and all valves that are necessary for proper operation and maintenance of systems and equipment. All piping connections to each piece of equipment and all branch connections to mains shall have cut-off valves.
- F. The following schedule of valves for steam condensate, hot water, etc. is based on Jenkins Brothers, Inc. catalog numbers (except as noted); equivalent Lukenheimer, Walworth, O-I-C, Crane Fairbanks Company valves will be acceptable.
- G. Ball Valves
 - 1. 1/4" to 2-1/2" rated for 600 p.s.i wog, with brass body, chrome plated brass ball, virgin PTFE seats, and full port with threaded or solder connections.
 - 2. 2-1/2" and larger rated for 200 p.s.i with carbon steel body, stainless steel full port ball, RTFE seats, lever operated to 4" gear operated 6" and above, with flanged end connections.
- H. Gate Valves
 - 1. Up to 2" : Bronze gate solid wedge, inside screw traveling stem union bonnet, - Fig. 47U
 - 2. 2-1/2" and 3" : Iron body, bronze-mounted gate, solid wedge, OS&Y rising stem, -Fig. 650-A
 - 3. 4" and larger: Iron body, bronze-mounted gate, solid wedge, OS&Y rising stem, -Fig. 651-A
- I. Globe Valves
 - 1. Up to 2" : Bronze body, regrinding seat ring and plug, union bonnet, -Fig. 546P
 - 2. 2-1/2" and 3" : Iron body, bronze-mounted globe and angle, regrinding disc and seat ring, OS&Y -Fig. 613
 - 3. All gate valves 6" and larger: Fitted 3/4" by-pass globe valve.
- J. Plug Valves
 - 1. Up to 2" : Lubricated, semi-steel short pattern wrench operated, -Fig. 142
 - 2. 2-1/2" and larger: Lubricated, semi-steel short pattern wrench operated, -Fig. 143
 - 3. Similar to Rockwell Mgd. Co., Jenkins, Kennedy or approved equal.

K. Butterfly Valves used for chilled water, condenser water and hot water shall be the following:

1. 2-1/2" to 12" rated for 175 p.s.i bubble tight close off, 14" and larger for 150 p.s.i close-off.
2. Full lug cast iron body, aluminum bronze disc, stainless steel stem EPDM peroxide cured seat.
3. 2-14" to 6" valves to be equipped with 10 position notch plate and lever lock handle. 8" and larger with handwheel gear operator.
4. On installation, valves to be in full open position when flange bolts are tightened and stem in a horizontal position except when equipped with a chainwheel gear operator.
5. Provide chain wheel gear operator on all valves installed 7 feet or higher.
6. Valves to be designed with replaceable seat and parts kits.
7. Valve to be Bray series 31, Dezurik 637 or Demco.

L. Check Valves

1. 150 p.s.i. WSP class.
2. Up to 2" : Bronze, regrinding bronze disc, screw-in cap, -Fig. 762A
3. 2-1/2" and 3" : Iron body, bronze mounted regrinding bronze seat ring and disc, - Fig. 623
4. 4" and larger: Iron body, bronze mounted regrinding bronze seat ring and disc, - Fig. 624

M. Drain Valves: All low points shall have drain valves, with hose ends. Where 1/2" and 3/4" sizes are indicated, "Standard" hose end drain valves shall be used. Provide brass hose end drain caps at each drain valve. Where larger than 3/4" drains are shown, gate valve shall be used. Provide brass nipples and reducer from drain valve size to 3/4" terminating with 3/4" hose end drain valve and cap.

2.3 FITTINGS

A. Nipples

1. All nipples shall have clean cut threads and shall be made from new pipe, standard weight for all lengths, except that close and shoulder nipples shall be extra heavy.
2. Fittings - 2-1/2 and Smaller: All fittings shall be standard weight steam pattern gray cast iron, Grinnell, Stockholm or equal approved.
3. Fitting - 3" and Larger: The Contractor has the option to use screwed, flanged or welded fittings so long as all ASME requirements are met.

B. Joints and Unions

1. Threaded joints shall be full and clean cut. The ends of pipe shall be reamed to the full inside diameter, all burrs shall be removed and no more than three threads shall be exposed beyond fittings when made up. Joints shall be made up tight with graphite base pipe joint compound. Exposed threads of ferrous pipe shall be painted with acid-resisting paint after caulking, lampwick or other material will be allowed for correction of defective joints.
2. Flange joints shall be made up perfectly square and tight. Screwed flanges and loose flanges shall be cast iron and welding flanges shall be steel. Flanges shall be faced true and bolted up tight with 1/16" Carlock ring type gasket.
3. Bolts shall be high quality steel with hexagon nuts and heads. The Contractor shall apply grease to threads of bolt.
4. Welded joints in piping shall be by the electric or oxyacetylene process using welding rods if the characteristics similar to pipe material and as recommended by the pipe manufacturer and shall be done in accordance with the ASME Code for pressure piping. Welding shall be done by qualified welders under the requirements of the ASME Boiler and Pressure Vessel Code.
5. The pipe lengths shall be aligned with welding rings and the abutting pipe ends shall be concentric. Prior to welding, the groove and adjacent surfaces shall be thoroughly cleaned of all grease, scale, or rust. During welding, all slag, or flux remaining on the bead shall be removed before laying down the next bead. The welding metal shall be thoroughly fused with the base metal at all sections of the weld. Short lengths of pipe may be beveled on the job with oxyacetylene torch, provided all scale and oxides are removed.
6. Joints shall be butt-welded, single V-type. All fittings shall be steel welding fittings. Elbows and fittings formed with coupling or welded cut pipe sections shall not be acceptable.
7. Bonney Weldolets or welding saddles may be used for branch connections, which are less than one-half the size of the main to which they connect.
8. Ground Joint Unions, Flange Connections, Reaming & Filling Ground joint unions shall be 200 lb. s.w.p. for brass. Flanges shall be 150 lb. s.w.p. for brass, 125 lb. s.w.p. for cast iron.
9. Ground joint unions of flanges shall be used only on exposed accessible piping. Where concealed, right and left nipples and couplings must be used. Where flanged connections are used, full size gaskets must be inserted.

- C. Threads: Shall be standard, clean cut and tapered. All piping shall be reamed free from burrs. All piping shall be kept free of scale and dirt. Caulking of threads will not be permitted. All piping shall be threaded and made up in accordance with the current edition of the ASA Standard Specifications for pipe threads.

D. Unions

1. Unions for use on ferrous pipe 2" and smaller shall be malleable iron with brass to iron ground joint spherical seat and threaded connections. Unions 2 1/2" and over shall be flanged type with gasket.
2. Unions for copper tubing shall be cast bronze conforming to ASA B16. The Contractor shall furnish adapters where required for copper pipe.
3. Where copper pipe connects to ferrous pipe or metals, the Contractor shall furnish EPCO isolating type dielectric unions. Plastic type isolating bushings are not acceptable.
4. Unions shall be installed wherever necessary for repair or replacement of equipment, valves, strainers, etc. Final connections to equipment shall be made in a manner that will permit removal without cutting of pipelines.

E. Solder

1. All sweat joints shall be made up with 95/5 solder.
2. Solder shall be National Lead or approved equal. Flux shall be non-toxic and non-corrosive.
3. All copper tubing ends shall be reamed, filed and cleared of burrs and rough edges. All pipes shall be reamed after cutting and threading.

F. Expansion

1. The entire piping installation shall be installed with adequate provision for expansion. No rigid connections will be permitted.
2. Branches shall be of sufficient length and have 3 elbow swings to allow for pipe expansion.
3. Provide expansion joints, guides and anchors equal to "Metra-Flex MetraLoops" where indicated on Drawings or where necessary for proper expansion compensation. Submit shop drawing.
4. Any breaks in the piping within the guarantee period due to improper provision for expansion must be replaced at the expense of this Contractor, and the conditions corrected to prevent future recurrence.
5. Any damages to surrounding areas and equipment due to this failure shall also be repaired and paid for at the expense of the Contractor.
6. Joints to have 150 psi rating, ANSI-B16.5 with liner and cover.

2.4 PIPING SLEEVES

- A. Furnish sleeves built into place for all piping passing through walls, floors or building construction. Sleeves, not less than 1/2" larger in diameter than piping and its covering, if any, and extending full depth of construction pierced. Pack sleeves through walls/floors in accordance with Underwriters' Requirements.
- B. Sleeves piercing exterior walls, integral waterproofed walls shall be standard weight steel piping. Furnish welded center flange buried in construction for sleeves through exterior walls below grade. At exterior walls, make pipes watertight in sleeves with oakum packing and caulked lead joints on both sides of wall. All other sleeves: Galvanized sheet steel with lockseam joints, #22 USSG for 3" or under. Sleeves for piping 4" and larger, #18 USSG.
- C. Pipes passing through interior membrane waterproofed floors, cast iron flashing sleeve, with integral flashing flange and clamping ring, similar to Josam Series #1880. Adjust sleeves to floor construction with steel or wrought iron pipe nipples top and bottom, extending 3" above finished floor. Burn & J.R. Smith are equal.
- D. Pipes passing through membrane waterproofed walls, cast iron flashing sleeve with internal flashing flange and clamping ring similar to Josam Series #1870. Make pipes watertight in sleeves with oakum packing and caulked lead joints. Burn & J.R. Smith are equal.
- E. For flashing sleeves specified in Pars. C and D, lead flashing extended at least 10" around flashing sleeves, securely held in place by clamping device.

2.6 PIPING ENCLOSURES

- A. Where concealed piping in ceilings and wall of finished spaces is not possible vertical or horizontal metal piping enclosures equal to "Sterling" model PCH (horizontal) or PCHV (vertical). Provide all required hangers, supports, corners, brackets, etc. color per Architect.

PART 3 - EXECUTION

3.1 GENERAL NOTES - PIPING NOTES, DRAINING, VENTING AND MISCELLANEOUS WATER SPECIALTIES

- A. Piping shall be installed as indicated on Drawings. Elevations and dimensions are indicated as a guide only and are subject to change with actual job conditions.
- B. Except for drainage piping, which shall pitch down with flow, mains shall pitch upward or be installed dead level as indicated. Horizontal runs shall be parallel to walls.
- C. In general, all branch connections shall be top of bottom 45 degree or 90 degree, pitching up or down from mains.

- D. Where indicated, flexible connectors shall be installed. All final connections to equipment, pumps, units, etc. shall have companion flanged, flange unions or ground joint unions. (125 lbs.)
- E. All piping shall be adequately supported with approved type hangers so as to prevent absolutely any sagging of lines, or any undue strain on pipes or fittings. All pipe lines shall be capped during construction to prevent entry of dirt or other foreign material. All piping lines after erection shall be blown or flushed out to render the piping system as clean as possible before system water is added for operation.
- F. Clean interior and exterior surfaces promptly after installation of equipment and components. Take care to avoid damage to protective coatings and finishes. Remove excess sealants, lubrication, dirt and other foreign substances.
- G. Comply with manufacturer's instructions and recommendations for installation of equipment, accessories and components.
- H. All heating, ventilating and air conditioning equipment shall be carefully designed, constructed and installed so as to prevent any objectionable noise or vibration reaching any part of the building outside of the mechanical equipment room. The Contractor shall be required to rectify or replace at his own expense, any equipment not complying with the foregoing requirements.

3.2 DRAINING

- A. All low points shall have drain valves with hose ends. Where 1/2" and 3/4" sizes are indicated, "Standard" hose end drain valves shall be used. Provide brass hose end drain caps at each drain valve. Where larger than 3/4" drains are shown, gate valve shall be used. Provide brass nipple and reducer from drain valve size to 3/4" terminating with 3/4" hose end drain valve and cap.

3.3 VENTING (For Hot Water)

- A. All high points in piping shall be vented automatically with float vents. At all high points of piping, whether specifically indicated or not, provide Maid-o-Mist or B&G No. 7 or 27 Air Eliminators with shut off cock, auxiliary key vent and copper tubing overflow carried to floor along wall as indicated or directed.

3.4 WATER SPECIALTIES

- A. Air Vents: Install at all high points automatic air vents to eliminate air binding. All automatic air vents shall be approved heavy duty type equipped with petcocks and tubing for manual venting. All vents installed in coils, etc. shall be of manual key operated type. All vents concealed from view shall be accessible through access doors. Vents shall be by Hoffman, Anderson or Bell & Gossett, 125 p.s.i.g. rated.
- B. Pressure Gauge: Furnish and install pressure gauges on suction and discharge sides of each pump and as required to check operation of equipment; pressure gauges shall have 4-1/2" diameter dials, Ashton, Ashcroft or approved equal.

- C. Install thermometers at all locations in piping system as noted on Drawings and as required to check system performance. Thermometers shall be installed at the supply and return of coils and 3-way diverting valves as manufactured by Trerice, Weksler or Moeller, with 4-1/2 inch face, cast aluminum case, chrome plated steel ring, white background with black embossed markings, glass window, stainless steel pointer, brass movement, 316 stainless steel bulb. Provide separable, universal angle sockets for all thermometers.

END OF SECTION 230410

SECTION 230420 - SUPPORTS, SLEEVES AND PLATES

PART 1 - GENERAL

Applicable Provisions of the Conditions of the Contract and Division 1 General Requirements govern work in this section. Submit shop drawings for checking and approval.

1.1 DESCRIPTION OF WORK

- A. This Contractor shall furnish and install all plates, hangers and supports for his equipment including piping, headers, fans expansion tank, ductwork, etc.
- B. All ductwork, piping and equipment shall be hung or supported from structural members only.

PART 2 - PRODUCTS

2.1 PIPING, DUCTWORK AND EQUIPMENT

- A. All piping shall be supported from building structure in a neat and workmanlike manner wherever possible, parallel runs of horizontal piping shall be grouped together on trapeze hangers. Vertical risers shall be supported at each floor line with steel pipe clamps. Use of wire perforated metal to support pipes will not be permitted. Hanging pipes from other pipes will not be permitted.
- B. Necessary structural members, hangers and supports of approved design to keep piping in proper alignment and prevent transmission of injurious thrusts and vibrations shall be furnished and installed. In all cases where hangers, brackets, etc., are supported from concrete construction, care shall be taken not to weaken concrete or penetrate waterproofing.
- C. All hangers and supports shall be capable of screw adjustment after piping is erected. Hangers supporting piping expanding into loops, bends and offsets shall be secured to the building structure in such a manner that horizontal adjustment perpendicular to the run of piping supported may be made to accommodate displacement due to expansion. All such hangers shall be finally adjusted, both in the vertical and horizontal direction, when the supported piping is hot.
- D. Pipe hangers shall be as manufactured by Grinnell, whose catalog numbers are given herein, or equivalent Carpenter and Paterson, or F&S Mfg. Co.
- E. Piping shall be supported as follows unless otherwise indicated on the Drawings:
 - 1. Heating piping shall be 1-1/2 " and smaller Fig. #260 adjustable clevis hanger. 2" and larger Fig. #174 one-rod swivel roll hanger.
 - 2. Two-rod hangers shall be used for piping close to the ceiling slab or where conditions prohibit use of other hanger types.

3. Anchors for hanger rods shall be Phillips "Red Head" self-drilling type. Anchors shall be placed only in vertical surfaces.
 4. Spacing of pipe supports shall not exceed 8 feet for pipes up to 1-1/2" and 10 feet on all other piping.
 5. Hangers shall pass around insulation and a 16 gauge steel protective cradle; 12" long shall be inserted between hangers and insulation. Insulation under cradle shall be high density calcium silicate or approved equal to prevent crushing.
 6. All piping shall be supported to allow free movement where expanding or contracting. Pipe shall be anchored as required or directed.
 7. All lateral runs of piping shall be securely supported on hangers, rolls, brackets, etc. and in manner to allow for proper expansion and elimination of vibration.
 8. 2" and smaller pipe, where run on walls, shall be supported on wrought iron "J" hook brackets with anchor bolts.
 9. All horizontal pipes, where run overhead or on walls, shall be supported as follows unless otherwise indicated: On adjustable steel clevis type hangers suspended on hanger rods, pipe sizes up to and including 4".
- F. Space limitations in hung ceilings spaces and conditions in other locations may require use of other type of hangers than those specified above. Suitable and approved pipe hangers shall be provided for such job conditions.
- G. All supports shall be fastened to structural members or additional steel supports furnished by this Contractor.
- H. Hanger rods shall be steel, threaded with nuts and lock nuts sizes in accordance with the following schedule:
- | <u>Pipe Size</u> | <u>Rod Size</u> |
|-------------------------|-----------------|
| 3/4" to 2" inclusive | 3/8" |
| 2-1/2" and 3' inclusive | 1/2" |
| 4" and 5" inclusive | 5/8" |
| 6" | 3/4" |
| 8" to 12" inclusive | 7/8" |
- I. Hangers for copper tubing shall be tacked up with formed lead sheet on which tubing, or pipe shall be placed.
- J. Where pipes pass through masonry, concrete walls, foundations, or floors, this Contractor shall set sleeves as are necessary for passage of pipes. These sleeves shall be of sufficient size to permit insulation where required to be provided around pipe passing through. This Contractor shall be responsible for exact location of these sleeves.

- K. Sleeves shall not be used in any portion of building where use of same would impair strength of construction features of the building. Inserts for supporting lateral pipes and equipment shall be placed and secured to form work, and all sleeves inserts locations shall be thoroughly checked with Architect so as not to conflict with other trades.
- L. Where pipes pass through floor or walls, they shall be provided with chromium plated escutcheons.
- M. Anchor horizontal piping where indicated and wherever necessary to localize expansion or prevent undue strain on branches. Anchors: Heavy forged construction entirely separate from supports.
- N. Anchor vertical piping wherever indicated and wherever necessary to prevent undue strain on offsets and branches. Anchors, unless otherwise noted: Heavy steel clamps securely bolted and welded to pipes. Extension ends shall bear on building construction.
- O. Ducts shall be hung with 1" x 1/8" metal straps. When width of duct is less than 48", hangers shall be fastened to side of ducts. Auxiliary steel supports that may be required for all mechanical equipment shall be furnished and installed by this Contractor. All operating equipment including fans, piping, etc. shall be supported so as to produce minimum amount of noise transmission.
- P. Refer to "General Conditions" as well.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Inspect equipment space locations before beginning installation. Verify that the space is correct for entry and access. Do not proceed with installation of the equipment until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's instructions and recommendations for installation of equipment, accessories and components.
- B. All heating, ventilating and air conditioning equipment shall be carefully designed, constructed and installed so as to prevent any objectionable noise or vibration reaching any part of the building outside of the mechanical equipment room. Care shall also be taken to prevent transmission of noise or odor through ductwork into other spaces. The Contractor shall be required to rectify or replace at his own expense, any equipment not complying with the foregoing requirements.

3.3 CLEANING

- A. Clean interior and exterior surfaces promptly after installation of equipment and components. Take care to avoid damage to protective coatings and finishes. Remove excess sealants, lubrication, dirt and other foreign substances.

END OF SECTION 230420

SECTION 230430 - INSULATION AND COVERINGS

PART 1 - GENERAL

Applicable Provisions of the Conditions of the Contract and Division 1 General Requirements govern work in this section. Submit shop drawings for checking and approval.

1.1 DESCRIPTION OF WORK

- A. Furnish insulation for all piping, equipment and sheetmetal work as noted.
- B. Insulate no piping, ducts or equipment until tested and approved for tightness. All piping and ducts shall be dry when covered. Where existing insulation has been damaged, altered or removed during the course of the work, it shall be replaced with new insulation in a neat manner to match the adjacent insulation.
- C. All insulation must be done by an approved Sub-Contractor or by mechanics skilled in this line of work.
- D. Fire hazard classification shall be 2550 per ASTM E-84, NFPA 255 and UL 723. Insulation shall be rated non-combustible type classified flame spread - 25, smoke developed - 50.

PART 2 - PRODUCTS

2.1 DUCTWORK (INDOOR)

- A. All supply, outside air intake and exhaust (on discharge side of fan) and return (in unconditioned spaces) ductwork shall be covered with fiberglass with aluminum foil vapor barrier. All joints shall be lapped so maximum coverage is achieved.
- B. All insulated ductwork shall be insulated with thick fiberglass board insulation with canvas finish in areas where ductwork is exposed.
- C. Insulation thickness shall be in accordance with the latest edition of the New York State Energy Conservation Construction Code.
- D. Thermal acoustic lining of ductwork a minimum of 20 linear feet from HVAC unit fans, a minimum of 10 linear feet from VAV Boxes, and where indicated on drawings shall be 1-1/2" thickness closed cell elastomeric thermal acoustic liner unless otherwise noted. The lining shall meet the Life Safety Standards as established by NFPA 90A and 9B and conform to the requirements of ASTM C 1071.

2.2 DUCTWORK (OUTDOOR)

- A. All exposed ductwork shall be insulated with 2" thick flexible elastomeric thermal insulation with 12 mil laminated covering with pressure sensitive adhesive. Provide 6" wide seam tape with matching cladding. Manufactured by Polyguard Model Type Alumaguard; Armacell Model Type Armatuff or approved equal.

- B. Make proper provision with ductwork support(s) so that insulation is not damaged. All exterior ductwork must be designed with adequate slope (watershed) to prevent ponding water.

2.3 PIPING / EQUIPMENT (INDOOR)

- A. All new or altered heating and chilled water system supply and return piping shall be covered with Manville Micro-Lok or equal approved fiberglass insulation with all service (factory applied) vapor retardant jacket. Seal with type H mastic.
- B. Fittings shall be insulated with same material and thickness as adjoining pipe insulation and shall be pre-molded fittings or miter cut segmental insulation wired on. Over the insulation, apply a wrapper of OCF glass cloth sealed with type H mastic. Apply aluminum bands on pipe covering in addition to self-sealing feature.
- C. Insulation Material: Molded fibrous glass insulation, density not less than 4 lbs. per cubic foot.
- D. Insulation Thickness: Shall be in accordance with the latest edition of the New York State Energy Conservation Construction Code.
- E. Jacket and Finish: White flame retardant type, meeting all requirements of "Fire Hazard Classification" of NFPA, similar to "Fiberglass" Type FRJ, Insul-Coustic, Johns-Manville or approved equal.
- F. Insulation and Finishes for Fittings, Valves and Flanges
 - 1. Valves, fittings and flanges other than vapor seal insulation: Insulated in same manner and same thickness as piping in which installed.
 - 2. Use pre-molded sectional covering where available; otherwise use mitered segments of pipe covering.
 - 3. Obtain written approval prior to using other than molded sectional covering.
- G. Vapor seal Insulation for Valves, Fittings and Flanges: Same as above, except joints sealed with vapor barrier adhesive and wrapped with glass mesh tape. Each fitting shall be finished with two coats of vapor seal mastic adhesive.
- H. Jacket and Finishes: Exposed fittings - 6 oz. canvas jacket adhered with lagging adhesive.
- I. Concealed fittings: Standard weight canvas jacket adhered with lagging adhesive and with bands of 18 gauge copper coated steel - 2 bands at elbows, 3 at tee.

J. Insulation at Pipe Hangers

1. Where shields are specified at hangers on piping with fibrous glass covering, provide load bearing calcium silicate between shields and piping as follows:
 - a. For pipe covering without vapor barrier jacket, furnish at each shield 12" - long calcium silicate section with canvas section with canvas jacket continuous between shield and insulation.
 - b. For pipe covering with vapor barrier jacket, furnish at each shield 12" - long vapor barrier jacket section with section of fibrous glass replaced with section of calcium silicate. Vapor barrier jacket, continuous between shield and insulation for continuous vapor barrier.

K. Condensate drain and refrigerant piping shall be insulated with 1/2" Imcosheild un-split polyolefin insulation.

L. Equipment

1. Secure fibrous glass block or board insulation in place with wire or galvanized steel bands.
 - a. Small Areas: Secure insulation with 16 gauge wire on maximum 6" centers.
 - b. Large Areas: Secure insulation with 14 gauge wire or .015" thick by 1/2" wide galvanized steel bands on maximum 10" centers. Stagger insulation joints.
 - c. Irregular Surfaces: Where application of block or board insulation is not practical insulate with insulating cement built-up to same thickness as adjoining insulation.
2. Fill joints, voids and irregular surfaces with insulating cement to a uniform thickness.
3. Stretch wire mesh over entire insulated surface and secure to anchors with wire edges laced together.
4. Apply finishing cement, total of 1/2" thick, in 1/4" thick coats. Trowel second coat to a smooth hard finish.
5. Neatly bevel insulation around handholes, cleanouts, ASME stamp, manufacturer's nametag and catalog number.

M. Insulated Covers for Pumps: Do not extend pump insulation beyond or interfere with stuffing boxes or interfere with adjustment and servicing of parts regular maintenance or operating attention.

2.4 PIPING (OUTDOOR)

- A. All supply and return piping shall be covered with 2" thickness insulation.
- B. Insulation shall be calcium silicate with aluminum jacket.
- C. Calcium silicate insulation shall conform with ASTM C 533, Type I, and shall be Manville "Thermo-12" or approved equal.
- D. Insulation jacket shall be 0.016 inch thick aluminum for pipes 2-1/2 inches and larger, and 0.010 inch thick for pipes 2 inches and smaller with a built-in isolation felt. All seams and joints shall be weatherproof.
- E. Refrigerant piping shall be insulated with 1/2" Imcosheild un-split polyolefin insulation.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Inspect equipment space locations before beginning installation. Verify that the space is correct for entry and access. Do not proceed with installation of the equipment until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's instructions and recommendations for installation of equipment, accessories and components.
- B. All heating, ventilating and air conditioning equipment shall be carefully designed, constructed and installed so as to prevent any objectionable noise or vibration reaching any part of the building outside of the mechanical equipment room. Care shall also be taken to prevent transmission of noise or odor through ductwork into other spaces. The Contractor shall be required to rectify or replace at his own expense, any equipment not complying with the foregoing requirements.

3.3 CLEANING

- A. Clean interior and exterior surfaces promptly after installation of equipment and components. Take care to avoid damage to protective coatings and finishes. Remove excess sealants, lubrication, dirt and other foreign substances.

END OF SECTION 230430

SECTION 230440 - DAMPERS AND MISCELLANEOUS

PART 1 - GENERAL

Applicable Provisions of the Conditions of the Contract and Division 1 General Requirements govern work in this section. Submit shop drawings for checking and approval.

PART 2 - PRODUCTS

2.1 DAMPERS AND MISCELLANEOUS

- A. Furnish and install where shown on Drawings ARROW PIN-LOCK Dampers No. OBDPL-507 (Opposed) as manufactured by the Arrow Louver & Damper Corp. of Maspeth, NY 11378, or approved equal. Frames and blades to 1/8" extruded aluminum.
- B. Blades to be single unit PIN-LOCK design 6" wide, with the PIN-LOCK an integral section within the blade center axis. Frames to be a combination of 4" extruded aluminum channel and angle, with reinforcing bosses and groove inserts for vinyl seals.
- C. Pivot rods to be 1/2" diameter extruded aluminum, PIN-LOCK design interlocking into blade section. Bearings to be "Double-Sealed" type with Celcon inner bearing on rod riding in Merlon Polycarbonate outer bearing inserted in frame so that outer bearing cannot rotate.
- D. Blade linkage hardware is to be installed in angle or channel frame section out of air stream. All hardware to be of non-corrosive reinforced material or to be cadmium plated.
- E. Rod bearing to be designed for minimum air leakage by means of overlapping design and by extruded vinyl seals to fit into integral ribbed groove inserts in both frames and blades. All dampers in excess of 10 sq. ft. free area to have reinforced corners by means of gusset plates.
- F. Dampers shall be sized by the Control Manufacturer to properly control the flow of air and ensure minimum air stratification in mixing applications. Sizing shall be submitted for approval with information similar to that submitted on valve when sizing valve.

2.2 FIRE DAMPERS

- A. Dampers shall be multi blade construction UL labeled and be installed in accordance with UL 555, with breakaway connections. The units shall have stainless steel actuator springs with locking devices for horizontally mounted type.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Inspect equipment space locations before beginning installation. Verify that the space is correct for entry and access. Do not proceed with installation of the equipment until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's instructions and recommendations for installation of equipment, accessories and components.
- B. All heating, ventilating and air conditioning equipment shall be carefully designed, constructed and installed so as to prevent any objectionable noise or vibration reaching any part of the building outside of the mechanical equipment room. Care shall also be taken to prevent transmission of noise or odor through ductwork into other spaces. The Contractor shall be required to rectify or replace at his own expense, any equipment not complying with the foregoing requirements.

3.3 CLEANING

- A. Clean interior and exterior surfaces promptly after installation of equipment and components. Take care to avoid damage to protective coatings and finishes. Remove excess sealants, lubrication, dirt and other foreign substances.

END OF SECTION 230440

SECTION 230460 - AUTOMATIC TEMPERATURE CONTROLS

PART 1 - GENERAL

Applicable Provisions of the Conditions of the Contract and Division 1 General Requirements govern work in this section. Submit shop drawings for checking and approval.

1.1 QUALIFICATIONS OF BIDDER

- A. All bidders must be building automation contractors in the business of installing direct digital control building automation systems for a minimum of 10 years.
- B. All bidders must have an office in the within 50 miles of jobsite.
- C. All bidders must be authorized distributors or branch offices of the manufacturers specified.
- D. All bidders must have a trained staff of application Engineers, who have been certified by the manufacturer in the configuration, programming and service of the automation system.

1.2 DESCRIPTION OF WORK

- A. This Contractor shall furnish an Electronic/DDC system of temperature controls as manufactured by Andover Controls, Johnson Controls or school district standardized manufacture. All temperature control wiring regardless of voltage shall be done by this Contractor. The automatic temperature control manufacturer shall provide wiring diagrams, field supervision and one (1) year guarantee on the installed DDC system and three (3) year factory warrantee on all control equipment manufactured by the DDC manufacturer.
- B. Day/night heating control devices, etc. are indicated on the drawings in general. All temperature sensors shall have in addition separately mounted extra heavy guards. Submit sample.
- C. Contractor shall include all new heating control devices, thermostats, etc. indicated on drawings or that is part of a new system. Contractor shall furnish all necessary Electrical controls, motor, starters, switches, etc. for proper operation of equipment furnished by him under this Contract and as herein noted.

1.3 TRAINING

- A. Provide a minimum of (40) hours of on-site training for (3) system operators. The training will be hands-on type at the Owner's office. The training class will use the actual Operator's Manual that will be submitted for this project. In addition, provide (2) weeks of classroom training for one individual at the Manufacturer's sponsored training courses.

1.3 SOFTWARE CODE

- A. Owner shall be furnished with a complete, hard-bound copy of all installed software code. Final payment shall be contingent upon this requirement being met.

PART 2 - PRODUCTS

2.1 CONTROL VALVES (With Electric Actuator)

- A. Provide automatic control valves suitable for the specified controlled media (water or glycol). Provide valves, which mate and match the material of the connected piping. Equip control valves with the actuators of required input power type and control signal type to accurately position the flow control element and provide sufficient force to achieve required leakage specification.
- B. Control valves shall meet the heating and cooling loads specified and closes off against the differential pressure conditions within the application. Valves should be sized to operate accurately and with stability from 10% to 100% of the maximum design flow.
- C. Trim material shall be stainless steel for hot water and high differential pressure applications.
- D. Electric actuation should be provided on all terminal unit reheat applications.

2.2 DAMPERS (With Electric Actuators)

- A. Automatic dampers furnished by the Building Automation Contractor shall be single or multiple blade as required. Dampers are to be installed by the HVAC Contractor under the supervision of the BAS Contractor. All blank-off plates and conversions necessary to install smaller than duct size dampers are the responsibility of the Sheetmetal Contractor.
- B. Damper frames are to be constructed of 13-gauge galvanized sheet steel mechanically joined with linkage concealed in the side channel to eliminate noise as friction. Compressible spring stainless steel side seals and acetyl or bronze bearings shall also be provided.
- C. Damper blade width shall not exceed eight inches. Seals and 3/8-inch square steel zinc plated pins are required. Blade rotation is to be parallel or opposed as shown on the schedules.
- D. For high performance applications, control dampers will meet or exceed the UL Class I leakage rating.

2.3 DAMPER ACTUATORS

- A. Electronic Actuators: The actuator shall be direct coupled over the shaft, enabling it to be mounted directly to the damper shaft without the need for connecting linkage. The actuator shall have electronic overload circuitry to prevent damage. For power-failure/safety applications, an internal mechanical, spring return mechanism shall be built into the actuator housing. Non-spring return actuators shall have an external manual gear release to allow positioning of the damper when the actuator is not powered.
- B. All valves shall be fully proportioning, unless otherwise specified, quiet in operation, and shall be arranged to fail safe, in either a normally open or normally closed position, in the event of power failure. The open or closed position shall be as specified or as required to suit job conditions. All valves shall be capable of operating at varying rates of speed to correspond to the exact dictates of the controller and variable load requirements.
- C. Where valves operate in sequence with other valves or damper operators, provide on each valve a pilot positioner to provide adjustable operating ranges and starting points and positive close off at the required control signal pressure. Positioners must be directly connected to the valve stem. Ratio relays are not acceptable.
- D. Valves shall be sized by the Temperature Control Manufacturer and guaranteed to meet the heating or requirements as specified and indicated on the Drawings. Unless otherwise specified, all shall conform to the requirements herein specified for the piping system in which they are installed.

2.4 CENTRAL CONTROL PANEL

- A. Provide a central control touch screen panel located in owner directed location. This central panel will allow for time clock scheduling, setpoints, monitoring of points and alarm. Any freeze-stats will be reset manually at the central panel. All alarms will be displayed and reset manually at central panel.
- B. All scheduled HVAC units shall be controlled by the central control panel.

1.8 LOCAL STAND-ALONE CONTROLLERS

- A. Provide local stand-alone controllers as required. These controllers will, through DDC programs control local units. They shall be networked together to central touch screen panel.

1.9 DUCT AND PIPE MOUNTED CONTROLLERS

- A. Unless specifically specified there shall be no duct or pipe mounted controllers or control limit thermostats. All controllers, whether or not low or high limit, will be panel mounted.
- B. If specifically called for, duct and pipe mounted controllers shall comply with the sensing requirements specified for transmitters and the control capabilities of receiver controllers.

1.10 CONTROL DIAGRAMS

- A. Complete new control diagrams showing type of apparatus, cycles of operation and details of all equipment must be submitted for checking and be approved before installation is started.
- B. Submit three (3) preliminary copies of the control diagrams, sequence descriptions, and equipment Shop Drawings for checking and the submit six (6) copies, complete for final approval.
- C. At the completion of installation, control manufacturer shall furnish non-fading original, plastic laminated copies of all control diagrams as the apply to the particular instruments thereon. One complete set of non-fading plastic laminated diagrams shall be mounted on wall as directed.

PART 3 - EXECUTION

3.1 GENERAL

- A. All DDC Controllers shall be networked to Central Communications controller.
- B. Communications cabling shall be run in hallways above hung ceiling with plenum cable and wiremold where exposed.

3.2 CONTRACTOR RESPONSIBILITIES

- A. General: The Contractor or a Sub-Contractor shall perform installation of the building automation system. However, all installation shall be under the personal supervision of the Contractor. The Contractor shall certify all work as proper and complete.
- B. Demolition: Remove controls, which do not remain as part of the building automation system, all associated abandoned wiring and conduit and all associated pneumatic tubing. The Owner will inform the Contractor of any equipment, which is to be removed, that will remain the property of the Owner. The Contractor will dispose of all other equipment that is removed.
- C. Access to Site: Unless notified otherwise, entrance to building is restricted. No one will be permitted to enter the building unless their names have been cleared with the Owner or the Owner's representative.
- D. Code Compliance: All wiring shall be installed in accordance with all applicable electrical codes and will comply with equipment manufacturer's recommendations. Should any discrepancy be found between wiring Specifications in Division 26 and Division 22, wiring requirements of Division 26 will prevail for work specified in Division 26.

- E. Cleanup: At the completion of the work, all equipment pertinent to this Contract shall be checked and thoroughly cleaned, and all other areas shall be cleaned around equipment provided under this Contract. Clean the exposed surfaces of tubing, hangers, and other exposed metal of grease, plaster, or other foreign materials.

3.3 WIRING, CONDUIT, TUBING AND CABLE

- A. All wire will be copper and meet the minimum wire size and insulation class listed below:

<u>Wire Class</u>	<u>Wire Size</u>	<u>Isolation Class</u>
Power	12 Gauge	600 Volt
Class One	14 Gauge Std.	600 Volt
Class Two	18 Gauge Std.	300 Volt
Class Three	18 Gauge Std.	300 volt
Communications	Per Mfr.	Per Mfr.

- B. Power and Class One wiring may be run in the same conduit. Class Two and Three wiring and communications wiring may be run in the same conduit.
- C. Where different wiring classes terminate within the same enclosure, maintain clearances and install barriers per the National Electric Code.
- D. Where wiring is required to be installed in conduit, EMT shall be used. Conduit shall be minimum 1/2-inch galvanized EMT. Setscrew fittings are acceptable for dry interior locations. Watertight compression fittings shall be used for exterior locations and interior locations subject to moisture. Provide conduit seal off fitting where exterior conduits enter the building or between areas of high temperature/moisture differential.
- E. Flexible metallic conduit (max. 3 feet) shall be used for connections to motors, actuators, controllers, and sensors mounted on vibration producing equipment. Liquid-tight flexible conduit shall be use in exterior locations and interior locations subject to moisture.
- F. Junction boxes shall be provided at all cable splices, equipment termination, and transitions from EMT to flexible conduit. Interior dry location J-boxes shall be galvanized pressed steel, nominal four-inch square with blank cover. Exterior and damp location JH-boxes shall be cast alloy FS boxes with threaded hubs and gasket covers.
- G. Where the space above the ceiling is a supply or return air plenum, the wiring shall be plenum rated. Teflon wiring can be run without conduit above suspended ceilings. EXCEPTION: Any wire run in suspended ceilings that is used to control outside air dampers or to connect the system to the fire management system shall be in conduit.
- H. Coaxial cable shall conform to RG62 or RG59 rating. Provide plenum rated coaxial cable when running in return air plenums.

3.4 HARDWARE INSTALLATION

A. Installation Practices for Wiring and Tubing

1. All controllers are to be mounted vertically and per the manufacturer's installation documentation.
2. The 120 VAC power wiring to each Ethernet or Remote Site controller shall be a dedicated run, with a separate breaker. Each run will include a separate hot, neutral and ground wire. The ground wire will terminate at the breaker panel ground. This circuit will not feed any other circuit or device.
3. A true earth ground must be available in the building. Do not use a corroded or galvanized pipe, or structural steel.
4. Wires are to be attached to the building proper at regular intervals such that wiring does not drop. Wires are not to be affixed to or supported by pipes, conduit, etc.
5. Wiring in finished areas will be concealed in ceiling cavity spaces, plenums, and furred spaces and wall construction. Exception; metallic surface raceway may be used in finished areas on masonry walls. All surface raceway in finished areas must be color matched to the existing finish within the limitations of standard manufactured colors.
6. Wiring, in non-finished areas where possible, will be concealed in ceiling cavity spaces, plenums, furred spaces, and wall construction. Exposed conduit will run parallel to or at right angles to the building structure.
7. Wires are to be kept a minimum of three (3) inches from hot water or condense piping.
8. Where sensor wires leave the conduit system, they are to be protected by a plastic insert.

B. Installation Practices for Field Devices

1. Well-mounted sensors will include thermal conducting compound within the well to insure good heat transfer to the sensor.
2. Actuators will be firmly mounted to give positive movement and linkage will be adjusted to give smooth continuous movement throughout 100 percent of the stroke.
3. Relay outputs will include transient suppression across all coils. Suppression devices shall limit transients to 150% of the rated coil voltage.
4. Water line mounted sensors shall be removable without shutting down the system in which they are installed.

5. For duct static pressure sensors, the high-pressure port shall be connected to a metal static pressure probe inserted into the duct pointing upstream. The low-pressure port shall be left open to the plenum area at the point that the high-pressure port is tapped into the ductwork.
6. For building static pressure sensors, the high-pressure port shall be inserted into the space via a metal tube. Pipe the low-pressure port to the outside of the building.

C. Enclosures

1. For all I/O requiring field interface devices, these devices, where practical, will be mounted in a field interface panel (FIP). The Contractor shall provide an enclosure, which protects the device(s) from dust, moisture, conceals integral wiring and moving parts.
2. FIP's shall contain power supplies for sensors, interface relays and Contractors, safety circuits, and I/P transducers.
3. The FIP enclosure shall be of steel construction with baked enamel finish; NEMA 1 rated with a hinged door and keyed lock. The enclosure will be sized for 20% spare mounting space. All locks will be keyed identically.
4. All wiring to and from the FIP will be to screw type terminals. Analog or communications wiring may use the FIP as a raceway without terminating. The use of wire nuts within the FIP is prohibited.
5. All outside mounted enclosures shall meet the NEMA-4 rating.
6. The wiring within all enclosures shall be run in plastic track. Wiring within controllers shall be wrapped and secured.

D. Identification

1. Identify all control wires with labeling tape or sleeves using either words, letters, or numbers that can be exactly cross-referenced with As-Built Drawings.
2. All field enclosures, other than controllers, shall be identified with a Bakelite nameplate. The lettering shall be in white against a black or blue background.
3. Junction box covers will be marked to indicate that they are a part of the BAS system.
4. All I/O field devices (except space sensors) that are not mounted within FIP's shall be identified with nameplates.
5. All I/O field devices inside FIP's shall be labeled.

E. Control System Switch-Over

1. Demolition of the existing control system will occur after the new temperature control system is in place including new sensors and new field interface devices.
2. Switch over from the existing control system to the new system will be fully coordinated with the Owner. A representative of the Owner will be on site during switch over.
3. The Contractor shall minimize control system downtime during switch over. Sufficient installation mechanics will be on site so that the entire switch over can be accomplished in a reasonable time frame.

F. Location

1. The location of sensors is per Mechanical and Architectural Drawings.
2. Outdoor air sensors will be mounted on the north building face directly in the outside air. Install these sensors such that the effects of heat radiated from the building or sunlight is minimized.
3. Field enclosures shall be located immediately adjacent to the controller panel(s) to which it is being interfaced.

3.5 SOFTWARE INSTALLATION

- A. General: The Contractor shall provide all labor necessary to install, initialize, start-up and debug all system software as described in this section. This includes any operating system software or other third-party software necessary for successful operation of the system.
- B. Database Configuration: The Contractor will provide all labor to configure those portions of the database that are required by the points list and sequence of operation.
- C. Color Graphic Slides: Unless otherwise directed by the Owner, the Contractor will provide color graphic displays as depicted in the Mechanical Drawings for each system and floor plan. For each system or floor plan, the display shall contain the associated points identified in the point list and allow for set point changes as required by the Owner.
- D. Reports - The Contractor will configure a minimum of 6 reports for the Owner as listed below:
1. Central Plant Status Report
 2. Air Handler Status Report
 3. Energy Consumption Report
 4. Space Temperature Report
 5. Specialty Equipment Status Report

E. Documentation - As-built software documentation will include the following:

1. Descriptive point lists
2. Application program listing
3. Application programs with comments
4. Printouts of all reports
5. Alarm list
6. Printouts of all graphics

3.6 COMMISSIONING AND SYSTEM STARTUP

A. Point-to-Point Checkout:

Each I/O device (both field mounted as well as those located in FIP's) shall be inspected and verified for proper installation and functionality. A checkout sheet itemizing each device shall be filled out, dated and approved by the Project Manager for submission to the Owner or Owner's representative.

B. Controller and Workstation Checkout:

A field checkout of all controllers and front-end equipment (computers, printers, modems, etc.) shall be conducted to verify proper operation of both hardware and software. A checkout sheet itemizing each device and a description of the associated tests shall be prepared and submitted to the Owner or Owner's representative by the completion of the project.

C. System Acceptance Testing

1. All application software will be verified and compared against the sequences of operation. Control loops will be exercised by inducing a setpoint shift of at least 10% and observing whether the system successfully returns the process variable to setpoint. Record all test results and attach to the Test Results Sheet.
2. Test each alarm in the system and validate that the system generates the appropriate alarm message, that the message appears at all prescribed destinations (workstations or printers), and that any other related actions occur as defined (i.e. graphic panels are invoked, reports are generated, etc.). Submit a Test Results Sheet to the Owner.
3. Perform an operational test of each unique graphic display and report to verify that the item exists, that the appearance and content are correct, and that any special features work as intended. Submit a Test Results Sheet to the Owner.
4. Perform an operational test of each third-party interface that has been included as part of the automation system. Verify that all points are properly polled, that alarms have been configured, and that any associated graphics and reports have been completed. If the interface involves a file transfer over Ethernet, test any logic that controls the transmission of the file, and verify the content of the specified information.

3.7 SEQUENCES OF OPERATION

A. HVAC Packaged Rooftop Units with VAV AC-1, AC-2, AC-3 & AHU-2.

1. Point List

- a. Space Temperature
- b. Space Temperature Setpoint
- c. Discharge Temperature
- d. Freezestat Status
- e. Fan Start/Stop (2)
- f. Fan Status (2)
- g. OA/RA/EA Modulation
- h. Hot Water Reheat Coil Valves Modulation
- i. Radiation Valves Modulation
- j. DX Cooling Staging
- k. VAV Box Modulation

2. Sequence of Operation

- a. Unoccupied Mode: During the unoccupied heating mode, the outside air damper shall be closed, the return air damper and hot water coil valves shall be open. The radiation valve shall modulate to maintain night setback setpoint. Should the radiation alone fail to maintain the setpoint, the unit fan shall be energized. During the unoccupied cooling mode, the outside air damper shall close, the return damper shall be open. The unit fan and DX cooling shall be energized and modulate as necessary to maintain the setpoint. Unoccupied set points shall be 65 °F (field adjustable) for heating mode and 80 °F (field adjustable) for cooling mode.
- b. Occupied Mode: Unit supply and exhaust fans to be VFD driven. During morning warm-up mode (room temperature more than 2 degrees below daytime setpoint), OA/EA damper shall be closed. **Morning warm-up shall be scheduled to occur prior to space occupancy.** (Provide a similar morning cool-down mode) As room temperature rises the OA/RA/EA shall modulate to the minimum position. Should room temperature continue to rise past the setpoint, radiation and reheat coil valves shall modulate closed and then OA/RA/EA dampers shall modulate further to provide free cooling (based on enthalpy calculation). Upon further room temperature rise past setpoint the OA/RA/EA dampers shall return to their minimum OA positions and DX cooling shall be energized. As room temperature decreases the reverse shall occur. A manual reset freeze stat shall stop the fan, close the outside air damper and open the reheat coil valves.

- c. VAV Control: Static pressure sensor in the supply ductwork, located at the end of the duct system, will on an increase in static pressure, modulate both the supply and exhaust fans variable frequency drives. The static pressure setpoint will be reset by outside air temperature and average room temperature through software. During the warm-up cycle, the VAV boxes will reverse their action through software. When warm-up cycle is completed, the system will modulate OA/RA/EA dampers in sequence to maintain a discharge setpoint temperature that is reset by outside air temperature and average space temperature so that one VAV box will always be 100% open. Switchover from heating to cooling mode of VAV box operations shall be based on outdoor air temperature.
- d. To maintain minimum OA quantity at all times, the OA damper shall modulate based on the supply fan's speed. When the supply fan is at its maximum speed (when the VAV boxes are at their maximum position), the OA damper shall be at its minimum position providing the minimum OA required for the system in that condition. As the fan modulates down to the lowest set speed (the VAV boxes modulate towards their minimum position), the OA air damper shall modulate accordingly to its maximum position to ensure that the minimum OA required for the system is being provided for those conditions. All dampers (damper actuators) (outside air/return air/relief air) must modulate in conjunction with modulation of all fan motors (supply/relief) to provide the minimum required volumetric flow rate of outside air during all occupied times at all VAV positions. OA minimum and maximum setpoints shall be indicated on ventilation schedules.

B. Exhaust Fans (EF)

- 1. Point List
 - a. Fan Start/Stop
 - b. Fan Status
- 2. Sequence of Operation
 - a. Unoccupied Mode: Fan Off
 - b. Occupied Mode: Fan On

C. Cabinet Heaters / Unit Heaters / Convectors / Fin-Tube Radiation (Existing)

- 1. Point List.
 - a. Space Temperature
 - b. Valve Modulation

2. Sequence of Operation

- a. Unoccupied Mode: Modulate control valve to maintain night setback temperature set point (adjustable).
- b. Occupied Mode: Modulate control valve to maintain daytime temperature set point (adjustable).

3.8 CERTIFICATION

- A. After completion of installation and after equipment has been placed on operation, the temperature control manufacturer shall submit in writing, a complete and detailed report and certification that the entire installation is operating exactly as specified and shall be guaranteed for two (2) years. Report shall state temperature and throttling range readings and settings of all control instruments. Submit to the Engineer preliminary for checking and approval.

3.9 INSTALLATION

- A. All work under the automatic temperature control Sub-Contract shall be done by competent skilled mechanics regularly in the employ of the temperature control manufacturer.
- B. The ATC Sub-Contractor must be a control manufacturer currently involved in the production of commercial pneumatic/electric temperature controls. Franchises and associations all on considered control manufacturers.
- C. Provide start-up supervision, complete with all programming and instructions for use to the owners/operators of the system.

3.10 INSTRUCTIONS TO OWNER'S PERSONNEL

- A. The Automatic Temperature Control Sub-Contractor shall provide the services of competent instructors to fully instruct designated personnel in the adjustment, operation and maintenance, including pertinent safety requirements of the equipment and systems specified. The training shall be oriented toward the installed system rather than being a general (canned) training course. Each instructor shall be thoroughly familiar with all aspects of the subject to be taught.
- B. All equipment and materials required for classroom training shall be provided by the DDC Contractor.

END OF SECTION 230460

SECTION 230470 - TESTING, START-UP AND ADJUSTMENTS

PART 1 - GENERAL

Applicable Provisions of the Conditions of the Contract and Division 1 General Requirements govern work in this section.

1.1 TESTING, START-UP AND ADJUSTMENTS

- A. Furnish all materials, supplies, labor and power required for testing. Make preliminary tests and prove work satisfactory. Notify Architect and all authorities having jurisdiction in ample time to be present for final testing of all piping. Test before insulating or concealing any piping. Repair defects disclosed by tests, or if required by Architect, replace defective work with new work without additional cost to Owner. Make tests in stages if so ordered by Architect to facilitate work of others. Use of wicking in tightening leaking joints not permitted.
- B. HVAC Contractor is responsible for work of other trades disturbed or damaged by tests and/or repair and replacement of his work, and shall cause work so disturbed or damaged to be restored to its original condition at his own expense.
- C. Unless otherwise specified, all piping systems shall be hydrostatically tested to 150 p.s.i.g. Tests shall be of four (4) hour duration during which time piping shall show no leaks and during time no sealing of leaks will be permitted.
- D. HVAC Contractor shall balance out system and submit test reports showing operating data to include the following:
 - 1. C.F.M. of all air handling equipment.
 - 2. C.F.M. at each air outlet.
 - 3. G.P.M. for equipment.
 - 4. R.P.M. for each fan and fan motor.
 - 5. Motor power consumption.
 - 6. Air temperature readings before and after coils.
 - 7. Water temperature readings in and out of coils and through equipment.
 - 8. Pressure gauge readings before and out of all pertinent equipment.
- E. If the performance of the systems does not conform to the design parameters, the Contractor shall return to the site until the systems perform as designed.
- F. HVAC Contractor shall furnish services of qualified personnel, thoroughly familiar with job, to operate and make all adjustments so that system and control equipment shall operate as intended. This shall include adjustment/replacement of sheaves/impellers to achieve design performance. Adjustments shall be made including balancing of water and air systems in cooperation with qualified representatives of mechanical equipment manufacturers and temperature control manufacturer. This shall include any required adjustment/replacement of sheaves, belts, impellers, etc. to achieve design performance. Architect/Engineer is to be notified when this balancing is to be performed.

- G. When all work is in an acceptable operating condition, furnish operating and maintenance manuals as specified in General Requirements.
- H. All HVAC equipment shall be carefully designed, constructed, and installed so as to prevent any objectionable noise or vibration reaching any part of the building outside of the mechanical equipment room. Care shall also be taken to prevent transmission of noise or odor through ductwork into other spaces.
- I. Contractor shall include in his Bid, adjustment of air quantity below scheduled C.F.M. for air systems deemed "noisy" by Owner subsequent to initial balancing.
- J. The Contractor shall be required to rectify or replace at his own expense, any equipment not complying with the foregoing requirements.
- K. Final inspection and approval shall be made only after proper completion of all of above requirements.

END OF SECTION 230470

SECTION 230480 - GENERAL LABELING, VALVE CHARTS AND PIPING IDENTIFICATION

PART 1 - GENERAL

Applicable Provisions of the Conditions of the Contract and Division 1 General Requirements govern work in this section. Submit shop drawings for checking and approval.

1.1 GENERAL LABELING AND VALVE CHARTS

- A. This Contractor shall have appropriate descriptive labels, identification tags and nameplates of equipment, valves, etc. furnished and installed under this Contract and shall be properly placed and permanently secured to (or adjacent to) the item being installed. All such labels, identifications, tags, nameplates, etc. shall be selected by the Architect/Engineer.
- B. In general, labels shall be the lamacoid type of sufficient size to permit easy identification, black coated, white edged, with letters 3/16" high. Major equipment, apparatus, control panels, etc. shall have 8" x 4" lamacoid plates with lettering of appropriate size.
- C. Provide tags for all valves, automatic and manual dampers. Tags shall be Type #2020 anodized aluminum of #1420 lamacoid engraved. Tags may not necessarily be standard. Fasten tags to valve or damper with brass chain.
- D. All nameplates, labels, identifications, and tags shall be as manufactured by the Seton Name Plate Co., of New Haven, CT or approved equal. Submit complete schedules, listings, and descriptive data together with samples for checking and approval before purchasing. Labeling shall include the "number" of the equipment, valve, dampers, switch, etc. and service of the valve.
- E. Mount on laminated plastic boards with transparent surface all valves, wiring diagrams, control diagrams, instruction charts, permits, etc. Valve chart shall be non-fading with original copies laminated.

1.2 IDENTIFICATION OF PIPING

- A. This Contractor shall provide on all piping, semi-rigid, wrap around plastic identification markers equal to Seton Snap-Around and/or Seton Strap-On pipe markers.
- B. Each marker background is to be appropriately color coded with a clearly printed legend to identify the contents of the pipe. Directions of flow arrows are to be included on each marker.
- C. Identification of all piping shall be adjacent to each valve, at each pipe passage through wall, floor, and ceiling construction and at each branch and riser take-off.
- D. Identification shall be on all horizontal pipe runs, marked every 15 ft. as well as at each inlet outlet of equipment.

END OF SECTION 230480

SECTION 230485 - HVAC SYSTEMS COMMISSIONING

PART 1 - GENERAL

Applicable Provisions of the Conditions of the Contract and Division 1 General Requirements govern the work in this section.

1.1 RELATED DOCUMENTS

- A. In the case of a conflict between this and any other section in the project specifications, the more stringent or detailed requirements shall apply.

1.2 DEFINITIONS

- A. Commissioning Plan: A document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process.
- B. CxA: Commissioning Authority.

1.3 DESCRIPTION

- A. The systems that shall be commissioned in this project include but are not limited to the following:
 - 1. Central Building Automation System including packaged unitary controllers.
 - 2. Equipment of the heating, ventilating and air conditioning systems.
- B. The commissioning authority (CxA) for this project shall be the AE of record. His contractor shall cooperate in all respects with the commissioning process as outlined below.

1.4 OVERVIEW OF CONTRACTOR'S RESPONSIBILITIES

- A. Perform commissioning inspections and tests at the direction of the CxA.
- B. Attend construction phase controls coordination meeting.
- C. Attend testing, adjusting, and balancing (TAB) review and coordination meetings.
- D. Participate in HVAC systems, assemblies, equipment, and component maintenance orientation and inspection as directed by the CxA.
- E. Provide information requested by the CxA for final commissioning documentation.
- F. Provide measuring instruments and logging devices to record test data and provide data acquisition equipment to record data for the complete range of testing for the required test period.
- G. Provide detailed startup procedures.

- H. Provide copies of all submittals, including all changes thereto, with details as required in the appropriate subsection of 3.1 Responsibilities.
- I. Facilitate the coordination of the commissioning process and incorporate commissioning activities into overall project schedule (OPS).
- J. Ensure all subcontractors and vendors execute their commissioning responsibilities according to the contract documents and the OPS.
- K. Provide required demonstration and training of owner's personnel.
- L. Review and accept construction checklists provided by commissioning authority (CxA).
- M. Prepare O&M manuals, according to the contract documents, including clarifying and updating the original sequences of operation to as-built/as-tested conditions.
- N. Cooperate with the CxA for resolution of issues recorded in the "Issues Log"
- O. Prepare and provide all documentation as necessary for the compilation of the Systems Manual.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

- A. The HVAC Contractor shall provide all standard testing equipment required to perform startup, initial checkout, and testing requirements of Division 23.
- B. The Controls Contractor shall provide all standard testing equipment required to test the Building Automation and Automatic Temperature Control System (BAS), including calibration of valve and damper actuators and all sensors. Trend logs for functional testing shall be generated through the BAS interface as requested by the CxA.
- C. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the following tolerances. Temperature sensors and digital thermometers shall have a certified calibration, performed within the past year, to an accuracy of 0.5°F and a resolution of ± 0.1 °F. Pressure sensors shall have an accuracy of $\pm 2.0\%$ of the value range being measured (not full range of meter) and have been calibrated within the last year. All equipment shall be calibrated according to the manufacturer's recommended intervals and when dropped or damaged. Calibration tags shall be affixed or certificates readily available.

PART 3 - EXECUTION

3.1 RESPONSIBILITIES

- A. HVAC, Controls and TAB Contractors. The commissioning responsibilities applicable to each of the HVAC, Controls and TAB Contractors of Division 23 are follows:
 - 1. Attend the initial commissioning meeting conducted at the start of construction, the commissioning meeting held 30 days prior to startup of the primary equipment, and all commissioning team meetings.

2. Provide a copy of approved shop drawings and startup reports for all commissioned equipment to the CxA. Supplement the shop drawing data with the manufacturer's installation and start-up procedures. This material should be identical to the literature which will be included in the Operation and Maintenance Manuals.
3. The Operation and Maintenance Manuals shall be submitted to the CM prior to the start of training (three (3) weeks before startup and training and at least sixty (60) days before substantial completion).
4. Perform and document results of Pre-functional Inspections at the direction of the CxA. Ensure that the inspection checklists are completed before startup or as specified by the CxA.
5. During the startup and initial checkout process, execute all portions of the manufacturer's start-up checklists for all commissioned HVAC equipment.
6. Perform and clearly document all completed startup and system operational checkout procedures and provide a copy to the CxA.
7. Perform and document results of equipment functional testing at the direction of the CxA. Ensure that the testing is completed in the timeline specified by the CxA.
8. Address current A/E punch list items and Commissioning corrective action items on the "Issues Log" before functional testing. Air and water TAB shall be completed, with discrepancies and problems remedied, before functional testing of the respective air-or water-related systems.
9. Provide skilled technicians to execute starting of equipment and to perform tests in accordance with all Division 23 sections. Where specified, startup shall be performed by a factory authorized service representative. Ensure that they are available and present during the agreed-upon schedules for the sufficient duration to complete the necessary tests, adjustments and problem-solving.
10. Correct deficiencies (differences between specified and observed performance as interpreted by the CxA and A/E) and retest the equipment.
11. Provide training of Owner's operating staff as specified in Division 23 Sections. Use expert qualified personnel.
12. Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty.
13. Correct deficiencies and make necessary adjustments to O&M manuals for applicable issues identified in any seasonal testing.

- B. HVAC Contractor. The responsibilities of the HVAC Contractor, during construction and acceptance phases in addition to those listed in (A) are:
1. Provide startup for all HVAC equipment.
 2. Prepare a preliminary schedule for Division 23 pipe and duct system testing, flushing, and cleaning, equipment start-up and TAB start and completion for use by the PM and CxA. Update the schedule as appropriate.
 3. Notify the PM and CxA when pipe and duct system testing, flushing, cleaning, startup of each piece of equipment, and TAB will occur. Be proactive in seeing that commissioning processes are executed and that the CxA has the scheduling information needed to efficiently facilitate the commission process.
 4. Calibrations: The HVAC Contractor is responsible to calibrate all factory-installed sensors and actuators. Sensors installed in the unit at the factory with calibration certification provided need not be field calibrated by the HVAC Contractor.
 5. Supervise all commissioning activities executed by subcontractors, including the Controls Contractor.
 6. List and clearly identify on the as-built duct and piping drawings the locations of all flow meters, fire and smoke dampers, duct detectors, temperature sensors, relative humidity sensors, CO2 sensors, static and differential pressure sensors (air, water and building pressure).
- C. Controls Contractor - The commissioning responsibilities of the Controls Contractor, during construction and acceptance phases in addition to those listed in (A) are:
1. Sequences of Operation Submittals. The Controls Contractor's submittals of control drawings shall include complete detailed sequences of operation for each piece of equipment, regardless of the completeness and clarity of the sequences in the specifications. The submitted sequences shall generally include the following, but can vary according to project needs:
 - a. An overview narrative of the system (one or two paragraphs) generally describing its purpose, components, and function.
 - b. Logic diagrams detailing the flow of information for each control algorithm. These diagrams should include all inputs, outputs, and computations.
 - c. All interactions and interlocks with other systems.
 - d. Detailed delineation of control between any packaged controls and the building automation system, listing which points the only monitored at the BAS, and which points can be controlled by and adjusted at the BAS.
 - e. Written sequences of control for packaged controlled equipment. (Equipment manufacturers' stock sequences may be included but will generally require additional narrative).
 - f. Start-up sequences.
 - g. Warm-up mode sequences.
 - h. Normal operating mode sequences.
 - i. Unoccupied mode sequences.
 - j. Shutdown sequences.

- k. Capacity control sequences and equipment staging.
 - l. Temperature and pressure control: setbacks, setups, resets, etc.
 - m. Detailed sequences for all control strategies, e.g., economizer control, optimum start/stop, staging, optimization, demand limiting, etc.
 - n. Effects of power or equipment failure with all standby component functions.
 - o. Sequences for all alarms and emergency shutdowns.
 - p. Seasonal operational differences and recommendations.
 - q. Initial and recommended values for all adjustable settings, setpoints and parameters that are typically set or adjusted by operating staff; and any other control settings or fixed values, delays, etc. that will be useful during testing and operating the equipment.
 - r. Daily/weekly/monthly schedules, as appropriate, if known.
 - s. To facilitate referencing in testing procedures, all sequences shall be written in small statements, each with a number for reference. Where possible, the numbering sequence shall correspond with Section 23 0460 Automatic Temperature Controls.
2. Control Drawings Submittal:
- a. The control drawings shall have a key to all abbreviations.
 - b. The control drawings shall contain graphic schematic depictions of the system and each component.
 - c. The schematics shall include the system and component layout of any equipment that the control system monitors, enables, or controls, even if the equipment is primarily controlled by packaged or integral controls.
 - d. Provide a full points list with at least the following included for each point:
 - 1. Controlled system.
 - 2. Point abbreviation
 - 3. Point description
 - 4. Display unit.
 - 5. Control point or setpoint (Yes/No)
 - 6. Input point (Yes/No)
 - 7. Output point (Yes/No)
 - e. The controls contractor shall keep the A/E, CxA, HVAC and TAB Contractor informed, in a timely manner, of all changes to this list during programming and setup.
3. Submit a written checkout plan indicating in a step-by-step manner, the procedures that will be followed to test, checkout and adjust the control system prior to functional testing. At minimum, the checkout plan shall include for each type of equipment controlled by the building automation system:
- a. System name.
 - b. List of devices.

- c. Step-by-step procedures for testing each controller after installation, including:
 - 1. Process of verifying proper hardware and wiring installation.
 - 2. Process of downloading programs to local controllers and verifying that they are addressed correctly.
 - 3. Process for performing and documenting point-to-point checkout for each digital and analog input and output.
 - 4. Process of performing operational checks of each controlled component.
 - 5. Plan and process for calibrating valve and damper actuators and all sensors.
 - 6. A description of the expected field adjustments for transmitter, controllers and control actuators should control responses fall outside of expected values.
 - d. A copy of the log and field checkout sheets that will document the process. This log must include a place for initial and final read values during calibration of each point and clearly indicate when a sensor, controller or command has "passed" and is operating within the contract parameters.
 - e. A description of the instrumentation required for testing.
 - f. Indicate the portion of the controls checkout plan that should be completed prior to TAB using the controls system for TAB work. Coordinate with the CxA and TAB Contractor for this determination.
4. Point-to-Point Checkout: Include in the checkout plan a point-to-point checkout. Each control point tied to a central control system shall be verified to be commanding, reporting, and controlling according to its intended purpose. For each output, commands shall be initiated and verified to be functioning by visually observing and documenting the status of the controlled device in the field (e.g. valve or damper actuator response, pump, or fan status). For each input, the system or conditions shall be altered to initiate the input response being tested and the response in the control system observed and recorded (e.g. high duct static pressure alarm).
5. Calibrations: The Controls Contractor is responsible to calibrate all field installed sensors and actuators using test and documentation methods approved by the CxA. The HVAC Contractor is responsible to calibrate all factory installed sensors and actuators.
- a. Sensors installed in the unit at the factory, with a calibration certification provided, need not be field calibrated by the HVAC Contractor.
 - b. Valve leak-by tests shall be conducted by the Contractor when shown on a construction checklist.
 - c. All procedures used shall be fully documented by the Controls Contractor on suitable forms, clearly referencing the procedures followed and written documentation of initial, intermediate, and final results.

6. Beyond the control points necessary to execute all documented control sequences, provide monitoring, control and virtual points as indicated in the Specifications.
 7. Provide an official notice to proceed to the CxA and project team upon completion of the Building Automation System (BAS) and Automatic Temperature Control System (ATC) installation, including checkout and calibration of each controlled device, to confirm that all system programming is complete as to all respects of the Contract Documents. This shall be submitted by the Controls Contractor prior to the start of functional testing by the CxA.
- D. TAB Contractor: The scope of work for the TAB Contractor is provided in Section 230460.

3.2 SUBMITTALS

- A. The Contractor shall send one copy of product data, shop drawings and similar submittals to the CxA at the same time they are submitted to the A/E. The CxA will review the submittals and provide any comments to the A/E for inclusion in their comments. The Architect will transmit to the CxA, for the CxA's use in preparing functional test procedures; one reviewed and approved copy of product data, shop drawings and similar submittals received from the HVAC, Controls and TAB Contractors, pertinent to equipment and systems to be commissioned.

3.3 STARTUP

- A. The HVAC, Controls and TAB Contractors shall follow the start-up and initial checkout procedures listed in the Responsibilities list in this section. Equipment start-up is required to complete systems and sub-systems, so they are fully functional, in compliance with the Contract Documents. The commissioning procedures and functional testing do not relieve or lessen this responsibility, or partially shift that responsibility to any extent onto the Commissioning Agent or Owner.
- B. Testing is intended to begin upon completion of a system.

3.4 TESTS

- A. The HVAC and Controls Contractors shall provide the necessary support to the CxA to complete functional testing. The Controls Contractor shall fully test and verify all aspects of the BAS Contract Work on a point / system / integrated operational basis for all points, features and functions specified. The following requirements apply to all mechanical and control systems and features that are to be commissioned when referenced below. Tests shall:
1. Verify functionality and compliance with the basis of design for each individual sequence module in the sequence of operations. Verify proper operation of all control strategies, energy efficiency and self-diagnostics features by stepping through each sequence and documenting equipment and system performance. Tests shall include startup, normal operation, shutdown, scheduled 'on' and 'off', unoccupied and manual modes, safeties, alarms, over-rides, lockouts and power failure.

2. Verify operation of systems and components that may be impacted during low, normal, and high load conditions and during combinations of environmental and interacting equipment conditions that could reasonably exist and potentially result in adverse system reaction.
 3. Verify all alarm and high and low limit functions and messages generated on all points with alarm settings.
 4. Verify integrated performance of all components and control system components, including all interlocks and interactions with other equipment and systems.
 5. Verify shutdown and restart capabilities for both scheduled and unscheduled events (e.g. power failure recovery and normal scheduled start/stop).
 6. Verify proper sequencing of heat transfer elements as required to prevent simultaneous heating and cooling, unless specifically required for dehumidification operation.
 7. Verify system response and stability of control loops under different load conditions and determine if additional loop tuning is required for dehumidification operation.
 8. When applicable, demonstrate a full cycle from 'off' to 'on' and 'no load' to 'full load' and then to 'no load' and 'off'.
 9. Verify time of day schedules and setpoints.
 10. Verify all energy saving control strategies.
 11. Verify that all control system graphics are complete, that graphics are representative of the systems, and that all points and control elements are shown in the same location on the graphics as they are located in the field.
 12. Verify operation control of all adjustable system control points, including proper access level as agreed to during the controls system demonstration.
- B. In addition to specific details, and/or standards referenced for acceptance testing indicated in other Division 23 sections, the following common acceptance criteria shall apply to all mechanical equipment, assemblies, and features:
1. For the conditions, sequences and modes tested, the equipment, integral components and related equipment shall respond to varying loads and changing conditions and parameters appropriately as expected, according to the sequence of operation, as specified, according to acceptable operating practice and the manufacturer's performance specifications.
 2. Systems shall accomplish their intended function and performance (e.g. provide supply air and water at designated temperature and flow rate, etc., and maintain space conditions in terms of air temperature, relative humidity, and CO2 concentration) at specified levels at varying conditions.

3. Control loops shall be stable under all operating conditions. Control loops shall exhibit a quarter decay ratio type response to a step change or other upset and return to stable operation in a time frame that is reasonable and realistic for the system that they are associated with.
4. Resetting a manual safety shall result in a stable, safe, and predictable return to normal operation by the system.
5. Safety circuits and permissive control circuits shall function in all possible combinations of selector switch positions (hand, auto, inverter, bypass etc.).
6. Additional acceptance criteria may be defined by the CxA when detailed tested procedures are developed.
7. At the CxA's discretion, if large numbers of deficiencies or repeated deficiencies are encountered, the CxA shall suspend functional testing until the Contractor corrects the deficiencies and troubleshoots all remaining systems at issue on their own. The Contractor shall be responsible for any resulting schedule delays that increase the overall time period to complete functional testing.
8. Retesting: The CxA will direct the retesting of the equipment once at no charge to the Owner for their time. The CxA's time and expenses incurred for a second retest, if required due to no fault of the CxA, will be reviewed by the Owner to determine the appropriate means of compensation to the CxA for extension of services. The functional testing shall include operating the system and components through each of the written sequences of operation, and other significant modes and sequences, including startup, shutdown, unoccupied mode, manual mode, staging, miscellaneous alarms, power failure, security alarm when impacted and interlocks with other systems or equipment. Sensors and actuators shall be calibrated during construction checkout by the installing contractors and spot-checked by the CxA during functional testing.

3.5 WRITTEN WORK PRODUCTS

- A. Written work products of Contractors shall consist of the filled out start-up, initial checkout, and test documentation in accordance with all Division 23 sections.

END OF SECTION 230485

SECTION 230490 - GUARANTEE

PART 1 - GENERAL

Applicable Provisions of the Conditions of the Contract and Division 1 General Requirements govern work in this section.

1.1 GUARANTEE

- A. The Contractor shall remove, replace and/or repair at his own expense and at the convenience of the Owner, any defects in workmanship, materials, ratings, capacities and/or characteristics occurring in the work within one (1) year or within such longer period as may be provided in the Drawings and/or Section of the Specifications, which guarantee period shall commence with the final acceptance of the entire Contract in accordance with the guarantee provisions stated in the General Conditions, and the Contractor shall pay for all damage to the system resulting from defects in the work and all expenses necessary to remove, replace, and/or repair any other work which may be damaged in removing, replacing and/or repairing the work.

END OF SECTION 230490

SECTION 260100 - GENERAL CONDITIONS

PART 1 - GENERAL

Applicable provisions of the conditions of the Contract and Division 1 General Requirements govern the work in this section.

1.1 DESCRIPTION OF WORK

- A. It is the intention of the Specification and Drawings to call for finish work, tested and ready for operation.
- B. Any apparatus, appliance material or work not shown on the Drawings but mentioned in the Specifications, or vice versa, or any incidental accessories or ancillary devices necessary to make ready for operation even if not particularly specified, shall be furnished, delivered and installed under their respective Division without additional expense to the Owner.
- C. Minor details not usually shown or specified, but necessary for proper installation and operation, shall be included in the work as though they were hereinafter specified or shown.
- D. Work under each section shall include giving written notice to the Architect of any materials or apparatus believed inadequate or unsuitable, in violation of laws, ordinances, rules and regulations of authorities having jurisdiction; and any necessary items of work omitted. In the absence of such written notice, it is mutually agreed that work under each section has included the cost of all necessary items for the approved satisfactory functioning of the entire system without extra compensation.
- E. Small scale drilling through walls and floors which may contain asbestos shall be performed by a person with a "restricted asbestos handler allied trades certificate" and shall have a copy of it in his possession at all times while working of the project.

1.2 DRAWINGS

- A. Drawings are diagrammatic and indicate the general arrangement of the system and work included in the Contract. (Do not scale the drawings). Consult the Architectural Drawings and details for exact location of fixtures and equipment; where same are not definitely located, obtain this information from the general construction supervisor.
- B. Work under each section shall closely follow Drawings in layout of work; check Drawings of other Divisions to verify spaces in which work will be installed. Maintain maximum headroom; do not begin work until unsatisfactory conditions are corrected.
- C. Make reasonable modifications in the layout as needed to prevent conflict with work of other Sections of the Specifications or for proper execution of the work.
- D. It shall be understood that the right is reserved by the Architect/Engineer to change the location of equipment and apparatus to a reasonable extent as building conditions may dictate, prior to their installation without extra cost to the Owner.

1.3 SURVEYS AND MEASUREMENTS

- A. Base all measurements, both horizontal and vertical, from established benchmarks. All work shall agree with these established lines and levels. Verify all measurements at site and check the correctness of same as related to the work.
- B. Before proceeding with the work resolve discrepancies between actual measurements and those indicated, which prevent following good practice or intent of the Drawings or Specifications.

1.4 CODES AND STANDARDS – Coordinate with Division 1

- A. The Codes and Standards listed below apply to all Electrical work codes or standards that are mentioned in these Specifications; the latest edition or revision shall be followed:
 - 1. NEMA - Standards
 - 2. ANSI CI - National Electrical Code (NFPA 70)
 - 3. ANSI C50 - Rotating Electrical Machinery
 - 4. ANSI C51.1 - Construction and guide for selection, installation and use of electric motors.
 - 5. ANSI C52.1 - Motors and Generators
- B. The following State and Local Codes shall apply: New York State Uniform Fire Prevention and Building Code, and Local Building Codes.
- C. The following abbreviations are used within this Division of the Specifications:
 - 1. IES - Illuminating Engineering Society.
 - 2. NEC - National Electrical Code
 - 3. ANSI - American National Standards Institute
 - 4. ASTM - American Society for testing and materials
 - 5. EPA - Environmental Protection Agency
 - 6. IEEE - Institute of Electrical and Electronic Engineers
 - 7. NEMA - National Electrical Manufacturers Association
 - 8. NFPA - National Fire Protection Association.
 - 9. OSHA - Occupational Safety and Health Administration
 - 10. UL - Underwriter's Laboratories

1.5 PERMITS AND FEES

- A. Give all necessary notices, obtain all permits and pay all Government and State sales taxes and fees where applicable, and other costs, including utility connections or extensions in connection with work of this Division. File all necessary plans, prepare all documents and obtain all necessary approvals of all Governmental and State departments having jurisdiction; obtain all necessary certificates of inspections for his work and deliver a copy to the Architect before request for acceptance and final payment for the work. Pay fees for utility construction/connections.

- B. Include in the work, without extra cost to the Owner, any labor, materials, services, and apparatus, Drawings in order to comply with all applicable laws, ordinances, rules and regulations, whether or not shown on the Drawings and/or specified.
- C. All materials furnished and all work installed shall comply with the rules and recommendations of the National Fire Protection Association, with the requirements of the local utility companies, with the recommendations of fire insurance rating organization having jurisdiction and with the requirements of all governmental departments having jurisdiction.
- D. All materials and equipment for the electrical portion of the mechanical systems shall bear the approval label of or shall be listed by the Underwriter's Laboratories, Inc.

1.6 TEMPORARY LIGHT AND POWER – See Division 1

- A. The Contractor shall furnish, install, maintain and, upon direction to do so, remove system of temporary lighting and power for the use of all construction trades.
- B. The Electrical Contractor shall provide adequate electrical service for the needs of all Contracting Trades.
- C. Wiring shall be provided for temporary use during building construction, including grounding and fused main cut-off switches. Temporary electric lines with branch switches shall be provided for lighting and for taps for electric tools, pumps and other temporary equipment; all connected to a main line looped through floor spaces and up stair wells or shafts. All power outlets shall be grounded to an equipment ground wire in an approved manner. Electric lines shall be extended to power tools, which cannot be located within reach of extension cords.
- D. Light bulbs shall be provided in sufficient quantity to light the building for safety purposes. Extension cords shall be provided as may be essential to the proper execution of the work. Temporary lighting shall be provided for all stairs and other locations where needed for safety or the proper execution of the work.
- E. The Electrical Contractor shall maintain temporary lighting and power systems in good working condition, including the relocation and reinstallation when required to avoid interference with the progress of construction.
- F. Provide ground-fault personnel ampere protection for all single phase, 15 and 20 ampere receptacles. All receptacles and portable cord connectors shall have NEMA standard locking type configurations.
- G. The Electrical Contractor shall turn lights on and off at the beginning and end of each working day of any trade unless otherwise directed. He shall arrange for all temporary light and power for all trades which do not have holidays (days off) similar to the electrical trade. The Electrical Contractor shall patch and repair all openings left damaged by the installation and removal of the temporary light and power.

1.7 MANUFACTURER'S IDENTIFICATION

- A. Manufacturer's nameplate, name or trademark and address shall be attached permanently to all equipment and materials furnished under this Division. The nameplate of a contractor or distributor may not be used.

1.8 SHOP DRAWINGS – See Division 1

- A. Submit for approval detailed shop drawings of all equipment and materials in accordance with working procedures.
- B. Furnish all necessary templates and patterns for installation work and for the purpose of making adjoining work conform; furnish setting plans and shop details to other trades as necessary.
- C. Submit shop drawings for the following:
 - 1. Light Fixtures, Dimming System.
 - 2. Receptacles, Switches, Occupancy Sensors.
 - 3. Overcurrent Protective Devices.
 - 4. Sub-Meter.
 - 5. Panelboards.
 - 6. Clocks and P.A. System Components.
 - 7. Fire Alarm System.

1.9 MATERIALS AND WORKMANSHIP

- A. All materials and apparatus necessary for the work, except as specifically indicated otherwise, shall be new, of first class quality and shall be furnished, delivered, erected, connected and finished in every detail and shall be so selected and arranged as to fit properly into the building spaces. Where no specific kind or quality of material is given, a first class standard article as accepted by the Architect shall be furnished.
- B. Furnish the services of an experienced Superintendent who shall be constantly in charge of the installation of the work, together with all skilled workmen, helpers, and labor to unload, transfer, erect, connect up, adjust, start, operate and test each system.
- C. Unless otherwise specifically indicated on the Drawings or Specifications, all equipment and materials shall be installed in accordance with the recommendations of the manufacturer. This includes the performance of such tests as the manufacturer recommends.

1.10 PROTECTION

- A. Work under each Section shall include protecting the work and materials of all other Sections from damage from work or workmen, and shall include making good all damage thus caused. Be responsible for work and equipment until finally inspected, tested, and accepted; protect work against theft, injury or damage; and carefully store material and equipment received on site, which is not immediately installed. Close open ends of work with temporary covers or plugs during construction to prevent entry of obstructing or other foreign material.

- B. Work under each section includes receiving, unloading, uncrating, storing, protecting, setting in place and connecting up completely of any equipment supplied under each section. Work under each section shall also include exercising special care in handling and protecting equipment and fixtures, and shall include the cost of replacing any of the above equipment and fixtures which are missing or damaged by reason of mishandling or failure to protect on the part of the Contractor.

1.11 BASES AND SUPPORTS

- A. Unless specifically noted otherwise, provide all necessary supports, pads, bases, and piers required for all equipment under this Division. Provide all temporary bases and supports as required.
- B. All equipment, unless shown otherwise, shall be securely attached to the building structure. Attachments shall be of a strong and durable nature; any attachments that are, insufficient, shall be replaced as directed by the Architect.

1.12 SLEEVES, INSERTS AND ANCHOR BOLTS

- A. All conduits passing through floors, walls or partitions shall be provided with sleeves having an internal diameter one inch larger than the outside diameter of the conduit, or insulation enclosing the conduit.
- B. Furnish all sleeves, inserts, and anchor bolts necessary to be installed under other sections of the Specifications to accommodate work of this section.
- C. Sleeves through outside walls shall be cast iron sleeves with intermediate integral flange. Sleeves shall be set with ends flush with each face of wall. The remaining space shall be packed with oakum to within 2 inches of each face of the wall. The remaining shall be packed and made watertight with a waterproof compound.
- D. Sleeves through concrete floors or interior masonry walls shall be schedule 40 black steel pipe, set flush with finished walls or ceiling surfaces but extending 2 inches above finished floors.
- E. Sleeves through interior partitions shall be 22 gauge galvanized sheet steel, set flush with finished surfaces or partitions.
- F. Inserts shall be individual or strip type of pressed steel construction with accommodation for removable nuts and threaded rods up to 3/4" inch diameter, permitting lateral adjustment. Individual inserts shall have an opening at the top to allow reinforcing rods up to 1/2" diameter to be passed through the insert body. Strip inserts shall have attached rods having hooked ends to allow fastening to reinforcing rods. Inserts shall be as manufactured by Carpenter and Patterson, Inc. or Grinnell Co., Inc.
- G. Penetrations through fire-rated walls, ceilings and floors in which cables, conduits pass, shall be sealed by a UL approved fire stop fitting classified for an hourly rating equal to the fire rating of the floor, wall or ceiling shall be Gedney Fire Seal Type CFSF of CAPS.

1.13 PAINTING – See Division 1; all work required shall be performed by this Contractor.

- A. All finish painting in finished areas shall be performed by others.
- B. All materials shipped to the job site under the Division, such as panels and plates, shall have a prime coat and standard manufacturer's finish unless otherwise specified.
- C. Inaccessible conduits, hangers, supports and anchors and ducts shall be coated prior to installing.
- D. All components of the fire alarm system raceway shall be painted red. This includes but is not limited to conduit, junction boxes, pull boxes.

1.14 CUTTING AND PATCHING – See Division 1

- A. All cutting and patching required for the work of this Division shall be done by this Division.
- B. Work under this Division shall include furnishing, locating and setting inserts and/or sleeves. Do all drilling and cutting necessary for the installation.
- C. All holes cut through concrete slabs and structural steel shall be punched or drilled from the underside. No structural member shall be cut without the written acceptance of the Architect and all such cutting shall be done in a manner directed by him.
- D. Refer to Division 1 for additional requirements.

1.15 SCAFFOLDING, RIGGING AND HOISTING – Coordinate with Division 1

- A. Furnish all scaffolding, rigging, hoisting, and services necessary for erection and delivery into the premises of any equipment and apparatus furnished under this Division. Remove same from premises when no longer needed.

1.16 EXCAVATING AND BACKFILLING

- A. All excavation and backfilling for the work of this Division shall be performed by Division 2.

1.17 WATERPROOFING

- A. Where any work penetrates waterproofing, including waterproof concrete and floors in wet areas. Submit proposed method of installation for review by the Architect before beginning work. Furnish all necessary sleeves, caulking and flashing necessary to make opening absolutely watertight.

1.18 ACCESSIBILITY AND ACCESS PANELS

- A. Be responsible for the sufficiency of the size of shafts and chases, the adequate thickness of partitions, and the adequate clearance in double partitions and hung ceilings for the proper installation of the work of this Division.

- B. Locate all equipment, which must be serviced, operated or maintained in fully accessible positions. Minor deviations from Drawings may be allowed for better accessibility with approval of the Architect.

1.19 SHUTDOWNS – See Division 1

- A. When installation of a new system necessitates the temporary shutdown of an existing utility operating system the connection of the new system shall be performed at such time as designated by and in consultation with the Utility Company. Work required after normal business hours shall be done so at no additional cost to the Owner.

1.20 CLEANING - Coordinate with Division 1

- A. Thoroughly clean all equipment of all foreign substances inside and out before being placed in operation.
- B. If any foreign matter should stop any part of a system after being placed in operation, the system shall be disconnected, cleaned and reconnected whenever necessary to locate and remove obstructions. Any work damaged in the course of removing obstructions shall be repaired or replaced when the system is reconnected at no additional cost to the Owner.
- C. Upon completion of work remove from the premises all rubbish, debris, and excess materials. Any oil or grease stains on floor areas caused by work of this Division shall be removed and floor areas left clean.

1.21 RECORD DRAWINGS – Work shall be governed by requirements set forth in Division 1

- A. Maintain at the job site a record set of Electrical Drawings on which any changes in location of equipment, panels, devices, and major conduits shall be recorded. Indicate dimensions of all items installed underground or in concrete.

1.22 OPERATING INSTRUCTIONS – Coordinate with requirements set forth in Division 1

- A. Upon completion of all work and all tests, the Contractor shall furnish the necessary skilled labor and helpers for operating his system and equipment for a period specified under each applicable Section of this Division. During this period, he shall instruct the Owner or his representative fully in the operation, adjustment and maintenance of all equipment furnished. Give at least 7 days' notice to the Owner in advance of this period.
- B. The manufacturer shall attest in writing that his equipment has been properly installed prior to start. The following is some of the equipment necessary for this inspection: fire alarm system. These letters will be bound into the operating and maintenance books.

1.23 ADJUSTING AND TESTING

- A. After all equipment and accessories to be furnished are in place, they shall be put in final adjustment and subjected to such operating tests as will assure the Architect that they are in proper adjustment and in satisfactory permanent operating condition.

- B. This particular work shall include the services of a factory engineer to inspect the installation and assist in the initial startup and adjustment to the equipment. The period of these services shall be for such time as necessary to secure proper installation and adjustments. After the equipment is placed in permanent operation, there shall be furnished the service of said engineer for the purpose of supervising the initial operation of the equipment and to instruct the personnel responsible for operation and maintenance of the equipment.
- C. At the completion of the job when all panels, devices, etc. are at full working load the Contractor shall provide infrared scan thermographic inspection test of all connection points, terminals, etc. of wires #8 AWG and larger to detect "hot-spots" in the electrical current flow. Correct all hot-spots.

1.24 UNDERWRITER'S LABEL

- A. All electrical equipment and materials shall be new and shall comply with the standards of and shall bear the label of the Underwriter's Laboratories.

1.25 ELECTRICAL SAFETY INSPECTION

- A. Electrical Contractor shall arrange for an Electrical Safety Inspection to be performed by the Local Inspection Agency (i.e.: New York Electrical Inspection Services, Atlantic Inland, Middle Department Inspection Agency). A Certificate of Compliance "Underwriter's Certificate" shall be issued to the Owner. All costs and coordination required shall be included in this Contractors Base Bid.

1.26 REMOVALS – Coordinate with Division 1 and Division 2

- A. The scope of removals shown on the Drawings are diagrammatic only and indicate the intent of the work to be performed and not the complete scope of demolition and/or removal work. It shall be the responsibility of this Contractor to remove any electrical devices even if not specifically indicated to be removed on these Drawings in order to accommodate new work.
- B. All power conductors, control wiring and conduit associated with mechanical equipment such as fans, pumps, etc. designated for removal on the HVAC Drawings shall be removed clear back to the source of power and disconnected. All motor starters, disconnect switches, control devices, etc. shall be removed. Refer to HVAC Drawings for extent of HVAC removals.
- C. Any device removed shall include (but shall not be limited to) the removal of all associated wiring, conduit, boxes, and auxiliary devices back to the previous device on the circuit, or back to the panelboard or origin of the circuit or any other items that are not incorporated in new layout, until such removal is complete. If the removal of any device interrupts service of any other device that is to remain, the Contractor shall provide all materials and labor to ensure continuity of service to those devices to remain.
- D. Junction boxes, pullboxes, wireways, conduits, or any other devices required to reconnect circuitry shall be installed concealed within the ceilings, partitions and/or walls, floors, no surface or exposed circuiting shall be permitted, unless specifically indicated.

- E. The Electrical Contractor shall patch all openings in walls, ceilings or roof that are left open as a result of removals. Refer to cutting and patching section.
- F. Any electrical device removed including but not limited to disconnect switches, panelboards, etc. shall be cleaned, protected and turned over to the Owner or disposed of as directed by Owner.

END OF SECTION 260100

SECTION 260125 - SCOPE OF WORK

PART 1 - GENERAL

Applicable Provisions of the Conditions of the Contract and Division 1 General Requirements govern work in this section.

1.1 SCOPE OF WORK

- A. The work under this section includes all labor, materials, equipment, tools, transportation and the performance of all work necessary and required for furnishing and installing all Electrical work shown on the Contract Documents, as specified herein and as otherwise required by job conditions or reasonably implied, including, but not necessarily limited to the following:
1. Modify the existing fire alarm panel and add amplifiers, power supplies, modules automatic fan shutdown, for new and existing HVAC equipment, etc. as required to support the installation of new speakers/strobes, smoke detectors, etc. Remove all existing devices as indicated on Contract Documents and provide paintable metal cover plates for all locations and replace ceiling tiles to match existing.
 2. The contractor shall dispose of all debris, including but not limited to fixtures, equipment, lamps, ballast, wiring devices and the like in accordance with, as defined by governing law and regulations of the jurisdiction where the work is being performed.
 3. Removal of existing public address system and replace with new.
 4. Provisions for temporary fire prevention actions to be taken during the period of construction until the modifications to the existing fire alarm system is taken offline and placed back into operation.
 5. Provide new sub-meter to existing main distribution board on the 120/208V main service switch.
 6. Modifications to existing electrical distribution system as indicated on the Drawings.
 7. Service switchboards, distribution panelboard, circuit breaker panelboards, feeder, conduit, cables and branch circuit wiring with all connections complete.
 8. Conduit, conduit fittings, junction and pull boxes and all appurtenances necessary for the raceway systems including necessary supports and fasteners.
 9. Electrical conductors, connectors, fittings and connection lugs.
 10. Branch circuit devices, outlet boxes, pull boxes, motor disconnect switches, etc.
 11. Power wiring to HVAC and Plumbing equipment including disconnect switches as shown and/or required by NEC.

12. Conduit and Cat 5E cable for computer drops.
13. Lighting fixtures and lamps including occupancy sensor.
14. New public address speakers and connection of existing clocks into new master clock built into P.A. system.
15. Core drilled holes for conduit passing through walls, ceilings and floors.
16. All necessary cutting, patching and core drilling incidental to the electrical work.
17. Temporary light and power.
18. Licenses, permits, inspection and approvals.
19. Grounding as required as per NEC.
20. Sleeves for conduit and watertight caulking between conduit and sleeve.
21. Testing.
22. Cutting, patching and drilling.

- B. Coordination Drawings (if applicable): Attention is directed to Division 1 for coordination drawing requirements for this project. These drawings are critical to the proper execution of the work and failure to honor these requirements may become the basis for denial of any and all claims for either or both "time" and "money".

1.2 WORK NOT INCLUDED

- A. The following related items will be done by others:
1. Furnishing motors and controllers.

END OF SECTION 260125

SECTION 260150 - APPROVED MANUFACTURERS

PART 1 - GENERAL

Applicable provisions of the Conditions of the Contract and Division 1 General Requirements govern work in this section.

1.1 APPROVED MANUFACTURERS

A. The following list of manufacturers constitutes an approved list:

- | | | |
|-----|--------------------------|--|
| 1. | Panelboards | Siemens, Square D, GE |
| 2. | Disconnect Switches | Siemens, Square D, GE |
| 3. | Conduit (steel) | Wheatland, Allied, Republic Conduit |
| 4. | Conduit Fittings (steel) | Appleton, Crouse-Hind, O-Z, T&B, M&W |
| 5. | Wire and Cable | General, South Wire, Rome, Cerro |
| 6. | Splicing Connectors | 3M, O-Z, Thomas & Betts |
| 7. | Outlet Boxes | Appleton, National, Steel City, Raco |
| 8. | Wiring Devices | Arrow-Hart, Hubbell, P & S |
| 9. | Fuses | Bussman, Ferraz-Shawmut, Littlefuse |
| 10. | Lamp | GE, Sylvania, Philips |
| 11. | Motion Sensors | Watt Stopper, Sensorswitch |
| 12. | LED Drivers | GE, Universal, Advance |
| 13. | Fire Alarm System | Edwards System Technologies or approved equal. |
| 14. | Public Address System | Bogen or approved equal. |
| 15. | Sub-Meter | Shark 250 or approved equal. |

B. All materials and appliances shall have listing of Underwriters Laboratories, Inc. and be so labeled, or shall conform to their requirements, in which case certified statements to that effect shall be furnished by the manufacturer with a copy of an examination report by a recognized independent testing laboratory acceptable to the Architect and his Engineer. Use new materials and appliances throughout.

C. Where several types or makes of materials are specified, the Contractor has the option of using any of these, but after a type or make has been selected and has received the approval of the Architect, it shall be used throughout.

- D. The Contractor shall provide all structural supports for the proper attachment of equipment supplied by him and also for all equipment supplied to him under other sections of the Specifications for mounting and connections.
- E. Secure all equipment to the building structure independently. Do not secure to work of other trades such as ceiling lath, piping racks, etc., unless specified or noted otherwise.
- F. Wall mounted equipment shall be directly secured to wall by means of steel bolts. Maintain at least 1/4" air space between equipment and supporting wall. Pre-fabricated steel channels providing a high degree of mounting flexibility, such as those manufactured by Kindorf and Unistrut, shall be used for mounting arrays of equipment.
- G. All fastening, supports, hangers, anchors, etc., shall be of a type made for the specific purpose. On masonry walls, metallic expansion shield and machine screws shall be used. Screws with wooden plugs or anchors will not be acceptable on any part of the work.

END OF SECTION 260150

SECTION 260200 - CONDUIT

PART 1 - GENERAL

Applicable provisions of the conditions of the Contract and Division 1 General Requirements govern the work in this section. Submit shop drawings for checking and approval.

1.1 WORK INCLUDED

- A. The work under this section shall include the furnishing of all material, labor, tools and services necessary to install rigid metal conduit, electrical metallic tubing and liquid tight flexible metal conduit, including all fittings to complete all work shown on the Drawings or specified herein.

1.2 RELATED WORK

- A. Cutting and patching.
- B. Trenching: Excavation and backfill for conduit and utility on site.
- C. Sheet metal flashing and trim.

1.3 REFERENCE FOR METAL RACEWAY

- A. UL 5 - Surface Metal Raceways and Fittings.
- B. UL 870 - Wireways, Auxiliary Gutters, and Associated Fittings.

PART 2 - PRODUCTS

2.1 RIGID STEEL CONDUIT

- A. Industry standard heavy wall conduit.
- B. Minimum 3/4" trade size.
- C. Threaded.
- D. Hot dipped galvanized finish by means of plating after cutting of threads.

2.2 INTERMEDIATE METAL CONDUIT

- A. Industry standard steel conduit.
- B. Minimum 3/4" trade size.
- C. Threaded.
- D. Hot dipped galvanized finish by means of plating after cutting of threads.

2.3 ELECTRICAL METALLIC TUBING

- A. Industry standard thin wall conduit of galvanized steel only.
- B. Minimum 3/4" trade size.
- C. Maximum 4" trade size.

2.4 FLEXIBLE METAL CONDUIT

- A. Galvanized steel tape formed into an industry standard interlocking coil.
- B. Minimum 3/4" trade size except for connection of lighting fixtures.
- C. Grounding type.
- D. Separate ground conductor.
- E. Use for short connections to motor terminal box, other vibrating equipment using a minimum length of 18" with 50% slack and a maximum of 6'.
- F. From outlet box to recessed lighting fixtures with a maximum length of 6'.

2.5 WIREWAYS

- A. Lay-in type, UL listed as wireway or auxiliary gutter.
- B. Wireway shall be of code gauge steel construction (UL standard for Wireway Auxiliary Gutters and Associated Fittings) with removable cover. Tamperproof screws shall be provided for sealing covers to prevent access by unauthorized personnel. Wireway shall be provided with knockouts.
- C. Connector and covers shall be attached so that removal of connectors is not necessary to utilize the lay-in feature.
- D. Finish: All sheet metal parts shall be provided with a rust inhibiting phosphating coating and baked enamel finish. All hardware shall be plated to prevent corrosion. All screws extending into the wireway shall be protected by spring nuts or otherwise guarded to prevent wire insulation damage.

2.6 CONDUIT SUPPORTS

- A. Conduit clamps, straps and supports: Steel or malleable iron.

2.7 CONDUIT FITTINGS

- A. Use compression fittings for all EMT in exposed areas. Utilize set screw fittings only above hung ceilings and concealed areas.

2.8 SURFACE METAL RACEWAY

- A. Metal raceway shall be of a two-piece design with a base and snap-on cover.
- B. Raceway and all components shall be listed by Underwriters Laboratories
- C. Single Channel: Steel, zinc plated, off-white finish suitable for repainting. Two piece design with metal base and snap-on cover. Wire Mold V700, Hubbell Inc. 750 Series, or Panduit PMR5/PMR7
- D. Dual Channel: Steel, galvanized, off-white finish but suitable for repainting. Two-piece design with metal base and snap-on cover, minimum 0.04" thick base and cover. Base shall be divided by a removable barrier section. Provide duplex receptacles mounted in top cell and communication outlets in the bottom cell. Coordinate communications jack requirements with owner's IT personnel. Provide Wiremold V4000, Wiremold DS4000 Series, Hubbell Inc. 4000 Series or Panduit PMR40.

PART 3 - EXECUTION

3.1 CONDUIT SIZING, ARRANGEMENT AND SUPPORT

- A. Minimum size - 3/4". Provide grounding bushings on all conduits 1-1/4" and larger.
- B. Arrange conduit to maintain headroom and present a neat appearance.
- C. Route exposed conduit and conduit above accessible ceilings parallel and perpendicular to walls and adjacent piping.
- D. Draw up couplings and fittings full and tight. Protect threads cut in field from corrosion. Paint newly threaded joints of steel conduit with T & B "Kopershield" compound before installation. Running threads prohibited; use three-piece unions or split couplings instead. Use only compression fittings for all EMT in areas where it will be exposed in finished and unfinished areas. Provide set screw fittings only when installed above hung ceilings.
- E. Maintain minimum 6-inch clearance between conduit and piping. Maintain 12-inch clearance between conduit and heat sources such as flues; steam pipes and heating appliances.
- F. Arrange conduit supports to prevent distortion of alignment by wire pulling operations. Fasten conduit using galvanized straps, lay-in adjustable hangers, clevis hangers, or bolted split stamped galvanized hangers.
- G. Group conduit in parallel runs where practical and use conduit rack constructed of steel channel with conduit straps or clamps. Provide space for 25 percent additional conduit.
- H. Do not fasten conduit with wire or perforated pipe straps. Remove all wire used for temporary conduit support during construction, before conductors are pulled.
- I. Exposed conduit on ceiling shall be parallel or perpendicular to wall and vice versa to ceiling when installed on wall. Secure conduit clamps and supports to masonry materials by toggle bolt, expansion bolt or steel insert. Spacing of conduit supports shall not exceed 7 feet.

3.2 CONDUIT INSTALLATION

- A. Cut conduit square using a saw or pipe cutter, Deburr cut ends.
- B. Bring conduit to the shoulder of fittings and couplings and fasten securely.
- C. Use conduit hubs or sealing locknuts for fastening conduit to cast boxes and for fastening conduit to sheet metal boxes in damp or wet locations.
- D. Install no more than the equivalent of three 90-degree bends between boxes.
- E. Use conduit bodies to make sharp changes in direction, as around beams.
- F. Use hydraulic one-shot conduit bender or factory elbows for bends in conduit larger than 2-inch size.
- G. Avoid moisture traps where possible; where unavoidable, provide junction box with drain fitting at conduit low point.
- H. Use suitable conduit caps to protect installed conduit against entrance of dirt and moisture.
- I. Provide No. 12 AWG insulated conductor or suitable pull string in empty conduit, except sleeves and nipples.
- J. Install expansion-deflection joints where conduit crosses building expansion or seismic joints.
- K. Where conduit penetrates fire-rated walls and floors, provide pipe sleeves two sizes larger than conduit; Pack void around conduit with fire-stop fittings with UL listed fire rating equal to wall or floor ratings; Seal opening around conduit with UL listed foamed silicone elastomer compound.
- L. Installation of conduit in slab shall comply with ACI 318.
- M. Route conduit through roof openings for piping and duct work where possible; otherwise, route through roof with pitch pocket.
- N. Maximum size conduit in slabs above grade: 1 inch. Do not route conduits to cross each other in slabs above grade. Conduits crossing each other may not be larger than 3/4 inch.
- O. All conduit used for fire alarm system shall be painted red.
- P. For Surface Metal Raceway
 - 1. When installing surface metal raceway contractor shall provide boxes from the same manufacturer of the surface metal raceway.
 - 2. Install separate grounding conductor. Grounding conductors for surface metal raceways.
 - 3. Surface metallic raceways in close proximity of other trades, shall be arranged to allow for proper clearance for servicing and headroom. Surface metallic raceway shall be installed parallel to walls, floors and ceilings in a neat workmanlike manner.

3.3 CONDUIT INSTALLATION OF SCHEDULE

- A. Underground installations: PVC minimum Schedule 40, unless otherwise noted on Drawings.
- B. Installations in or under concrete slab: PVC minimum Schedule 40, unless otherwise noted on Drawings.
- C. Exposed outdoor locations: Rigid galvanized steel conduit.
- D. Wet interior locations: Rigid galvanized steel conduit.
- E. Concealed dry interior locations and above accessible ceiling for receptacle and lighting branch wiring: Electrical metallic tubing up to first junction box and flexible metallic tubing (MC cable only) thereafter.
- F. Concealed dry interior locations other than receptacle and lighting branch wiring: Electrical metallic tubing.
- G. Concealed dry interior locations and above accessible ceiling for fire alarm runs: Fire alarm armored cable type MC with red stripe as manufactured by AFC series 1800.
- H. Concealed and exposed dry interior location for feeder runs: Electric metallic tubing.
- I. Exposed dry interior in unfinished locations other than Boiler Rooms: Electric metallic tubing.
- J. Final connections to motors: Flexible metallic tubing (MC cable). Minimum of 10" to maximum of 6' for connections to motors.
- K. Existing exposed dry interior locations (finished spaces), for branch wiring and fire alarm wiring, one-piece steel raceway (similar to Wiremold V-500, V-700).
- L. Final connections to motors: Flexible metallic tubing (MC cable). Minimum of 18" to maximum of 6' for connections to motors.
- M. All conduit installed in boiler room up to 10'-0" AFF and lower shall be rigid galvanized steel conduit. All conduit above 10'-0" shall be electric metallic tubing.
- N. Final connections to equipment and/or motors in boiler room, outdoors and potentially wet indoor areas: liquid tight, flexible; minimum of 18" to maximum 6'-0" connections.

END OF SECTION 260200

SECTION 260300 - WIRE AND CABLE

PART 1 - GENERAL

Applicable provisions of the conditions of the Contract and Division 1 General Requirements govern the work in this section. Submit shop drawings for checking and approval.

1.1 WORK INCLUDED

- A. The work under this section shall include the furnishing of all material, labor, tools and services necessary to wire and cable in raceway specified in other sections to complete all work shown on the Drawings or specified herein.

PART 2 - PRODUCTS

2.1 BUILDING WIRE

- A. Thermoplastic-insulated building wire: Type THHN.
- B. Rubber insulated building wire: NEMA WC 3.
- C. Feeders and branch circuits larger than number 6 AWG: Copper, stranded conductor, 600 volt insulation, type THHN.
- D. Feeder and branch circuits 6 AWG and smaller: Copper conductor, 600 volt insulation, THWN/THHN, 6 and 8 AWG, stranded conductor; Smaller than 8 AWG, solid conductor.
- E. Service feeders and branch circuits in conduit in contact with earth shall be type XHHW.
- F. Control circuits: Copper, stranded conductor 600 volt insulation, THHN.

2.2 ARMORED CABLE

- A. BX or pre-manufactured cables are not acceptable except for Type MC for branch wiring after the first junction box (for receptacle and lighting branch circuits) and final connections to motors in interior dry accessible locations, minimum length shall be 18" with a maximum length of 6' for motors. Except for outdoor and boiler room equipment and/or motors. Provide flexible liquid tight conduit.
- B. Type MC fire alarm cable with red stripe for concealed fire alarm wiring as manufactured by AFC series 1800.
- C. Armored cable, Type MC size 14 through 6 AWG: Copper conductor, 600 volt thermoplastic insulation, rated 90 degrees C., with separate green ground conductor.

2.3 REMOTE CONTROL AND SIGNAL CABLE

- A. Control Cable for Class 2 or Class 3 Remote Control and Signal Circuits:
Copper conductor, 300 volt insulation, rated 60 degree C, individual conductors twisted together shielded and covered with a nonmetallic jacket; UL listed for use in air handling ducts, hollow spaces used as ducts and plenums. Verify wiring type with manufacturer.

2.4 COLOR CODING

- A. All wiring shall be color-coded. Neutral wire shall be white throughout and each phase wire shall be identified any place in the system by its color code. All conductors in panel boxes and junction boxes shall be properly tagged with red non-flammable tags properly attached.

- B. Wire shall be color coded as follows:

<u>120/208 volt system</u>		<u>Fire Alarm</u>
A Phase	Black	Red
B Phase	Red	
C Phase	Blue	

- C. Equipment ground wires or ground jumpers shall be Green.
- D. In addition to the basic color-coding described the following additional identification and tagging shall apply.
1. The switch legs for the local wall switches and in switch panel shall have distinctive stripes. In instances where color-coding is not practicable, such as short runs of heavy feeder cables, taping the ends of the cable with coded colors as indicated above or tagging will be permitted.
 2. Cables shall be tagged in all pull boxes, wireways and wiring gutters of panels.
 3. Where two (2) or more circuits run to or through a control device, outlet box or junction box, each circuit shall be tagged as a guide in making connections.
 4. Tags shall identify wire or cable by number and/or piece of equipment served as shown on the Drawings.

PART 3 - EXECUTION

3.1 GENERAL WIRING METHODS

- A. Use no wire smaller than 12 AWG for power and lighting circuits, and no smaller than 14 AWG for control wiring.
- B. Use 10 AWG conductor for 20 ampere, 120 volt branch circuit home runs longer than 75 feet and for 20 ampere.

- C. Place an equal number of conductors for each phase of a circuit in same raceway or cable. No more than one of each phase shall be supported by a single neutral.
- D. Splice only in junction or outlet boxes.
- E. Neatly tag, identify, train and lace wiring inside boxes, equipment and panelboards.
- F. Make conductor lengths for parallel circuits equal.

3.2 WIRING INSTALLATION IN RACEWAYS

- A. Pull all conductors into a raceway at the same time. Use UL listed wire pulling lubricate for pulling 4 AWG and larger wires.
- B. Completely and thoroughly swab raceway system before installing conductors.
- C. Install wire in raceway after interior of building has been physically protected from the weather and all mechanical work likely to injure conductors has been completed.

3.3 CABLE INSTALLATION

- A. Support cables above accessible ceilings; do not rest on ceiling tiles. Use spring metal clips or metal cable ties to support cables from structure (not ceiling suspension system). Include bridle rings or drive rings.
- B. Use suitable cable fitting and connectors.

3.4 WIRING CONNECTIONS AND TERMINATIONS

- A. Splice only in accessible junction boxes.
- B. Use solderless pressure connections with insulating covers for copper wire splices and tape, 8 AWG and smaller. For 10 AWG and smaller, use insulated spring wire connectors with plastic caps.
- C. Provide extended gutters and tap blocks or pull boxes with tap rail systems similar to Burndy MT Series or Burndy Electrorail system for wire splices 6 AWG and larger.
- D. Tape uninsulated conductors with electrical tape to 150 percent of the insulation value of conductor.
- E. Thoroughly clean wires before installing lugs and connectors.
- F. Make splices, taps and terminations to carry full ampacity of conductors without perceptible temperature rise.
- G. Terminate spare conductors with electrical tape.

3.5 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of the Specifications.
- B. Inspect wire and cable for physical damage and proper connection.
- C. Torque test conductor connections and terminations to manufacturer's recommended values.
- D. Perform continuity test on all power and equipment branch circuit conductors. Verify proper phasing connections.

3.6 WIRE AND CABLE INSTALLATION SCHEDULE

- A. All wiring and cable shall be installed in conduit unless otherwise noted. Refer to conduit section 260200 for conduit types at various locations.

END OF SECTION 260300

SECTION 260320 - OVERCURRENT PROTECTIVE DEVICES

PART 1 - GENERAL

Applicable Provisions of the Conditions of the Contract and Division 1 General Requirements govern the work in this section. Submit shop drawings for checking and approval.

1.1 WORK INCLUDED

- A. Work of this section includes all labor, materials, equipment and services necessary to complete the electrical work as shown on the Drawings and specified herein, including, but not limited to, the following:
- B. Fuses
 - 1. Current limiting cartridge fuses.
 - 2. Time delay cartridge fuses.
- C. Circuit Breakers
 - 1. Standard molded case circuit breakers "bolted in" type.
 - 2. Solid state circuit breakers.
 - 3. Current limiting circuit breakers.
 - 4. Enclosed circuit breakers.

1.2 SUBMITTALS

- A. Shop drawings showing dimensions, location of equipment and method of installation.
- B. Product Data: Manufacturer's printed data, catalog cuts.

PART 2 - PRODUCTS

2.1 DISCONNECT SWITCHES

- A. Fusible switch assemblies: Quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover when switch is in ON position. Handle lockable in OFF position. Fuse clips shall be designed to accommodate Class R, J fuses.
- B. Non-fusible switch assemblies: Quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover when switch is in ON position. Handle lockable in OFF position.
- C. Enclosures: NEMA Type 1, 3R or 4 as required.

2.2 FUSES

- A. Voltage ratings of fuses shall be suitable for the supply characteristics to which they are applied.

- B. Fuse type and size shall be suitable for installation in related disconnect switch or circuit breaker.
- C. Current limiting fuses shall be as follows:
1. Regardless of actual available fault current, they shall, at full recovery voltage, be capable of safely interrupting fault currents of 200,000 amperes RMS symmetrical or 280,000 amperes RMS asymmetrical, deliverable at the line side of the fuse.
 2. They shall have average melting time-current characteristics to meet the Underwriters' Laboratories requirements for "Class RK-1" 0-600 amp fuses.
- D. Regardless of actual available fault current, they shall be capable of limiting peak let through current to the following values based on 200,000 amperes RMS symmetrical or 280,000 amperes asymmetrical being available:

<u>Rating In Amperes</u>	<u>Peak Let Through Current In Amps</u>
15-30	6,000
35-50	8,000
70-100	12,000
125-200	20,000
225-601	38,000

- E. Fuses shall be rejection type. Fuse clip shall be rejection type.

- F. Fuse Type and Application Table:

<u>Category of Application</u>	<u>Acceptable Fuse Types</u> (Bussman Designations @ 600V)
Motor feeder	LPS below 600A
Power panel feeders	LPS below 600A
Safety switches	LPS

2.3 CIRCUIT BREAKERS

- A. "Bolted-In" type, manually operated, quick-make, quick-break, mechanically trip-free operating mechanisms for simultaneous operation, of all poles, with contacts, arc interrupters and trip elements for each pole. "Plug-in" breakers are not permitted. New circuit breakers to be installed in existing panelboards shall be U.L. certified for installation in those panelboards and be labeled with make and model.
- B. Tripping units shall be "thermal-magnetic" type having bimetallic elements for time delay overload protection, and magnetic elements for short circuit protection.
- C. Manually operable by mean of toggle type operating handles having tripped positions midway between the "on-off" position. Handle to be clearly labeled as to breaker rating.

- D. Minimum frame size for all circuit breakers, 1, 2 or 3 pole shall be 100 amperes.
- E. Their interrupting rating shall not be less than 25,000 amperes RMS symmetrical at 208 volt for distribution panels and 10,000 amperes for power panels.

2.4 APPLICATIONS

A. Category of Application for Fuses:

- 1. Feeders on switchboards.
- 2. Branch fused switch unit in distribution panel.
- 3. Fused safety switch.
- 4. Combination motor starters.

B. Category of Application for Circuit Breakers:

- 1. Panelboards.
- 2. Switchboards.
- 3. Individual enclosures.
- 4. Combination motor starters.

2.5 SPARE FUSES

- A. Upon Engineer's acceptance of the electrical distribution system, provide spare fuses as follows: 10% of each type and rating installed 600 amperes and smaller (minimum of 3). Provide spare fuse cabinet with directory to store all spare fuses. Locate as directed by Engineer and/or Owner.

2.6 APPROVED MANUFACTURERS

- A. Fuses: Bussman, Ferraz-Shawmut.
- B. Circuit Breakers: Siemens, General Electric, Square D.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. All material installation shall be in accordance with manufacturer recommendations and the provisions of all applicable codes.
- B. All fuses and circuit breakers shall be selectively coordinated.
- C. Install disconnect switches where indicated on Drawings.
- D. Install fuses in fusible disconnect switches.
- E. Disconnects shall have NEMA 3R enclosure.

3.2 RECORD DRAWINGS

- A. Shop drawings showing dimensions, location of equipment and method of installation.
- B. Product Data: Manufacturer's printed data, catalog cuts, performance curves.

END OF SECTION 260320

SECTION 260350 - BOXES

PART 1 - GENERAL

Applicable provisions of the conditions of the Contract and Division 1 General Requirements govern the work in this section. Submit shop drawings for checking and approval.

1.1 WORK INCLUDED

- A. The work under this section shall include the furnishing of all material, labor, tools and services necessary to install wall and ceiling outlet boxes, floor boxes, pull and junction boxes to complete all work shown on the Drawings or specified herein.

1.2 RELATED WORK

- A. Access Doors.
- B. Cabinets and Enclosures.

PART 2 - PRODUCTS

2.1 OUTLET BOXES

- A. Sheetmetal outlet boxes: ANSI/NEMA OS 1; Galvanized steel, with 1/2 inch male fixture studs where required.
- B. Cast boxes: Cast ferroalloy, deep type, gasketed cover, threaded hubs.
- C. Typical receptacle box shall be 4" square metal boxes, 30.8 cubic inch capacity with brackets as required. Provide 4" square raised device covers.

2.2 PULL AND JUNCTION BOXES

- A. Sheet metal boxes: ANSI/NEMA OS 1; Galvanized steel.
- B. Sheet metal boxes larger than 12 inches in any dimension: hinged enclosure in accordance with Section 260450.
- C. Cast metal boxes for outdoor and wet location installations: NEMA 250; Type 4 and type 6, flat-flanged, surface-mounted junction box, UL listed as raintight. Galvanized cast iron box and cover with ground flange, neoprene gasket, and stainless steel cover screws.
- D. Cast metal boxes for underground installation: NEMA 250; Type 4, inside flanged, recessed cover box for flush mounting, UL listed as raintight. Galvanized cast iron box and plain cover with neoprene gasket and stainless cover screws.

PART 3 - EXECUTION

3.1 COORDINATION OF BOX LOCATIONS

- A. Provide electrical boxes as required in excess of that shown on Drawings and as required for splices, taps, wire pulling, equipment connections and code compliance.
- B. Electrical box locations shown on Contract Drawings are approximate unless dimensioned. Verify location of floor boxes and outlets in offices and work areas prior to rough-in.
- C. Locate and install boxes to allow access. Where installations are accessible, coordinate locations and sizes of required access doors with Division 1.
- D. Locate and install to maintain headroom and to present neat appearance.

3.2 OUTLET BOX INSTALLATION

- A. Do not install boxes back-to-back in walls. Provide minimum 6 inch separation, except provide minimum 24 inch separation in acoustic-rated walls.
- B. Locate boxes in masonry walls to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat openings for boxes.
- C. Provide knockout closures for unused openings.
- D. Support boxes independently of conduit except for cast iron boxes that are connected of rigid metal conduits, both supported within 12 inches of box.
- E. Use multiple-gang boxes where more than one device is mounted together; do not use sectional boxes. Provide barriers to separate wiring of different voltage systems.
- F. Install boxes in wall without damaging wall insulation.
- G. Coordinate mounting heights and locations of outlets mounted above counters, benches and backspaces.
- H. Position outlets to locate luminaries as shown on reflected ceiling plans.
- I. In inaccessible ceiling areas, position outlets and junction boxes within 6 inches of recessed luminaire, to be accessible through luminaire ceiling opening.
- J. Provide recessed outlet boxes in finished areas; secure boxes to interior wall and partition studs, accurately positioning to allow for surface finish thickness. Use stamped steel stud bridges for flush outlets in hollow stud wall, and adjustable steel channel fasteners for flush ceiling outlet boxes.
- K. Align wall-mounted outlet boxes for switches, thermostats, and similar devices.
- L. Provide cast outlet boxes in exterior locations exposed to the weather and wet locations.

3.3 PULL AND JUNCTION BOX INSTALLATION

- A. Locate pull boxes and junction boxes above accessible ceilings or in unfinished areas.
- B. Support pull and junction boxes independent of conduit.

END OF SECTION 260350

SECTION 260400 - WIRING DEVICES

PART 1 - GENERAL

Applicable Provisions of the Conditions of the Contract and Division 1 General Requirements govern work in this section. Submit shop drawings for checking and approval.

1.1 WORK INCLUDED

- A. The work under this section shall include the furnishing of all materials, labor, tools and services necessary to install receptacles, service fittings device plates and box covers to complete all work shown on the Drawings or specified herein.

1.2 REFERENCES

- A. FS W-C-596 - Electrical power connector, plug, receptacles and cable outlet.
- B. FS W-S-896 - Switch, toggle.
- C. NEMA WD 1 - General purpose wiring devices.
- D. NEMA WD 5 - Specific-purpose wiring devices.

1.3 SUBMITTALS

- A. Submit product data under Provisions of Contract and Division 1.
- B. Provide product data showing configurations, finishes, dimensions and manufacturer's instructions.

PART 2 - PRODUCTS

2.1 RECEPTACLES

- A. Convenience and straight-blade receptacles: 125 V, 2 pole, 3 wire, 20 ampere specification grade, ground fault interrupting or isolated ground type.
- B. Internal ground clip of receptacles shall be in one piece with the receptacle mounts.
- C. Receptacles with riveted ground clips will not be accepted.
- D. Isolated ground type receptacle shall be orange in color.

2.2 WALL SWITCHES

- A. Wall switches for lighting circuits and motor loads under 1/2 hp: AC general use snap switch with toggle handle, rated 20 amperes and 120-277 volts AC.
- B. Handle: Ivory plastic.

- C. Pilot light type: Lighted handle. Pilot strap in adjacent gang.
- D. Locator type: Lighted handle.

2.3 COVER PLATES

- A. Decorative cover plate: Stainless steel 302/304 smooth Hubbell "S" series.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install receptacles on roof along parapet wall.
- B. Install specific use receptacles at heights shown on contract drawings.
- C. Install plates on switch, receptacle, and blank outlets in finished areas, using jumbo size plates for outlets installed in masonry walls.
- E. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings and on surface mounted outlets.
- F. Install devices and wall plates flush and level.

END OF SECTION 260400

SECTION 260450 - CABINETS AND ENCLOSURES

PART 1 - GENERAL

Applicable Provisions of the conditions of the Contract and Division 1 General Requirements govern the work in this section. Submit shop drawings for checking and approval.

1.1 WORK INCLUDED

- A. The work under this section shall include the furnishing of all materials, labor, tools and services necessary to install hinged cover enclosures to complete all work shown on the Drawings or specified herein.

1.2 REFERENCES

- A. NEMA 250 - Enclosures for electrical equipment (1000 volts maximum).
- B. Submittals - Submit product data under Provisions of Contract and Division 1.

PART 2 - PRODUCTS

2.1 HINGED COVER ENCLOSURES

- A. Construction: NEMA 250; Type 1 and 3R steel.
- B. Finished: Manufacturer's standard enamel finish.
- C. Covers: Continuous hinge, held closed by operable by key.
- D. Provide barriers between normal and emergency wiring. Barriers shall be of non-current carrying material of adequate thickness for mechanical strength but in no case less than 1/4". Each barrier shall have an angle iron framing support all around.

2.2 FABRICATION

- A. Shop assemble enclosures in accordance with ANSI/NEMA ISC 6.
- B. Provide knockouts on enclosures.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install enclosures plumb; Anchor securely to wall and structural supports at each corner, minimum.
- B. Provide necessary feet for free-standing equipment enclosures.
- C. Install trim plumb.

END OF SECTION 260450

SECTION 260500 - SUPPORTING DEVICES

PART 1 - GENERAL

Applicable Provisions of the Conditions of the Contract and Division 1 General Requirements govern work in this section. Submit shop drawings for checking and approval.

1.1 WORK INCLUDED

- A. The work under this section shall include the furnishing of all material, labor, tools and services necessary to install rigid metal conduit, electrical metallic tubing and flexible metal conduit, including all fittings to complete all work shown on the Drawings or specified herein.

1.2 RELATED WORK

- A. Conduit and equipment supports.
- B. Fastening hardware.

1.3 REFERENCES

- A. Conduit supports.

1.4 QUALITY ASSURANCE

- A. Support system shall be adequate for weight of equipment and conduit, including wiring, which they carry.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Support Channel: Galvanized or painted steel.
- B. Hardware: Corrosion resistant.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Fasten hanger rods, conduit clamps, outlet, junction boxes to building structure using preset inserts, beam clamps and spring steel clips.
- B. Use toggle bolts or hollow wall fasteners in hollow masonry, plaster, or gypsum board partitions and walls; expansion anchors or preset inserts in solid masonry walls; self-drilling anchors or expansion anchors on concrete surfaces; sheet metal screws in sheet metal studs and wood screws in wood construction.
- C. Do not fasten supports to piping, ductwork, mechanical equipment or conduit.

- D. Do not use powder-actuated anchors.
- E. Fabricate supports from structural steel or steel channel, rigidly welded or bolted to present a neat appearance. Use hexagon head bolts with spring lock washers under all nuts.
- F. In wet locations install free-standing electrical equipment on concrete pads.
- G. Install surface mounted cabinets and panelboards with minimum of four anchors. Provide steel channel supports to stand cabinet one inch off wall.
- H. Bridge studs top and bottom with channels to support flush mounted cabinets and panelboards in stud walls.

END OF SECTION 260500

SECTION 260550 - GENERAL LABELING AND IDENTIFICATION

PART 1 - GENERAL

Applicable Provisions of the Conditions of the Contract and Division 1 General Requirements govern the work in this section. Submit shop drawings for checking and approval.

1.1 WORK INCLUDED

- A. The work under this section shall include the furnishing of all material, labor, tools and services necessary to install nameplates, tape labels, wire markers, conduit color coding to complete all work shown on the Drawings or specified herein.

1.2 RELATED WORK

- A. Painting.

1.3 SUBMITTALS

- A. Submit shop drawings under provisions of Division 1.
- B. Include schedule for nameplates and tape labels.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Nameplates: Engraved three-layer laminated plastic, white letters on a black background.
- B. Tape labels: Embossed adhesive tape with 3/16 inch black letters on a white background.
- C. Wire and cable markers: Cloth markers, split sleeve or tubing type.

PART 3 - EXECUTION

3.1 INSTALLATION

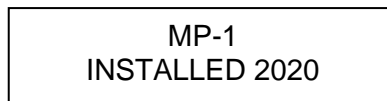
- A. De-grease and clean surfaces to receive nameplates and tape labels.
- B. Install nameplates and tape labels parallel to equipment lines.
- C. Secure nameplates to equipment fronts using screws, rivets, or adhesive. Secure nameplate to inside face of recessed panelboard doors in finished locations.
- D. Embossed tape will not be permitted for any application. Use embossed tape only for identification of individual wall switches and receptacles and control device stations.

3.2 WIRE IDENTIFICATION

- A. Provide wire markers on each conductor in panelboard gutters, pull boxes, outlet and junction boxes and at load connection. Identify each branch circuit or feeder number for power and lighting circuits and each control wire number as indicated on equipment manufacturer's shop drawings for control wiring.

3.3 NAMEPLATE ENGRAVING SCHEDULE

- A. Provide nameplates to identify all electrical distribution, control equipment and loads served including year of installation. Letter height: 1/2 inch for individual switches, loads served, distributions and control equipment identification. For example:



- B. Panelboards: 3/4 inch, identify equipment designation. 1/2 inch, identify voltage rating and source of power.
- C. Individual circuit breakers, switches and motor starters in panelboards, switchboards and motor control centers: 1/4 inch, identify circuit and load served, including location.
- D. Individual circuit breakers, enclosed switches and motor starters: 1/2 inch, identify load served.

3.4 FIRE ALARM

- A. All fire alarm raceway components shall be painted red and identified.

END OF SECTION 260550

SECTION 260575 - INTERIOR LUMINAIRES

PART 1 - GENERAL

Applicable provisions of the Conditions of the Contract and Division 1 General Requirements govern work in this section. Submit shop drawings for checking and approval.

1.1 WORK INCLUDED

- A. Interior luminaires and accessories.
- B. Emergency lighting units.
- C. Exit signs.
- D. LED Driver.
- E. LED dimming and controls.
- F. LED emergency power supply.
- G. Lamps.
- H. Luminaire accessories.

1.2 REFERENCES

- A. ANSI/IES RP-16-10 – Nomenclature and Definitions for Illuminating Engineering.
- B. ANSI C78.37 7 – Specifications for the Chromaticity of Solid-State Lighting (SSL) Products.
- C. IES LM-79-08 – Electric and Photometric Measurements of Solid-State Lighting Products.
- D. IES LM-80-08 – Measuring Lumen Maintenance of LED Light Sources.
- E. IES 7M-21-11 – Projecting Long Term Lumen Maintenance of LED Light Sources.
- F. IES LM-82-11 – IES Approved Method for the Characterization of LED Light Engines and LED Lamps for Electrical and Photometric Properties as a Function of Temperature.
- G. UL 8750 – LED Equipment for Use in Lighting Products.
- H. NEMA WD 6 - Wiring Devices – Dimensional Requirements.
- I. NFPA 70 - National Electrical Code.
- J. NFPA 101- Life Safety Code.

1.3 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum five (5) years documented experience.

1.4 REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70 and to requirements of NFPA 101.
- B. Products: Listed and classified by Underwriters Laboratories, Inc. (UL), American National Standards Institute (ANSI) and Illuminating Engineering Society (IES).

1.5 SUBSTITUTIONS

- A. All proposed substitutions must be submitted with each light fixture specification cutsheet, accompanied with footcandle calculation for all spaces, provided for Architect and Engineer's review, prior to approval.
- B. If the substitution is accepted, the contractor accepts responsibility and associated costs for all required modifications to circuitry, devices, and wiring.

PART 2 - PRODUCTS

2.1 LUMINAIRES

- A. Furnish products as scheduled.

2.2 EXIT SIGNS

- A. Manufacturers: As scheduled.
- B. Description: Exit sign fixture suitable for use as emergency lighting unit.
- C. Housing: Extruded aluminum or steel as per schedule.
- D. Face: Aluminum stencil face with red letters, unless otherwise noted.
- E. Directional Arrows: Universal type for field adjustment, direction per drawing.
- F. Mounting: Universal, for field selection or per drawing.
- G. Lamps: L.E.D.
- H. Input Voltage: As scheduled.

2.3 LED DRIVERS

- A. Manufacturers: As scheduled.
- B. Voltage: As scheduled.

2.4 LAMPS

- A. Lamp Types: As specified for luminaire. LED source.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install suspended luminaires and exit signs using pendants supported from swivel hangers. Provide pendent length required to suspend luminaire at indicated height.
- B. Support luminaires 2 x 4 foot (600 x 1200 mm) and larger in size independent of ceiling framing.
- C. All lay-in luminaires shall be supported with chains to building structure.
- D. Install surface mounted luminaires and exit signs plumb and adjust to align with building lines and with each other. Secure to prevent movement.
- E. Exposed Grid Ceilings: Support surface mounted luminaires on grid ceiling directly from building structure. Provide auxiliary members spanning ceiling grid members to support surface mounted luminaires. Fasten surface mounted luminaires to ceiling grid members using bolts, screws, rivets, or suitable clips.
- F. Install wall mounted luminaires, emergency lighting units and exit signs at 80" above finished floor, unless otherwise noted.
- G. Install accessories furnished with each luminaire.
- H. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.
- I. Bond products and metal accessories to branch circuit equipment grounding conductor.
- J. Install specified lamps in each emergency lighting unit, exit sign, and luminaire.

3.2 FIELD QUALITY CONTROL

- A. Operate each luminaire after installation and connection. Inspect for proper connection and operation.

3.3 ADJUSTING

- A. Aim and adjust luminaires as indicated.
- B. Position exit sign directional arrows as indicated.

3.4 CLEANING

- A. Clean electrical parts to remove conductive and deleterious materials.
- B. Remove dirt and debris from enclosures.
- C. Clean photometric control surfaces as recommended by manufacturer.
- D. Clean finished and touch up damage.

3.5 PROTECTION OF FINISHED WORK

- A. Re-lamp luminaires that have failed lamps as substantial completion.

END OF SECTION 260575

SECTION 260600 - DISCONNECT SWITCHES

PART 1 - GENERAL

Applicable provisions of the conditions of the Contract and Division 1 General Requirements govern the work in this section. Submit shop drawings for checking and approval.

1.1 WORK INCLUDED

- A. The work under this section shall include the furnishing of all materials, labor, tools and services necessary to install disconnect switches, fuses and enclosures to complete all work shown on the Drawings or specified herein.

1.2 SUBMITTALS

- A. Submit product data under Provisions of Contract and Division 1.
- B. Include outline Drawings with dimensions, equipment ratings for voltage, capacity, horsepower and short circuit.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - DISCONNECT SWITCHES

- A. Siemens.
- B. Square 'D'.
- C. General Electric.
- D. Or approved equal.

2.2 DISCONNECT SWITCHES

- A. Fusible switch assemblies: Quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch is in ON position. Handle lockable in OFF position. Fuse clips: Designed to accommodate class R, J fuses.
- B. Non-fusible switch assemblies: Quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position.
- C. Enclosures: NEMA Type 1; 3R; 4 as indicated on Drawings.

2.3 ACCEPTABLE MANUFACTURERS - FUSES

- A. Bussman.
- B. Ferraz-Shawmut.
- C. Or approved equal.

2.4 FUSES

- A. Fuses 600 amperes and less: ANSI/UL 198E, class RK1; RK5; Dual element, current limiting, time delay, 250 volt.
- B. Interrupting rating: 200,000 rms amperes.
- C. An additional fuse of each size required to be supplied.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install disconnect switches where indicated on Drawings.
- B. Install fuses in fusible disconnect switches.
- C. Disconnects installed outdoors shall have NEMA 3R enclosures.
- D. Disconnects installed indoors in dry locations shall have NEMA 1 enclosure.

END OF SECTION 260600

SECTION 260650 - GROUNDING

PART 1 - GENERAL

Applicable provisions of the conditions of the Contract and Division 1 General Requirements govern the work in this section. Submit shop drawings for checking and approval.

1.1 WORK INCLUDED

- A. The work under this section shall include the furnishing of all materials, labor, tools and services necessary to install the power system grounding to complete all work shown on the Drawings or specified herein.

1.2 RELATED WORK

- A. Panelboards.
- B. Raceways.
- C. Connection Equipment.
- D. Electric Equipment.
- E. Tests and Acceptance.

1.3 SUBMITTALS

- A. Manufacturers' data, catalog cuts of ground rods, connectors, bushings, etc., along with recommended installation procedures.

PART 2 - PRODUCTS

2.1 WIRING

- A. All wiring used for grounding shall be insulated copper, unless otherwise noted. Size shall be in accordance with code for the application, minimum #12.
- B. Where used in conjunction with computer equipment, grounding conductors shall be equal in size to the phase conductors.
- C. Avoid splices in ground conductors.

2.2 RACEWAY

- A. Grounding continuity shall be maintained for all metallic raceways.
- B. Provide bonding jumpers across metal parts separated by non-conducting materials.
- C. Where a grounding conductor is installed as a supplement to metallic raceway serving as the equipment grounding conductor, bonding conductor to the raceway at each end.
- D. All raceway accessories, such as locknuts, bushings, expansion fittings, etc. shall be installed to provide maximum metal-to-metal bonding.

2.3 CLAMPS

- A. Provide approved ground clamps for connecting grounding conductors to pipe, conduits, wireways, building steel, grounding rods, etc.
- B. Where bond will be in an inaccessible location or as an alternate to ground clamps, provide exothermic weld, similar to Cadweld.

2.4 ACCESSORIES

- A. Provide all necessary accessories of appropriate size and material for connection or termination of grounding conductors including:
 - 1. Straps.
 - 2. Clamps.
 - 3. Lugs.
 - 4. Bars and buses.
 - 5. Isolators (where applicable).
 - 6. Locknuts and bushings.

2.5 ACCEPTABLE MANUFACTURERS

- A. Copperweld.
- B. Cadweld (for exothermic welds).
- C. O.Z. Gedney.
- D. Burndy.

PART 3 - EXECUTION

3.1 RACEWAYS

- A. Grounding continuity is to be maintained for all metallic raceways. Provide necessary clamps, bushings, straps and locknuts to assure continuity.
- B. For non-metallic or flexible raceways, provide a separate equipment-grounding conductor bonded to both ends.
- C. Where indicated, an additional equipment-grounding conductor shall be provided in metallic raceway.
- D. Where indicated, an isolated ground conductor shall be provided in addition to the equipment-grounding conductor. Bond at each end to the isolated ground terminal identified.

3.2 EQUIPMENT

- A. All equipment shall be grounded.
- B. Where isolated grounding is indicated, it shall be for the isolation of internal equipment components only. All metallic enclosures of such equipment shall be connected to the equipment ground system.

3.3 PANELBOARDS

- A. All panelboards and distribution panels shall be provided with a ground bar bonded to the enclosure. Provide an isolated ground bar connected to the incoming feeder ground where indicated.

3.4 TESTING

- A. Upon completion of the installation, confirm the grounding continuity of all raceways, conductors and equipment. Maximum allowable resistance is 25 ohms.

3.5 RECORD DRAWINGS

- A. Submit record As-Built Drawings indicating the location of all points where grounding conductors are bonded to steel, rods, plates, etc.
- B. Indicate the location of all grounding buses not installed within distribution equipment.

END OF SECTION 260650

SECTION 260700 - PANELBOARDS

PART 1 - GENERAL

Applicable provisions of the Conditions of the Contract and Division 1 General Requirements govern work in this section. Submit shop drawings for checking and approval.

1.1 WORK INCLUDED

- A. The work under this section shall include the furnishing of all materials, labor, tools and services necessary to install the panelboard to complete all work shown on the Drawings or specified herein.

1.2 RELATED WORK

- A. Grounding.
- B. Overcurrent Protection.

1.3 SUBMITTALS

- A. Submit shop drawings for equipment and component devices under provisions of Division 1.
- B. Include outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, circuit breaker and fusible switch arrangement and sizes.
- C. Furnish two (2) sets of keys to Owner.

1.4 REFERENCES

- A. FS W-C-375 - Circuit breakers, molded case, branch circuit and service.
- B. FS W-P-115 - Power distribution panel.
- C. NEMA AB 1 - Molded case circuit breakers.
- D. NEMA KS 1 - Enclosed switches.
- E. NEMA PB 1 - Panelboards.
- F. NEMA PB 1.1 - Instruction for safe installation, operation and maintenance of panelboard rated 600 volts or less.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - PANELBOARD AND LOAD CENTERS

- A. Siemens.
- B. Square "D".
- C. General Electric.
- D. Or approved equal.

2.2 BRANCH CIRCUIT PANELBOARDS

- A. Lighting and appliance branch circuit panelboards: NEMA PB 1; circuit breaker type.
- B. Enclosure: NEMA PB 1; Type 1.
- C. Cabinet Size: Approximately 6 inches deep; 20 inches wide for 240 volt and less panelboards. Verify field conditions and alter dimensions to suit at no additional cost.
- D. Provide surface cabinet front door-in-door with concealed trim clamps, concealed hinge and flush lock all keyed alike. Finish in manufacturer's standard gray enamel.
- E. Provide panelboards with copper bus, rating as scheduled on Drawings. Provide copper ground bus in all panelboards and isolated ground bus in those as indicated on Drawings.
- F. Minimum Integrated Short Circuit Rating: 10,000 amperes rms symmetrical for 240 volt rated for 125 amps or less, 22,000 amperes rms symmetrical for 240 volt rated greater than 125 amps to 225 amps and 30,000 amperes for emergency power panelboards (verify in field). If panelboard is noted as a main distribution panelboard, than panel shall be rated as a distribution panelboard. Contractor shall provide short circuit study to ensure adequacy.
- G. Molded Case Circuit Breakers: Bolt-on type thermal magnetic trip handle for all poles. Provide circuit breakers UL listed as type SWD for lighting circuits. Breaker handle to indicate ampere rating.

2.3 DISTRIBUTION PANELBOARDS

- A. Description: NEMA PB 1, circuit breaker type. The bus of all panels rated a minimum 400 amps shall be distribution type.
- B. Panelboard Bus: Copper, ratings as indicated. Provide copper ground bus in each panelboard.
- C. Minimum Integrated Short Circuit Rating: 65,000 amperes rms symmetrical for 240 volt panelboards; 65,000 amperes rms symmetrical for 480 volt panelboards, unless otherwise noted on Drawings.

- D. Model Case Circuit Breakers: NEMA AB 1, circuit breakers with integral thermal and instantaneous magnetic trip in each pole. Provide circuit breakers UL listed as Type HACR as specified on Drawings.
- E. Enclosure: NEMA PB 1, Type 1.
- F. Cabinet Front: Surface type, fastened with screws. Double hinged doors with flush lock, metal directory frame, finished in manufacturer's standard gray enamel. One hinged door to access breakers, the other to access wiring compartment.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install panelboards flush or surface mounted as indicated on Drawings.
- B. Mounting height maximum 6 ft. (2 m) to top circuit breaker.
- C. Provide filler plates for unused spaces in panelboards.
- D. Provide type written circuit directory for each branch circuit panelboard. Indicate loads served and panel name by matching that shown on panel schedules on Drawings. Revise directory to reflect circuiting changes required to balance phase loads. Provide a second copy and turn over to Owner.
- E. Provide 3/4" thick plywood backboard for mounting of panels. Paint backboard with fire retardant paint.
- F. Provide nameplates as indicated in Section 260550.

3.2 FIELD QUALITY CONTROL

- A. Measure steady state load currents at each panelboard feeder. Should the difference at any panelboard between phases exceed 20 percent, rearrange circuits in the panelboard to balance the phase loads within 20 percent. Take care to maintain proper phasing for multi-wire branch circuits.
- B. Visual and mechanical inspection: Inspect for physical damage, proper alignment, anchorage and grounding. Check proper installation and tightness of connections for circuit breakers, fusible switches and fuses.
- C. Provide thermographic inspections in accordance with Section 260100.

3.3 TESTS

- A. Submit certification that each panelboard has withstood, without breakdown, a factory dielectric (Hi-Pot) test consisting of a one minute application of a 60 cycle AC test voltage applied between phase legs and from each phase leg to enclosure.

- B. The applied test voltage shall have an RMS value of at least twice the line to line system voltage to which the panelboard is to be applied, plus one thousand volts (minimum 1500V).

3.4 RECORD DRAWINGS

- A. Submit As-Built Drawings indicating the location of all panelboards.

END OF SECTION 260700

SECTION 260780 - ELECTRICAL SUB-METER

PART 1 - GENERAL

Applicable provisions of the Conditions of the Contract and Division 1 General Requirements govern work in this section. Submit shop drawings for checking and approval.

1.1 WORK INCLUDED

- A. The work under this section shall include the furnishing of all materials, labor, tools and services necessary to install the electrical sub-meter to complete all work shown on the Drawings or specified herein.

PART 2 - PRODUCTS

2.1 POWER METERS

- A. The meter shall be UL listed and CE marked.
- B. The meter shall be designed for Multifunction Electrical Measurement on 3 phase power systems. The meter shall perform to spec in harsh electrical applications in high and low voltage power systems.
 - 1. The meter shall support 3 Element Wye, 2.5 Element Wye, 2 Element Delta, 4 wire Delta systems.
 - 2. The meter shall accept universal voltage input.
 - 3. The meter's surge withstand shall conform to IEEE C37.90.1.
 - 4. The meter shall be user programmable for voltage range to any PT ratio.
 - 5. The meter shall accept a burden up to 0.018 W at 120 V.
 - 6. The meter shall accept a voltage input range of up to 576 volts Line to Neutral, and up to 721 volts Line to Line.
 - 7. The meter shall accept a current reading of up to 11 Amps continuous.
 - 8. The meter shall have color-coordinated voltage and current inputs.
 - 9. The meter shall have a phasor diagram, through software, that clearly shows wiring status.
- C. The meter shall use a dual input method for current inputs. Method one shall allow the CT to pass directly through the meter without any physical termination on the meter. The second method shall provide additional termination pass through bars, allowing the CT leads to be terminated on the meter. The meter must support both termination methods.
 - 1. Fault Current Withstand shall be 100 A for 10 seconds, 300 A for 3 seconds, and 500 A for 1 second.
 - 2. The meter shall be programmable for current to any CT ratio. DIP switches or other fixed ratios shall not be acceptable.
 - 3. The meter shall accept a burden of 0.005 VA per phase, Max at 11 A.
 - 4. The meter shall begin reading at 0.1% of the nominal current.
 - 5. Pass through wire gauge dimension of 0.177" / 4.5 mm shall be available.
 - 6. All inputs and outputs shall be galvanically isolated to 2500 V AC.
 - 7. The meter shall accept current inputs of Class 10: (0.005 to 11) A, 5 A Nominal, 18 A max and Class 2 (0.001 to 2) A, 1 A Nominal Secondary, 2 A max.

- D. The meter shall have an accuracy of +/- 0.1% or better for voltage and amperes, and 0.2% for power and energy functions. The meter shall meet the accuracy requirements of IEC62053-22 (Class 0.2%) and ANSI C12.20 (Class 0.2%). The meter shall have a Frequency measurement accuracy of not less than 0.007 Hz.
1. The meter shall provide true RMS measurements of voltage, - phase to neutral and phase-to-phase; and current, per phase and neutral.
 2. The meter shall calculate RMS readings, sampling at over 400 samples per cycle on all channels of measured readings continuously, with no cycle blind spots.
 3. The meter shall utilize 24 bit Analog to Digital conversion.
 4. The meter shall provide THD (Total Harmonic Distortion). Harmonic magnitude recording to the 40th order shall be available for voltage and current harmonics.
- E. The meter shall provide a simultaneous voltage and current waveform recorder.
1. The meter shall be capable of recording 512 samples per cycle for a voltage sag or swell or for a current fault event.
 2. The meter shall provide pre and post-event recording capability.
 3. The meter shall have a programmable sampling rate for the waveform recorder.
 4. The meter shall have an advanced DSP design that allows power quality triggers to be based on a 1 cycle updated RMS.
 5. Up to 319 events shall be recorded.
 6. The meter shall store waveform data in a first-in, first-out circular buffer to insure that data is always being recorded.
- F. The meter shall include a three-line, bright red, .56" LED display.
1. The meter shall fit in both DIN 92 mm and ANSI C39.1 round cut-outs.
 2. The meter must display a % of Load Bar on the front panel to provide an analog feel. The % Load bar shall have not less than 10 segments.
- G. The meter shall be available in transducer only version, with no display.
1. The transducer version shall mount directly to a DIN rail and provide RS485 Modbus or DNP3 output, as well as optional communication cards.
- H. The meter shall be a traceable revenue meter, which shall contain a utility grade test pulse allowing power providers to verify and confirm that the meter is performing to its rated accuracy.
- I. The meter shall include virtual measurement upgrade packs (V-Switch™ keys), which shall allow user to upgrade in field without removing installed meter.
1. The four Virtual Upgrade packs shall be:
 - a. Volts, Amps, kW, kVAR, PF, kVA, Freq., kWh, kVAh, kVARh, and I/O Expansion - V1
 - b. Above with 2 Megabytes of memory for Data-logging - V2
 - c. Above with 128 samples per cycle waveform recording and 10 Megabytes memory – V3.
 - d. Above, with 512 samples per cycle waveform recording and 128 Megabytes memory - V4.
 2. The V-Switch™ keys must be able to be implemented without physically removing the installed meter.

- J. The meter shall include 2 independent communications ports on the back and face plate, with advanced features.
 - 1. One port shall provide RS485 communication speaking Modbus ASCII, Modbus RTU, or DNP3 protocol through the back plate. Baud rates shall be from 1200 baud to 57600 baud for the RS485 port.
 - 2. The meter shall have a USB port (through the faceplate) as the second standard communication port, which shall allow the unit to be set up and programmed using a laptop computer. Baud rate for the USB port shall be 57600; Modbus ASCII protocol, no Parity, 8 Data bits, and 1 Stop bit shall be supported.
- K. The meter shall provide user configured fixed window or rolling window demand. This shall allow the user to set up the particular utility demand profile.
 - 1. Readings for kW, kVAR, kVA and PF shall be calculated using utility demand features.
 - 2. All other parameters shall offer max and min capability over the user selectable averaging period.
 - 3. Voltage shall provide an instantaneous max and min reading displaying the highest surge and lowest sag seen by the meter.
 - 4. The meter shall provide an update rate of every 6 cycles for W, VAR and VA and Wh, VARh, and VAh. All other parameters shall be every 60 cycles.
- L. The meter shall support a power supply of (90 to 265) V AC or (100 to 370) V DC. Universal AC/DC Supply shall have a burden of 10 VA max. An optional power supply of (18 to 60) V DC shall be available.
- M. The meter shall provide Limits/Alarms and control capability as follows:
 - 1. Limits can be set for any measured parameter.
 - 2. Up to 16 limits can be set.
 - 3. Limits shall be based on % of Full Scale settings.
 - 4. Manual relay control shall be available through software.
 - 5. Relay set delays and reset delays shall be available.
 - 6. Relay control shall be available through DNP3 over Ethernet with the Ethernet Option card.
- N. The meter shall have data logging capability of up to 128 MB memory. The meter shall have a real-time clock that allows for time stamping of all the data in the meter when log events are created.
 - 1. The meter shall have up to six historical logs for trending profiles. Each log shall be capable of being programmed with up to 64 parameters. The user shall have the ability to allocate memory between the three historical logs in order to increase or decrease the memory allotted to each of the logs. The duration of a historical log with 4 data channels being recorded at 15 minute intervals shall be 76 months.
 - 2. The meter shall have a log for Limits/Alarms. The Limits log shall provide magnitude and duration of an event, time-stamp, and log value. The log must be capable of recording up to 2048 events.

3. The meter shall have a log for System Events. The System Events log shall record the following occurrences with a time-stamp: Demand Resets, Password Requests, System Startup, Energy Resets, Log Resets, Log Reads, Programmable Settings Changes, and Critical Data Repairs.
 4. The meter shall have a log for I/O changes. The I/O Change log shall provide a time-stamped record of any Relay Outputs and any Input Status changes. The log must be capable of recording up to 2048 events.
 5. The meter with Virtual Upgrade packs 3 and 4 shall have a log which is capable of recording a waveform both when a user-programmed value goes out of limit and when the value returns to within limit. Up to 319 waveform events can be stored.
 6. The meter shall have a log for PQ events, with millisecond recording of waveform events.
- O. The meter shall have I/O expandability through two Option card slots on the back.
1. The cards shall be capable of being installed in the field, without removing the meter from installation.
 2. The meter shall auto-detect the presence of any I/O Option cards.
 3. The Option card slots shall accept I/O cards in all of the following formats: 100BaseT Ethernet Communication Card; Four Channel Bi-directional 0-1mA Output Card; Four Channel 4-20mA Output Card; Two Relay Outputs/2 Status Inputs Card; Four Pulse Outputs/4 Status Inputs Card; Fiber Optic Card; IEC 61850 Protocol Ethernet Network Card; RS232/RS485 Serial Communication Card.
 4. The meter shall be capable of accepting any combination of up to two cards.
 - a. When two Ethernet cards are installed in the meter, an independent IP address and MAC address shall be assignable to each card.
 5. The Ethernet Option Card shall provide the meter with 100BaseT Ethernet functionality. The Ethernet Option card shall:
 - a. Allow the meter to speak with 12 simultaneous sockets of Modbus TCP, so that multiple requests for data can be received simultaneously.
 - b. Allow the meter to speak with 5 simultaneous sockets of DNP3 over TCP/IP.
 - c. Allow the meter to speak with both Modbus TCP and DNP3 over Ethernet simultaneously.
 - d. Allow auto transmit/receive detection for straight or crossover RJ45 cables.
 - e. Provide an embedded Web server that allows access to metered readings through the Internet, using any standard Web browser from a PC, smart phone, or tablet PC.
 - f. Provide email on configured alarms.
 - g. Provide email notification of meter status and reading data on a programmed schedule.

6. The 1mA Option Card shall provide the following features:
 - a. 4 channel, bi-directional 0-1 mA outputs.
 - b. Assignable to any measured parameter.
 - c. 0.1% of Full Scale accuracy throughout range and load.
 - d. Maximum load impedance to 10 k Ω , with no accuracy losses.
7. The 20mA Option Card shall provide the following features:
 - a. 4 channel, 4-20 mA outputs.
 - b. Assignable to any measured parameter.
 - c. 0.1% of Full Scale accuracy throughout range and load.
 - d. Maximum load impedance to 850 Ω , with no accuracy losses.
 - e. Loop powered using up to 24 V DC.
8. The Relay Output/Status Input Option Card shall provide the following features:
 - a. 2 Relay outputs, 2 Status inputs.
 - b. Status Inputs – Wet/Dry Auto Detect up to 150 V DC.
 - c. Trigger on user-set Limits/Alarms.
 - d. Set delays and Reset delays.
9. The Pulse Output/Digital Input Option Card shall provide the following features:
 - a. 4 KYZ pulse/4 Status inputs.
 - b. Programmable to any energy parameter and pulse value.
 - c. Programmable to End of Interval pulse.
 - d. Can function for manual relay control and limit based control.
 - e. 120 mA continuous load current.
 - f. DNP3 input.
10. The Fiber Optic Option Card shall provide the following features:
 - a. Built in logic to mimic RS485 half-duplex bus, allowing the user to daisy chain meters for low installation cost.
 - b. ST Terminated Option.
 - c. Versatile Link Terminated Option.
 - d. Modbus and DNP3 protocols available.
11. The IEC 61850 Protocol Ethernet Network Option Card shall provide the following features:
 - a. Integrates into any IEC 61850 network.
 - b. Provides support for Modbus TCP and IEC 61850 protocols simultaneously.
 - c. Configurable for multiple logical nodes.
 - d. Provides buffered and unbuffered reporting.
 - e. Is certified by a 3rd party Authorized IEC 61850 Test Laboratory.
 - f. Is capable of supporting two Ethernet cards with separate /IP addresses, each running IEC 61850 protocol.

12. The RS1S Communication card adds another serial communication port - either RS232 or RS485.
- P. The meter shall have transformer loss, line loss, and total substation loss compensation.
1. Substation losses shall be programmable for Watts and VARs, and for Ferris and Copper losses.
- Q. The meter shall compensate for errors in current transformers and potential transformers.
1. Errors shall include voltage, multipoint current, multiphase angle, and better than .01% resolution.
- R. The meter shall internally record and store Time of Use data in a perpetual TOU calendar.
1. The following Time of Use parameters must be included:
 - a. Bi-directional consumption and demand.
 - b. Configurable accumulators.
 - c. Up to four seasons and 12 months.
 2. The meter must provide the following TOU information for all rates in real time:
 - a. Current month accumulations.
 - b. Previous month accumulations.
 - c. Current season (or weekly, or daily) accumulations.
 - d. Previous season (or weekly, or daily) accumulations.
 - e. Total accumulations to date.
 - f. Cumulative Demand.
 - g. Continuous cumulative demand shall be available.
- S. The meter shall provide multi-level Cyber Security:
1. The meter shall have highly secure encrypted passwords of up to 30 characters in length.
 2. The meter's security shall allow for 9 user IDs and passwords.
 3. There shall be one admin level and up to 8 customizable user levels.
 4. There shall be password fail timeouts.
 5. Password restriction shall be available for most meter functions.
- T. The meter shall be able to be stored in (-20 to +70) °C.
1. Operating temperature shall be (-20 to +70) °C.
 2. NEMA 1 faceplate rating shall be available.
 3. Humidity rating to 95% R.H.
 4. Standard conformal coating on PCBs.
- U. The meter shall have a standard 4-year warranty.

V. Acceptable product is Electro Industries/GaugeTech, Model: Shark®250-60-10-V4-D2-INP100S-INP300S – ELWC6-1600-RA05-EL-LABOR.

1. Add the following suffixes for added options:
 - a. E205301: RS485 to USB Communication Converter
 - b. E169305: USB-A to USB Mini-B cable.
 - c. Unicom 2500: Isolated RS485 to RS232 Converter
 - d. Unicom 2500-F: Isolated RS485 to RS232 to Fiber Optic Converter
 - e. Modem Manager, Model #, MM1: RS485 to RS232 Converter for Modem Communication
 - f. Certificate of Calibration, Part #, Ccal: This provides Certificate of Calibration with NIST traceable test data.
 - g. COMEXT4: Communicator EXT™ 4.0 Software application
2. For specification information, contact:
Electro Industries/GaugeTech
1800 Shames Drive
Westbury, NY 11590
Phone: 516-334-0870
Fax: 516-338-4741
www.electroind.com

END OF SECTION 260780

SECTION 260800 - FIRE ALARM SYSTEM

PART 1 - GENERAL

Applicable Provisions of the Conditions of the Contract and Division 1 General Requirements govern work in this section. Submit shop drawings for checking and approval.

1.1 DESCRIPTION

- A. At the time of bid, all exceptions taken to these Specifications, all variances from these Specification and all substitutions of operating capabilities or equipment called for in these Specification shall be listed in writing and forwarded to the Engineer. Any such exception, variances or substitutions which were not listed at the time of bid and are identified in the submittal, shall be grounds for immediate disapproval without comment.
- B. The entire system shall be installed with aesthetics in mind. All control panels and remote annunciators installed in public spaces shall be semi-flush mounted with no exposed conduit or cable trays.

1.2 WORK INCLUDED

- A. The work covered by this Section of the Specification shall include all labor, equipment, materials and services to furnish and install a complete fire alarm system of the addressable, non-coded type. It shall be complete with all necessary hardware, software and memory specifically tailored for this installation. It shall be possible to permanently modify the software on site by using a plug-in programmer. The system shall consist of, but not be limited to, the following:
 - 1. Fire Alarm Control Panel and related remote data gathering panels.
 - 2. Remote Annunciators with semi flush backbox.
 - 3. Addressable manual fire alarm stations.
 - 4. Addressable analog area smoke detectors.
 - 5. Addressable analog duct smoke detectors.
 - 6. Addressable analog heat detectors.
 - 7. Magnetic door\card access release override control.
 - 8. Audible notification appliances - Speakers.
 - 9. Visual notification appliances - strobes.
 - 10. Central station alarm connection control.
 - 11. Air handling systems shutdown control.
 - 12. Magnetic door holder release.
 - 13. Dry pipe sprinkler release valve/deluge valve control.
 - 14. Pre-Action Sprinkler System.
 - 15. Sprinkler supervisory switches and tamper switch supervision.
 - 16. Battery standby.
 - 17. Kitchen Ansul System Monitoring

1.3 APPLICABLE CODES AND STANDARDS

- A. All equipment shall be UL listed for its intended use and conform to the latest UL Standards.
- B. Underwriters Laboratories Inc.: The system and all components shall be listed by Underwriters Laboratories Inc. for use in fire protective signaling system under the following standards as applicable:

UL 864/UOJZ, APOU	Control Units for Fire Protective Signaling Systems.
UL 268Smoke	Detectors for Fire Protective Signaling Systems.
UL 268A	Smoke Detectors for Duct Applications.
UL 217	Smoke Detectors Single Station.
UL 521	Heat Detectors for Fire Protective Signaling Systems.
UL 228	Door Holders for Fire Protective Signaling Systems.
UL 464	Audible Signaling Appliances.
UL 1638	Visual Signaling Appliances.
UL 38	Manually Activated Signaling Boxes.
UL 346	Waterflow Indicators for Fire Protective Signaling Systems.
UL 1971	Standard for Signaling Devices for the Hearing Impaired
UL 1481	Power Supplies for Fire Protective Signaling Systems.
UL 1711	Amplifiers for Fire Protective Signaling Systems.
UUKL	The Fire Alarm system shall be UUKL for Smoke Control.

- C. This installation shall comply with:
 - 1. Americans with Disabilities Act (ADA)
 - 2. National Electric Code, Article 760.
 - 3. National Fire Protection Association Standards: NFPA72
 - 4. Local and State Building Codes and the Local Authorities Having Jurisdiction.
 - 5. International Standards Organization (ISO): ISO-9001

1.4 RELATED DOCUMENTS

- A. Secure permits and approvals prior to installation.
- B. Prior to commencement and after completion of work notify Authorities Having Jurisdiction.
- C. Submit letter of approval for installation before requesting acceptance of system.

1.5 RELATED WORK

- A. The Contractor shall coordinate work in this Section with all related trades. Work and/or equipment provided in other Sections and related to the fire alarm system shall include, but not be limited to:

1. Sprinkler waterflow and supervisory switches shall be furnished and installed by the fire protection contractor, but wired and connected by the electrical contractor. Modification of existing sprinkler devices to accommodate monitoring by the new fire alarm system shall be the responsibility of the fire alarm system installing contractor.
2. Duct smoke detectors shall be furnished, wired and connected by the electrical contractor. The HVAC contractor shall furnish necessary duct opening to install the duct smoke detectors.
3. New air handling and smoke exhaust system fan control circuits and status contacts to be furnished by the HVAC control equipment.
4. Elevator recall control circuits to be provided by the elevator control equipment. Modifications to the existing elevator controls to accommodate ANSI A17.1 shunt trip activation shall be provided by the elevator controls contractor. Any shunt trip circuit breakers and related wiring required for ANSI A17.1 compliance shall be provided by the electrical contractor (see power riser for more details).
5. Dry pipe/deluge sprinkler system release valve control circuits and supervision contacts shall be provided by the dry pipe/deluge sprinkler system control equipment.
6. Conduit: Section 260200.
7. Wire and Cable: Section 260300.
8. Installing dedicated outgoing RJ-31X telephone lines (2) shall be the responsibility of the Installing **Electrical Contractor**. Establishment of central station monitoring account shall be the responsibility of the fire alarm equipment vendor.

1.6 SUBMITTALS

- A. Provide list of all types of equipment and components provided. This shall be incorporated as part of a Table of Contents, which will also indicate the manufacturer's part number, the description of the part, and the part number of the manufacturer's product datasheet on which the information can be found.
- B. Provide description of operation of the system (Sequence of Operation), similar to that provided in Part 2 of this Section of the Specifications, to include any and all exceptions, variances or substitutions listed at the time of bid. Any such exceptions, variances or substitutions which were not listed at the time of bid and are identified in the submittal, shall be grounds for immediate disapproval without comment. The sequence of operation shall be project specific, and shall provide individual sequences for every type of alarm, supervisory, or trouble condition, which may occur as part of normal or off-normal system use.
- C. Provide manufacturer's ORIGINAL printed product data, catalog cuts and description of any special installation procedures. Photocopied and/or illegible product data sheets shall not be acceptable. All product datasheets shall be highlighted or stamped with arrows to indicate the specific components being submitted for approval.

- D. Provide manufacturer's installation instruction manual for specified system.
- E. Provide samples of various items when requested.
- F. Provide copy of State License to perform such work.
- G. Provide copies of NICET Level II Fire Alarm certifications for the two (2) technicians assigned to this project.
- H. Provide shop drawings as follows:
 - 1. Coversheet with project name, address and drawing index.
 - 2. General notes drawing with peripheral device backbox size information, part numbers, device mounting height information, and the names, addresses, point of contact, and telephone numbers of all contract project team members.
 - 3. Device riser diagram that individually depicts all control panels, annunciators, addressable devices, and notification appliances. Shall include a specific, proposed point descriptor above each addressable device. Shall include a specific, discrete point address that shall correspond to addresses depicted on the device layout floor plans. Drawing shall provide wire specifications, and wire tags shown on all conductors depicted on the riser diagram. All circuits shall have designations that shall correspond with those require on the control panel and floor plan drawings. End-of-line resistors (and values) shall be depicted.
 - 4. Control panel termination drawing(s). Shall depict internal component placement and all internal and field termination points. Drawing shall provide a detail indicating where conduit penetrations shall be made, so as to avoid conflicts with internally mounted batteries. For each additional data gathering panel, a separate control panel drawing shall be provided, which clearly indicated the designation, service and location of the control enclosure. End-of-line resistors (and values) shall be depicted.
 - 5. See section 3.4 DOCUMENTATION AND TRAINING for other documents relating to this section.
 - 6. Device typical wiring diagram drawing(s) shall be provided which depict all system components, and their respective field wiring termination points. Wire type, gauge, and jacket shall also be indicated. When an addressable module is used in multiple configurations for monitoring or controlling various types of equipment, different device typical diagrams shall be provided. End-of-line resistors (and values) shall be depicted.

7. Device layout floor plans shall be created for every area served by the fire alarm system. CAD Files (AutoCAD latest version) shall be provided by the consulting engineer for the use of the fire alarm system equipment vendor in the preparation of the floor plans. Floor plans shall indicate accurate locations for all control and peripheral devices. Drawings shall be NO LESS THAN 1/8 INCH SCALE. All addressable devices shall be depicted with a discrete address which corresponds with that indicated on the Riser Diagram. All notification appliances shall also be provided with a circuit address which corresponds to that depicted on the Riser Diagram. If individual floors need to be segmented to accommodate the 1/8" scale requirements, KEY PLANS and BREAK-LINES shall be provided on the plans in an orderly and professional manner. End-of-line resistors (and values) shall be depicted.
 8. Contained in the title block of each drawing shall be symbol legends with device counts, wire tag legends, circuit schedules for all addressable and notification appliance circuits, the project name/address, and a drawing description which corresponds to that indicated in the drawing index on the coversheet drawing. A section of each drawing title block shall be reserved for revision numbers and notes. The initial submission shall be Revision 0, with Revision A, B, or C as project modifications require.
 - I. Battery calculations shall be provided on a per power supply/charger basis. These calculations shall clearly indicate the quantity of devices, the device part numbers, the supervisory current draw, the alarm current draw, totals for all categories, and the calculated battery requirements (which reflect a 20% DEGRADE, for 24 Hour supervisory, 15 minute alarm operation). Battery calculations shall also reflect all control panel component, remote annunciator, and auxiliary relay current draws. Failure to provide these calculations shall be grounds for the complete rejection of the submittal package.
 - J. Table of contents, product data sheets, sequences of operation, battery calculations, installation instructions, licenses, NICET certifications and B-Size (blackline) reduced shop drawings shall be provided by the fire alarm vendor as part of a single, spiral bound submittal book. The submittal book shall have laminated covers indicating the project address, project number, system type, and contractor. The book shall consist of labeled dividers, and shall not exceed 9 1/2" in width, and 11 1/2" in height. No less than three (3) sets of submittal booklets shall be provided to the consulting engineer for review and comment. Additional copies may be required at no additional cost to the project.
 - K. Scale drawing sets shall be submitted along with the submittal booklets. These drawings may be either D-Size or E-Size Blue-line drawings and of a sufficient resolution to be completely read. Sets shall be bound and folded so that it does not take up more than 100 square inches of space. No less than three (3) sets of scale drawing sets shall be provided to the consulting engineer for review and comment. Additional copies may be required at no additional cost to the project.
- 1.7 WARRANTY
- A. All work performed and all material and equipment furnished under this contract shall be free from defects and shall remain so for a period of at least one (1) year from the date of acceptance or approval by AHJ. The full cost of maintenance, labor and materials required to correct any defect during this one year period shall be included in the submittal bid.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. The catalog numbers used are those of Edwards EST by UTC Fire and Security "**or equal**", and constitute the type and quality of equipment to be furnished. For a list of Edwards EST authorized fire alarm vendors, contact Dana Ferrer at UTC Fire and Security at dana.ferrer@fs.utc.com.
- B. If equipment of another manufacturer is to be submitted for approval as equal, the contractor shall, at the time of bid, list all exceptions taken to these Specifications, all variances from these Specifications and all substitutions of operating capabilities or equipment called for in these Specifications and forward said list to the Engineer. Any such exceptions, variances or substitutions that were not listed at the time of bid and are identified in the submittal, shall be grounds for immediate disapproval without comment. Final determination of compliance with these Specifications shall rest with the Engineer, who, at his discretion, may require proof of performance.
- C. Alternate product submissions made without proof of no less than three (3) factory authorized and certified manufacturer's distributors residing within 50 miles of the project job site shall be rejected. These distributors must not only provide installation support, but must have a service organization capable of 24 hour emergency call service and **MUST HAVE BEEN CONTRACTED AND DELIVERED NO LESS THAN FIVE (5) ACCEPTED PROJECTS USING THE SUBMITTED PRODUCT OVER THE PAST YEAR.**
- D. Alternate product submissions based upon use of a product line considered proprietary in its distribution, design, application software, or ongoing maintenance and repair shall not be acceptable. Proof of a product's non-proprietary nature shall be the burden of the contractor at the time of Bid, and shall be in the form of written documentation. The determination of a product's compliance to this requirement shall be exclusively that of the Consulting Engineer.
- E. All products used shall be of a single manufacturer. Submission of notification appliances, auxiliary relays, or documentation from other than a single manufacturer shall not be acceptable and will be grounds for immediate disapproval without comment.

2.2 CIRCUITING GUIDELINES

- A. Each addressable analog loop shall be circuited so device loading is not to exceed 80% of loop capacity in order to leave for space for future devices. The loop shall have Class B operation.
- B. Where it is necessary to interface conventional initiating devices provide intelligent input modules to supervise Class B zone wiring.
- C. Each of the following types of devices or equipment shall be provided with supervised circuits as shown on the drawings but shall be typically as follows:

1. Sprinkler Valve Supervisory Switches: Provide one (1) supervisory module circuit for each sprinkler valve supervisory switch.
 2. When waterflow and tamper switches exist at the same location, provide one (1) dual input addressable module. When odd numbers of devices exist at a single location, provide additional single input addressable modules.
- D. Each of the following types of alarm notification appliances shall be circuited as shown on the drawings but shall be typically as follows:
1. Audible Signals: Provide sufficient spare capacity to assure that the addition of five (5) audible devices can be supported without the need for addition control components (power supplies, signal circuit modules, amplifiers, batteries, etc.)
 2. Visual Signals Provide sufficient spare capacity to assure that the addition of three (3) visual devices can be supported without the need for addition control components (power supplies, signal circuit modules, batteries, etc.)
- E. Each of the following types of remote equipment associated with the fire alarm system shall be provided with a form 'C' control relay contact as shown on the drawings, but shall be typically as follows:
1. HVAC Fan Systems: Provide one (1) shutdown control relay contact for each HVAC fan system.
 2. HVAC Supply Fans: Provide one (1) shutdown control relay contact for each HVAC supply fan.
 3. HVAC Return Fans: Provide one (1) shutdown control relay contact for each HVAC return fan.
- F. Provide a dedicated 24VDC circuit to feed all auxiliary relays required for inductive loads. Circuits shall be supervised via an end-of-line relay and addressable input module. Auxiliary relays shall not derive their power from the starter or load being controlled.
- G. Each control or data gathering panel shall have a dedicated 20Amp-120VAC feed. This feed shall come from an emergency or lighting circuit breaker panel, and shall have a locked circuit breaker. Earth grounds shall also terminate to the same circuit breaker panel from each respective control panel.
- ### 2.3 FIRE ALARM SYSTEM SEQUENCE OF OPERATION
- A. The system shall identify any off normal condition and log each condition into the system database as an event.
1. The system shall automatically display on the control panel Liquid Crystal Display the first event of the highest priority by type. The priorities and types shall be alarm, supervisory, trouble, and monitor.

2. The system shall have a Queue operation, and shall not require event acknowledgment by the system operator. The system shall have a labeled color coded indicator for each type of event; alarm - red, supervisory - yellow, trouble - yellow, monitor - yellow. When an unseen event exists for a given type, the indicator shall be lit.
 3. For each event, the display shall include the current time, the total number of events, the type of event, the time the event occurred and up to a 42 character custom user description.
 4. The user shall be able to review each event by simply selecting scrolling keys (up-down) for each event type.
 5. New alarm, supervisory, or trouble events shall sound a silencing audible signal at the control panel.
- B. Operation of any alarm initiating device shall automatically:
1. Update the control/display as described above (A.1.)
 2. Sound all audible speaker appliances with a prerecorded message. Audible devices shall have the ability to be silenced.
 3. Activate all strobe appliances throughout the facility. ALL STROBE APPLIANCES SHALL BE SYNCHRONIZED WITH EACH OTHER IN ANY LOCATION WITH TWO OR MORE DEVICES IN A COMMON FIELD OF VIEW. Visual devices shall be non-silenced unless the system is successfully reset.
 4. Operate control relay contacts to shut-down all HVAC units serving the floor of alarm initiation.
 5. Operate control relay contacts to return all elevators that serve the floor of alarm initiation to the ground floor. If the alarm originates from the ground floor, operate control circuits contacts to return all elevators to the floor above or to a level as directed by the local fire department.
 6. Operate control relay contacts to release all magnetically held smoke doors throughout the building.
 7. Visually annunciate the individual point of alarm on all remote annunciator panels. The visual indication shall remain on until the alarm condition is reset to normal.
 8. Transmit an alarm condition, via the integral central station communicator, to central station/Local Fire Department (as required by the AHJ).
- C. Elevator smoke and heat detector sequences shall comply with the ANSI A17.1 requirements for main/alternate floor recalls, and shunt trip activations.

- D. Activation of a sprinkler supervisory initiating device shall:
 - 1. Update the control/display as described above (A.1.)
 - 2. Transmit a supervisory condition, via the integral central station communicator, to central station/Local Fire Department (as required by the AHJ).
 - 3. Visually annunciate the individual point of alarm on all remote annunciator panels. The visual indication shall remain on until the alarm condition is reset to normal.
- E. The entire fire alarm system wiring shall be electrically supervised to automatically detect and report trouble conditions to the fire alarm control panel. Any opens, grounds or disarrangement of system wiring and shorts across alarm signaling wiring shall automatically:
 - 1. Update the control/display as described above (A.1.)
 - 2. Transmit a trouble condition, via the integral central station communicator, to central station/Local Fire Department (as required by the AHJ).
 - 3. Visually and audibly annunciate a general trouble condition, on the remote annunciator panels. The visual indication shall remain on until the trouble condition is repaired.

2.4 SUPPORT FOR INSTALLER AND OWNER MAINTENANCE

- A. Provide a coded one-man walk test feature. Allow audible or silent testing. Signal alarms and troubles during test. Allow receipt of alarms and programmed operations for alarms from areas not under test.
- B. Provide internal system diagnostics and maintenance user interface controls to display/report the power, communication, and general status of specific panel components, detectors, and modules.
- C. Provide loop controller diagnostics to identify common alarm, trouble, ground fault, Class A fault, and map faults. Map faults include wire changes, device type changes by location, device additions/deletions and conventional open, short, and ground conditions. Ground faults on the circuit wiring of remote module shall be identified by device address.
- D. Allow the user to display/report the condition of addressable analog detectors. Include device address, device type, percent obscuration, and maintenance indicator. The maintenance indicator shall provide the user with a measure of contamination of a device upon which cleaning decisions can confidently be made.
- E. Allow the user to report history for alarm, supervisory, monitor, trouble, smoke verification, watchdog, and restore activity. Include Facility Name, Licensee, Project Program Compilation date, Compiler Version, Project Revision Number, and the time and date of the History Report.
- F. Allow the user to disable/enable devices, zones, actions, timers and sequences. Protect the disable function with a password.

- G. Allow the user to activate/restore outputs, actions, sequences, and simulate detector smoke levels.
- H. Allow the service user to enter time and date, reconfigure an external port for download programming, initiate auto programming and change passwords. Protect these functions with a password.
- I. THE END-USER SHALL RETAIN COMPLETE RIGHTS AND OWNERSHIP TO ALL SOFTWARE RUNNING IN THE SYSTEM. The fire alarm equipment vendor shall provide useable hard and soft copies of the software database to the End-User at the end of the warranty period. The database provided shall be useable by any authorized and certified distributor of the product line, and shall include all applicable passwords necessary for total and unrestricted use and modification of the database. The Consulting Engineer shall define the extent of hardcopy database documentation to be provided.

2.5 UL LISTED AND APPROVED EQUIPMENT

- A. Fire Alarm Control Panel is existing, EST3 series. Provide additional modules, power supplies, amplifiers to support all devices and Requirements: The fire alarm control panel or panels and all system devices and equipment as per Contract Documents.
- B. The Fire Alarm / Life Safety System shall incorporate a true digital integrated audio system into the network, multiplexing 8 independent audio channels over a single pair of wires. The system shall include distributed audio amplifiers, one for each speaker circuit, for the ultimate in system survivability. The system shall provide a local temporal back up tone at each amplifier to allow evacuation signals to be broadcast in the protected premises in the event of a loss of data communication from the multiplexed audio riser. A digital message unit shall be provided which provides up to 32 minutes of pre-recorded emergency messaging. The message contained in the fully digital message unit shall be recordable in the field on a computer. Audio Source Unit (3-ASU): The Fire Alarm / Life safety System shall be provided with a fully integrated Emergency Communications System. The Emergency Communications System shall include a paging microphone, digital message playback unit, and 8 fully digitized and multiplexed Audio Channels. Four dedicated page mode control switches shall provide the emergency operator with instantaneous one touch paging to safely control the staged evacuation of building occupants. Automatic programming shall dynamically group the most frequently targeted paging zones. The "All Call" switch will direct the manual page to the entire facility. The "Page to Evac" switch will direct the manual page to those building areas automatically receiving the Evacuation Signal. The "Page to Alert" switch will direct the manual page to those building areas automatically receiving the Alert Signal. The "All Call Minus" switch will direct the manual page to those building areas which are programmed to receive the auxiliary and general channel connections such as stairwells. The system shall have paging control switches and LEDs to support specific zone selection as shown on the plans. The zone control / displays shall confirm amplifier selection and annunciate amplifier and amplifier circuit trouble. The system shall automatically deliver a preannounce tone of 1000 Hz for three seconds when the emergency operator presses the microphone talk key. A 'ready to page' LED shall flash during the preannounce and turn steady when the system is ready for the user's page delivery. The system shall include a page deactivation timer which activates for 3 seconds when the emergency user release the microphone talk key. Should the user subsequently press the microphone

key during the deactivation period a page can be delivered immediately. Should the timer complete its cycle the system shall automatically restore emergency signaling and any subsequent paging will be preceded by the pre-announce tone. A VU display shall display voice level to the emergency operator.

- C. Audio Amplifiers: Each audio power amplifier shall have integral audio signal de-multiplexers, allowing the amplifier to select any one of eight digitized audio channels. The channel selection shall be directed by the system software. Up to 8 multiple and different audio signals must be able to be broadcast simultaneously from the same system network node. Each amplifier output shall include a dedicated, supervised 25/70 Vrms speaker circuit which is suitable for connection of emergency speaker appliances. Each amplifier shall also include a notification appliance circuit rated at 24Vdc @ 3.5A for connection of visible (strobe) appliances. This circuit shall be fully programmable and it shall be possible to define the circuit for the support of audible, visible, or ancillary devices. Standby Audio amplifiers shall be provided that automatically sense the failure of a primary amplifier, and automatically program themselves to select and de-multiplex the same audio information channel of the failed primary amplifier, and fully replace the function of the failed amplifier. In the event of a total loss of audio data communications, all amplifiers will default to the local "EVAC" tone generator channel. If the local panel has an alarm condition, then all amplifiers will sound the EVAC signal on their connected speaker circuits. In the event of a loss of the fully digitized, multiplexed audio riser, the audio amplifiers shall automatically default to an internally generated alarm tone which shall be operated at a 3-3-3 temporal pattern. Audio amplifiers shall automatically detect a short circuit condition on the connected speaker circuit wiring, and shall inhibit itself from driving into that short circuit condition.
- D. Fire Fighters' Telephone Communication System: The Fire and Life Safety System shall include a fully integrated UL864 listed Fire Fighters' Telephone Communication System as part of the Fire Command Station (FCS). The Fire Fighter's Telephone Communications System shall include a Master Telephone handset that provides a totally independent 2-way communication between the Fire Command Station and remote Warden Telephone Stations and/or Fire Fighter Telephone Jacks (see project plans for locations and type of telephone device). The Fire Fighters' Telephone system shall include an 8-line 160 character LCD display to show the operator the identity and location of up to 20 waiting calls. Each remote Telephone shall be annunciated and connected independently using a dedicated addressable control module. The LCD will display call-in information in full English language up to 20 characters, without the need for individual LEDs and switches per telephone station. The user shall connect a call by pressing the 'connect' switch and support up to a minimum of 5 connected calls simultaneously while also annunciating pending calls. The connection shall be a "conference" or "party Line" call. To terminate a call, the operator shall scroll the display cursor over the connected callers' ID message, and press the 'disconnect' switch. Any Telephone, by means of a manual operation at the FCS, shall be allowed to make an emergency announcement in his/her area, without affecting the simultaneous alarm signals or announcements to any other area or floor in the building. Should the Fire Fighter's Telephone system for any reason require additional controls and indicators, a selection switch and connection LED for each and every telephone shall be provided so as to provide individual annunciation and control.

- E. User Interface: The 3-LCDXL Display Module shall be of membrane style construction with a 24 line by 40-character (960 total characters) Liquid Crystal Display (LCD). The LCD shall use super-twist technology and backlighting for high contrast visual clarity and a colored gray/black and white display. In the normal mode the LCD shall display the time, a customer facility name, and the number of history events. In the alarm mode the LCD display the total number of events and the type of event on display. The LCD shall reserve 42 characters of display space for each user custom message by addressable device. The module shall have visual indicators for the following common control functions; Power, Alarm, Supervisory, Monitor, Trouble, Disable, Ground Fault, CPU fail, and Test. There shall be common control keys and visual indicators for reset, alarm silence, panel silence, and drill. Provide four pairs of display control keys for selection of event display by type (alarm, supervisory, monitor and trouble) and forward / backward scrolling through event listings. The operation of these keys shall be integrated with the related common control indicators to flash the indicators when undisplayed events are available for display and turn on steady when all events have been displayed. The LCD shall display the first event of the highest priority as well as the previous seven (7) alarm events "hands free" in chronological order so that the arriving firefighter may track the fires progression. Provide system function keys; status, reports, enable, disable, activate, restore, program, and test. The module shall have a numeric keypad, zero through nine with delete and enter keys.
- F. Power Supplies: The power supply shall be a high efficiency switch mode type with line monitoring to automatically switch to batteries for power failure or brown out conditions. The automatic battery charger shall have low battery discharge protection. The power supply shall provide internal power and 24 Vdc at 7.0A continuous for notification appliance circuits. The power supply shall be capable of providing 7A to output circuits for a maximum period of 100 ms. All outputs shall be power limited. The battery shall be sized to support the system for 24 hours of supervisory and trouble signal current plus general alarm for 15 minutes.
- G. Auxiliary power supplies shall be a high efficiency switch mode type with line monitoring to automatically switch to batteries for power failure or brown out conditions. The automatic battery charger shall have low battery discharge protection. The power supply shall provide internal power and 24 Vdc at 7.0A continuous for notification appliance circuits. The power supply shall be capable of providing 7A to output circuits for a maximum period of 100 ms. All outputs shall be power limited. The battery shall be sized to support the system for 24 hours of supervisory and trouble signal current plus general alarm for 15 minutes.
- H. Network alpha-numeric annunciators shall be located throughout the facility as indicated on the plans. The system shall have the capacity to support 64 network annunciators or EST3 network panel nodes. Each annunciator shall contain a supervised, back lit, liquid crystal with a minimum of 8 line with 21 characters per line. Where required, the annunciator shall include additional zonal annunciation and manual control without additional enclosures. The annunciator shall support full ability to serve as the operating interface to the system and shall include the following features; Matched appearance with other system displays. Each LCD Display on each node (cabinet) in the system shall be configurable to show the status of any or all of the following functions anywhere in the system: Alarm, Supervisory, Trouble, Monitor. It must be possible to have up to 64 network annunciators or EST3 panels on the network.

- I. Each annunciator must be capable of supporting custom messages as well as system event annunciation. It must be possible to filter unwanted annunciation of trouble, alarm or supervisory functions on a by point or by geographic area.
- J. The annunciators shall be mounted in stand-alone enclosures or integrated into the network panels as indicated on the plans.

2.6 COMPONENTS

- A. Intelligent Devices — General: Each remote device shall have a microprocessor with non-volatile memory to support its functionality and serviceability. Each device shall store as required for its functionality the following data: device serial number, device address, device type, personality code, date of manufacture, hours in use, time and date of last alarm, amount of environmental compensation left/used, last maintenance date, job/project number, current detector sensitivity values, diagnostic information (trouble codes) and algorithms required to process sensor data and perform communications with the loop controller. Each device shall be capable of electronic addressing, either automatically or application programmed assigned, to support physical/electrical mapping and supervision by location. Setting a device's address by physical means shall not be necessary.
- B. Intelligent Detectors — General: The System Intelligent Detectors shall be capable of full digital communications using both broadcast and polling protocol. Each detector shall be capable of performing independent fire detection algorithms. The fire detection algorithm shall measure sensor signal dimensions, time patterns and combine different fire parameters to increase reliability and distinguish real fire conditions from unwanted deceptive nuisance alarms. Signal patterns that are not typical of fires shall be eliminated by digital filters. Devices not capable of combining different fire parameters or employing digital filters shall not be acceptable. Each detector shall have an integral microprocessor capable of making alarm decisions based on fire parameter information stored in the detector head. Distributed intelligence shall improve response time by decreasing the data flow between detector and analog loop controller. Detectors not capable of making independent alarm decisions shall not be acceptable. Maximum total analog loop response time for detectors changing state shall be 0.5 seconds. Each detector shall have a separate means of displaying communication and alarm status. A green LED shall flash to confirm communication with the analog loop controller. A red LED shall flash to display alarm status. The detector shall be capable of identifying up to 32 diagnostic codes. This information shall be available for system maintenance. The diagnostic code shall be stored at the detector. Each smoke detector shall be capable of transmitting pre-alarm and alarm signals in addition to the normal, trouble and need cleaning information. It shall be possible to program control panel activity to each level. Each smoke detector may be individually programmed to operate at any one of five (5) sensitivity settings. Each detector microprocessor shall contain an environmental compensation algorithm that identifies and sets ambient "Environmental Thresholds" approximately six times an hour. The microprocessor shall continually monitor the environmental impact of temperature, humidity, other contaminants as well as detector aging. The process shall employ digital compensation to adapt the detector to both 24-hour long term and 4-hour short-term environmental changes. The microprocessor shall monitor the environmental compensation value and alert the system operator when the detector approaches 80% and 100% of the allowable environmental compensation value. Differential sensing

algorithms shall maintain a constant differential between selected detector sensitivity and the "learned" base line sensitivity. The base line sensitivity information shall be updated and permanently stored at the detector approximately once every hour. The intelligent analog detectors shall be suitable for mounting on any Signature Series detector mounting base.

- C. Fixed Temperature/Rate of Rise Heat Detector/Combination Heat and CO Detector, SIGA-HRD, SIGA-HCD: Provide intelligent combination fixed temperature/rate-of-rise heat detectors SIGA-HRS. The heat detector shall have a low mass thermistor heat sensor and operate at a fixed temperature and at a temperature rate-of-rise. It shall continually monitor the temperature of the air in its surroundings to minimize thermal lag to the time required to process an alarm. The integral microprocessor shall determine if an alarm condition exists and initiate an alarm based on the analysis of the data. Systems using central intelligence for alarm decisions shall not be acceptable. The intelligent heat detector shall have a nominal fixed temperature alarm point rating of 135°F (57°C) and a rate-of-rise alarm point of 15°F (9°C) per minute. The heat detector shall be rated for ceiling installation at a minimum of 70 ft (21.3m) centers and be suitable for wall mount applications. Where shown on the project plans, include SIGA2-HCOS combination Heat and Carbon Monoxide (CO) detector. The combination Heat and CO device shall report separately to the control panel where a heat condition is considered a fire alarm and a CO condition is a supervisory alarm with separate and unique evacuation sequence.
- D. Photoelectric Smoke Detector, SIGA-PD: Provide intelligent photoelectric smoke detectors SIGA-PD. The analog photoelectric detector shall utilize a light scattering type photoelectric smoke sensor to sense changes in air samples from its surroundings. The integral microprocessor shall dynamically examine values from the sensor and initiate an alarm based on the analysis of data. Systems using central intelligence for alarm decisions shall not be acceptable. The detector shall continually monitor any changes in sensitivity due to the environmental effects of dirt, smoke, temperature, aging and humidity. The information shall be stored in the integral processor and transferred to the analog loop controller for retrieval using a laptop PC or the SIGA-PRO Signature Program/Service Tool. The photo detector shall be rated for ceiling installation at a minimum of 30 ft (9.1m) centers and be suitable for wall mount applications. The photoelectric smoke detector shall be suitable for direct insertion into air ducts up to 3 ft (0.91m) high and 3 ft (0.91m) wide with air velocities up to 5,000 ft/min. (0-25.39 m/sec) without requiring specific duct detector housings or supply tubes. The percent smoke obscuration per foot alarm set point shall be field selectable to any of five sensitivity settings ranging from 1.0% to 3.5%. The photo detector shall be suitable for operation in the following environment: Temperature: 32°F to 120°F (0°C to 49°C), Humidity: 0-93% RH, non-condensing, Elevation: no limit.
- E. Addressable Carbon Monoxide (CO) Detector, EST model SIGA-COD with audible sounder base. Provide intelligent addressable Carbon Monoxide Detector with Temporal 4 Audible Base. The CO detection element shall indicate a trouble condition at the FACP signaling end of life. It shall be programmed at the main control panel as a supervisory indication and transmit a separate supervisory signal to the central station. The CO detector shall be UL 2075 listed.

- F. Standard Detector Mounting Bases, SIGA-SB / SIGA-SB4: Provide standard detector mounting bases SIGA-SB suitable for mounting on North American 1-gang, 3½" or 4" octagon box and 4" square box. The base shall contain no electronics, support all Signature Series detector types and have the following minimum requirements: Removal of the respective detector shall not affect communications with other detectors, Terminal connections shall be made on the room side of the base, bases that must be removed to gain access to the terminals shall not be acceptable. The base shall be capable of supporting one (1) Signature Series SIGA-LED Remote Alarm LED Indicator. Provide remote LED alarm indicators where shown on the plans.
- G. Audible Detector Mounting Base, SIGA-AB4GT. Where shown on the project plans include detector audible/sounder base model SIGA-AB4GT. The sounder base shall be capable of two tones, Temporal 3 for a fire condition and Temporal 4 for a Carbon monoxide condition. The tones shall be fully programmable and also synchronize the sound with other sounder bases. The system shall be UL2017 listed for dual signaling for this purpose.
- H. Duct Detector Housing, SIGA-SD: Provide model SIGA-SD Low profile intelligent addressable DUCT smoke detector as indicated on the project plans. Provide for variations in duct air velocity between 100 and 4,000 feet per minute and include a wide sensitivity range of .79 to 2.46%/ft. Obscuration. Include one Form-C shut down relay rated 2.0 amps @ 30 Vdc and also include slave high contact relays if required. Provide an air exhaust tube and an air sampling inlet tube that extends into the duct air stream up to ten feet. The addressable DUCT housing shall be suitable for extreme environments, including a temperature range of -20 to 158 degrees F (-29 to 70 degrees Celsius) and offer a harsh environment gasket option. Provide Remote Alarm LED Indicators SIGA-LED and/or remote test station model SD-TRK as indicated on the project plans.
- I. Intelligent Modules — General: It shall be possible to address each Intelligent Signature Series module without the use of DIP or rotary switches. Devices using DIP switches for addressing shall not be acceptable. The personality of multifunction modules shall be programmable at site to suit conditions and may be changed at any time using a personality code downloaded from the Analog Loop Controller. Modules requiring EPROM, PROM, ROM changes or DIP switch and/or jumper changes shall not be acceptable. The modules shall have a minimum of 2 diagnostic LEDs mounted behind a finished cover plate. A green LED shall flash to confirm communication with the loop controller. A red LED shall flash to display alarm status. The module shall be capable of storing up to 24 diagnostic codes which can be retrieved for troubleshooting assistance. Input and output circuit wiring shall be supervised for open and ground faults. The module shall be suitable for operation in the following environment: Temperature: 32°F to 120°F (0°C to 49°C), Humidity: 0-93% RH, non-condensing.
- J. Single Input Module, SIGA-CT1 (Waterflow Detectors, Tamper Switches etc.): Provide intelligent single input modules SIGA-CT1. The Single Input Module shall provide one (1) supervised Class B input circuit capable of a minimum of 4 personalities, each with a distinct operation. The module shall be suitable for mounting on North American 2 ½" (64mm) deep 1-gang boxes and 1 ½" (38mm) deep 4" square boxes with 1-gang covers. The single input module shall support the following circuit types: Normally-Open Alarm Latching (Manual Stations, Heat Detectors, etc.), Normally-Open Alarm Delayed Latching

(Waterflow Switches), Normally-Open Active Non-Latching (Monitor, Fans, Dampers, Doors, etc.), Normally-Open Active Latching (Supervisory, Tamper Switches).

- K. Dual Input Module, SIGA-CT2: Provide intelligent dual input modules SIGA-CT2. The Dual Input Module shall provide two (2) supervised Class B input circuits each capable of a minimum of 4 personalities, each with a distinct operation. The module shall be suitable for mounting on North American 2 ½" deep 1-gang boxes and 1 ½" (38mm) deep 4" square boxes with 1-gang covers. The dual input module shall support the following circuit types: Normally-Open Alarm Latching (Manual Stations, Heat Detectors, etc.), Normally-Open Alarm Delayed Latching (Waterflow Switches), Normally-Open Active Non-Latching (Monitor, Fans, Dampers, Doors, etc.), Normally-Open Active Latching (Supervisory, Tamper Switches).
- L. Single Input Signal Module, SIGA-CC1: Provide intelligent single input signal modules SIGA-CC1. The Single Input (Single Riser Select) Signal Module shall provide one (1) supervised Class B output circuit capable of a minimum of 2 personalities, each with a distinct operation. When selected as a telephone power selector, the module shall be capable of generating its own "ring tone". The module shall be suitable for mounting on North American 2 ½" (64mm) deep 2-gang boxes and 1 ½" (38mm) deep 4" square boxes with 2-gang covers, or European 100mm square boxes. The single input signal module shall support the following operations: Audible/Visible Signal Power Selector (Polarized 24 Vdc @ 2A).
- M. Control Relay Module, SIGA-CR and SIGA-CRH: Provide intelligent control relay modules SIGA-CR for low current/voltage applications and SIGA-CRH "H" for High current/voltage applications. The Control Relay Module shall be used for control of external appliances (door locking and holding, Damper control etc.) or equipment shutdown. The SIGA-CR Control Relay Module shall provide one form "C" dry relay contact rated at 2 amps @ 24 Vdc. The control relay shall be rated for pilot duty and releasing systems. The SIGA-CRH shall provide dual Form-C relay contacts rated for 7 amps 120 VAC\240VAC and 6 Amps @ 24 Vdc. The position of the relay contact shall be confirmed by the system firmware. The Low Contact Relay Control Module shall be suitable for mounting on North American 2 ½" (64mm) deep 1-gang boxes and 1 ½" deep 4" square box with a 1-gang cover. The High Contact Control Relay shall be suitable for mounting in North American double-gang box or 4 inch square box that is a minimum of 2 1/8 (54mm) inches deep.
- N. Intelligent Manual Pull Stations — General: It shall be possible to address each Signature Series fire alarm pull station without the use of DIP or rotary switches. Devices using DIP switches for addressing shall not be acceptable. The manual stations shall have a minimum of 2 diagnostic LEDs mounted on their integral, factory assembled single or two stage input module. A green LED shall flash to confirm communication with the loop controller. A red LED shall flash to display alarm status. The station shall be capable of storing up to 24 diagnostic codes that can be retrieved for troubleshooting assistance. Input circuit wiring shall be supervised for open and ground faults. The fire alarm pull station shall be suitable for operation in the following environment: Temperature: 32°F to 120°F (0°C to 49°C), Humidity: 0-93% RH, non-condensing.

- O. Manual Pull Station, SIGA-270: Provide intelligent single action, single stage fire alarm stations SIGA-270. The fire alarm station shall be of metal construction with an internal toggle switch. Provide a locked test feature. Finish the station in red with silver "PULL IN CASE OF FIRE" English lettering. The manual station shall be suitable for mounting on North American 2 ½" (64mm) deep 1-gang boxes and 1 ½" (38mm) deep 4" square boxes with 1-gang covers.
- P. Notification Appliances – General: All appliances shall be UL Listed for Fire Protective Service. All strobe appliances or combination appliances with strobes shall be capable of providing the "Equivalent Facilitation" which is allowed under the Americans with Disabilities Act accessibility guidelines (ADA(AG)), and shall be UL 1971, and ULC S526 Listed. All appliances shall be of the same manufacturer as the Fire Alarm Control Panel **(NO EXCEPTIONS)** specified to insure absolute compatibility between the appliances and the control panels, and to insure that the application of the appliances are done in accordance with the single manufacturers' instructions. Any appliances that do not meet the above requirements, and are submitted for use must show written proof of their compatibility for the purpose intended. Such proof shall be in the form of documentation from **THE CONTROL PANEL MANUFACTURER** clearly stating that the control equipment (as submitted) is 100% compatible with the submitted Notification Appliances.
- Q. Strobes, G1RF-VM Series: Provide EST Series G1RF-VM series low profile wall mounted strobes at the locations shown on the drawings. Strobes shall provide synchronized flash outputs. Strobe output shall be field selectable as indicated on the drawings in one of the following intensity levels; 15/75, 15cd, 30cd, 75cd or 110cd. Low profile strobes shall mount in a North American 1-gang box or surface mounted on a matching back box provided by the manufacturer, as directed in the field.
- R. Provide high fidelity (520 Hz compatible) speaker/strobes with a 4" cone as manufactured by EST, model G4HF-S7 Series. The rear of the speaker shall be completely sealed protecting the cone during and after installation and screw terminals shall be provided for wiring. Speaker/strobe housings shall be red and include "FIRE" labeling. Speakers shall be provided for use with 70V systems and shall provide power taps at 1/4w, 1/2w, 1w, and 2w. High Fidelity Speaker listed frequency response of 400 to 4,000 Hz and listed sound output of 90.5 dBA at 10 feet, as measured in reverberation room per UL-1480. Speaker shall be listed in compliance to produce 520Hz low frequency tone signal. Strobes shall provide 15, 30, 75 cd 110 candela synchronized flash outputs. The strobe shall have lens markings oriented for wall mounting. Ceiling mounted Speaker/Strobes shall have lens markings with correctly oriented lettering. Speaker/strobes shall mount in a North American 4" electrical box with extension ring using the 2 screws provided with ring.
- S. Multi-Voltage Control Relays, MR-200 Series: Provide remote control relays connected to supervised ancillary circuits for control of fans, dampers, door releases, etc. Relay contact ratings shall be DPDT and rated for 10 amperes at 115 Vac. A single relay may be energized from a voltage source of 24 Vdc, 24 Vac, 115 Vac, or 230 Vac. A red LED shall indicate the relay is energized. A metal enclosure shall be provided.

- T. Electromagnetic Doorholders – General: Electromagnetic doorholders submitted for use must have written proof of their compatibility for the purposes intended. Such proof shall be in the form of documentation from all manufacturers that clearly states that their equipment (as submitted) is 100% compatible with each other for the purposes intended.
- U. Wall Mounted, 1504/1505/1508/1509 Series: Provide flush, semi-flush or surface wall mounted electromagnetic doorholder/releases rated at 24 Vac/dc as directed by the Consulting Engineer. Finish shall be brushed zinc.
- V. STI Stopper II Lexan Guards: Manual pull stations that are provided with STI Stopper II Lexan guards shall include non-audible alarms as required on the plans. They shall be surface or flush mounting, as required for each individual device. Stopper Covers shall only be included on devices shown on the plans to include them.
- W. Projected Beam Detector – Single End – Model EST EC-50/100R. The projected beam type smoke detector shall be a 4-wire 12/24 Vdc device monitored by the Fire Alarm control panel through a two circuit SIGA-CT2 monitor module (one zone for alarm and one for trouble). The unit shall be listed to UL 268 and shall consist of an integrated transmitter and receiver. The beam detector shall operate between a range of 15 and 160 feet (4.57 and 48.77 m) or 160 and 330 feet (48.77 and 100 m)(contractor shall determine distance to select appropriate model). It shall feature automatic gain control, which will compensate for gradual signal deterioration due to dirt accumulation on the lenses. The unit shall include a wall mounting bracket. Testing shall be carried out using a calibrated test filter. It shall be possible to test the detector without direct access to it by means of a remotely installed key-operated test station.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. All additional head-end equipment and all devices being added to fire alarm system shall be installed in a workmanlike manner, in accordance with approved manufacturer's wiring diagram. The contractor shall furnish all conduit, wiring, outlet boxes, junction boxes, cabinets and similar devices necessary for the complete installation. All wiring shall be of the type recommended by the manufacturer, approved by the local Fire Department and specified with in.
- B. All penetration of floor slabs and firewalls shall be sleeved (1" conduit minimum) fire stopped in accordance with all local fire codes.
- C. End of Line Resistors shall be furnished as required for mounting as directed by the manufacturer. Devices containing end-of-line resistors shall be appropriately labeled. Devices should be labeled so removal of the device is not required to identify the EOL device.
- D. All manual pull stations shall be mounted 48 inches above the finished floor, as measured to the handle.

- F. All audio/visual devices shall be mounted 80 inches above the finished floor, as measured to the lens. Devices shall be mounted no less than 6 inches from the ceiling. All audiovisual devices shall have Lexan covers in all areas subject to mechanical damage.
- G. No area smoke detectors shall be mounted within 36 inches of any HVAC supply, return air register or lighting fixture.
- G. No area smoke or heat detector shall be mounted within 12 inches of any wall. All detectors shall be installed in strict accordance with NFPA 72 (1999) guidelines for such devices.
- H. All mechanical rooms, boiler rooms, gymnasiums, wiring closets, custodian rooms, attic spaces, etc. or areas with no hung ceilings shall be piped with 3/4" conduit. All device plenum rated wiring shall be mechanically protected with conduit. All areas in public view shall be in metal V-700 Wiremold (or equal). All boxes must be painted red and labeled "FIRE ALARM".
- I. All addressable modules shall be mounted within 36 inches of the monitored or controlled point of termination. This shall include, but is not necessarily limited to, fan shutdown, elevator recall, shunt trip, sprinkler status points, Ansul/Hood subsystems, or door release. Label all addressable modules as to their function.
- J. New door holders shall derive their 24VAC/VDC power from a separate power supply housed in a dedicated, metal enclosure. The power supply shall have a 120VAC feed, and is to be centrally located to serve door holders on a per floor or area basis. All existing door holders shall be connected to new FACP. E.C. shall extend all existing wiring in order to make this work. Locations and quantities of door holder power supplies shall be referenced and submitted in the submission package for approval by the Consulting Engineer.
- K. All low voltage wiring terminated to the fire alarm system shall be PLENUM RATED with no exceptions and no less than No. 18 AWG in size, and solid copper.
- L. All line voltage (120VAC) wiring shall be no less than No. 12 AWG in size, and solid copper. This shall include all system grounding. FACP must have a DEDICATED 20 Amp circuit marked back at the power panel NO EXCEPTIONS.
- M. All wiring shall be color-coded throughout, to National Electrical Code standards.
- N. Power-limited/Non-power-limited NEC wiring standards SHALL BE OBSERVED.
- O. All junction box covers shall be painted federal safety red and labeled FIRE ALARM SYSTEM ONLY in black letters.
- P. Fire alarm system wiring shall not co-mingle with any other system wiring in the facility. Conduits shall not be shared under any circumstance. Only when fire alarm wiring enters the enclosure of a monitored or controlled system will co-habitation be permitted (i.e. at fan starters or elevator controllers). THIS WILL BE FIELD INSPECTED BY THE PROJECT ENGINEER.

- Q. Fire alarm control panel enclosures shall have engraved labels indicating, "FIRE ALARM SYSTEM", and the areas of the building served by that panel.
- R. Auxiliary relays shall be appropriately labeled to indicate "FIRE ALARM SYSTEM" and their specific function (i.e. FAN S-1 SHUTDOWN).
- S. All fire alarm wiring shall be continuous and unspliced. Terminations shall only occur at fire alarm devices or control panel enclosures under terminal screws. All other splicing methods are specifically disallowed (i.e. plastic wirenuts).
- T. All fire alarm wiring shall be installed using a dedicated system of supports (i.e. bridle rings). Fire alarm wiring shall not be bundled or strapped to existing conduit, pipe or wire in the facility. THIS WILL BE FIELD INSPECTED BY THE PROJECT ENGINEER.
- U. All fire alarm wiring shall be sleeved when passing through any wall, using conduit sleeves (1" min.) with bushings, and fire stopped in accordance with Code.
- V. The system shall be arranged to receive power from one three wire 120 Vac, 20 A supply. All low voltage operation shall be provided from the fire alarm control panel.
- W. All fire alarm devices shall be accessible for periodic maintenance. Should a device location indicated on the Contract Drawings not meet this requirement, it shall be the responsibility of the installing contractor to bring it, in writing, to the attention of the Project Engineer. Failure to bring such issues to the attention of the Project Engineer shall be the exclusive liability of the installing Electrical Contractor.
- X. The existing fire alarm system shall remain in operation until such time that approval has been granted for its removal. The installing Electrical Contractor shall be responsible for the upkeep of the existing system until such time that it can be removed.
- Y. The installing Electrical Contractor shall be responsible for the removal of ENTIRE existing fire alarm system components and controls on the demolition drawing shown or not, upon approval of the AHJ and the Consulting Engineer. The End-User reserves the right to retain any existing fire alarm system components, upon their request. All existing fire alarm system components requiring special handling for disposal (due to radioactivity) shall be the responsibility of the installing contractor. Written proof of proper disposal by the installing contractor shall be required prior to release of outstanding retainage.

3.2 FIELD QUALITY CONTROL

- A. The system shall be installed and fully tested under the supervision of a trained manufacturer's representative. The system shall be demonstrated to perform all of the function as specified.
- B. The installing contractor or fire alarm equipment vendor shall have no less than two (2) NICET Level II fire alarm technicians dedicated to this project.
- C. The Installing Contract and the Fire Alarm System Vendor shall, upon the request of the Consulting Engineer or End-User, attend any and all project meetings for the purpose of accurately determining progress.

- D. It shall be the responsibility of the installing contractor to assure that construction debris does not adversely affect any sensing devices installed as part of this project. Should it be deemed necessary by the Consulting Engineer, End-User or AHJ, the installing contractor shall be responsible for the cleaning of all smoke detectors prior to final acceptance.

3.3 TESTS

- A. The fire alarm system vendor shall test the system in accordance with the manufacturer's requirements and NFPA 72 7-3 (1999). The vendor shall provide completed NFPA 72 7-3 (1999) reports to the Consulting Engineer for review and approval prior to final acceptance.
- B. Each individual system operation on a circuit by circuit basis shall be tested for its complete operation. The procedure for testing the entire fire alarm system shall be set forth with the consent of the code enforcement official, the Engineer and the manufacturer.

3.4 DOCUMENTATION AND TRAINING

- A. The contractor shall compile and provide to the owners three (3) complete manual on the completed system to include SITE SPECIFIC operating and maintenance instruction, catalog cuts of all equipment and components, as-built wiring diagrams and a manufacturer's suggested spare parts list. An operational Video, on DVD media, shall also be included.
- B. In addition to the above manuals, the Electrical Contractor shall provide the services of the manufacturer's trained representative for two (2) separate calendar days for a period of four (4) hours per day to instruct the owners' designated personnel on the operation and maintenance of the entire system.
- C. As-Built drawings shall consist of the following:
 - 1. Complete revision of all previously submitted drawings.
 - 2. Point-to-point depiction of all device wiring on the device layout floor plans.
 - 3. One (1) set of B-size, laminated As-Built drawings.
 - 4. Two (2) sets of 30" x 42" inch 1/16"=1' scale drawings showing all points of fire alarm. One set shall be submitted with the close-out documents. Second set shall be mounted in frame with a Lexan cover. These drawing must be submitted to project Engineer or approval.
- D. Turnover of all software database hard/soft copies shall be required. This shall include all possible programming software logs, diskettes or CDs containing exported project files, hard copies of all device maps, the revision number of the version of programming utility used, and all required passwords. The turnover of all database information shall occur prior to the end of the One (1) warranty period (or period as amended earlier in this specification).

END OF SECTION 260800

SECTION 260825 - INTEGRATED TELECOMMUNICATIONS/TIME/AUDIO/MEDIA SYSTEM

PART 1 - GENERAL

Applicable provisions of the conditions of the Contract and Division 1 General Requirements govern the work in this section. Submit shop drawings for checking and approval.

PART 1 - GENERAL

1.1 GENERAL

- A. The conditions of the General Contract (General, Supplementary, and other Conditions) and the General Requirements are hereby made a part of this Section.
- B. All bids shall be based on the equipment as specified herein. The catalog numbers and model designations are that of the Bogen Communications, Inc. the specifying authority must approve any alternate system.
- C. Bidders wishing to submit alternate equipment shall submit to the specifying authority, at least 15 days prior to bid opening, the equipment proposed to provide a precise functional equivalent system to meet specifications. Bidder shall provide adequate information prior to bid date such as specification sheets, working drawings, shop drawings, and a demonstration of the system. The bidder shall also provide the FCC registration number of the proposed system. Alternate supplier-contractor must also provide a list to include six installations of the identical system proposed which have been in operation for a period of two years.
- D. Final approval of the alternate system shall be determined at the time of job completion. Failure to provide the "precise functional equivalent" shall result in the removal of the alternate system at the contractor's expense.

1.2 SCOPE OF WORK

- A. Furnish and install all equipment, accessories, and materials in accordance with these specifications and drawings to provide a complete and operating school communications system including but not limited to:
 - 1. Two way communication between any administrative phone and any classroom speaker.
 - 2. Classroom telephones.
 - 3. Public automated building exchange system.
 - 4. Interface to PBX / VoIP System
 - 5. Telemedia control of VCR's, DVD's laser disk players.
 - 6. Digital Video on Demand Server/ Encoder
- B. Telephone service with public utilities shall be arranged by the owner, in conjunction with the equipment supplier. Equipment supplier shall generate a one page document that will provide the Owner with information concerning number of outside lines (minimum of 8), number of digital sets request for bell schedule and architectural room numbers.

1.3 SUBMITTALS

- A. Specification Sheets shall be submitted on all items including cable types.
- B. Submit outline drawing of system control cabinet showing relative position of all major components.
- C. Submit wiring diagrams showing typical connections for all equipment.
- D. Submit a certificate of completion of installation and service training from the system manufacturer.

1.4 SERVICE AND MAINTENANCE

- A. The contractor shall provide a one year warranty of the installed system against defects in material and workmanship. All labor and materials shall be provided at no expense to the owner during normal working hours. The warranty period shall begin on the date of acceptance by the owner/engineer.
- B. The contractor shall, at the owner's request, make available a service contract offering continuing factory authorized service of this system after the initial warranty period.
- C. The system manufacturer shall maintain engineering and service departments capable of rendering advice regarding installation and final adjustment of the system.

1.5 QUALITY ASSURANCE

- A. All items of equipment including wire and cable shall be designed by the manufacturer to function as a complete system and shall be accompanied by the manufacturer's complete service notes and drawings detailing all interconnections.
- B. The contractor shall be an established communications and electronics contractor that has had and currently maintains a locally run and operated business for at least three years. The contractor shall be a duly authorized distributor of the equipment supplied with full manufacturer's warranty privileges.
- C. The contractor shall show satisfactory evidence, upon request, that he maintains a fully equipped service organization capable of furnishing adequate inspection and service to the system. The contractor shall maintain at his facility the necessary spare parts in the proper proportion as recommended by the manufacturer to maintain and service the equipment being supplied.

1.6 SINGLE SOURCE RESPONSIBILITY

- A. Except where specifically noted otherwise, all equipment supplied shall be the standard product of a single manufacturer of known reputation and experience in the industry. The supplying contractor shall have attended the manufacturer's installation and service school. A certificate of this training shall be provided with the contractor's submittal.

1.7 SAFETY/COMPLIANCE TESTING

- A. The communications system shall bear the label of a Nationally Recognized Testing Laboratory (NRTL) such as D.S. & G. and be listed by their re-examination service. All work must be completed in strict accordance with all applicable electrical codes, including N.E.C. Section 800-51 (i), under direction of a qualified and factory approved distributor, to the approval of the owner.
- B. The system is to be designed and configured for maximum ease of service and repair. All major components of the system shall be designed as a standard component of one type of card cage. All internal connections of the system shall be with factory-keyed plugs designed for fault-free connection. The printed circuit card of the card cage shall be silk screened to indicate the location of each connection.

1.8 IN-SERVICE TRAINING

- A. The contractor shall provide a minimum of eight hours of in-service training with this system. These sessions shall be broken into segments, which will facilitate the training of individuals in the operation of this system. Operators Manuals and Users Guides shall be provided at the time of this training.

1.9 WIRING

- A. System wiring and equipment installation shall be in accordance with good engineering practices as established by the EIA and the NEC. Wiring shall meet all state and local electrical codes. All wiring shall test free from all grounds and shorts.
- B. All communication system wiring shall be labeled at both ends of the cable. All labeling to be based on the room numbers as indicated in the architectural graphics package.

1.10 PROTECTION

- A. The contractor shall provide all necessary transient protection on the AC power feed and on all station lines leaving or entering the building.
- B. The contractor shall note in his system drawings, the type and location of these protection devices as well as all wiring information. Such devices are not to be installed above the ceiling.

PART 2 - PRODUCTS

2.1 COMPONENTS

A. CONSOLE

- 1. Rack-mounted equipment shall be Bogen Model TCPER
 - a. Rack-TCPER42/TCPER61/TCPER70-42"/60"77" High

2. MCRMP
 - a. Rack-mounting panel. Includes the following components:
MC512A-Power Supply (1 per system)
MC2626B-Power Supply (1 for up to 120 stations, 2 for more than 120 stations)
MCAPI-Audio Program Module Interface Assembly (1 per system)
3. MCRMF
 - a. Rack mounting mainframe (1 per 120 stations). Includes built-in ventilation fans and the following circuit cards:
 - i. MCPCA2-Processor card (1 per system)
 - ii. MCACB-Analog card (1 per 24 stations)
 - iii. MCSC-Station card (1 per 24 stations)
 - iv. MCJCA-Ribbon cable assembly (interconnects 2 MCRMF)
4. MCRM
 - a. Relay module (1 per 24 stations). Mounts to:
 - i. MCRRP-Stand-alone configuration
 - ii. SBA225-Series 2223 configuration
 - iii. SBA325-Series 2233 configuration
5. MCRCA
 - a. Ribbon cable assembly
6. Program Sources
 - a. CDC-3 CD Player
 - b. TP30D AM/FM Receiver
 - c. Wireless Bus Microphone
 - d. Bluetooth
 - e. I Pad Docking Station
7. Power Amplifiers
 - a. BPA60-60 watt
 - b. HTA-125A-125 watt
 - c. HTA-250A-250 watt
 - d. PV250 Power Vector Mixer Amp
 - e. As required
8. Optional Equipment
 - a. MCTC-Telephone access card
 - b. TMC4 – 4 channel IR interface
 - c. DVS – Digital Video Server
 - d. DVSES – Digital MPEG Encoding Station

2.2 PERIPHERAL DEVICES

A. ADMINISTRATIVE DISPLAY PHONE MCDS3

1. Administrative display phones shall be Bogen Model MCDS3. The administrative telephone display panel shows the time of day and day of week, the current time signaling schedule, and the station numbers and call-in priority of staff stations that have called that particular administrative station. A 2-key response is used to scroll the display, and answer or erase normal and urgent calls. Depending upon the system access level, an administrative station can use display menus to activate zone pages, alarm signals and external functions, as well as select program sources and distribute or cancel a program to any or all speakers or zones.
2. Administrative stations have the option of dialing either the loudspeaker or phone at each station location. An automatic switch from phone-to-intercom to phone-to-phone communication is made when the staff handset is lifted.
3. A built-in program clock, with battery backup, is included to automatically control class change or other signals. The clock may be synchronized with a master clock. 1024 events may be programmed into the system's eight time signaling schedules.

B. ENHANCED STAFF STATIONS

1. Room phones shall be Bogen Model MCESS. Enhanced staff stations can dial administrative stations, initiate emergency calls, and enable or disable the reception of program material at their location. Depending upon the level of system access, enhanced staff stations can dial other staff stations, perform all-call, zone pages, and conference call and call transfer. Provide as shown on the plans.
2. Staff stations can be assigned to initiate calls at three levels; normal/emergency, urgent/emergency, and emergency. Emergency calls ring the administrative phone with a special tone and will interrupt a non-emergency call in progress. An integral emergency announce feature (no external amplifier necessary) gets prompt attention when needed by routing unanswered emergency calls to a designated emergency station. Emergency calls continue to ring until answered.

2.3 SPEAKERS

- A. Classroom speakers and grilles (ceiling mounted-flush) shall be Bogen Model S86T725PG8W Mounted in a RE84 enclosure, TB8 tile bridge.
- B. Classroom speakers (wall mounted) shall be Bogen Model WBS8T725.
- C. Wiring shall be done per manufacturer's recommendation, West Penn #357. All terminal connections to be on barrier strips. All cables to be labeled by room.
- D. Outdoor horns shall be Bogen SPT-15A.
- E. Supply U.P.S. unit for stand-by power during power failures.

2.4 ACCEPTABLE MANUFACTURERS

- A. The equipment model numbers specified herein are that of the BOGEN COMMUNICATION CORPORATION, Ramsey, New Jersey.
- B. The intent is to establish a standard of quality, function and features. It is the responsibility of the bidder to insure that the proposed product meets or exceeds every standard set forth in these specifications.
- C. The functions and features specified are vital to the operation of this facility; therefore, inclusion in the list of acceptable manufacturers does not release the contractor from strict compliance with the requirements of this specification.

2.5 INTERCOM AND PUBLIC ADDRESS OPERATION

- A. The communication system shall be a Bogen MULTICOM 2000, and shall provide a comprehensive communication network between administrative and staff locations. The central processor and switching unit shall be of the modular plug-in printed circuit board type, using HMOS microprocessor and TTL logic and HCMOS memory and sensing. HCMOS circuitry shall be protected with transient suppression devices on all inputs and outputs. Nonvolatile EPROM shall store permanent memory and nonvolatile EEPROM shall store field-programmable memory. System, which uses a battery to maintain system configuration information, shall not be acceptable.
- B. The system shall provide no less than the following features and functions:
 - 1. Telephonic communication, complete with DTMF signaling, dial tone, ringing and busy signals, and data display on administrative stations, shall use two wires (one is ground). Systems, which use more than two wires for communication, tones and data display shall not be acceptable.
 - 2. Amplified-voice communication with loudspeakers shall use a shielded audio pair (shield can be used as one of the two required conductors for phone or call-in switch).
 - 3. The system shall be available in the following configurations:
 - a. MC2K Wall-mounted in a custom enclosure. Station capacity shall be from 24 to 120 stations in increments of 24.
 - b. MC2KR Rack-mounted. Station capacity shall be from 24 to 240 stations in increments of 24 with an option for 1200 plus interfaced stations. All telephone stations shall have the ability to support displays.

- c. 2223/2233MC2KR Rack-mounted and integrated with Bogen Multi-Graphic Series 2223 or Series 2233 equipment. In this configuration, MULTICOM 2000 system station capacity shall be expandable up to 240 stations and 240 telephonic stations in increments of 24 with an option for 1200 plus interfaced stations. All telephone stations shall have the ability to support displays. The Multi-Graphic system equipment provides the following: life safety redundant intercom and paging functions, Note the systems operate independently if one was to fail the other provides intercom for student safety. Plus two additional program channels, additional Multi-Graphic functions, and unlimited Multi-Graphic-only station capacity. It shall be possible, by use of a separate call-in switch, to annunciate only to the Multi-Graphic portion of the system without using additional station ports within the Multicom 2000 system.
- 4. The system shall consist of ANY COMBINATION OF staff, enhanced staff, and administrative stations (minimum of one administrative telephone required per system).
 - a. Staff stations shall consist of wall- or ceiling-mounted loudspeakers with call-in switches or handsets.
 - b. Enhanced staff stations shall consist of DTMF dialing 2500 telephone sets.
 - c. Administrative stations shall consist of DTMF dialing telephone sets with a four line by 16-character LCD display panel. They shall be equipped with a standard 12 key push button dialing keypad. Phones utilizing membrane-type keypads, or requiring special function keys to perform common functions, or requiring external LCD displays shall not be accepted as an equal. Optionally, a loudspeaker may be connected at each administrative station location.
 - d. Enhanced staff and administrative stations shall have the option of including a loudspeaker.
 - e. All types of stations shall utilize the same type of field wiring. Future station alterations to require only station type change, not field wiring or system head-end alterations. All field wiring and system head-end equipment shall support any type of station, at the time of installation. All contractor proposals shall reflect this capacity. Failure to submit and bid this project in this manner will be deemed as being in direct conflict of these specifications and will be rejected.
 - f. There shall be no limit to the number of administrative display stations within the total capacity of the system (e.g. a 240 station will support 240 administrative display stations).
 - g. It shall be possible at any time to change the type of station at any location without equipment or wiring changes. Systems that limit the quantity of each station type, or require future additional equipment and/or system expansion to provide additional administrative telephones shall not be accepted as an equal.

5. The system shall be a global switching system, providing eight (8) unrestricted simultaneous private telephone paths. The system shall also be capable of providing up to eight (8) simultaneous amplified-voice intercom paths. One amplified intercom path shall automatically be provided with each increment of 24 stations of system capacity. All hardware, etc., required to achieve the maximum number of amplified-voice intercom channels for this system shall be included in this submittal. Amplified-voice intercom channels shall provide voice-activated switching. Systems requiring the use of a push-to-talk switch on administrative or enhanced staff telephones shall not be acceptable. There shall be an automatic level control for return speech during amplified-voice communications. The intercom amplifier shall also provide control over the switch sensitivity and delay times of the VOX circuitry.
6. It is of utmost importance that emergency calls from staff stations receive prompt attention. It therefore, is important that there be an alternate destination in case the call does not get answered at the primary location. To this end:
 - a. Staff generated Emergency calls shall be treated as the highest system priority. Therefore, all Emergency calls shall announce at the top of the call queue of their respective administrative telephone(s). Should that emergency call go unanswered for 15 seconds, the call should re-route to an alternate speaker station then prompt the caller to make a verbal call for help. During the transfer, the original administrative telephone shall continue to ring the distinctive Emergency ring. Should the Emergency transfer to station have an associated administrative telephone, it too shall ring the distinctive Emergency ring.
 - b. The Emergency transfer to station shall be field programmable.
 - c. Should the original administrative telephone be engaged in a non-emergency conversation, its conversation shall be automatically terminated, indicated with an alert tone, and then reconnected to the station that generated the Emergency call.
 - d. Should the administrative telephone be engaged in an Emergency conversation, successive emergency calls shall log into the call queue as well as transfer to the emergency transfer station for their verbal call for help. Upon termination of the initial emergency conversation, the next one shall immediately ring the administrative telephone.
 - e. Systems failing to transfer unanswered Emergency calls or failing to immediately connect to the administrative telephone shall not be deemed as equal.

7. There shall be a system-wide emergency all-call feature. The emergency all-call shall be accessed by dialing "911" from designated administrative phones or by the activation of an external contact closure which shall give the third audio program input emergency status. The Emergency "911" all-call function shall have the highest system priority and shall override all other loudspeaker related functions including time tone distribution.
 - a. Considering that emergencies are to be treated with the highest level of concern, systems in which the Emergency-All-Call page from an administrative telephone is not the highest priority shall not be deemed as equal.
 - b. Upon picking up the receiver and dialing "9", a menu shall appear on the display prompting the user to enter each subsequent digit. In this way, the user shall not be required to memorize complicated key sequences in order to access emergency functions.
 - c. The emergency all-call shall capture complete system priority, shall be transmitted over all speakers. It shall also activate an external relay, which can be used to automatically override other systems.
 - d. Systems without emergency all-call, or systems with all-call that cannot be activated by external means, or which do not capture complete system priority or activate an external relay, shall not be acceptable.
8. There shall be at least four built-in dedicated emergency alarm tones. Each may be accessed by dialing a three-digit number (912 through 915) from designated administrative telephones. These emergency tones should be separate from the time tones. Systems using external alarm generators, or having less than four emergency alarm tones shall not be acceptable.

Upon picking up the receiver and dialing "9", a menu shall appear on the display prompting the user to enter each subsequent digit. In this way, the user shall not be required to memorize complicated key sequences in order to access emergency alarm tones.
9. There shall be four (4) external-function relay driver outputs, accessible from designated administrative telephones by dialing a four-digit number. These outputs remain set until accessed and reset at a later time. The user shall have the ability to review the status of each relay driver. A plain English menu, prompting the user through the fields without requiring the user to remember any dialing sequences shall support this feature. Systems that require the user to remember complicated dialing schemes or prompt the user via cryptic commands shall not be deemed equal. There shall be 240 low voltage security contact relays for use with magnetic locks, motion detectors, cameras or any low voltage device. Systems without relay driver outputs for control of external functions shall not be acceptable. Upon picking up the receiver and dialing "9", a menu shall appear on the display prompting the user to enter each subsequent digit. In this way, the user shall not be required to memorize complicated key sequences in order to access external relay functions.
10. There shall be a program-material interface included, which shall accept up to three (3) Bogen D-Series program modules. Systems requiring an external program source interface shall not be acceptable.

11. There shall be an outside line feature. The circuitry shall interface with the station ports of an external telephone system, and shall provide facilities for up to sixteen(16) incoming lines which shall be designated by the user to ring "day" and "night" enhanced staff or administrative stations. Where an administrative station is designated to receive outside line calls, the phone shall ring with a unique tone and the outside line number shall appear on the display panel. The option shall also provide the ability to make outside line calls from enhanced staff or administrative stations. This ability shall be programmable for each phone and there shall be three (3) access levels: no access, restricted access (local calls only), or unrestricted access (local and long-distance calls). This feature shall be capable of supporting DIL, DISA and a password protected DISA function. Security is of the utmost concern. Wireless security page offer a password DISA feature that shall be accessible only from authorized Police, Fire, Emergency personal or an off-premise security office, which monitors the facilities security system. It shall function as follows: **Upon confirmation of the password DISA number, the system shall allow security personnel to dial access any station and monitor the activity without the preannounce and the privacy tones. This will then allow the security office to determine exactly what actions need to be taken.**
12. The system shall provide for field-programmable three/four-digit architectural station numbers.
13. An architectural-number/station-number cross-reference shall be field-accessible to facilitate service.
14. There shall be an automatic level control for return speech during amplified-voice communications.
15. Each station loudspeaker shall be assignable to any one, any combination, or all of eight (8) Administrative page zones, 99 programmable zones or any of 240 hardwired zones.
16. Each station loudspeaker shall be assignable to any one, any combination, or all, of eight (8) time-signaling zones. Systems with less than eight (8) time-signaling zones shall not be acceptable.
NOTE: Systems, which use the same eight zones as both page zones and time zones, shall not be acceptable.
17. THERE SHALL BE EIGHT (8) TIME-SIGNALING SCHEDULES WITH A TOTAL OF 1024 USER-PROGRAMMED EVENTS and an option for 280 schedules and 3000 timed events. Each event shall sound one of eight (8) user-selected tones or any dedicated wave file (Fire, Tornado, and Emergency evacuation). It shall be possible to assign each schedule to a day of the week, or manually change schedules from an authorized administrative telephone. Systems, which do not provide eight (8) time-signaling schedules or a choice of eight (8) time tones, shall not be acceptable.

18. An internal program clock (with battery back-up) shall be included, allowing a total of 1024 user-programmed events. It shall be possible to synchronize the program clock with an external master clock. Systems, which do not provide an internal program clock not meeting these specifications, shall provide an external program clock that does. This external program clock shall then synchronize daily with the system clock to ensure that all time displays are the same.
 - a. There shall be eight (8) time signaling schedules and an option for 280 schedules. It shall be possible to assign each schedule to a day of the week, or manually change schedules from an authorized administrative telephone.
 - b. Each event shall be able to be directed to any one or more of the eight (8) time-signaling zones.
 - c. Each of the eight (8) time zones shall have a programmable "tone duration" unique unto itself. For example: the gymnasium shall receive a time tone for ten (10) seconds while the rest of the facility receives a tone for five (5) seconds.
 - d. Each event shall sound one (1) of eight (8) user-selected tones. Each event may utilize a different time tone. It shall be utilized to send the gymnasium, shop classes, and pool (if necessary), a separate time tone to indicate "clean up". Minutes later the entire facility can then receive the same time tone to indicate class change.
 - e. Each of the eight (8) distinct time tone signals or any dedicated wave file (Fire, Tornado, and Emergency evacuation) may be manually activated by selected administrative telephones. These tone signals shall remain active as long as the telephone remains off-hook, or until canceled from the keypad.
 - f. Upon picking up the receiver and dialing "9", a menu shall appear on the display prompting the user to enter the next digit. In this way, the user shall not be required to memorize complicated key sequences in order to access manual time-tone functions.
 - g. Systems that do not provide at least eight (8) time signaling schedules or do not provide automatic activation of schedules shall not be acceptable.
19. There shall be a zone-page/all-page feature that is accessible by selected enhanced staff and administrative stations.
 - a. There shall be automatic muting of the loudspeaker in the area where a page is originating.
 - b. There shall be a pre-announce tone signal at any loudspeaker selected for voice paging.
 - c. Upon picking up the receiver and dialing "#", a menu shall appear on the display prompting the user to enter the next digit. In this way, the user shall not be required to memorize complicated key sequences in order to access paging functions.

20. There shall be a voice-intercom feature that is accessible by selected enhanced staff stations and all administrative stations.
 - a. There shall be a periodic privacy tone signal at any loudspeaker selected for amplified-voice communication.
 - b. There shall be a pre-announce tone signal at any loudspeaker selected for voice-intercom communication.
 - c. Privacy and pre-announce tone signals shall be capable of being disabled during system initialization.
 - d. There shall be an automatic switchover to private telephone communication should the person at the loudspeaker pick up his handset.
 - e. Upon picking up the receiver and dialing the first digit of the number of the station to be called, that number shall appear on the display along with a loudspeaker symbol, prompting the user to enter the next digits. There shall be no confusion as to the type of conversation that is to be established.
21. There shall be a telephonic communication feature, which is accessible by all enhanced staff and administrative stations.

There shall be an audible ring signal announcing that a call has been placed to that station.

Upon picking up the receiver and dialing "*", a telephone symbol shall appear on the display, prompting the user to enter the number of the station to be called.

There shall be no confusion as to the type of conversation that is to be established.
22. There shall be an automatic disconnect of staff handsets left off-hook to prevent them from tying up communications channels. The station shall receive a busy signal and shall automatically disconnect after 45 seconds. Systems shall also be capable of doing off hook emergency call in.
23. There shall be an automatic disconnect of administrative and enhanced staff stations to prevent them from tying up communications channels. When a station goes off-hook and does not initiate a call within ten seconds, the station shall receive a busy signal and shall automatically disconnect after 45 more seconds.
24. Staff and enhanced staff stations may be programmed to ring an administrative telephone during day hours and another administrative telephone during night hours. Day and night hours shall be user-programmable. Assignment of staff stations shall not be restricted to any particular administrative station. Systems that limit the number and assignment of staff call-in to particular administrative station or groups of administrative stations shall not be acceptable.

25. Each staff station shall be programmable for three levels of call-in, as follows:
Level 1 - Normal/Emergency
Level 2 - Urgent/Emergency
Level 3 - Emergency
 - a. Staff stations programmed for access level 1 or 2 shall be able to initiate an emergency call by repeated flashing of the hook switch or repeated pressing of the call-in switch. Systems, which require additional switches and/or conductors to initiate an emergency call, shall not be acceptable.
 - b. Emergency calls from staff stations shall interrupt a non-emergency call in progress at the designated administrative phone. The administrator shall receive a warning tone and be connected to the emergency caller. The disconnected party shall receive a busy signal. Systems which do not provide emergency call interrupt shall not be acceptable.
 - c. It shall be possible to connect a single push emergency call-in switch to any staff or enhanced staff station, without effecting normal station operation.
26. Calls from staff stations shall be logged into queue for the designated administrative telephones. Administrative phones shall ring for a period of 45 seconds when they receive a call, and then stop ringing.
 - a. Each queue shall first be sorted according to call priority (emergency calls, then urgent calls, and then normal calls). Calls are sorted within each priority level on a first-in first-out basis. When a call is answered, it shall automatically be removed from the queue. Systems, which do not sort calls according to priority and order received, shall not be acceptable. 1) The display shall simultaneously show up to four calls pending. Additional calls, beyond four (4), shall be indicated by an arrow pointing down thus prompting the user that additional calls are waiting.
 - b. It shall be possible to answer any incoming call simply by picking up the handset while it is ringing. It shall not be necessary to hit any buttons to answer a call.
27. Enhanced staff stations shall receive dial tone upon going off-hook. Outgoing calls are made by dialing the desired station. Incoming calls can be directed to the telephone or to the associated loudspeaker for a hands-free reply. There shall be an automatic switchover from loudspeaker to private telephone communication should the person pick up his handset.
28. Enhanced staff stations shall be able to make a normal call to any administrative telephone by dialing the number. Enhanced staff stations shall also be able to initiate an emergency call by flashing the hook switch. Emergency calls shall ring the designated day/night administrative station and then their speaker will be connected to the emergency station if not answered within a predetermined time period. The system shall provide for selected administrators to have a PIN Number. By dialing the PIN at any system telephone, the administrator shall have access to emergency paging regardless of the restrictions on the phone he is currently using.

29. Administrative stations shall receive dial tone upon going off-hook. Outgoing calls are made by dialing the desired stations. Incoming calls can be directed to the telephone or to the associated loudspeaker for a hands-free reply. There shall be an automatic switchover from loudspeaker to private telephone communication should the person pick up his handset.
30. Administrative stations shall be equipped with a 4-line by 16-character alphanumeric display panel.
 - a. The display shall normally show the time-of-day and day of week, the current time signaling schedule, and the numbers of up to four stations calling in along with the call-in status of each station (normal, urgent, emergency). When dialing from the administrative phone, the display shall indicate the station number and type of station (loudspeaker or handset) being dialed.
 - b. The display shall also provide user-friendly menu selections to assist the operator when paging and distributing program material. Displays shall be in English with internationally recognized symbols for maximum ease of use. Systems, which require the operator to memorize long lists of operating symbols or control codes, shall not be acceptable.
31. Administrative stations shall be programmable for three levels of system access, as follows:
 - a. Level 7 - Shall permit dialing any station in the system, turn program material on/off at their location, scroll, erase and auto-dial call-waiting queue, make conference calls and transfer calls, call forward to other administrative stations, make all-zone pages and emergency all-zone pages, have access to outside lines and be designated to receive outside line calls.
 - b. Level 8 - Capabilities of the Level 7 station plus select and distribute/cancel program material to and combination of stations, paging zones, or all zones; set/reset alarm/external functions and zone page.
 - c. Level 9 - Capabilities of Level 8 station plus bump or join a conversation in progress, manually initiate time tones and have access to system and station programming functions (when accompanied by a valid password).
32. Program selection, and its distribution or cancellation shall be accomplished from a designated administrative telephone, with the assistance of the menu display system. Distribution and cancellation shall be to any one, or combination of speakers, or any zone(s), or all zones. It shall be possible to provide three program channels at the same time.

33. It shall be possible, via an administrative telephone, to manually initiate any of eight (8) tones or any dedicated wave file (Fire, Tornado, and Emergency evacuation). The tones shall be separate and distinctly different from the emergency tones. The tone selected shall continue to sound until it is canceled, or until the administrative phone is placed back on-hook.
34. Each administrative telephone shall maintain a unique queue of all stations calling that particular phone.
35. System programming shall be from an administrative telephone with Level 9 access. All system programming data shall be stored in nonvolatile memory. A valid password shall be required to gain access to the following programmable functions:
36. System initialization shall be accomplished from an administrative telephone with Level 9 access. All system initialization data shall be stored in nonvolatile memory. A password (separate from the password necessary for system programming) shall be required to gain access to the following system initialization parameters:
37. Station Initialization shall be accomplished from an administrative phone with Level 9 access. All station initialization data shall be stored in nonvolatile memory. A password (separate from the password necessary for system programming) shall be required to gain access to the following station initialization parameters:
 - a. The system shall be capable of being interfaced with either an on-site or off-site window based programming and diagnostics computer direct via, RS232 modem, TCP/IP interface for system configuration programming and system diagnostics. It shall be possible to change the baud rate of the system.
 - b. Diagnostics shall also be built into the administrative telephones and accessible only by authorized personnel. Diagnostics shall indicate passes and failures of system memory, system clock, all audio busses, tone generators, DTMF generators and decoders and the integrity of the field wiring.
 - c. The diagnostics feature shall be completely menu driven. It shall be possible to individually select the test and card, or all to run diagnostics on. This shall be a standard feature of the system and supplied at the time of installation. It shall be accessible only by authorized stations and personnel.
 - d. Systems not capable of supporting both the Administrative Phone and any computer interface for programming and diagnostics, nor supportive of built-in diagnostics for the end user shall not be deemed as equal.

2.6 CLOCK SYSTEM

A. Master Control Unit: Microprocessor based unit with solid-state switching circuits, program control and clock controls.

1. The master clock shall be microprocessor based and programmable via a 16 pad waterproof, 20 character X 2 row LCD display, and 0.56 inch LED display. The master clock shall include frequency stability of 5 ppm and aging of 5 ppm per year. The master clock shall have a frequency tuning circuit to allow for time base corrections with changes in temperature. The master clock shall also provide field enable/disable daylight savings time. The programmable master clock shall be capable of storing, in a non-volatile memory, and controlling up to 800 events (3,000 as option), each set with precise second resolution. Special programs shall be readily programmed for up to 255 different schedules and holidays, and 50 scheduling changes can be set in advance. The master clock shall be capable of controlling two different clock systems simultaneously, in addition to RS485 input and output and two wire output for controlling Bogen RS485 and Bogen digital communication analog clocks. The master clock shall have a ten-year battery backup for timekeeping, an RS232 computer interface port, and an input port to interface with other systems and WWVB/GPS interface capability.

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| a. | Operating Voltage: | 110/24 VAC, 60 Hz |
| b. | Time Base: | Crystal Control |
| c. | Frequency Aging: | 5 ppm/year |
| d. | Frequency Stability: | 5 ppm/year |
| e. | Standby Time Keeping: | 10 years |
| f. | Program Retention: | Non-volatile/unlimited |
| g. | Auxiliary Circuits: | 4 standard up to 12 maximum |
| h. | Contact Rating: | 8 amps, 220 volt |
| i. | 2 Circuits Selectable Clock System | RS485 and digital communication output |
| j. | Interfaces: | RS232, G.P.S./WWVB, Interface with other systems, RS485 input |
| k. | Mounting: | Surface/semi-flush or rack |
| l. | Signal Duration: | 2 programmable signals per Circuit, 1-3 600 seconds or on/off |
| m. | Operation: | 2 menu levels, technician and end-user |
| n. | Size: | EIA 19" Rack Mountable in racks as specified. |
| o. | Options: | Up to 12 auxiliary outputs 3000 event capability |

B. Clocks: Connect existing clock to new master clock.

2.7 VIDEO ON DEMAND – SHALL BE CAPABLE TO SUPPORT THE FOLLOWING:

- A. The system shall provide the capacity to control remotely located telemedia video sources via any DTMF type telephone in the system and/or a hand held remote control as the controlling devices or a classroom may be equipped with either or both of the control devices.
- B. Telemedia video sources, which may be controlled, shall include most infrared controllable; videocassette recorder, video laser disk, DVD, and cable television converter box. The telemedia control panel shall also have the ability to control most infrared controllable; compact disk players, cassette players, AM/FM tuners, or most other infrared controllable source/device. NOTE: Video sources, television, and an MATV system shall be provided, however, they are specified elsewhere.
- C. There shall be LED's mounted on the face panel of the telemedia control panel to indicate that a source has been reserved, power is applied to the telemedia control panel, the telemedia control panel is in the learn mode, or that there has been an error in the programming of the telemedia control panel.
- D. The telemedia control panel shall have the ability to learn and reproduce the infrared commands of most sources the user wishes to control. This ability shall not be limited to only VCR's, DVD's and video laser disk players. As this feature will allow the user to alter or replace any source in the future without the worry of source control compatibility, it is essential that all telemedia control panels submitted include this capability. Those submissions, which include telemedia control devices, which do not have the ability to learn source control commands, will not be accepted as equal to that which is specified.
- E. The telemedia control panel shall be a microprocessor based, self-contained unit capable of learning, storing and then reproducing the infrared control commands of up to four different sources. The telemedia control panel shall be capable of learning, storing, and then reproducing up to twenty different commands for each of the four different sources. The learned commands shall be stored in nonvolatile memory.
- F. It shall be possible to standardize the telephone button/feature assignment of all the different sources to be controlled, example: 1-play, 2-stop, 3-pause, 4-rewind, 5-fast forward, etc., for all of the sources. This way, in conjunction with the reconnect command, the user is not necessarily required to be aware of which source they are actually controlling. This standardized telephone button/feature assignment is crucial to the ease of operation of this system. All submittals shall indicate whether or not the button to feature assignment is a standard function of the system. If it is not a standard function of the system, the submittal shall indicate precisely how this function is to be accomplished. Failure to submit alternate button standardization shall be deemed as being in direct conflict with these specifications and, therefore, not equal to that which is specified.
- G. The system shall be capable of supporting multiple telemedia control panels. It shall not be necessary for the telemedia control panel to be located in the central communications rack.

- H. There shall be an administrative telephone with a plain English menu driven display located in the media center for use by the media center personnel. This station may have an associated loudspeaker. In addition to the media control features, this telephone shall support all other system feature and functions.
- I. It shall be possible for the media personnel, from their administrative display telephone, to pre-assign any telemedia source to any station. A plain English menu prompting the media personnel through the various programming options shall aid this pre-assignment. Programming capabilities are review source/station assignment (if any), enter source/station assignment, delete source/station assignment, and exit. Once a source has been reserved for a station, all other staff stations are completely locked out the control of that source. After a telemedia source has been reserved for a specific station, that station shall need only to depress their "9" button twice to be (re)connected to their pre-assigned source, thus eliminating the need to remember the telemedia source station number.
- J. Access to a specific telemedia source is achieved, using the classroom telephone, by dialing the extension number of the desired source OR, if pre-assigned by the media personnel, simply by depressing the "9" button twice.
- K. To (re)connect to the telemedia source the user simply shall remove the telephone handset from its cradle and dial the reconnect code, "99". Systems, which require the user to remember exactly which source they are to be using, are too complicated and, therefore, in direct conflict with these specifications. Submittal of systems which do not offer the above specified reconnect command shall precisely indicate an alternate method of how the above specified reconnect command is to be accomplished.
- L. Upon access of the telemedia source the user shall receive a continual confirmation beep to indicate continued access and control of the source. Upon activation of a function, the user shall be sent a double pulse of the confirmation tone to indicate the command was recognized and processed. The user shall be capable of continuing to enter functions as long as they remain off hook.
- M. Once the telemedia source has been reserved or accessed, the user may connect and disconnect at their discretion. The user may hand up the telephone without releasing the telemedia source to other users. While the telephone is in the on-hook condition, no link within the system shall be occupied.
- N. The telephone and/or speaker shall remain available for all normal station activities and communications while telemedia source reception is in process. Systems which require that a link be maintained throughout the duration of the source use or that restrict the use of any of the stations functions shall not be deemed as equal.
- O. Release of the telemedia source shall be accomplished by either the media personnel or the source/station user. It shall be possible to release the source from either location via telephone or manually from the media center.

- P. A telemedia source control panel shall be located in the media center to accept direct commands from the classroom telephones and convert them into source control commands. The interface between the telemedia control panel to any of the sources shall not require any modification to the source or the telemedia control panel as this would void any warranty.
- Q. The telemedia control panel shall be a "smart" device, in that it shall be capable of learning the control commands of most infrared controllable sources. Those systems, which rely on "universal" or preprogrammed type remote controls, are limited to their library of controllable sources and quickly become obsolete. It is absolutely imperative that the end user maintain the ability to change, replace, or upgrade their sources without having to upgrade or change any other equipment. All submittals shall indicate if their submitted telemedia control panel is capable of learning infrared control commands. If it is not capable, the submission shall precisely indicate an alternate method of achieving the same result without subjecting the end user to future expenses beyond simple source changes.
- R. There shall be a computer and associated software supplied to support a video clock and scrolling message center. These images are to be distributed facility wide via an unused channel on the MATV system.

2.8 SOUND REINFORCEMENT SYSTEM

A. Related Documents

- 1. General Conditions and Requirements, Special Provisions, and applicable portions of Division I of the general contract are hereby made a part of this Section.
- 2. Architectural, structural, mechanical, electrical, and other applicable documents and drawings are considered a part of the Sound Reinforcement systems (hereafter referred to as Sound Systems) documents in so far as they apply as if referred to in full.

B. Scope of Work

- 1. These Specifications, together with the related drawings and General Conditions of the contract, comprise the requirements for the Sound Systems for the project.
- 2. Furnish, deliver, erect, install and connect completely all of the material and appliances described herein and in the Drawings, and supply all other incidental material and appliances, tools, transportation, etc., required to make the work complete, and to leave the systems in first class operating condition, excluding those items listed.
- 3. Perform all assembly of equipment, wiring and inter-connection and soldering of wires to jacks, devices, terminals or equipment, using technical employees only, who are experienced in the installation of low voltage sound/intercom equipment and its inter-connection. Coordinate final utility rough-in locations with actual equipment furnished.
- 4. Verify dimensions and conditions at the job site prior to installation, and perform installation in accordance with these Specifications, manufacturers' recommendations and all applicable code requirements.

C. Quality Assurance

1. The intent of these Specifications is to describe and provide for a complete Sound Reinforcement System of high professional quality and reliability. Professional performance standards by the Sound Systems Contractor (hereafter referred to as Contractor) and the equipment will be required.
2. Electro Acoustic Simulation for Engineers (EASE 3.0 or 4.0)
For an additional negotiated fee or consideration a predictive analysis of the room acoustics and the performance of the speaker systems within the room may be arranged with the sound system contractor.

D. Substitutions

1. Many items are listed in the Specifications by the manufacturer's type or model number, without a detailed performance specification, and may not include the phrase "or approved equal". Where this is the case, no substitutions will be accepted, without a written request from the Contractor and the written consent of the owner architect/engineer.
2. Where the phrase "or approved equal" appears, the item specified shall set a standard of quality and performance, based on the published specifications of the manufacturer and on the actual performance as known by the Contractor. Requests for substitution, when forwarded by the Contractor to the owner engineer/architect are understood to mean that the Contractor represents that he has personally investigated the proposed substitute product and determined that it is equal to or superior in all respects to that specified, that the same guarantee will be provided for the substitution as for the specified product, and that the Contractor will coordinate the installation of the accepted substitute, making such changes as may be required for the work to be complete in all respects. Substitutions will not be considered if they are indicated or implied in Shop Drawing submissions without previous formal request, or, for their implementation, they require a substantial revision of the Contract Documents in order to accommodate their use. Space allocations and utility rough-ins have been designed on the basis of equipment items named by manufacturer and model number. If any equipment not so named is offered which differs substantially in dimension or configuration from the named equipment, provide scaled shop drawings showing that the substitute can be installed in the space available without interfering with other trades or with access for operation and maintenance in the completed project. The Contractor shall coordinate utility rough-in locations with actual equipment furnished. Where substitute equipment requiring different arrangement or connections from those indicated in the drawings is accepted by the owner, architect/engineer, install the equipment to operate properly and in harmony with the intent of the Drawings and Specifications, making all necessary incidental changes without increasing the Contract amount. All requests for substitutions shall be submitted at least two weeks before the bid opening date. Substitutions shall be requested in writing only.

E. Installer Qualifications

1. The lead installation technician shall have 3 years' experience installing professional quality low voltage sound/intercom systems similar in size and scope to this specification. The contractor shall designate one person to act as the project manager having total responsibility for communications and project technical integrity. This project manager shall have a minimum of Five (5) years' experience in project management of similar projects of this size and scope.
2. The work performed under this Section shall be performed by a Low voltage systems Contractor, normally engaged in the business of sound reinforcement / intercom systems installation.
3. Subcontracting of the installation of this project may be approved by written request to the Architect/engineer/owner submitted at least two weeks before the scheduled start of the installation. In all cases the qualifications of the subcontracting firm shall meet or exceed those as stated in section (a). The contractor shall be required to supply a project manager to oversee the subcontractor's adherence to all specifications. The total responsibility for professional, to exact specification, installation shall remain with the contractor and his project manager.

F. Cooperation and Coordination

1. Cooperate and coordinate as required with the other contractors who are responsible for work not included in this section.
2. Provide any and all information as required or requested by the Owner, Architect, or General Contractor in order for this work to be completed to the satisfaction of the Owner, and in the best interests of the Project. Such assistance or information shall be transmitted in writing to the requesting party in all cases. All written. Correspondence shall be copied to the owner.

G. Guarantee a Warranty

1. Guarantee all parts, labor, and workmanship furnished under this contract for the minimum period of twelve months from the date of substantial completion, or first formal use by the Owner, whichever is last to occur. During the warranty period, report to the site and repair or replace any defective materials or workmanship without cost to the Owner. Non-emergency Warranty service shall be rendered within 24 hours after request by the Owner. Emergency service shall be provided within 8 hours of request by owner. Equivalent replacement equipment shall be temporarily provided when immediate on-site repairs cannot be made. Where warranties on individual pieces of equipment exceed twelve months, the guarantee period shall be extended to the warranty period of the particular items.
2. After completion of the work the Contractor shall submit a Certificate of Warranty, stating commence and expiration dates and conditions of the warranty, for signature of both participating parties. Incremental warranties for completed portions of the work may be negotiated at the discretion of the Owner, if delays occur beyond the control of the Contractor.

H. Shop Drawings and Submittals

1. Completely detailed shop drawings shall be prepared prior to the procurement of equipment or commencement of work. Equipment lists, data sheets, etc. shall be 8-1/2" x 11" size, properly bound into a single or multiple volumes. Within 45 days after the notice to proceed, submit to the Architect, six (6) identical copies of the following for approval:
2. A complete equipment list, with manufacturers' names, model numbers, and quantities of each item.
3. Manufacturers' data sheets on all equipment items; Equipment rack layouts showing all rack mounted equipment items Floor plans, prepared at a scale of not less than 1/8"=1'-0", showing loudspeaker locations and orientation, wall plates, and all other related device locations;
4. Proposed constructions details for all custom fabricated items, including interface panels, patch panels, and wall plates. These details shall show dimensions, materials, finishes and color selection.
5. Comprehensive system schematics, showing detailed connections to all equipment. Riser diagrams showing conduit requirements with pull boxes, outlet boxes, part numbers of cable types used, and number of circuits in each conduit.
6. Electrical power requirements for head-end and ancillary equipment. Include diagrams for any remote control of electrical power, in sufficient detail to coordinate with Division 26. Certain other submittals as noted elsewhere in this specification, and as may be required for various equipment items prior to construction, fabrication, or finishing of that item.
7. All final documentation shall be submitted and approved before final acceptance by the Owner will be granted. Within 45 days after completion of the work, deliver to the Architect, (4) identical copies of the following:
8. Complete as-installed equipment list, listed by room, with manufacturers' names, model numbers, serial numbers, and quantities of each item;
9. Complete and correct system schematic, showing detailed connections.
10. Step by-step operation of the system and preventive maintenance procedures. This manual shall include descriptions of the system components and their relationship to system function. This manual shall be bound separately and labeled appropriately

I. Related Work By Others

1. All conduits with pull cords, all electrical pull boxes, grounding rods and all outlet boxes (except for floor pockets and the flush mounted ceiling loudspeaker enclosures described later in this Section) shall be furnished and installed under the electrical section of Division 26. Coordinate as necessary for proper installation. All conduit systems shall be insulated from the equipment racks using non-metallic bushings or raceways.
2. All 120V AC power conductors and conduits associated with power circuits to all equipment locations shall be furnished and installed under the electrical section of Division 26. The 120V AC power to the equipment racks shall be terminated inside the racks to Sound Contractor-supplied Plugmold isolated ground plugstrips or isolated ground quad convenience outlets. All conduit systems shall be insulated from the equipment racks using non-metallic bushings or raceways.
3. An insulated 4 AWG THW stranded copper ground wire from each equipment rack to a dedicated driven ground rod within the building shall be furnished and installed under the electrical section of Division 26.

J. General

1. All equipment items shall be new and unused.
2. The following sections specifically list the acceptable equipment types and items for this project. Where quantities are not noted, they may be obtained from the drawings. In the event of a discrepancy between the specifications and the drawings, the greater quantity or better quality shall be furnished.

K. Wire and Cable

1. All wire and cables shall be new and unused. All wire and cable shall be enclosed in conduit unless otherwise noted. Wire not installed in equipment racks, not portable, or not installed in conduit shall meet all applicable codes.
2. Constant voltage (70-volt) speaker cable: West Penn stranded 16A WG twisted pair or approved equal.
3. Voice coil speaker cable: Low Frequency -Stranded 12AWG THHN, Mid Frequency Stranded 12AWG THHN, High Frequency 14AWG THHN or approved equal for all home-runs.
4. Microphone-level audio cable (installed in conduit, not portable): Belden 8451 stranded 20A WG twisted pair with foil shield or approved equal.
5. Line-level audio cable and all inter-rack audio cable: Belden 8451 twisted pair with foil shield or stranded 20A WG or approved equal.

6. Portable microphone cables: Bogen MAC series black flexible cable or approved equal. Portable monitor speaker cables: Bogen MAC series black flexible cable or approved equal
7. Other equipment control cables shall be stranded wire, appropriately shielded, of gauge and number of conductors required by the manufacturer for proper operation of the system or equipment item furnished.
8. Wire and cable for all other devices shall be supplied in accordance with the recommendations of the device manufacturer and the National Electrical Code.
9. Furnish insulated 12A WG THW stranded copper wire connecting the mixing console sheet metal and the auxiliary equipment rack to the main equipment rack sheet metal, and terminate at each end to bare metal. The primary 4A WG ground buss cable will be installed under Division 16. Multiple racks shall be securely bolted together. Terminate all ground cables at each end to bare metal using approved connectors and clamps.

L. Jacks, Connectors and Wall Plates

1. All plate-mounted connectors shall be ground-insulated from the plates on which they are mounted. For non-standard and custom panels, connectors shall be installed on 1/8" thick anodized brushed aluminum panels. Nomenclature shall be shown on the panel with 1/8" block letters. All other jacks shall be installed on standard brushed stainless steel finish plates with 1/8" block letters. All microphone jack locations shall be numbered consecutively, starting from one (1).
2. Unless otherwise specified, all jacks and connectors for the sound systems shall be as follows:
 - a. Microphone and line-level input jacks: Switchcraft / Neutrix 3-pin female XLR connectors, or approved equal.
 - b. Audio output jacks: Switchcraft / Neutrix 3-pin male XLR connectors, or approved equal.
 - c. Cable-end audio connectors: Switchcraft / Neutrix 3-pin XLR connectors, or approved equal.
 - d. Furnish and install the required number of jacks and connectors as indicated on the drawings.

M. Equipment Racks

1. Furnish equipment racks for use in housing the equalizers, power amplifiers and ancillary devices necessary to the operation of the system.
 - a. Each equipment rack shall include a locking front and back door, side panels, and top and bottom panels unless otherwise noted.
 - b. Heat-producing components, such as power amplifiers, shall be mounted with one 1-3/4 " vent panel installed between units. Fill all other unused portions of rack front sections with matching blank panels.

- c. Power distribution within the main equipment racks shall be supplied via rack-mounted switched power strips Plugmold isolated ground plugstrips with surge suppression, noise filter, and front-panel on-off switch. Furnish Three (3) keys for each type of equipment rack lock installed.
 - d. Install the required number of units, of sufficient size to accommodate the equipment specified, at the locations indicated in the drawings.
 2. Mixing position Equipment Rack
 3. Remote Amplifier Rack
- N. Acceptable Manufacturers
 1. Bogen
 2. Lowell
 3. Atlas Soundolier
- O. Loudspeakers:

The speakers shall be mounted at the positions and angles indicated on the drawings. Suspend each component with aircraft quality steel cable, in such a way as to facilitate angle adjustments. Secure any loose hardware to prevent vibration and rattling. Suspension hardware shall be designed for a safety factor of at least five. Loudspeakers wired for 25 or 70V lines shall be used for voice and paging reinforcement throughout the facility. A direct input from the School Intercom Communications system shall be capable of muting and overriding the program source material for emergency all call pages. Each speaker home run shall have its cable run to the equipment racks without splices. Connect as indicated in the drawings.

 1. Two-way or Three-way loudspeaker enclosures and subwoofers sufficient in driver complement to provide an even distribution of high bandwidth sound with no more than +- 3dB variance of SPL throughout the listening area. FOH Speakers must be processor based with factory set EQ, phase forward limiting, Linear-phase crossover and active crossover sub-woofer outputs. Each speaker may be passive or bi-amplified with a minimum of 12 hang points.
 2. Delay (rear fill) loudspeakers (If Required) mounted just before the critical distance measurement of the Front of House loudspeakers and in accordance with the drawings and mounting/aiming instructions on the Design drawings and written instructions. Speakers must be processor based with factory set EQ, phase forward limiting, Linear-phase crossover and active crossover sub-woofer outputs. Delay lines shall be used on all delay rear fill speakers over 60ft from the FOH speakers
 3. Short front fill loudspeakers (If Required) shall be used as necessary to provide coverage of the very front seating when the main front of house speakers vertical pattern is too narrow to cover these seats. Speakers must be processor based with factory set EQ, phase forward limiting, Linear-phase crossover and active crossover sub-woofer outputs. Each speaker may be passive or bi-amplified with a minimum of 12 hang points.

4. Ceiling mounted loudspeakers may be used in under balcony, low ceiling Cafeteriums, and auxiliary spaces, which serve as overflow areas. Surface mount 4 Watt, Hanging Pendant style, or High Fidelity Flush mounted two Way 2-32Watt 6.5" high impedance taps and 16 ohm low impedance taps shall be required. In the case of flush mounted 6.5" speakers an 11" sealed back can, Ferro fluid cooled, dual bass vent ported speaker assembly shall be required.
5. Monitor Loudspeakers 12" Two way loudspeaker two position floor mount portable. Each Monitor speaker with differing mix signals shall have a dedicated amplifier and a DSP based processor or 31 Band Graphic Equalizer. Provide 25' monitor cables with appropriate connectors.

P. Acceptable Manufacturers

1. Apogee Sound AE, FH, AFI, ACS series
2. Bogen/NEAR SM4T, HFCS, ORBIT OPS1, and OCS1
3. Ashley or Furman Sound 31 band equalizers Symetrix

Q. Power Amplifiers:

Furnish and install power amplifiers for use in amplifying audio signals for distribution to the loudspeakers.

1. Each power amplifier shall have an input connector, which is either a screw-type barrier strip or XLR type. Output connectors shall be either barrier strip, or Neutrik Speakon. Other types of connectors shall not be accepted.
2. All power amplifiers shall have input level controls. Amplifier loads shall not be below the rated operational use guidelines. Amplifier available power shall be 35-50% or more of the rated speaker/speakers continuous power handling specification at its nominal impedance rating.
ALL APOGEE AMPLIFIER CHANNELS SHALL BE ACTIVE PROCESSED WITH SPECIFIC APOGEE SOUND SERIES PROCESSORS.
3. Install one 1-3/4" vent panel between each power amplifier and any other rack mounted component or as recommended by the Manufacturer. Rear rack mount supports shall be required. Sequential power up shall be required for systems with 3 or more amplifiers with remote relay control optional. Install the units in the remote amplifier rack and connect as indicated in the drawings.

R. Acceptable Manufacturers

1. Apogee Sound DA, CA, MA series amplifiers
2. Bogen MClass, Power Vector, or Black Max Amplifiers

S. Audio Mixing Console FOH

1. A professional quality rack mountable or console mixing desk shall be provided to accommodate the required number of inputs and output signal sources as shown in the drawings. Small 8 channel mixers shall have compressor/limiter and assignable dual channel outputs available. 12 to 40 channel mixers shall at a minimum have 4-8 sub master outputs, 2-6 aux or monitor sends per channel, 2-3 Main output channels with matrix mixing outputs preferred.
2. An automatic mixer may be substituted to reduce the total number of FOH mixing console inputs and provide higher gain before feedback of vocal microphone inputs.
3. Provide a 5-channel mixer with phantom power to mix signal sources from the overhead stage condenser microphones, Connect as shown in the drawing.

T. Acceptable Manufacturers

1. Soundcraft, Allen and Heath, Mackie Designs, Bogen, RDL

U. Signal Processing Equipment

1. Digital Signal Processor
The audio processing shall be in the digital domain following the input source and shall remain until power amplification is required. The system shall be able to provide a list of audio devices that may be chosen and configured into the system at any time, from a device menu running under the Windows TM environment. The list shall include, but not be limited to: externally controllable levels, delay lines of various delay length, Compressor/limiter, 1/3-octave equalizers, parametric equalizers, high and low pass filter. This device will be installed in the Mixer Position Equipment rack.

V. Microphones, Stands, Cords and Miscellaneous

Furnish various types of Bogen microphones for use in sound reinforcement and recording. Each microphone shall be equipped with its own cable, with Switchcraft connectors installed on each end. Furnish and install the following:

1. Bogen WCU-250 hanging condenser Microphone (Qty per drawing)
2. Bogen GDU-250 18" uni-directional gooseneck Microphone with isolation low profile shock mount MSM (Qty 1)
3. Bogen HDU-250 unidirectional condenser Hand Held Microphone (Qty per drawing)
4. Bogen SF4 and MC22 Microphone stands and Microphone clips: (Qty per drawing)
5. Bogen MAC 25' Microphone cable with one (1) male and one (1) female Switchcraft series connector or approved equal. (Qty: per Drawing)

W. Wireless Microphone System

1. Diversity Single or Dual Channel UHF wireless microphone systems shall be used in the facility.
2. Operating frequency shall be as high as possible, and shall be selected so as to avoid interference. The wireless receivers shall be provided with rack-mount kits. Mount the receivers in the Mixing position equipment rack at the sound control booth.
3. Mount the antennae vertically in locations shown in the drawings, being careful to avoid interfering objects. The antennae shall be mounted to the side of the equipment rack.
4. Provide active antenna combiner/distribution system as necessary.
5. Furnish and install the following wireless system and accessories:
 - a. Combination Wireless Microphone System with lavalier microphone supplied with each belt pack system.
 - b. Hand held Microphone transmitter.

X. Acceptable Manufacturers

1. Shure Brothers
2. Telex

Y. Acceptable Manufacturers

1. Denon
2. Tascam

ZZ. Compact Disc Player

1. Furnish a compact disc player for playback/recording of compact disks through the sound reinforcing system. Connect as indicated on the drawings.
2. Bogen CDC3 Compact Disk Player Multi Disk.
3. Tascam or Denon

AA. Bluetooth

BB. I Pad Dock

CC. Assistive Listening System

1. Furnish and install a FM wireless assistive listening system for use by the hearing-impaired
2. Mount the transmitter in the main equipment rack. Ensure that the operation frequency does not interfere with the wireless microphone systems.
3. Furnish and install the following:
Williams Sound PPA, or Listen LP-9-216 Complete System or approved equal.
(Qty: 1 ea.) Complete system)

DD. Production Intercom (optional for elementary and middle schools)

1. A two channel Production Intercom will be used within the facility for communication between individuals associated with the event staff. (Optional for Middle and High School Auditoriums.
2. Install the Power Supply in the equipment rack.
3. Provide additional power supplies as needed in order to drive all intercom outlets and intercom speaker stations shown in the contract documents.
4. Furnish and install the following:
 - a. 2-channel headset/Speaker Main Station. (Qty1ea.)
 - b. 2-channel select flush mount headset/speaker station.
 - c. Single channel monaural belt pack.
 - d. Single-Ear Headset.
 - e. Wall Plates, Intercom outlet wall plate. (Qty as required)
 - f. 25' Super flexible cable (6 Pin)
 - g. 50' Super flexible cable (6 Pin)

EE. Acceptable Manufacturers

1. Audiocom by Telex
2. Clearcom Communications

FF. Execution Installation

1. Furnish components, racks, wire, cabinetry, connectors, materials, parts, equipment and labor necessary for the complete installation of the systems, in full accordance with the recommendations of the equipment manufacturers and the requirements of the drawings and specifications.

2. Installation shall follow standard broadcast wiring and installation practice, and shall meet or exceed industry standards for such work. Equipment shall be held firmly in place with proper types of mounting hardware. All equipment affixed to the building structure must be self-supporting with a safety factor of at least three. All equipment shall be installed so as to provide reasonable safety to the operator. Supply adequate ventilation for all enclosed equipment items, which produce heat.
3. Furnish the system to facilitate expansion and servicing using modular, solid-state components. All equipment shall be designed and rated for continuous operation and shall be listed by an OSHA standards testing laboratory and manufactured to meet those standards.
4. Observe proper circuit polarity and loudspeaker wiring polarity. No cables shall be wired with a polarity reversal between connectors with respect to either end. Special care shall be taken when wiring microphone cables, to insure that constant polarity is maintained.

GG. Wire Connector Signal

1. Shields of audio cables shall be grounded at one end only, at the inputs of the various equipment items in the system. Route cables and wiring within equipment racks and cabinetry according to function, separating wires of different signal levels (video, microphone level, line level, amplifier output, 120V AC, intercom, control, etc.) by as much physical distance as possible. Neatly arrange and bundle all cables loosely with plastic cable ties. Cables and wires shall be continuous lengths without splices.
2. All system wire, except spare wire, after being cut and stripped, shall have the wire strands twisted back to their original lay and be terminated by approved soldered or mechanical means. No un-terminated wire ends will be accepted. Heat shrink type tubing shall be used to insulate and dress the ends of all wire and cables. Include a separate tube for the ground or drain wire.
3. All cables in conduits shall be insulated from each other and from the conduit the entire length and shall not be spliced. All cables and wires are to be continuous lengths without splices. All solder joints and terminations shall be made with resin-core silver solder. Temperature regulated soldering irons rated at least 60 watts shall be used for all soldering work. No soldering guns or temperature-unregulated irons shall be used on the job site. Mechanical connections shall be made using approved connectors of the correct size and type for the connection. Wire nuts will not be accepted.
4. Each mechanical connector shall be attached using the proper size controlled-duty-cycle ratcheting crimp tool, which has been approved by the manufacturer of the connectors. Conventional non-ratcheting type crimping tools are unacceptable, and shall not be used on the job site. Label all wires in racks and console as to destination and purpose. Clearly and permanently label all jacks, controls, and connections with permanent engraved laminated plastic labels or by engraving and filling mounting plates, unless otherwise noted. Attach laminated plastic labels with contact cement. Embossed or printed label tape, and press-on or lift-off lettering systems will not be accepted. All labeling shall be completed prior to final system inspection. If permanent labels cannot be furnished prior to final system inspection, label all controls with write-on tape.

HH. Final Testing and Equalization

1. The completed sound system is to be inspected and tested for compliance with the Specifications.
2. The testing and equalization work shall be performed after the installation work has been completed, but prior to any use of the system. During the testing and equalization work, the Installer shall have on the job site one (1) competent technician who is fully familiar with the project, and who will be prepared to stay as long as their services are needed. It is estimated that approximately sixteen (16) hours will be required for this work.
3. The process of equalizing and testing the system may necessitate moving and adjusting certain loudspeakers. Adjustments shall be performed without claim for additional payment.
4. Coordinate as necessary to ensure a totally quiet room during the sound reinforcement systems testing and balancing period.
5. Prior to requesting systems testing, verify the following:
6. All systems are in first-class working condition and free of short circuits, ground loops, parasitic oscillations, excessive system noise beyond published specifications of the equipment, hum, RF interference, or instability of any form.
7. All loudspeaker circuits have been tested, are connected to the proper crossover frequency, and are in perfect working order.
8. All equipment controls are labeled, even if unused. If permanent labels cannot be furnished prior to system inspection, temporarily label ~ control as to its function with write-on tape. Supply labels or markers suitable for indicating knob settings after equalization is performed.
9. Operation manuals for all equipment items furnished are on hand at the job site.
10. Should the performance testing show that the Contractor has not properly completed the systems, the Contractor shall make all necessary corrections or adjustments, and a second demonstration shall be arranged at the Contractor's additional expense.
11. The final acceptance of the system by the Owner will be based upon the report of the Contractor following inspection, testing, and demonstration.

II. System Performance

1. After equalization and testing, the sound system shall meet or exceed the following specifications:
System shall be free of short circuits, ground loops, parasitic oscillation, excessive system noise, hum, RF interference, and instability of any form.
2. Maximum SPL with band-Limited pink noise input to the system shall be 96dB before audible distortion occurs.
3. Seat-to-seat variation in SPL at 4kHz octave band pink noise shall be within a tolerance of plus or minus 3dB SPL.
4. Acoustic response of the system shall be plus or minus 1.5dB along a line which is flat from 60Hz to 4000Hz and which rolls off at 2 dB per octave to 16kHz.
5. Approved measurement devices shall include but not be limited to: GOLDLINE TEF20, IVIE IE30, IE33 and SIA SMART SYSTEM.
6. STI, RASTI, ALCONS and Clarity measurements shall meet or exceed industry standard acceptable measurements.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. The installation, adjustment, testing and final connection of all conduit, wiring, boxes, cabinets, etc., shall conform to the requirements for branch circuit wiring and shall be sized and installed in accordance with NEC, NEMA and manufacturer's approved shop drawings.
- B. Low voltage wiring may be run exposed above ceiling areas where they are easily accessible.
- C. Contractor shall install new rack console at location shown on plans.
 1. Solder each speaker line splice and tape each individual wire. Wire nuts will not be accepted.
 2. Connect remote slave clocks to master clock in console.
- D. All classroom phones shall be wall mounted.
 1. Mount at 54" AFF.
 2. All wiring should be concealed.
 3. Verify exact location with Architect.

- E. All administrative telephones shall be desk or counter mounted.
 - 1. Provide standard wall receptacle 16" AFF.
 - 2. Verify exact location with Architect.
- F. Speaker and telephone lines run above ceiling and not in conduit shall be tie wrapped to ceiling joist with a maximum spacing of 8' between supports. No wires shall be laid on top of ceiling tile.
- G. Connect field cable to each speaker transformer using UL butt splices for 22 AWG wire. Wire nuts will not be accepted.
- H. Terminate field wiring on wall adjacent to rack using Telco 66 type blocks. Provide neat cross connect system for wiring. Wiring to be labeled to indicate final architectural room number that it services on the Telco block.
- I. Rack shall be labeled in numerical order with speaker/phone combinations first, speaker/outside horn combinations last. Labeling and order shall reflect final Architectural room numbers posted outside the rooms. Use three digit dialing extensions.
- J. Contractor shall provide a minimum of (8) hours of operational and programming instruction to school personnel.
- K. On the first school day following installation of Multicom System, the Contractor shall provide a technician to stand-by and assist in system operation.
- M. Mark and label all telephone outlets and or sets with the graphic room numbers. Label all demarks IDF and MDF points with destination point numbers. Rooms with more than one outlet shall be marked XXX-1, XXX-2, XXX-3,...XXX-25 where XXX is the room number.
- N. No graphic room number shall exceed the sequence from 100 through 699. This reserves the numbers 770-999 for the telemedia system.
- O. All outside speakers shall be on separate zone.
- P. All zones shall be laid out not to exceed 12 watts maximum audio power zone.
- Q. All outside speakers shall be tapped at 3-1/2 watts maximum.
- R. All classroom speakers shall be tapped at ½ watt maximum.
- S. Large rooms such as Cafeteria shall be tapped at 2 watts maximum.

3.2 DIVISION OF WORK

- A. While all work included under this specification is the complete responsibility of the contractor, the division of actual work listed following shall occur.

- B. The conduit, outlets, terminal cabinets, etc., which form part of the rough-in work shall be furnished and installed completely by the electrical contractor. The balance of the system, including installation of speakers and equipment, making all connections, etc., shall be performed by the manufacturer's authorized representative. The entire responsibility of the system, its operation, function, testing and complete maintenance for one (1) year after final acceptance of the project by the owner, shall also be the responsibility of the manufacturer's authorized representative.

3.3 EQUIPMENT MANUFACTURER'S REPRESENTATIVE

- A. All work described herein to be done by the manufacturer's authorized representative shall be provided by a documented factory authorized representative of the basic line of equipment to be utilized.
- B. As further qualification for bidding and participating in the work under this specification the manufacturer's representative shall hold a valid C-10 Contractor's License issued by the Contractor's State License Board of California. The manufacturer's representative shall have completed at least ten (10) projects of equal scope, giving satisfactory performance and have been in the business of furnishing and installing sound systems of this type for at least five (5) years. The manufacturer's representative shall be capable of being bonded to assure the owner of performance and satisfactory service during the guarantee period.
- C. The manufacturer's representative shall provide a letter with submittals from the manufacturer of all major equipment stating that the manufacturer's representative is an authorized distributor. This letter shall also state the manufacturer guarantees service performance for the life of the equipment, and that there will always be an authorized distributor assigned to service the area in which the system has been installed.
- D. The contractor shall furnish a letter from the manufacturer of the equipment, which certifies that the equipment has been installed according to factory intended practices, that all the components used in the system are compatible and that all new portions of the systems are operating satisfactorily. Further, the contractor shall furnish a written unconditional guarantee, guaranteeing all parts and all labor for a period of one (1) year after final acceptance of the project by the owner.

3.4 INSTALLATION

- A. Plug disconnect: All major equipment components shall be fully pluggable by means of multi-pin receptacles and matching plugs to provide for ease of maintenance and service.
- B. Protection of cables: Cables within terminal cabinets, equipment racks, etc., shall be grouped and bundled (harnessed) as to type and laced with No. 12 cord waxed linen lacing twine or T & B "Ty-Rap" cable. Edge protection material ("cat-track") shall be installed on edges of holes, lips of ducts or any other point where cables or harnesses cross metallic edge.

- C. Cable identification: Cable conductors shall be color-coded and individual cables shall be individually identified. Each cable identification shall be a unique number located approximately 1-1/2" from cable connection at both ends of cable. Numbers shall be approximately 1/4" in height. These unique numbers shall appear on the As-Built Drawings.
- D. Shielding: Cable shielding shall be connected to common ground at point of lowest audio level and shall be free from ground at any other point. Cable shields shall be terminated in same manner as conductors.
- E. Provide complete "in service" instructions of system operation to school personnel. Assist in programming of telephone system.

3.5 DOCUMENTATION

- A. Provide the following directly to the Supervisor of Technology Service.
 - 1. Provide a printed copy of all field programming for all components in system.
 - 2. Provide one copy of all diagnostic software with copy of field program for each unit.
 - 3. Provide one copy of all service manuals, parts list, and internal wiring diagrams of each component of system.
 - 4. Provide one copy of all field wiring runs, location and end designation of system.

END OF SECTION 260825

SECTION 260900 - GUARANTEE

PART 1 - GENERAL

Applicable Provisions of the Conditions of the Contract and Division 1 General Requirements govern work in this section.

1.1 GUARANTEE

- A. The Contractor shall remove, replace and/or repair at his own expense and at the convenience of the Owner, any defects in workmanship, materials, ratings, capacities and/or characteristics occurring in the work within one (1) year or within such longer period as may be provided in the Drawings and/or Section of the Specifications, which guarantee period shall commence with the final acceptance of the entire Contract in accordance with the guarantee provisions stated in the General Conditions, and the Contractor shall pay for all damage to the system resulting from defects in the work and all expenses necessary to remove, replace, and/or repair any other work which may be damaged in removing, replacing and/or repairing the work.

END OF SECTION 260900

SECTION 311000 - SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Protecting existing trees and vegetation to remain.
2. Removing trees and other vegetation.
3. Clearing and grubbing.
4. Topsoil stripping.
5. Removing above-grade site improvements.
6. Disconnecting, capping or sealing, and removing site utilities.
7. Temporary erosion and sediment control measures.

1.2 DEFINITIONS

- A. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.
- B. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches (50 mm) in diameter; and free of weeds, roots, and other deleterious materials.

1.3 MATERIALS OWNERSHIP

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

1.4 SUBMITTALS

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

1.5 QUALITY ASSURANCE

- A. Preinstallation Conference: Conduct conference at Project site to comply with requirements in General Requirements.

1.6 PROJECT CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 - 2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
- B. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.
- C. Notify utility locator service for area where Project is located before site clearing.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. Satisfactory Soil Materials: Requirements for satisfactory soil materials are specified in Division 31 Sections "Earthmoving for Sitework" and on the Structural Drawings.
 - 1. Obtain approved borrow soil materials off-site when satisfactory soil materials are not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

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

3.2 TREE PROTECTION

- A. Erect and maintain a temporary fence around drip line of individual trees or around perimeter drip line of groups of trees to remain. Remove fence when construction is complete.
 - 1. Do not store construction materials, debris, or excavated material within drip line of remaining trees.
 - 2. Do not permit vehicles, equipment, or foot traffic within drip line of remaining trees.
- B. Do not excavate within drip line of trees, unless otherwise indicated.
- C. Where excavation for new construction is required within drip line of trees, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible.
 - 1. Cover exposed roots with burlap and water regularly.
 - 2. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.
 - 3. Coat cut faces of roots more than 1-1/2 inches (38 mm) in diameter with an emulsified asphalt or other approved coating formulated for use on damaged plant tissues.
 - 4. Cover exposed roots with wet burlap to prevent roots from drying out. Backfill with soil as soon as possible.
- D. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, in a manner approved by Architect.
 - 1. Employ a qualified arborist, licensed in jurisdiction where Project is located, to submit details of proposed repairs and to repair damage to trees and shrubs.

3.3 EXISTING UTILITIES

- A. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed.
 - 1. Owner will arrange to shut off indicated utilities when requested by Contractor.
 - 2. Arrange to shut off indicated utilities with utility companies.
- B. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Owner not less than two days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Owner written permission.
- C. Excavate for and remove underground utilities indicated to be removed.

3.4 CLEARING AND GRUBBING

- A. Remove obstructions, trees, shrubs, grass, and other vegetation to permit installation of new construction. Removal includes digging out stumps and obstructions and grubbing roots.
 - 1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
 - 2. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.
 - 3. Completely remove stumps, roots, obstructions, and debris extending to a depth of 18 inches (450 mm) below exposed subgrade.
 - 4. Use only hand methods for grubbing within drip line of remaining trees.
- B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is indicated.
 - 1. Place fill material in horizontal layers not exceeding 8-inch (200-mm) loose depth, and compact each layer to a density equal to adjacent original ground.

3.5 TOPSOIL STRIPPING

- A. Remove sod and grass before stripping topsoil.
- B. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.
 - 1. Strip surface soil of unsuitable topsoil, including trash, debris, weeds, roots, and other waste materials.
- C. Stockpile topsoil materials away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.
 - 1. Limit height of topsoil stockpiles to 72 inches (1800 mm).
 - 2. Do not stockpile topsoil within drip line of remaining trees.
 - 3. Dispose of excess topsoil as specified for waste material disposal.
 - 4. Stockpile surplus topsoil and allow for respreading deeper topsoil.

3.6 SITE IMPROVEMENTS

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

3.7 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials, including trash and debris, and legally dispose of them off Owner's property.

END OF SECTION 311000

SECTION 311213 - EARTHMOVING FOR SITEWORK

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Preparing subgrades for walks, pavements, lawns, and plantings.
2. Excavating and backfilling for trench drains and underground storm structures.
3. Subbase course for concrete walks and pavements.

B. Related Sections include the following:

1. Division 32 Section "Turf and Grasses" for finish grading, including placing and preparing topsoil for lawns and plantings.

1.2 DEFINITIONS

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

B. Base Course: Layer placed between the subbase course and asphalt paving.

C. Borrow: Satisfactory soil imported from off-site for use as fill or backfill.

D. Excavation: Removal of material encountered above subgrade elevations.

1. Additional Excavation: Excavation below subgrade elevations as directed by Architect or Geotechnical Engineer. Additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
2. Bulk Excavation: Excavations more than 10 feet (3 m) in width and pits more than 30 feet (9 m) in either length or width.
3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated dimensions without direction by Architect or Geotechnical Engineer. Unauthorized excavation, as well as remedial work directed by Architect or Geotechnical Engineer, shall be without additional compensation

E. Fill: Soil materials used to raise existing grades.

F. Rock: Rock material in beds, ledges, unstratified masses, and conglomerate deposits and boulders of rock material exceeding 1 cu. yd. (0.76 cu. m) for bulk excavation or 3/4 cu. yd. (0.57 cu. m) for footing, trench, and pit excavation that cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:

- G. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- H. Subbase Course: Layer placed between the subgrade and base course for asphalt paving, or layer placed between the subgrade and concrete pavement, walk or slab-on-grade.
- I. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.

1.3 SUBMITTALS

- A. Product Data: For the following:
 - 1. Separation fabric.
- B. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:
 - 1. Classification according to ASTM D 2487 of each on-site or borrow soil material proposed for fill and backfill.
 - 2. Laboratory compaction curve according to ASTM D 698 for each on-site or borrow soil material proposed for fill and backfill.

1.4 QUALITY ASSURANCE

- A. NYSDOT Standards: Comply with New York State Department of Transportation "Standard Specifications, Construction and Materials," latest edition, abbreviated herein as NYSDOT.
- B. Geotechnical Engineer: Owner will employ a qualified geotechnical engineer to observe and monitor subsurface and subgrade conditions from stripping through foundation construction.
- C. Geotechnical Testing Agency Qualifications: An independent testing agency qualified according to ASTM E 329 to conduct soil materials and rock-definition testing, as documented according to ASTM D 3740 and ASTM E 548.
 - 1. Employ a qualified independent geotechnical engineering testing agency to classify proposed on-site and borrow soils to verify that soils comply with specified requirements and to perform required field and laboratory testing during earthwork operations.

1.5 PROJECT CONDITIONS

- A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Owner and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Owner not less than two days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Owner written permission.
 - 3. Contact utility-locator service for area where Project is located before excavating.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Soils: ASTM D 2487 soil classification groups GW, GP, GM, SW, SP, and SM, or a combination of these group symbols; free of rock or gravel larger than 3 inches (75 mm) in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
- C. Unsatisfactory Soils: ASTM D 2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT, or a combination of these group symbols.
 - 1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
- D. Backfill and Fill: Satisfactory soil materials.
- E. Subbase (use under paving): Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; meeting gradation of NYSDOT Section 304, Type 4; with at least 100 percent passing a 2- inch (50.4-mm) sieve and not more than 10 percent passing a No. 200 (0.075-mm) sieve.
- F. Structural Fill: Artificially graded mixture of crushed stone, meeting gradation of NYSDOT Section 304, Type 2; with at least 90 percent passing a 2-inch (50.4-mm) sieve and not more than 10 percent passing a No. 200 (0.075-mm) sieve.
- G. Drainage Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; meeting gradation of NYSDOT Section 304, Type 4; with at least 100 percent passing a 2- inch (50.4-mm) sieve and not more than 10 percent passing a No. 200 (0.075-mm) sieve.

2.2 ACCESSORIES

- A. Separation Fabric: Woven geotextile, specifically manufactured for use as a separation geotextile; made from polyolefins, polyesters, or polyamides; and with the following

minimum properties determined according to ASTM D 4759 and referenced standard test methods:

1. Grab Tensile Strength: 200 lbf (890 N); ASTM D 4632.
2. Tear Strength: 75 lbf (333 N); ASTM D 4533.
3. Puncture Resistance: 90 lbf (400 N); ASTM D 4833.
4. Water Flow Rate: 4 gpm per sq. ft. (2.7 L/s per sq. m); ASTM D 4491.
5. Apparent Opening Size: No. 30 (0.6 mm); ASTM D 4751.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
- B. Protect subgrades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.
- C. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.2 DEWATERING

- A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
 1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
 2. Install a dewatering system to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.

3.3 EXPLOSIVES

- A. Explosives: Do not use explosives.

3.4 EXCAVATION, GENERAL

- A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may

include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

3.5 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch (25 mm). Extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
 1. Excavation for Underground Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch (25 mm). Do not disturb bottom of excavations intended for bearing surface.

3.6 EXCAVATION FOR WALKS AND PAVEMENTS

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

3.7 EXCAVATION FOR TRENCH DRAINS

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.
- B. Excavate trenches to uniform widths to provide a working clearance on each side of trench drain.
- C. Trench Bottoms: Excavate trenches 4 inches (100 mm) deeper than bottom of trench drain to allow for bedding course.

3.8 APPROVAL OF SUBGRADE

- A. Notify Owner when excavations have reached required subgrade.
- B. If Owner determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
 1. Additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
- C. Proof roll subgrade with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof roll wet or saturated subgrades
 1. Completely proof-roll subgrade with a 10 ton roller by performing 4 passes; 2 in each direction, alternating in perpendicular direction each time.

2. Cut out yielding spots and soft spots, as determined by Owner's Geotechnical Engineer, and replace with compacted backfill or fill as directed.

- D. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect.

3.9 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under storm drainage structures and trench as directed by Owner.

3.10 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow materials and satisfactory excavated soil materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.11 BACKFILL

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

3.12 TRENCH BACKFILL

- A. Place and compact bedding course of drainage fill on trench bottoms.
- B. Coordinate backfilling with utilities testing.
- C. Place and compact final backfill of satisfactory soil material to final subgrade.

3.13 FILL

- A. Preparation: Remove vegetation, topsoil, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface before placing fills.

- B. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- C. Place and compact fill material to raise subgrade in layers to required elevations as follows:
 - 1. Under grass and planted areas, use satisfactory soil material.
 - 2. Under walks and pavements, use satisfactory soil material.
 - 3. Under steps and ramps, use structural fill.

3.14 MOISTURE CONTROL

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

3.15 COMPACTION OF BACKFILLS AND FILLS

- A. Place backfill and fill materials in layers not more than 8 inches (200 mm) in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches (100 mm) in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
- C. Compact soil to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:
 - 1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches (300 mm) of existing subgrade and each layer of backfill or fill material at 95 percent.
 - 2. Under walkways, scarify and recompact top 6 inches (150 mm) below subgrade and compact each layer of backfill or fill material at 95 percent.
 - 3. Under lawn or unpaved areas, scarify and recompact top 6 inches (150 mm) below subgrade and compact each layer of backfill or fill material at 85 percent.

3.16 GRADING

- A. General: Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
 - 1. Provide a smooth transition between adjacent existing grades and new grades.

2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
- B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
 1. Lawn or Unpaved Areas: Plus or minus 1 inch (25 mm).
 2. Walks: Plus or minus 1 inch (25 mm).
 3. Pavements: Plus or minus ½ inch (13 mm).

3.17 SUBBASE AND BASE COURSES

- A. Install separation fabric on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
- B. Under pavements and walks, place subbase course on separation fabric according to fabric manufacturer's written instructions and as follows:
 1. Place base course material over separation fabric.
 2. Compact subbase and base courses at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.
 3. Shape subbase and base to required crown elevations and cross-slope grades.
 4. When thickness of compacted subbase or base course is 6 inches (150 mm) or less, place materials in a single layer.
 5. When thickness of compacted subbase or base course exceeds 6 inches (150 mm), place materials in equal layers, with no layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick when compacted.
- C. Pavement Shoulders: Place shoulders along edges of subbase and base course to prevent lateral movement. Construct shoulders, at least 12 inches (300 mm) wide, of satisfactory soil materials and compact simultaneously with each subbase and base layer to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

3.18 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent geotechnical engineering testing agency to perform field quality-control testing.
- B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.
- C. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:

1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. (186 sq. m) or less of paved area or building slab, but in no case fewer than three tests.
 2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for each 100 feet (30 m) or less of wall length, but no fewer than two tests.
 3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for each 150 feet (46 m) or less of trench length, but no fewer than two tests.
- D. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.

3.19 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

3.20 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION 311213

SECTION 321216 - ASPHALT PAVING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Hot-mix asphalt paving.
 - 2. Pavement marking
- B. Related Sections include the following:
 - 1. Division 31 Section "Earthmoving for Sitework" for aggregate subbase and base courses and for aggregate pavement shoulders.

1.2 DEFINITIONS

- A. Hot-Mix Asphalt Paving Terminology: Refer to ASTM D 8 for definitions of terms.
- B. NYSDOT: The New York State Department of Transportation.

1.3 SYSTEM DESCRIPTION

- A. Provide hot-mix asphalt paving according to materials, workmanship, and other applicable requirements of standard specifications of state or local DOT.
 - 1. Standard Specification: New York State Department of Transportation.
 - 2. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.
- B. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.
- C. Qualification Data: For manufacturer.
- D. Material Test Reports: For each paving material.
- E. Material Certificates: For each paving material, signed by manufacturers.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer.
 - 1. Manufacturer shall be a paving-mix manufacturer registered with and approved by authorities having jurisdiction or the NYSDOT.
- B. Testing Agency Qualifications: Qualified according to ASTM D 3666 for testing indicated, as documented according to ASTM E 548.
- C. Regulatory Requirements: Comply with New York State Department of Transportation Specifications, Latest Edition, for asphalt paving work.
- D. Asphalt-Paving Publication: Comply with AI MS-22, "Construction of Hot Mix Asphalt Pavements," unless more stringent requirements are indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

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

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp or if the following conditions are not met:
 - 1. Prime and Tack Coats: Minimum surface temperature of 60 deg F (15.5 deg C).
 - 2. Slurry Coat: Comply with weather limitations of ASTM D 3910.
 - 3. Asphalt Base Course: Minimum surface temperature of 40 deg F (4 deg C) and rising at time of placement.
 - 4. Asphalt Surface Course: Minimum surface temperature of 60 deg F (15.5 deg C) at time of placement.
- B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F (4 deg C) for oil-based materials, 50 deg F (10 deg C) for water-based materials, and not exceeding 95 deg F (35 deg C).

PART 2 - PRODUCTS

2.1 AGGREGATES

- A. General: Use materials and gradations that have performed satisfactorily in previous installations and are approved by New York State Department of Transportation.

- B. Coarse Aggregate: ASTM D 692, sound; angular crushed stone, crushed gravel, or properly cured, crushed blast-furnace slag.
- C. Fine Aggregate: ASTM D 1073, sharp-edged natural sand or sand prepared from stone, gravel, properly cured blast-furnace slag, or combinations thereof.
 - 1. For hot-mix asphalt, limit natural sand to a maximum of 20 percent by weight of the total aggregate mass

2.2 ASPHALT MATERIALS

- A. Asphalt Binder: Type complying with New York State Department of Transportation Standards.
- B. Asphalt Cement: Type complying with New York State Department of Transportation Standards.
- C. Prime Coat: Asphalt emulsion prime complying with New York State Department of Transportation Standards.
- D. Tack Coat: Type complying with New York State Department of Transportation Standards.
- E. Water: Potable.

2.3 AUXILIARY MATERIALS

- A. Pavement-Marking Paint: Latex, waterborne emulsion, lead and chromate free, ready mixed, complying with FS TT-P-1952, with drying time of less than 45 minutes.
 - 1. Color: White, yellow or blue, or as indicated on the Drawings.

2.4 MIXES

- A. Hot-Mix Asphalt: Dense, hot-laid, hot-mix asphalt plant mixes approved by New York State Department of Transportation, and complying with the following requirements:
 - 1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.
 - 2. Surface Course: New York State Department of Transportation Item 403.1701 Type 6F.
 - 3. Binder Course: New York State Department of Transportation Item 403.13 Type 3.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that subgrade is dry and in suitable condition to support paving and imposed loads.

- B. Proof-roll subbase using heavy, pneumatic-tired rollers to locate areas that are unstable or that require further compaction.
- C. Proceed with paving only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

- A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.
 - 1. Sweep loose granular particles from surface of unbound-aggregate base course. Do not dislodge or disturb aggregate embedded in compacted surface of base course.
- B. Prime Coat: Apply uniformly over surface of compacted unbound-aggregate base course at a rate of 0.15 to 0.50 gal./sq. yd. (0.7 to 2.3 L/sq. m). Apply enough material to penetrate and seal but not flood surface. Allow prime coat to cure for 72 hours minimum.
 - 1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
 - 2. Protect primed substrate from damage until ready to receive paving.
- C. Patch and prime existing binder course scheduled to receive new top course as required to properly receive top course.

3.3 HOT-MIX ASPHALT PLACING

- A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.
 - 1. Place hot-mix asphalt base course in number of lifts and thicknesses indicated.
 - 2. Place hot-mix asphalt surface course in single lift.
 - 3. Spread mix at minimum temperature of 250 deg F (121 deg C).
 - 4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes, unless otherwise indicated.
 - 5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.
- B. Place paving in consecutive strips not less than 10 feet (3 m) wide unless infill edge strips of a lesser width are required.

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

3.4 JOINTS

- A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions with same texture and smoothness as other sections of hot-mix asphalt course.
 1. Clean contact surfaces and apply tack coat to joints.
 2. Offset longitudinal joints, in successive courses, a minimum of 6 inches (150 mm).
 3. Offset transverse joints, in successive courses, a minimum of 24 inches (600 mm).
 4. Construct transverse joints as described in AI MS-22, "Construction of Hot Mix Asphalt Pavements."
 5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
 6. Compact asphalt at joints to a density within 2 percent of specified course density.

3.5 COMPACTION

- A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or vibratory-plate compactors in areas inaccessible to rollers.
 1. Complete compaction before mix temperature cools to 185 deg F (85 deg C).
- B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.
- C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:
 1. Average Density: As per NYSDOT specifications.
- D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.
- E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.

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

3.6 PAVEMENT MARKING

- A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.
- B. Allow paving to age for 30 days before starting pavement marking.
- C. Sweep and clean surface to eliminate loose material and dust.
- D. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils (0.4 mm).

3.7 INSTALLATION TOLERANCES

- A. Thickness: Compact each course to produce the thickness indicated within the following tolerances:
 - 1. Base Course: Plus ½ inch (13 mm).
 - 2. Surface Course: Plus 1/4 inch (6 mm), no minus.
- B. Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot (3-m) straightedge applied transversely or longitudinally to paved areas:
 - 1. Base Course: 1/4 inch (6 mm).
 - 2. Surface Course: 1/8 inch (3 mm)
 - 3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch (6 mm).

3.8 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections 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 specified requirements.

- B. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- C. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.
- D. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.
- E. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement according to NYSDOT standards.
 - 1. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.
 - 2. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.
 - a. One core sample will be taken for every 1000 sq. yd. (836 sq. m) or less of installed pavement, with no fewer than 3 cores taken.
 - b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.
- F. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.9 DISPOSAL

- A. Except for material indicated to be recycled, remove excavated materials from Project site and legally dispose of them in an EPA-approved landfill.
 - 1. Do not allow excavated materials to accumulate on-site.

END OF SECTION 321216

SECTION 321313 - CONCRETE PAVING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes exterior cement concrete pavement for the following:
 - 1. Walkways.

1.2 SUBMITTALS

- A. Product Data: For each type of manufactured material and product indicated.
- B. Design Mixtures: For each concrete pavement mixture. Include alternate mixture designs when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
- C. Qualification Data: For manufacturer and testing agency.
- D. 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:
 - 1. Aggregates
- E. Material Certificates: Signed by manufacturers certifying that each of the following materials complies with requirements:
 - 1. Cementitious materials.
 - 2. Steel reinforcement and reinforcement accessories.
 - 3. Admixtures.
 - 4. Curing compounds.
 - 5. Bonding agent or epoxy adhesive.
 - 6. Joint fillers.
- F. Field quality-control test reports.

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products who complies with ASTM C 94/C 94M requirements for production facilities and equipment.
- B. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.
- C. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by requirements in the Contract Documents.
- D. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures. Owner will engage concrete testing and inspection agency to perform field evaluations and testing.

1.4 PROJECT CONDITIONS

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

PART 2 - PRODUCTS

2.1 FORMS

- A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.
 1. Use flexible or curved forms for curves with a radius 100 feet (30.5 m) or less
- B. 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.

2.2 STEEL REINFORCEMENT

- A. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

2.3 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source throughout the Project:
 1. Portland Cement: ASTM C 150, Type I, gray
- B. Normal-Weight Aggregates: ASTM C 33, Class 4S coarse aggregate, uniformly graded. Provide aggregates from a single source.
- C. Water: ASTM C 94/C 94M.
- D. Air-Entraining Admixture: ASTM C 260.

- E. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.
 - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 - 2. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 - 3. Provide IPANEX concrete waterproofing admixture in all exterior concrete flatwork.

2.4 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) dry.
- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Potable.
- D. Clear Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.
 - 1. Available Products: Provide one of the following or equal:
 - a. Anti-Hydro International, Inc.; AH Curing Compound #2 DR WB.
 - b. Burke by Edoko; Aqua Resin Cure.
 - c. ChemMasters; Safe-Cure Clear.
 - d. Conspec Marketing & Manufacturing Co., Inc.; W.B. Resin Cure.
 - e. Dayton Superior Corporation; Day Chem Rez Cure (J-11-W).
 - f. Euclid Chemical Company (The); Kurez DR VOX.
 - g. L&M Construction Chemicals, Inc.; L&M Cure R.
 - h. Meadows, W. R., Inc.; 1100 Clear.
 - i. Tamms Industries Inc.; Horn cure WB 30.

2.5 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.
- B. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- C. Surface-Applied Detectable Warning Tiles: Accessible truncated-dome detectable warning tiles configured for surface application on existing concrete walkway surfaces, with slip-resistant surface treatment on domes, field of tile, and beveled outside edges.
 - 1. Material: Diamond-hard vitrified polymer composite.
 - 2. Basis of Design Product: Armor-Tile ADA Sound Amplifying Detectable/Tactile Warning Surface Tile #ADA-S-1212 by Engineered Plastics, Inc. or equal.
 - 3. Size of Tile: 12" x 12".
 - 4. Color: As selected by Architect.

5. Accessories: Provide manufacturer's standard fasteners, adhesive and sealant for installing surface mats.

2.6 CONCRETE MIXTURES

- A. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.
 1. Use a qualified independent testing agency for preparing and reporting proposed concrete mixture designs for the trial batch method.
- B. Proportion mixtures to provide normal-weight concrete with the following properties:
 1. Compressive Strength (28 Days): 4000 psi.
 2. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.40.
 3. Slump Limit: 4 inches (100 mm), plus or minus 1 inch (25 mm).
- C. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows:
 1. Air Content: 5-1/2 percent plus or minus 1.5 percent for 1-1/2-inch (38-mm) nominal maximum aggregate size.
 2. Air Content: 6 percent plus or minus 1.5 percent for 1-inch (25-mm) nominal maximum aggregate size.
 3. Air Content: 6 percent plus or minus 1.5 percent for 3/4-inch (19-mm) nominal maximum aggregate size
- D. Limit water-soluble, chloride-ion content in hardened concrete to 0.10 percent by weight of cement.
- E. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.
 1. Use water-reducing admixture or high-range, water-reducing admixture in concrete, as required, for placement and workability.
- F. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 requirements for concrete exposed to deicing chemicals.

2.7 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Furnish batch certificates for each batch discharged and used in the Work.
 1. When air temperature is between 85 deg F (30 deg C) and 90 deg F (32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.
- B. Proceed with concrete pavement operations only after nonconforming conditions have been corrected and subgrade is ready to receive pavement.

3.2 PREPARATION

- A. Remove loose material from compacted subbase surface immediately before placing concrete.

3.3 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.
- B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.4 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.
- C. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

3.5 JOINTS

- A. General: Form construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.
 - 1. When joining existing pavement, place transverse joints to align with previously placed joints, unless otherwise indicated.

- B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour unless pavement terminates at isolation joints.
 - 1. Butt Joints: Use bonding agent at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.
 - 1. Locate expansion joints at intervals of 20 feet unless otherwise indicated.
 - 2. Extend joint fillers full width and depth of joint.
 - 3. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
 - 4. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
 - 5. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.
- D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows, and to match jointing of existing adjacent concrete pavement:
 - 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 3/8-inch radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.
- E. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to a 1/2-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.

3.6 CONCRETE PLACEMENT

- A. Inspection: Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast in. Notify other trades to permit installation of their work.
- B. Remove snow, ice, or frost from subbase surface and reinforcement before placing concrete. Do not place concrete on frozen surfaces.
- C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

- D. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.
- E. Do not add water to concrete during delivery or at Project site.
- F. Do not add water to fresh concrete after testing.
- G. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
- H. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.
 - 1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.
- I. Place concrete in two operations; strike off initial pour for entire width of placement and to the required depth below finish surface. Lay welded wire fabric or fabricated bar mats immediately in final position. Place top layer of concrete, strike off, and screed.
 - 1. Remove and replace concrete that has been placed for more than 15 minutes without being covered by top layer, or use bonding agent if approved by Architect.
- J. Screed pavement surfaces with a straightedge and strike off.
- K. Commence initial floating using bull floats or darbies to impart an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.
- L. When adjoining pavement lanes are placed in separate pours, do not operate equipment on concrete until pavement has attained 85 percent of its 28-day compressive strength.
- M. 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 (4.4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
 - 2. Do not use frozen materials or materials containing ice or snow.
 - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mix designs.

- N. Hot-Weather Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:
1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F (32 deg C) 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.

3.7 FLOAT FINISHING

- A. General: Do not add water to concrete surfaces during finishing operations.
- B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.
1. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch (1.6 to 3 mm) deep with a stiff-bristled broom, perpendicular to line of traffic.

3.8 DETECTABLE WARNING MARKING

- A. Surface-Applied Detectable Warning Tiles:
1. Lay out detectable warning tiles as indicated and mark concrete pavement.
 2. Prepare existing paving surface by grinding and cleaning as recommended by manufacturer.
 3. Apply adhesive to back of tiles in amounts and pattern recommended by manufacturer, and set tiles in place. Firmly seat tiles in adhesive bed, eliminating air pockets and establishing full adhesion to pavement. If necessary, temporarily apply weight to tiles to ensure full contact with concrete.
 4. Install anchor devices through face of tiles and into pavement using anchors located as recommended by manufacturer. Set heads of anchors flush with top surface of mat.
 5. Mask perimeter of tiles and adjacent concrete, and apply sealant in continuous bead around perimeter of tile installation.
 6. Remove masking, adhesive, excess sealant, and soil from exposed surfaces of detectable warning tiles and surrounding concrete pavement using cleaning agents recommended in writing by manufacturer.
 7. Protect installed tiles from traffic until adhesive has set.

3.9 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
- B. Comply with ACI 306.1 for cold-weather protection.
- C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- D. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:
 - 1. Moist 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 (300-mm) 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 (300 mm), and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - 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.

3.10 PAVEMENT TOLERANCES

- A. Comply with tolerances of ACI 117 and as follows:
 - 1. Elevation: 1/4 inch (6 mm).
 - 2. Thickness: Plus 3/8 inch (10 mm), minus 1/4 inch (6 mm).
 - 3. Surface: Gap below 10-foot- (3-m-) long, unlevelled straightedge not to exceed 1/4 inch (6 mm).
 - 4. Joint Spacing: 3 inches (75 mm).
 - 5. Contraction Joint Depth: Plus 1/4 inch (6 mm), no minus.
 - 6. Joint Width: Plus 1/8 inch (3 mm), no minus.

3.11 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- 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 at least 1 composite sample for each 100 cu. yd. (76 cu. m) 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 mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
 3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
 4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each composite sample.
 5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
 6. Compressive-Strength Tests: ASTM C 39/C 39M; test 1 specimen at 7 days and 2 specimens at 28 days.
 - a. A compressive-strength test shall be the average compressive strength from 2 specimens obtained from same composite sample and tested at 28 days.
- C. Strength of each concrete mix will be satisfactory if average of any 3 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 (3.4 MPa).
- D. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
- E. 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.
- F. 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.
- G. Remove and replace concrete pavement where test results indicate that it does not comply with specified requirements.
- H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.12 REPAIRS AND PROTECTION

- A. Remove and replace concrete pavement that is broken, damaged, or defective or that does not comply with requirements in this Section.
- B. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy adhesive.
- C. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.
- D. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 321313

SECTION 329200 - TURF AND GRASSES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Seeding.
2. Topsoil and amendments.
3. Restoration of lawns and grasses.

B. Related Sections:

1. Division 31 Section "Site Clearing" for topsoil stripping and stockpiling.
2. Division 31 Section "Earthmoving for Sitework" for excavation, filling and backfilling, and rough grading.

1.2 DEFINITIONS

- A. Finish Grade: Elevation of finished surface of planting soil.
- B. Manufactured Soil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
- C. Planting Soil: Native or imported topsoil, manufactured topsoil, or surface soil modified to become topsoil; mixed with soil amendments.
- D. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill immediately beneath planting soil.
- E. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture stating the botanical and common name and percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.
- C. Qualification Data: For qualified landscape Installer.
- D. Product Certificates: For soil amendments and fertilizers, from manufacturer.
- E. Material Test Reports: For existing surface soil and imported topsoil.

- F. Planting Schedule: Indicating anticipated planting dates for each type of planting.
- G. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of lawns during a calendar year. Submit before expiration of required initial maintenance periods.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful lawn establishment.
 - 1. Experience: Five years' experience in lawn installation on projects of comparable scope and size to this project.
 - 2. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
- B. Soil-Testing Laboratory Qualifications: An independent laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.
- C. Topsoil Analysis: Furnish soil analysis by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; deleterious material; pH; and mineral and plant-nutrient content of topsoil.
 - 1. Report suitability of topsoil for lawn growth. State-recommended quantities of nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory topsoil..

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Seed: Deliver seed in original sealed, labeled, and undamaged containers.

1.6 PROJECT CONDITIONS

- A. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with initial maintenance periods to provide required maintenance from date of Substantial Completion.
 - 1. Spring Planting: April 1 to June 1.
 - 2. Fall Planting: September 1 to October 15.
- B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit.

1.7 MAINTENANCE SERVICE

- A. Initial Lawn Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after

each area is planted and continue until acceptable lawn is established, but for not less than the following periods:

1. Seeded Lawns: 60 days from date of Substantial Completion.
 - a. When initial maintenance period has not elapsed before end of planting season, or if lawn is not fully established, continue maintenance during next planting season.

PART 2 - PRODUCTS

2.1 SEED

- A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Journal of Seed Technology; Rules for Testing Seeds" for purity and germination tolerances.
- B. Seed Species: Seed of grass species, proportioned by weight as follows:
 1. 65 percent Kentucky bluegrass (*Poa pratensis*).
 2. 20 percent chewings red fescue (*Festuca rubra* variety).
 3. 15 percent perennial ryegrass (*Lolium perenne*).

2.2 TOPSOIL

- A. Topsoil: ASTM D 5268, pH range of 5.5 to 7, a minimum of 4 percent organic material content; free of stones 1 inch (25 mm) or larger in any dimension and other extraneous materials harmful to plant growth.
 1. Topsoil Source: Reuse surface soil stockpiled on-site. Verify suitability of stockpiled surface soil to produce topsoil. Clean surface soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.
 - a. Supplement with imported or manufactured topsoil from off-site sources when quantities are insufficient. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches (100 mm) deep; do not obtain from bogs or marshes.

2.3 INORGANIC SOIL AMENDMENTS

- A. Lime: ASTM C 602, agricultural limestone containing a minimum of 80 percent calcium carbonate equivalent and as follows:
 1. Class: T, with a minimum of 99 percent passing through No. 8 (2.36-mm) sieve and a minimum of 75 percent passing through No. 60 (0.25-mm) sieve.
 2. Provide lime in form of dolomitic limestone.
- B. Sulfur: Granular, biodegradable, containing a minimum of 90 percent sulfur, with a minimum of 99 percent passing through No. 6 (3.35-mm) sieve and a maximum of 10 percent passing through No. 40 (0.425-mm) sieve.

- C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.
- D. Aluminum Sulfate: Commercial grade, unadulterated..
- E. Sand: Clean, washed, natural or manufactured, free of toxic materials.

2.4 ORGANIC SOIL AMENDMENTS

- A. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1/2-inch (12.5-mm) sieve; soluble salt content of 5 to 10 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
 - 1. Organic Matter Content: 50 to 60 percent of dry weight.
 - 2. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.
- B. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, and material harmful to plant growth.

2.5 FERTILIZER

- A. Bonemeal: Commercial, raw or steamed, finely ground; a minimum of 4 percent nitrogen and 10 percent phosphoric acid.
- B. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
 - 1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.
- C. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
 - 1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.

2.6 MULCHES

- A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.

2.7 PLANTING SOIL MIX

- A. Planting Soil Mix: Topsoil mixed with the following soil amendments and fertilizers in the following quantities:

1. Ratio of Loose Compost to Topsoil by Volume: 1:3.
2. Ratio of Loose Sand to Topsoil by Volume: 1:3.
3. Five pounds of bonemeal per cu. yd. of soil mixture.
4. One pound of commercial fertilizer per cu. yd. of soil mixture
5. One pound of slow release fertilizer per cu. yd. of soil mixture
6. Lime as required for pH of 6 - 7.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive lawns and grass for compliance with requirements and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.
- B. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.3 LAWN PREPARATION

- A. Limit lawn subgrade preparation to areas to be planted.
- B. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 6 inches (150 mm). Remove stones larger than 1 inch (25 mm) in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
 1. Thoroughly blend planting soil mix off-site before spreading or spread topsoil, apply soil amendments and fertilizer on surface, and thoroughly blend planting soil mix.
 - a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.
 - b. Mix lime with dry soil before mixing fertilizer.
 2. Spread planting soil mix to a depth of 6 inches (150 mm) but not less than required to meet finish grades after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.
- C. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch (13 mm) of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit finish grading to areas that can be planted in the immediate future.

- D. Moisten prepared lawn areas before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
- E. Before planting, restore areas if eroded or otherwise disturbed after finish grading.

3.4 SEEDING

- A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph (8 km/h). Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
 - 1. Do not use wet seed or seed that is moldy or otherwise damaged.
 - 2. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.
- B. Sow seed at a total rate of 5 lb/1000 sq. ft..
- C. Rake seed lightly into top 1/8 inch (3 mm) of soil, roll lightly, and water with fine spray.
- D. Protect seeded areas with slopes not exceeding 1:6 by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre (42 kg/92.9 sq. m) to form a continuous blanket 1-1/2 inches (38 mm) in loose depth over seeded areas. Spread by hand, blower, or other suitable equipment.

3.5 RESTORATION OF LAWNS AND GRASSES

- A. Restoration of Lawns and Grasses shall include:
 - 1. All lawn areas disturbed outside the area of the work
 - 2. All areas directly impacted by the work (excluding trenching), to 10' beyond such impact, including areas shown to re-grade
 - 3. All areas impacted by trenching, to 5' in each direction beyond the disturbance of the trench or location of overburden
 - 4. Contractor's route from end of fire road** to construction site and staging areas, to 5' beyond disturbance in each direction
 - 5. Staging area, to 5' beyond fence line
 - 6. Lawn areas, not included in above, within 15' of building, and 5' of existing patio area.
- B. Restoration shall include, filling all trenches with top soil (92% compaction), de-compaction of roadways and staging (to 92% compaction), and in all areas screened topsoil (4"), finished raking, seeding and straw mulch..

3.6 LAWN MAINTENANCE

- A. Maintain and establish lawn by watering, fertilizing, weeding, mowing, trimming, replanting, and other operations. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth lawn. Provide materials and installation the same as those used in the original installation.

1. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
- B. Watering: Provide and maintain temporary piping, hoses, and lawn-watering equipment to convey water from sources and to keep lawn uniformly moist to a depth of 4 inches (100 mm).
 1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
 2. Water lawn with fine spray at a minimum rate of 1 inch (25 mm) per week unless rainfall precipitation is adequate.
- C. Mow lawn as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than 1/3 of grass height. Remove no more than 1/3 of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height:
 1. Mow grass to a height of 1-1/2 to 2 inches (38 to 50 mm).

3.7 SATISFACTORY LAWNS

- A. Lawn installations shall meet the following criteria as determined by Architect:
 1. Satisfactory Seeded Lawn: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. (0.92 sq. m) and bare spots not exceeding 5 by 5 inches (125 by 125 mm)
- B. Use specified materials to reestablish lawns that do not comply with requirements and continue maintenance until lawns are satisfactory.

3.8 CLEANUP AND PROTECTION

- A. Promptly remove soil and debris, created by lawn work, from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
- B. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after lawn is established.
- C. Remove nondegradable erosion-control measures after grass establishment period.

END OF SECTION 329200

SECTION 329300 - PLANTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Plants
 - 2. Planting soils
 - 3. Tree watering bag

1.2 DEFINITIONS

- A. Backfill: The earth used to fill an excavation or the act of filling an excavation.
- B. Duff Layer: The surface layer of native topsoil that is composed of mostly decayed leaves, twigs, and detritus.
- C. Finish Grade: Elevation of finished surface of planting soil.
- D. Hardpan: A hard, usually clay-rich layer of soil lying at or just below the ground surface, in which soil particles are cemented together by silica, iron oxide, calcium carbonate, or organic matter that has precipitated from water percolating through the soil. Hardpans do not soften when exposed to water. Also called caliche.
- E. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
- F. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.
- G. Pests: Living organisms that occur where they are not desired, or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
- H. Percolation: A test to determine the suitability of a soil for planting in which a hole is dug and filled with water and the rate of water-level decline is measured.
- I. Planting Soil: Standardized topsoil; existing, native surface topsoil; imported topsoil; or manufactured topsoil that is modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.

- J. Plant; Plants; Plant Material: These terms refer to vegetation in general, including trees, shrubs, vines, ground covers, ornamental grasses, bulbs, corms, tubers, or herbaceous vegetation.
- K. Root Flare: Also called "trunk flare." The area at the base of the plant's stem or trunk where the stem or trunk broadens to form roots; the area of transition between the root system and the stem or trunk.
- L. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.
- M. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.
- N. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.
- O. Topsoil: Good clean soil from the top 3" of undisturbed ground (may be stockpiled) with no organic solids larger than 1" in diameter. In sites where there is no existing topsoil, a topsoil mix of 2 parts imported topsoil, 1 part compost, and 1 part clean sand shall be used.
- P. Tree Watering Bag: A watering bag made from a tough, UV-treated polyethylene that is reinforced with nylon webbing. A slow release watering system for new trees that delivers a high volume of water directly to the root system of a newly planted tree with no run-off or evaporation.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated, including soils.

1.4 INFORMATIONAL SUBMITTALS

- A. Product certificates.
- B. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of plants during a calendar year.

1.5 QUALITY ASSURANCE

- A. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
 - 1. Pesticide Applicator: State licensed, commercial.

B. Soil Analysis: Furnish soil analysis and a written report by a qualified soil-testing laboratory.

1. Planting bed areas shall have soil tested in multiple locations.
2. The soil-testing laboratory shall oversee soil sampling.
3. Report suitability of tested soil for plant growth.
 - a. State recommendations for nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory planting soil suitable for healthy, viable plants.
 - b. Report presence of problem salts, minerals, or heavy metals; if present, provide additional recommendations for corrective action.
 - c. Receive authorization from Architect prior to amending soil.

C. Percolation Test

1. Architect shall be notified 2 business days prior to percolation test.
2. Contractor shall verify with Architect locations of test holes. Planting beds and tree planting areas in or near construction zones shall be tested.
3. Contractor shall perform percolation test prior to preparing planting areas.
4. A percolation test shall be conducted by performing the following steps in sequence:
 - a. Prepare a test hole located within a proposed tree pit. The test hole shall have a diameter of 12 inches, as precisely as possible, with vertical sides 18 inches deep not including any allowable liners or filter layers on either the bottom or sides.
 - b. Establish a fixed point at the top or bottom of the test hole from which all measurements will be taken.
 - c. Scratch the bottom and sides of the test hole to remove any smeared soil surfaces, taking care not to significantly change the hole dimensions. Add two inches of coarse sand to protect the bottom from scouring, or insert a board or other impervious object in the hole so that water may be poured down or on it during the filling operation. A mesh or perforated liner designed to maintain the test hole dimensions in extremely loose soils while allowing essentially unrestricted flow of water may be used with permission of the Architect or owner's representative.
 - d. Carefully fill the hole with clear water to a minimum depth of 12 inches from the bottom of the hole. Maintain this minimum 12-inch or greater water level by adding water as necessary in order to saturate surrounding soils for a period of no less than 15 minutes after first filling the hole.
 - e. After saturation, if the water level drops to a depth of nine inches in fewer than 30 minutes, then measure the length of time in minutes for it to drop from a depth of nine inches to a depth of six inches. If the rate is erratic in the opinion of the Architect or owner's representative, the hole shall be refilled and soaked until the drop per increment of time is steady. The time for the level to drop from a depth of nine inches to a depth of six inches, divided by three, is the percolation rate in minutes per inch. 30-60 minutes per inch is acceptable percolation rate. If the rate varies (either faster or slower) contractor shall contact Architect to discuss remediation strategies.

- f. If the initial three-inch drop requires more than 30 minutes (rate equal to more than ten minutes per inch) the soil shall be saturated by filling the hole to the top and maintaining it full for at least four hours. The soil should then be permitted to swell a minimum of 12 hours so that the soil conditions will approach those which exist during the wettest season of the year. After the 12-hour swelling period, the test shall be made again by filling the hole to a 12-inch depth and maintaining that level for 15 minutes, letting the level drop to nine inches, then timing the drop between nine inches and six inches. The time elapsed between nine inches and six inches, divided by three, shall be the percolation rate.
 - g. In certain soils, particularly coarse sands, the soil may be so pervious as to make a percolation test difficult, impractical, and meaningless. At the discretion of the Architect or owner's representative, the percolation test may be discontinued and a rate of two minutes per inch or less can be assumed provided that at least 24 gallons of water has been added to the percolation hole within 15 minutes and it is impossible to obtain a liquid depth of nine inches.
- D. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1.
- E. Preinstallation Conference: Conduct conference at Project site with Architect and Owner's representative.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver bare-root stock plants freshly dug. Immediately after digging up bare-root stock, pack root system in wet straw, hay, or other suitable material to keep root system moist until planting.
- B. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of plants during shipping and delivery. Do not drop plants during delivery and handling.
- C. Handle planting stock by root ball.
- D. Store bulbs, corms, and tubers in a dry place at 60 to 65 deg F (16 to 18 deg C) until planting.
- E. Deliver plants after preparations for planting have been completed, and install immediately. If planting is delayed more than six hours after delivery, set plants and trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.

1.7 PROJECT CONDITIONS

- A. Planting Restrictions: Plant during the following period. Coordinate planting periods with initial maintenance periods to provide required maintenance from date of Substantial Completion.
 - 1. Spring Planting: April 1 to June 1.
 - 2. Fall Planting: September 1 to October 15.
- B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit.

1.8 WARRANTY

- A. Special Warranty: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by Owner, or incidents that are beyond Contractor's control.
 - b. Structural failures including plantings falling or blowing over.
 - 2. Warranty Periods from Date of Planting Completion:
 - a. Trees, Shrubs, Vines, and Ornamental Grasses: 12 months.
 - b. Ground Covers, Biennials, Perennials, and Other Plants: 12 months.
 - c. Annuals: Three months.

1.9 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Provide maintenance by skilled employees of landscape Installer, unless prior authorization is given by owner in writing at time of bid. Maintain as required in Part 3. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established but for not less than maintenance period below.
 - 1. Maintenance Period for Trees and Shrubs: 12 months from date of planting completion.
 - 2. Maintenance Period for Ground Cover and Other Plants: 12 months from date of planting completion.

PART 2 - PRODUCTS

2.1 PLANT MATERIAL

- A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant Schedule and planting notes shown on Drawings and complying with ANSI Z60.1; and with healthy root systems. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.
- B. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which shall begin at root flare according to ANSI Z60.1. Root flare shall be visible before planting.
- C. Annuals: Provide healthy, disease-free plants of species and variety shown or listed, with well-established root systems reaching to sides of the container to maintain a firm ball, but not with excessive root growth encircling the container. Provide only plants that are acclimated to outdoor conditions before delivery and that are in bud but not yet in bloom.
- D. Perennials: Provide healthy, disease-free plants of species and variety shown or listed, with well-established root systems reaching to sides of the container to maintain a firm ball, but not with excessive root growth encircling the container. Provide only plants that are acclimated to outdoor conditions before delivery.

2.2 INORGANIC SOIL AMENDMENTS

- A. General: No soil amendments to be used without prior authorization from Architect based on soil test results.
- B. Lime: ASTM C 602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:
 - 1. Class: T, with a minimum of 99 percent passing through No. 8 (2.36-mm) sieve and a minimum of 75 percent passing through No. 60 (0.25-mm) sieve.
 - 2. Class: O, with a minimum of 95 percent passing through No. 8 (2.36-mm) sieve and a minimum of 55 percent passing through No. 60 (0.25-mm) sieve.
- C. Sulfur: Granular, biodegradable, and containing a minimum of 90 percent sulfur, with a minimum of 99 percent passing through No. 6 (3.35-mm) sieve and a maximum of 10 percent passing through No. 40 (0.425-mm) sieve.
- D. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.
- E. Aluminum Sulfate: Commercial grade, unadulterated.

- F. Perlite: Horticultural perlite, soil amendment grade.
- G. Agricultural Gypsum: Minimum 90 percent calcium sulfate, finely ground with 90 percent passing through No. 50 (0.30-mm) sieve.
- H. Sand: Clean, washed, natural or manufactured, and free of toxic materials.
- I. Diatomaceous Earth: Calcined, 90 percent silica, with approximately 140 percent water absorption capacity by weight.
- J. Zeolites: Mineral clinoptilolite with at least 60 percent water absorption by weight.

2.3 ORGANIC SOIL AMENDMENTS

- A. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1/2-inch (13-mm) sieve; soluble salt content of 5 to 10 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
- B. Sphagnum Peat: Partially decomposed sphagnum peat moss, finely divided or granular texture, with a pH range of 3.4 to 4.8.
- C. Muck Peat: Partially decomposed moss peat, native peat, or reed-sedge peat, finely divided or of granular texture, with a pH range of 6 to 7.5, and having a water-absorbing capacity of 1100 to 2000 percent.
- D. Wood Derivatives: Decomposed, nitrogen-treated sawdust, ground bark, or wood waste; of uniform texture and free of chips, stones, sticks, soil, or toxic materials.
- E. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, debris, and material harmful to plant growth.

2.4 FERTILIZERS

- A. Bonemeal: Commercial, raw or steamed, finely ground; a minimum of 4 percent nitrogen and 12 percent phosphoric acid.
- B. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of 20 percent available phosphoric acid.
- C. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:

1. Composition: 1 lb/1000 sq. ft. (0.45 kg/92.9 sq. m) of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.
- D. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
 1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.
- E. Planting Tablets: Tightly compressed chip type, long-lasting, slow-release, commercial-grade planting fertilizer in tablet form. Tablets shall break down with soil bacteria, converting nutrients into a form that can be absorbed by plant roots.
 1. Size: 5-gram tablets.
 2. Nutrient Composition: 20 percent nitrogen, 10 percent phosphorous, and 5 percent potassium, by weight plus micronutrients.

2.5 PLANTING SOILS

- A. Planting Soil: ASTM D 5268 topsoil, with pH range of 5.5 to 6.5, a minimum of 5 percent organic material content. Existing, native surface topsoil formed under natural conditions with the duff layer retained during excavation process. Imported topsoil or manufactured topsoil from off-site sources; do not obtain from agricultural land, bogs or marshes. Verify suitability of soil to produce viable planting soil. Clean soil of roots, plants, sod, stones, clods, clay lumps, pockets of coarse sand, concrete slurry, concrete layers or chunks, cement, plaster, building debris, and other extraneous materials harmful to plant growth. Mix soil with the following soil amendments in the following quantities to produce the following planting soil mixes:
 1. Planting Mix: 2 parts topsoil with additive required to bring ph to 5.5-6.5 range, 1 part compost with organic material, and 1 part clean coarse sand.
 2. Planting Mix for Compacted Sites: 2 parts Permatill (or equal), 3 parts compost, 2 parts topsoil, and 2 parts clean course sand.

2.6 MULCHES

- A. Organic Mulch: Shredded hardwood.
- B. Compost Mulch: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1-inch (25-mm) sieve; soluble salt content of 2 to 5 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings.

2.7 WEED-CONTROL BARRIERS

- A. Nonwoven Geotextile Filter Fabric: Polypropylene or polyester fabric, 3 oz./sq. yd. (101g/sq. m) minimum.

- B. Composite Fabric: Woven, needle-punched polypropylene substrate bonded to a nonwoven polypropylene fabric, 4.8 oz/sq. yd. (162 g/sq. m).

2.8 PESTICIDES

- A. General: Pesticide registered and approved by EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

2.9 TREE WATER BAG

- A. Available Manufacturer: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following: Treegator® bag by Spectrum Products..
- B. Basis-of-Design Product: Subject to compliance with requirements, provide Treegator® bag by Spectrum Products.
- C. Materials: UV-treated polyethylene reinforced with nylon webbing and heavy duty nylon zippers sewn on each side.
- D. Size: 20 gallon capacity. Filled with water - 30" Tall x 18" Wide (at base). Single bag fits 1-4" caliper tree. Fill opening on bag shall fit up to a 3" diameter hose. Use two water release points per bag for even watering.

2.10 LANDSCAPE EDGINGS

- A. Steel Edging: Standard commercial-steel edging, fabricated in sections of standard lengths, with loops stamped from or welded to face of sections to receive stakes, in manufacturer's standard finish.

PART 3 - EXECUTION

3.1 PLANTING AREA ESTABLISHMENT

- A. Areas not impacted by construction activity or hardpan.
 - 1. Do not till if soil is loose, friable, or within wooded area.
- B. Areas compacted by construction activity or hardpan.
 - 1. If compaction exists, the Architect is to be contacted immediately to discuss a proper course of action.
- C. Avoiding dripline of existing trees, loosen subgrade of planting areas to a minimum depth of 8 inches (200 mm). Remove stones larger than 1 inch (25 mm) in any

dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.

1. Thoroughly blend planting soil off-site before spreading or spread topsoil, apply soil amendments and fertilizer on surface, and thoroughly blend planting soil.
 2. Spread planting soil to a depth of 8 inches (200 mm) but not less than required to meet finish grades after natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.
- D. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

3.2 EXCAVATION FOR TREES AND SHRUBS

- A. Planting Pits and Trenches: After completing the percolation test in Section 1.5, excavate circular planting pits with sides sloping inward at a 45-degree angle. Excavations with vertical sides are not acceptable. Trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Do not further disturb base. Ensure that root ball will sit on undisturbed base soil to prevent settling. Scarify sides of planting pit smeared or smoothed during excavation.
1. Excavate approximately three times the width of the ball diameter for compacted soil and two times the width of the ball diameter for noncompacted soil.
 2. Excavate at least 12 inches (300 mm) wider than root spread and deep enough to accommodate vertical roots.
 3. Do not excavate deeper than the depth of the root ball, measured from the root flare to the bottom of the root ball.
 4. Create 12" long wedge cuts at 45 degree increments (8 total) around excavated pit.
- B. Subsoil and topsoil removed from excavations may be used in the planting soil mix if deemed acceptable by the Architect.

3.3 TREE, SHRUB, AND VINE PLANTING

- A. Do not plant if planting soil or subgrade is frozen, muddy, or excessively wet.
- B. Before planting, verify that root flare is visible at top of root ball according to ANSI Z60.1.
- C. Notify Architect if any girdling roots and kinked roots are found. Remove only if instructed by Architect by cutting injured roots cleanly; do not break.
- D. Set stock plumb and in center of planting pit or trench with root flare 1 inch (25 mm) to 2 inches (50 mm) above adjacent finish grades.

1. Use appropriate planting mix as directed by the Architect.
 2. Balled and Burlapped: After placing some backfill around root ball to stabilize plant, carefully cut and remove burlap, rope, and wire baskets from tops of root balls and from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
 3. Container-Grown: Carefully remove root ball from container without damaging root ball or plant and scarify sides to free girdling, container bound roots.
 4. Bare-Root Stock: Set and support bare-root stock in center of planting pit or trench with root flare 1 inch (25 mm) to 2 inches (50 mm) above adjacent finish grade.
 - a. Spread roots without tangling or turning toward surface, and carefully work backfill around roots by hand. Puddle with water until backfill layers are completely saturated. Plumb before backfilling, and maintain plumb while working backfill around roots and placing layers above roots.
 5. Backfill around root ball in layers, tamping to settle soil and eliminate voids. Water thoroughly after planting to remove air pockets.
 6. Tree watering bag shall be installed at planting. Tree branches must be at least 30" off the ground. Do not use on evergreen trees that skirt the ground.
- E. When planting on slopes, set the plant so the root flare on the uphill side is flush with the surrounding soil on the slope; the edge of the root ball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of the root ball.

3.4 TREE, SHRUB, AND VINE PRUNING

- A. Remove only dead, dying, or broken branches. Do not prune for shape without prior authorization of Architect.

3.5 GROUND COVER AND PERENNIAL PLANTING

- A. Do not plant if planting soil or subgrade is frozen, muddy, or excessively wet.
- B. Set out and space ground cover and perennials other than trees, shrubs, and vines as indicated on plans. Where indicated with hatch patterns set out in even rows with triangular spacing.
- C. Use appropriate planting mix for backfill.
- D. Dig holes large enough to allow spreading of roots.
- E. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.
- F. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.

- G. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

3.6 PLANTING AREA MULCHING

- A. Install weed-control barriers before mulching according to manufacturer's written instructions. Completely cover area to be mulched, overlapping edges a minimum of 6 inches (150 mm) and secure seams with galvanized pins.
- B. Mulch backfilled surfaces of planting areas and other areas indicated.
 - 1. Trees and Tree-like Shrubs in Turf Areas: Apply organic mulch ring of 2-inch (50-mm) average thickness, with 36-inch (900-mm) radius or square if indicated on plans around trunks or stems. Do not place mulch within 3 inches (75 mm) of trunks or stems.
 - 2. Organic Mulch in Planting Areas: Apply 2-inch (50-mm) average thickness of mulch extending 12 inches (300 mm) beyond edge of individual planting pit or trench and over whole surface of planting area, and finish level with adjacent finish grades. Do not place mulch within 3 inches (75 mm) of trunks or stems.

3.7 PLANT MAINTENANCE

- A. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, resetting to proper grades or vertical position, and performing other operations as required to establish healthy, viable plantings. Spray or treat as required to keep trees and shrubs free of insects and disease.
- B. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas of subsidence.
- C. Apply treatments as required to keep plants, planted areas, and soils free of pests and pathogens or disease. Use practices to minimize the use of pesticides and reduce hazards.
- D. Apply pesticides and other chemical products and biological control agents in accordance with authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.
- E. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.

END OF SECTION 329300

SECTION 334100 - STORM UTILITY DRAINAGE PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes gravity-flow, nonpressure storm drainage units outside the building, as follows:
 - 1. Yard drains
 - 2. Trench drains.
 - 3. Replacement yard drain covers

1.2 SUBMITTALS

- A. Shop Drawings: For stormwater inlets, catch basins and drains. Include plans, elevations, sections, details, and frames, covers, and grates.

PART 2 - PRODUCTS

2.1 FIBER-REINFORCED CONCRETE, CHANNEL DRAINAGE SYSTEMS

- A. Description, General: Modular system of precast, fiber-reinforced concrete channel sections, grates, and appurtenances; designed so grates fit into channel recesses without rocking or rattling. Include number of units required to form total lengths indicated.
- B. Available Manufacturers:
 - 1. ABT, Inc.
 - 2. ACO Polymer Products, Inc.
 - 3. Innovative Plastics Products. Inc.
 - 4. Mea-Josam Div.; Josam Company.
 - 5. Strongwell; Lenoir City Div.
 - 6. Hydrotec Technologies/Sigma
- C. Flat Invert, Fiber-Reinforced Concrete Systems: Include the following components:
 - 1. Channel Sections: Interlocking-joint, precast, modular units with end caps; one open and one closed. Include 4-inch inside width and deep, rounded bottom, with flat slope and with outlets in number, sizes, and locations indicated. Include extension sections necessary for required depth.
 - a. Frame: Include cast-in edge rail in ductile iron.
 - b. Overall Depth: 6.30"
 - c. Channel Length per Section: 39.37"

2. Grates: Ductile iron with loading designation "Class C" with ADA compliant perforations that fit recesses in channels.
 3. Locking Mechanism: Manufacturer's standard device for securing grates to channel sections.
 4. Basis of Design Product: Maxi 100 System (4") by Hydrotec Technologies/Sigma or equal.
- D. Channel-Section Joining and Fastening Materials: As recommended by system manufacturer.

2.2 YARD DRAINS

- A. Yard Drains: Precast concrete units with cast iron covers.
1. Area Drains: 36-by-36-inch precast reinforced concrete body, with outlets in number and sizes indicated. Include gray-iron ADA compliant slotted grate, riser and short base.
 2. Covers: Campbell Foundry Co. Heavy Duty frame and grates, in design as selected by Architect.
- B. Replacement Yard Drain Covers: Gray Cast Iron ASTM A-48, Class 35B, complying with ADA requirements; by US Foundry, or equal, and as follows:
1. Grate: Round, 25 3/4" diameter, 2-1/2" overall depth; US Foundry USF 5658, ADA
 2. Ring: Round, 34" overall diameter, sized to fit grate specified; US Foundry USF 346.
- C. Supports, Anchors, and Setting Devices: Manufacturer's standard, unless otherwise indicated.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Excavation, trenching, and backfilling are specified in Division 31 Section "Earthmoving for Sitework."

3.2 DRAIN INSTALLATION

- A. Install type of drains in locations indicated.
- B. Fasten grates to drains if indicated.
- C. Set drain frames and covers with tops flush with pavement surface.
- D. Assemble trench sections with flanged joints.

3.3 CLEANING

- A. Clean interior of drains of dirt and superfluous materials.

END OF SECTION 334100