

# PROJECT MANUAL

## HVAC Replacement Newsome Park Elementary School Newport News Public Schools Newport News, Virginia

IFB #023-0-2022/SB

STATE PROJECT NO. 117-112-00-101



**THOMPSON**  
*Consulting Engineers*

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MJT Project No. 21-059

April 19, 2022

Final Submittal

HVAC REPLACEMENT  
NEWSOME PARK ELEMENTARY SCHOOL  
NEWPORT NEWS PUBLIC SCHOOLS

SECTION 000002 - PROJECT DIRECTORY

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END OF SECTION 000002



**Newsome Park Elementary School  
HVAC Replacement  
Newport News Public Schools  
April 19, 2022**

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1. SAFETY:

State Occupational Safety and Health Standards apply to this project. The Owner and Engineer shall not be held responsible for enforcement of safety conditions. Particular attention to the following subparts must be observed:

a. Ladders and Scaffolds: All ladders, scaffolds, or temporary work platforms to be kept in locked storage or removed from the job site when not in use or when unattended.

b. Cranes, Hoists, Elevators, and Conveyors: Cranes are to be guarded and/or secured at all times when on the job site so as to avoid becoming a hazard to the public and employees.

Material hoists, lifts, or conveyors are to be secured so as to avoid becoming a hazard when unattended.

c. Motor Vehicles and Mechanized Equipment: Keys must be removed and secured from vehicles and other mobile equipment when not in use or unattended.

Vehicles and mobile equipment with door locking capability will be locked when not in use.

d. Demolition: Pay particular attention to safe procedures for demolition and removal of debris so as not to create a hazard to the public and employees. The disposal of solid waste in open dumps is prohibited.

e. Additional Safety Requirements: No firearms, alcohol, or drugs may be brought onto the project at any time.

All poisonous or otherwise hazardous material will be kept in locked containers when not in use or left unattended.

Contractor's personnel will strictly adhere to all traffic regulations, traffic patterns, and speed limits.

If any hot work, including but not necessarily limited to welding, burning, or torch cutting, is required, the Contractor will station a watchman inside the building with proper fire extinguisher equipment.

f. Asbestos and all Materials Containing Asbestos: Asbestos containing materials (ACM) are present in the areas of work of this project. All known materials shall be identified to the Contractor by the Owner prior to starting any work. The Owner is responsible for the removal of all ACM required by the work of this project. If the Contractor, during the course of Work, observes or suspects the existence of asbestos in an area of the Work, the Contractor shall promptly notify the Owner. The Owner will provide the Contractor with

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the instructions relative to the suspected asbestos material. The Contractor shall not perform any work pertinent to the suspected asbestos material prior to receipt of special instruction from the Owner.

2. APPLICABLE STANDARDS AND CODES:

Wherever reference is made to any published standards, codes, or standard specification, it shall mean the latest standard code, specification, or tentative specification of the technical society, organization, or body referred to, which is in effect at the date of Invitation for Bids. The following is a partial list of typical abbreviations which may be used in the specifications and the organizations to which they refer:

ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
UL	Underwriters Laboratory
NEC	National Electrical Code
USBC	Uniform Statewide Building Code (Virginia)
VBPVRR	Virginia Boiler and Pressure Vessel Rules and Regulations

3. FIRE PROTECTION:

The Contractor shall not use flammable liquids or gases, stoves, salamanders, tar pots, etc., in and on the building unless approved by the Engineer. Where welding, cutting, or burning are necessary, incombustible shields shall be used, and suitable fire extinguishing equipment shall be maintained nearby. Paints, oils, turpentine, and similar materials shall be stored in well-ventilated spaces, and no other materials shall be stored therein. The arrangement for storage must have written approval of the Owner. The Contractor shall provide and maintain an adequate number of fire extinguishers throughout the construction period. Free and unobstructed access shall be maintained at all times to fire extinguishing equipment and fire hydrants.

The Contractor shall designate a regular supervisory employee as a Fire Warden, and he shall be responsible for all fire prevention, fire protective matters, and posting of fire protection procedures at the work site.

4. PREVENTION OF NUISANCE FROM NOISE, ETC.:

The Contractor shall be responsible for curtailing noise, smoke, fumes, or other nuisances resulting from his operations within the limitations set by law and as directed by the Owner or Engineer.

5. PERMITS:

Attention is called to license charges and fees pertaining to construction work, as levied by local governments. Such charges and fees, based on the amount of contracted work, are the responsibility of the Contractor. Such permits include but are not limited to hauling materials, dumping materials, and crossing roads with utilities. All crossings of roads shall be bore crossings

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unless otherwise agreed to by the Department of Transportation Resident Engineer. The Contractor is also responsible for paying all taxes applicable to the project.

6. TEMPORARY FACILITIES:

The Contractor shall coordinate with Owner Representative for location of trailers, storage, and portable toilet at the pre-construction meeting.

The Contractor shall control workers at all times. Workers are not to use school lounges or telephones.

When possible, parking areas for construction employees in the vicinity of the project site will be allocated. The Contractor is responsible for informing his employees that they cannot park in any location other than the allocated areas. All existing parking regulations will be enforced. Control of vehicles on the site is the responsibility of the Contractor.

Construction fencing, where required, must be adequate to protect persons and property.

7. UNDERGROUND SERVICES:

At all locations, all underground utilities or service lines uncovered or exposed by operations performed under the Contract shall be adequately protected by the Contractor. In the event of damage to underground utilities or service interruptions resulting from failure to follow all applicable procedures, the Contractor will be held responsible for resulting costs.

8. UTILITY OUTAGES:

The Contractor shall not disrupt traffic, utilities, or the normal daily operation of the school nor produce excessive dust, noise, or fumes without prior Owner Representative coordination and permission.

Authority for power outages must be obtained from the Engineer, who will coordinate the interruption of service with the Contractor and the City parties affected. In general, a request for interruption to service will require at least 21 working days for approval.

If telephone, power, cable television, gas, or water lines are to be affected by proposed digging operations, the Contractor shall notify the applicable utility company(s) and request that they locate their utilities in the field.

END OF SECTION 000820

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SECTION 000821 - OWNER'S SPECIAL RULES AND CONDITIONS

The following Rules and Conditions apply to this project. These Rules and Conditions take precedent if in conflict with other similar Rules and Conditions that appear elsewhere in this Specification.

- Contractor shall provide an on-site supervisor for the duration of the contract. Name and local telephone number will be provided to the Owner Representative.
- Contractor shall obtain and post all necessary permits. City Codes Compliance Department will inspect all aspects of the project for compliance with codes and regulations. Contractor's supervisor shall be present during all inspections.
- Contractor shall coordinate with Owner Representative for location of trailers, storage and portable toilet.
- Contractor shall not disrupt traffic, utilities, or the normal daily operation of the school nor produce excessive dust, noise, or fumes without prior Owner Representative permission.
- Contractor will be responsible for removal and proper disposal of all debris and materials generated by the project.
- Contractor shall provide safety barriers or tape around project areas. Contractor shall secure equipment and materials at all times.
- Contractor shall control workers at all times. Workers are not to use school lounges or telephones.
- Smoking is not permitted.
- Any damages sustained through the fault of the contractor shall be repaired or repaid by the contractor.

END OF SECTION 000821



SECTION 010200 - PROJECT SCHEDULE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 PURPOSE

- A. The Contractor shall begin work on the date to be specified on the Owner's written "Notice to Proceed" and shall substantially complete the project before July 31, 2024. The Contractor shall pay as liquidated damages the sum of \$1,000.00 per day for each consecutive calendar day thereafter for which the project is not substantially complete.

The Contractor shall achieve final completion the project before August 30, 2024. The Contractor shall pay as liquidated damages the sum of \$1,000.00 per day for each consecutive calendar day thereafter for which the project has not achieved final completion.

The Contractor can perform work during any period of time from the Notice to Proceed date and the substantial completion dated noted above, provided the following requirements are met:

- Prior to beginning work on site, the contractor shall present a complete project schedule to the Owner that outlines the intended construction schedule during the occupied and unoccupied periods.
- Any work completed during the occupied periods, shall not disrupt the activities of the students, staff, and operations of the facility.
- All spaces shall be heated or conditioned prior to staff and students returning to the space. If permanent HVAC equipment is not available, the Contractor shall provide temporary cooling or heating as required.
- The Contractor may work during nights, weekends and holidays to complete the project.

1.3 DETAILED DESCRIPTION OF WORK

- A. The "Work" generally includes but is not limited to the following:
1. Convert the packaged terminal window units to vertical air-cooled unit ventilators.
  2. Existing split systems will be replaced in kind as noted on the drawings.
  3. Provide new split systems as indicated on drawings.
  4. Replace exhaust fans as identified on the drawings.
  5. Replace the building automation system with HONEYWELL controls to be provided by a Honeywell Authorized Controls Integrator. This includes the NIAGRA/JACE web server platform.

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6. Provide Commissioning for all new mechanical units and controls.
7. All required electrical work to support the mechanical scope.

Contractor shall visit the site and explore the existing conditions prior to bidding. Contractor shall be aware of potential damage to building, sidewalks, roadways, and landscaping in determining the method for removal and installation of equipment. Contractor shall take special care in protecting trees that may interfere with the removal and installation of equipment.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 010200

SECTION 010800 - CODE OF CONDUCT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2. SUMMARY

- A. This Section specifies administrative and procedural requirements for the prescribed Code of Conduct while working on school premises.

1.3. CONDUCT

- A. The following rules shall apply at all times that students, faculty and staff are on the premises:
  1. Owner's Representatives are on site to assist the Contractor (and his subcontractors) in coordination of the Work at the school, and with any required interaction between school personnel. They shall be the only means of communication between the Contractor (and his subcontractors) and persons at the school, except in life threatening emergencies.
  2. Minor first-time violation of this relationship will result in a warning or removal from the project. Repeated violations will result in removal from the project.
  3. Construction workers shall under no circumstances consult with the school principal and / or teachers regarding any issue of a construction nature, except as noted above.
  4. All Contractors (subcontractors) shall wear a colored identification badge while on school premises. Failure to do so is reason for removal from the Job Site.
  5. The General Contractor will distribute and maintain badges in accordance with Owner guidelines.
  6. Fraternalization between construction workers and teachers or students is strictly prohibited. Any contact deviating from normal courteous behavior will be considered reason for removal from the project.
  7. If any student or teacher persist in disrupting the activities of construction work, the Owner's representative shall be notified immediately. Any work proceeding at the direction of a teacher, administrator or staff may result in the work being undone, corrected in accordance with the Contract Documents, or no compensation to the contractor.
  8. Use of vulgar, suggestive or abusive language is strictly prohibited in the presence of or within earshot of teachers, students, school administrators or staff.
  9. Consumption of alcohol or alcohol containing beverages is strictly prohibited on school grounds.
  10. Use and / or possession of any controlled substance or substances considered to be illegal are strictly prohibited on school grounds. Any violation will result in removal from the project, and violator shall be turned over to the proper authorities.
  11. Use and / or possession of any firearms or weapons considered to be illegal are strictly

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- prohibited on school grounds. Any violation will result in removal from the project, and violator shall be turned over to the proper authorities.
12. Cigarette smoking is prohibited on school grounds.
  13. The use of personal radios / stereos is not permitted.
  14. Construction workers shall not use the restrooms throughout the school facility.
  15. Contractors shall park in designated areas only.
  16. All construction materials and equipment shall be safely secured and stored when not in use.
  17. Any demolition work shall not cause any disruption of communication or fire alarm system in occupied areas.
  18. All construction work shall be performed to minimize disruption to any school activity. This may require the contractor to schedule work during off peak hours, and shall be accounted for by the contractor during scheduling and included within the bid. Any conflicts shall be brought to the attention of the Architect and Owner's representative prior to proceeding with the work.
  19. Construction workers are not permitted free access to the school: Access shall be limited to specific task of construction in designated areas only. The school shall not be used as a shortcut from one portion of construction Work to another, unless specifically designated as a construction route by the Contract Documents or the Owner's representative. This shall apply at all times during the Work without exception.
  20. Adequate temporary lighting shall be provided in all demolished / construction areas, including provisions for parking areas which remain in use subsequent to removal of fixtures.
  21. Fire exits may not be blocked. (except as indicated in the documents, and as directed by the local authority having jurisdiction)
  22. School dumpsters are not for construction debris. The contractor shall provide suitable equipment for prompt and safe removal of all construction debris.
  23. Adequate ventilation must be maintained during welding or torch cutting procedures. In addition, spark screens shall be used and adequate fire extinguishing equipment shall be present. All standard safety procedures shall be observed.
  24. Appropriate barricading, fencing and signage shall be used to clearly indicate areas of on-going construction, material storage, or any other condition that may create an unsafe environment for non-construction workers.
  25. The Contractor is responsible for the safety, security, and cleanliness of all school property which may remain in the assigned areas of construction.
  26. For the Contractor's protection, he may solicit the confirmation of the quantity, quality, etc. of the items of concern with the Owner's representative prior to occupancy. Any shortages or damages noted upon returning to the area of the school shall be considered the Contractor's responsibility. This is of special concern in areas where items (such as athletic equipment) are stored. This shall also include, but not be limited to, damage to carpet, vinyl floor, painted walls, blackboards, bulletin boards, clocks, speakers and furniture.
  27. Eating from the school cafeteria is not permitted.
  28. Fumes from work that occurs adjacent to HVAC intake or exhaust areas shall be blocked so that they do not enter into the HVAC system.

#### 1.4 RESPONSIBILITIES

- A. Contractor's responsibilities shall include but not be limited to the following:

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1. Owner's Representatives shall be informed and kept advised of all construction activities at the school. They will assist the Contractor in coordination of the Work effecting school systems, such as electrical, mechanical, plumbing, telephone, etc.
2. A minimum 48-hour notice is required prior to disruption of utilities or services to the school.
3. Owner's Representatives shall be informed and kept advised of the schedule for classroom turnover, and the need to have spaces vacated for construction.
4. Owner's Representatives shall be kept advised of any disruptions or concerns that develop at the school, or with any persons at the school not related to the construction.
5. The General Contractor shall have an authorized and qualified representative, project manager or superintendent *on the site at all times* during which Work is proceeding. *No exceptions.*

1.5 SPECIAL COORDINATION AND COOPERATION

- A. Owner Occupancy of Existing School Facility: The Owner may occupy all or portions of the existing school facility outside of the construction contract limits for each phase of the construction during some of the construction period. The Contractor shall cooperate with the Owner during the construction period to minimize conflicts and facilitate Owner's usage of the building / premises.
- B. The Contractor shall be responsible for scheduling Work so as not to interfere with the Owner's normal operations.
- C. To best facilitate the continued operation of the school (while in session), determine with the Owner a general sequence of construction. The additions can generally be constructed with minimal disturbance of the existing school operation. There will be the need to provide construction tunnels for Life Safety issues. See Plans.
- D. Generally, renovations shall be accomplished when areas are vacant or when school is not in session, with full access to the building unless noted otherwise.
- E. Where isolating work areas requires closing off existing exit-ways, work shall be coordinated with the Owner and the Fire Marshall, providing and maintaining safe egress from the building.
- F. Certain items / materials indicated for removal shall be salvaged and turned over to the Owner.
- G. The Contractor shall be advised of the schedule required for the installation of loose furniture, equipment, appliances, etc. as provided by the Owner under separate contract(s) in order to allow time for installation by the owner's forces.

END OF SECTION 010800

SECTION 011100 - SUMMARY OF WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DRAWINGS ACCOMPANYING PROJECT MANUAL

- A. The Drawings accompanying this Project Manual are listed immediately following the Table of Contents in this Project Manual.

1.3 PROJECT DESCRIPTION

- A. The “Work” generally includes but is not limited to the following:
  1. Convert the split system units serving the classrooms to vertical air-cooled unit ventilators.
  2. Existing split systems will be replaced in kind as noted on the drawings.
  3. Provide new packaged rooftop unit to serve the auditorium, gymnasium and cafeteria as indicated on the drawings.
  4. Replace exhaust fans as identified on the drawings.
  5. Replace the building automation system with HONEYWELL controls to be provided by a Honeywell Authorized Controls Integrator. This includes the NIAGRA/JACE web server platform.
  6. Provide Commissioning for all new mechanical units and controls.
  7. All required electrical work to support the mechanical scope.

Contractor shall visit the site and explore the existing conditions prior to bidding. Contractor shall be aware of potential damage to building, sidewalks, roadways, and landscaping in determining the method for removal and installation of equipment. Contractor shall take special care in protecting trees that may interfere with the removal and installation of equipment.

1.4 PERMITS, FEES AND CHARGES

- A. General: The Contractor shall obtain and pay for all applicable permits, fees and charges, not specifically excluded from the Contract and not specifically indicated to be obtained and paid for by the Owner.

PART 2 - PRODUCTS (NOT APPLICABLE)

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PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION 011100

SECTION 011400 - CONTRACTOR'S USE OF THE PREMISES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DESCRIPTION

- A. Work Included: This Section applies to situations in which the Contractor or his representatives, including but not necessarily limited to suppliers, subcontractors, employees, and field engineers, enter upon the Owner's property.

1.3 QUALITY ASSURANCE

- A. Promptly, upon award of the Contract, notify all pertinent personnel regarding requirements of this Section.
- B. Require that all personnel who will enter upon the Owner's property certify their awareness of and familiarity with the requirements of this Section.

1.4 SUBMITTALS

- A. Staff Names: Within 15 days of Notice to Proceed, submit a list of the Contractor's principal staff assignments, including the Superintendent and other personnel in attendance at the site; identify individuals, their duties and responsibilities; list their addresses and telephone numbers.
- B. Post copies of the list in the temporary field office.

1.5 GENERAL

- A. Construction areas of the building will be vacated during the construction period. The project shall be substantially complete before August 20, 2024. Final completion shall be achieved before September 28, 2024. The Contractor shall take all precautionary measures required by the Contract Documents, or as deemed necessary by the Owner or Engineer during the construction project, to maintain the site in a safe condition.
- B. Permission to interrupt utility service or gain access to the building shall be requested 7 calendar days in advance. Power outages must be coordinated with Owner a minimum of 21 days prior to the outage.



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- C. Limit use of the premises to construction activities in areas indicated; allow for Owner occupancy and use by the public. Confine operations to areas within limits indicated. Portions of the site beyond areas in which construction operations are indicated are not to be disturbed.
- D. The Contractor shall protect all improvements which are to remain from damage. All trees indicated to remain shall have protection devices provided, and the Contractor shall instruct all employees to prevent damage to trees and root systems. All improvement and ground areas damaged during construction shall be restored to like new work. All sidewalks, parking lot surfaces, and curbs shall be protected from the work. Any damaged surfaces shall be restored to new condition.
- E. The Contractor shall limit staging areas to prevent scattering of construction materials and equipment throughout site. The Contractor shall indicate at the Pre-Construction meeting the location and limits of staging areas that he anticipates utilizing for approval by Owner.
- F. Keep driveways and entrances serving the premises clear and available to the Owner and the Owner's employees at all times. Do not use these areas for parking or storage of materials.
- G. During the occupied portions of the project, park in designated pre-approved areas only.
- H. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on site.
- I. Maintain the building in a weather-tight condition throughout the construction period. Repair damage caused by construction operations. Take all precautions necessary to protect the building and its occupants during the construction period. Where removal of existing roof construction is necessary to accomplish the Work, have all material and labor ready to provide adequate and approved watertight temporary covering of exposed areas at the end of each day until work is complete.
- J. The Contractor shall strictly prohibit weapons, drugs, and tobacco products in all school buildings and property. The Contractor shall restrict and instruct all personnel at the project site that talking to students and/or teachers as well as using school telephones is prohibited. A dress code which requires all construction personnel to wear shirts at all times (without slogans) will be strictly enforced.

1.6 CONTRACTOR'S VEHICLES

- A. Parking for Contractor's vehicles, vehicles belonging to employees of the Contractor, and all other vehicles entering upon the Owner's property in performance of the Work of the Contract shall only use the parking and access route as authorized by the Owner.

1.7 SECURITY

- A. Restrict the access of all persons entering upon the Owner's property in connection with the work to the access route and to the actual site of the work. Employees of all Contractors shall

be required to display a photo identification badge at all times while on Newport News Public School property.

1.8 OWNER OCCUPANCY

- A. The Owner will occupy the site and all facilities located at the site during the entire period of construction. The Contractor shall cooperate fully with the Owner and any of his representatives during construction operations to minimize conflicts and to facilitate the Owner's usage of the facilities. The Contractor shall perform the work so as not to interfere with the Owner's usage and other facility operations.

1.9 CONTRACTOR'S USE OF EXISTING BUILDINGS

- A. Use of the building will not be permitted, except in the actual area of the work. The Contractor shall not allow the use of the Owner's telephone by the Contractor's personnel, subcontractor personnel, or other persons entering upon the Owner's buildings in connection with the work unless otherwise specified.

1.10 PROJECT SCHEDULE AND PHASING

- A. Refer to Section 010200, "Project Schedule".

1.11 RECORD OF EXISTING DAMAGE

- A. Prior to beginning work, the Contractor shall photograph or video tape all existing damage to building surfaces, finishes, furniture, equipment, and any other property left in the area of work. A copy of the record video, documentation, and photographs shall be provided to the Owner prior to beginning work. The Contractor shall be responsible for repair or replacement of all property damaged as a result of the Contractor's work. Should a dispute occur, the video tape, documentation, or photographs shall be used to settle the dispute. Any damage not documented shall be considered the Contractor's responsibility. Contractor shall verify the operation of all devices removed to facilitate the construction, including but not limited to speakers, clocks, motion detectors, smoke detectors, light fixtures, etc.

1.12 TIME OF WORK

- A. Construction work may be done between the hours of 6:00 A.M. and 4:00 P.M., Monday through Friday. With the Owner's prior approval, work may be done between the hours of 6:00 A.M. and 5:00 P.M., and on Saturday and Sunday.

1.13 SYSTEM SHUTDOWNS

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- A. The Contractor shall schedule the work in such a manner as to complete the work so that system downtime will be at a minimum. Under no circumstances shall the Contractor shut down any systems without Owner's approval.
- B. The Contractor shall not interfere with the operation of equipment and services in those areas of the facility where work is not scheduled and where the Owner, employees, and others occupy the facility, facilities, and/or site.
- C. The Owner's representative shall be informed at least 7 calendar days in advance of each scheduled shutdown. The Owner shall approve the shutdown schedule in writing.

1.14 CONTRACTOR'S DUMPSTER

- A. Contractor shall provide and dump regularly a minimum 10 cubic yard dumpster on site during the construction period for construction debris disposal.

1.15 MANNER OF CONDUCTING THE WORK

- A. **Daily Cleanup:** The Contractor shall regularly clean up work in a manner consistent with this Specification. The Contractor shall provide daily cleanup of dust and debris to preclude the potential of contamination of new materials and equipment or existing equipment. All building entrances, corridors, sidewalks, and exterior pavement shall be cleaned of debris and materials daily to provide clean and unobstructed vehicular and walk paths. The work shall be so executed, and such temporary facilities furnished, as to preclude interference with access within and between the existing building areas and structures and to cause no possible interference with the operation of any essential service thereof. If daily cleanup is not performed to the satisfaction of the Owner, the Owner reserves the right to perform cleanup after 24-hours' notice and back-charge Contractor at rate of \$30.00 per hour.
- B. **Existing Utilities and Equipment:** Do not operate or disturb the setting of valves, switches, or electrical equipment on the service lines to the building, and service within the building, except by proper previous arrangement with the Owner and in the presence of the Owner or his authorized representative.
- C. **Coordination:** Coordinate demolition and installation of temporary and permanent utilities with the Owner. Schedule this work so as to cause no disruption of existing building operation and minimum delay of the work. Notify the Owner a minimum of 7 calendar days in advance of anticipated utility outages, and schedule such work so as not interrupt normal school operations. Coordinate with the LOCALITY to ensure that all underground utilities are marked prior to start of work by Dominion Virginia Power. Coordinate with the LOCALITY Fire Marshal all fire system work and adhere to all requirements of the Fire Marshal for protection of the building.
- D. **Damage to Existing Facilities:** Restore existing work, including concealed work not indicated or specified to be modified, and which is damaged or otherwise affected by the Contractor's operations, to a condition equal to that which existed before the work was commenced. Use workmanlike manner where new construction adjoins, connects to, or abuts existing work. Join

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new work to existing work in such a manner as to make the joining as inconspicuous as possible. Obvious patching of damaged work will not be acceptable. At the completion, ensure that the buildings and grounds are in first-class condition within the intent of these Specifications, with all new parts well joined to the old as required, all connections completed, and all facilities in full working condition.

- E. Protection of Existing Floors, Desks, Carpets, Chairs, and Cabinetry and Other Furnishings: Protect all existing floors, carpets, desks, chairs, cabinetry, chalkboards, tackboards, and any other attached or unattached furnishings in the project areas with a minimum 6-mil polyethylene sheeting. Secure polyethylene sheeting to baseboards to protect floors. Protect wall finishes as required by construction activities. Wall finishes damaged by the attachment of protective sheeting shall be repaired and painted to match surrounding surfaces. Carpet shall be protected with a minimum of two layers of 6-mil polyethylene sheets.
- F. Prior to beginning work, the Contractor shall photograph or video tape all existing damage to building surfaces, finishes, furniture, equipment, HVAC equipment, lights, computers and peripherals, intercom, security system, computer drops, and any other property left in the area of work. A copy of the record video and photographs shall be provided to the Owner prior to beginning work. The Contractor shall be responsible for repair or replacement of all property damaged as a result of the Contractor's work. Should a dispute occur, the video tape or photographs shall be used to settle the dispute. Any damage not documented shall be considered the Contractor's responsibility.
- G. Final Cleaning: Provide professional cleaners using commercial quality building maintenance equipment and materials to clean the building in accordance with Section 017400, "Final Cleaning", prior to the date of Substantial Completion.
- H. Containment: Maintain containment barriers of the project areas as indicated and as required to preclude construction-generated dust and dirt from entering non-construction areas.
- I. In the event the Contractor does not comply with the construction documents, the Owner may procure the services of another qualified Contractor and deduct his costs from the Contract amount.

END OF SECTION 011400

SECTION 012000 - APPLICATIONS FOR PAYMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements governing the Contractor's Applications for Payment.
- B. Coordinate the Schedule of Values and Applications for Payment with the Contractor's Construction Schedule, List of Subcontracts, and Submittal Schedule.
- C. The Contractor's Construction Schedule and Submittal Schedule are included in Section "Submittals".

1.3 SCHEDULE OF VALUES

- A. Coordinate preparation of the Schedule of Values with preparation of the Contractor's Construction Schedule.
- B. Correlate line items in the Schedule of Values with other required administrative schedules and forms, including:
  - 1. Contractor's construction schedule.
  - 2. Application for Payment form.
  - 3. List of subcontractors.
  - 4. List of products.
  - 5. List of principal suppliers and fabricators.
  - 6. Schedule of submittals.
- C. Submit the Schedule of Values to the Engineer within ten (10) days after receipt of the Notice to Proceed, unless otherwise directed by the Owner.
- D. Use the Project Manual Table of Contents as a guide to establish the format for the Schedule of Values.
- E. Include the following Project identification on the Schedule of Values:
  - 1. Project name and location.
  - 2. Name of the Engineer.

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3. Project number.
  4. Contractor's name and address.
  5. Date of submittal.
- F. Arrange the Schedule of Values in a tabular form with separate columns to indicate the following for each item listed:
1. Generic name.
  2. Related Specification Section.
  3. Name of subcontractor.
  4. Name of manufacturer or fabricator.
  5. Name of supplier.
  6. Change Orders (numbers) that have affected value.
  7. Dollar value.
  8. Percentage of Contract Sum to the nearest one-hundredth percent, adjusted to total 100 percent.
- G. Provide a breakdown of the Contract Sum in accordance with requirements of the General Conditions and in sufficient detail to facilitate continued evaluation of Applications for Payment and progress reports. Break principal subcontract amounts down into several line items.
- H. Round amounts off to the nearest whole dollar; the total shall equal the Contract Sum.
- I. For each part of the Work where an Application for Payment may include materials or equipment, purchased or fabricated and stored, but not yet installed, provide separate line items on the Schedule of Values for initial cost of the materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
- J. Margins of Cost: Show line items for indirect costs, and margins on actual costs, only to the extent that such items will be listed individually in Applications for Payment. Each item in the Schedule of Values and Applications for Payment shall be complete including its total cost and proportionate share of general overhead and profit margin.
- K. At the Contractor's option, temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown as separate line items in the Schedule of Values or distributed as general overhead expense.
- L. Schedule Updating: Update and resubmit the Schedule of Values when Change Orders or Construction Change Directives result in a change in the Contract Sum.
- 1.4 APPLICATIONS FOR PAYMENT
- A. Each Application for Payment shall be consistent with previous applications and payments as certified by the Engineer and paid for by the Owner.
  - B. The initial Application for Payment, the Application for Payment at time of Substantial Completion, and the final Application for Payment involve additional requirements.

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- C. Payment Application Times: Each progress payment date is as indicated in the General Conditions. The period of construction Work covered by each Application or Payment is the period indicated in the General Conditions.
- D. Payment Application Forms: Use AIA Document G 702 and Continuation Sheets G 703 as the form for Application for Payment.
- E. Application Preparation: Complete every entry on the form, including notarization and execution by person authorized to sign legal documents on behalf of the Owner. Incomplete applications will be returned without action.
  - 1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions have been made.
  - 2. Include amounts of Change Orders and Construction Change Directives issued prior to the last day of the construction period covered by the application.
  - 3. Email a "pencil copy" to the Engineer for review and concurrence prior to sending the hard copies.
- F. Transmittal: Submit 3 executed copies of each Application for Payment to the Engineer by means ensuring receipt within 24 hours; one copy shall be complete, including waivers of lien, invoices for stored on site material, and similar attachments, when required.
  - 1. Mail hard copies to: Construction Administration Department, 22 Enterprise Parkway, Suite 200, Hampton Virginia 23666.
  - 2. Transmit each copy with a transmittal form listing attachments, and recording appropriate information related to the application in a manner acceptable to the Architect.
- G. Waivers of Mechanics Lien: With each Application for Payment submit waivers of mechanics liens from subcontractors or sub-subcontractors and suppliers for the construction period covered by the previous application.
  - 1. Submit partial waivers on each item for the amount requested, prior to deduction for retainage, on each item.
  - 2. When an application shows completion of an item, submit final or full waivers.
  - 3. The Owner reserves the right to designate which entities involved in the Work must Submit waivers.
  - 4. Submit final Application for Payment with or preceded by final waivers from every entity involved with performance of Work covered by the application who could lawfully be entitled to a lien.
- H. Waiver Forms: Submit waivers of lien on forms, and executed in a manner, acceptable to Owner.
- I. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of the first Application for Payment include the following:
  - 1. List of subcontractors.
  - 2. Schedule of Values.

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3. Contractor's Construction Schedule (preliminary if not final).
  4. Submittal Schedule (preliminary if not final).
  5. Copies of building permits
  6. Copies of authorizations and licenses from governing authorities for performance of the Work.
  7. Initial progress report.
  8. Report of pre-construction meeting.
  9. Certificates of insurance and insurance policies.
  10. Performance and payment bonds (if required).
  11. Data needed to acquire Owner's insurance.
- J. Application for Payment at Substantial Completion: Following issuance of the Certificate of Substantial Completion, submit an Application for Payment; this application shall reflect any Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
1. Administrative actions and submittals that shall proceed or coincide with this application include:
    - a. Occupancy permits and similar approvals.
    - b. Test/adjust/balance records.
    - c. Maintenance instructions.
    - d. Start-up performance reports.
    - e. Change-over information related to Owner's use, operation and maintenance.
    - f. Final cleaning.
    - g. Application for reduction of retainage, and consent of surety.
    - h. Advice on shifting insurance coverages.
    - i. List of incomplete Work, recognized as exceptions to Architect's Certificate of Substantial Completion.
    - j. Waivers of Mechanics Liens.
    - k. Items required by the General Conditions.
- K. Final Payment Application: Administrative actions and submittals which must precede or coincide with submittal of the final payment Application for Payment include the following:
1. Completion of Project closeout requirements.
  2. Completion of items specified for completion after Substantial Completion.
  3. Assurance that unsettled claims will be settled.
  4. Assurance that Work not complete and accepted will be completed without undue delay.
  5. Transmittal of required Project construction records to Owner.
  6. Proof that tax, fees and similar obligations have been paid.
  7. Removal of temporary facilities and services.
  8. Removal of surplus materials, rubbish and similar elements.
  9. Final waiver of Mechanics Liens.
  10. Items required by the General Conditions.

PART 2 - PRODUCTS (NOT APPLICABLE)



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PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION 012000

SECTION 012500 - PRODUCT SUBSTITUTIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements for handling requests for substitutions made after award of the Contract.
- B. The Contractor's Construction Schedule and the Schedule of Submittals are included under Section 013300, "Submittals".
- C. Standards: Refer to Section 014219 "Reference Standards and Definitions" for applicability of industry standards to products specified.
- D. Procedural requirements governing the Contractor's selection of products and product options are included under Section 018700 "Materials and Equipment".

1.3 DEFINITIONS

- A. Definitions used in this Article are not intended to change or modify the meaning of other terms used in the Contract Documents.
- B. Substitutions: Requests for changes in products, materials, equipment, and methods of construction required by Contract Documents proposed by the Contractor after award of the Contract are considered requests for "substitutions." The following are not considered substitutions:
  - 1. Substitutions requested by Bidders during the bidding period, and accepted prior to award of Contract, are considered as included in the Contract Documents and are not subject to requirements specified in this Section for substitutions.
  - 2. Revisions to Contract Documents requested by the Owner.
  - 3. Specified options of products and construction methods included in Contract Documents.
  - 4. The Contractor's determination of and compliance with governing regulations and orders issued by governing authorities.

1.4 SUBMITTALS

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- A. Substitution Request Submittal: Requests for substitution will be considered if received within 30 days after commencement of the Work. Requests received more than 30 days after commencement of the Work may be considered or rejected at the discretion of the Engineer.
- B. Submit 6 copies of each request for substitution for consideration. Submit requests in the form and in accordance with procedures required for Change Order proposals.
- C. Identify the product, or the fabrication or installation method to be replaced in each request. Include related Specification Section and Drawing numbers. Provide complete documentation showing compliance with the requirements for substitutions, and the following information, as appropriate:
  - 1. Product Data, including Drawings and descriptions of products, fabrication and installation procedures.
  - 2. Samples, where applicable or requested.
  - 3. A detailed comparison of significant qualities of the proposed substitution with those of the Work specified. Significant qualities may include elements such as size, weight, durability, performance and visual effect.
  - 4. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by the Owner and separate Contractors that will become necessary to accommodate the proposed substitution.
  - 5. A statement indicating the substitution's effect on the Contractor's Construction Schedule compared to the schedule without approval of the substitution. Indicate the effect of the proposed substitution on overall Contract Time.
  - 6. Cost information, including a proposal of the net change, if any in the Contract Sum.
  - 7. Certification by the Contractor that the substitution proposed is equal-to or better in every significant respect to that required by the Contract Documents, and that it will perform adequately in the application indicated. Include the Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of the failure of the substitution to perform adequately.
- D. Engineer's Action: Within 10 days of receipt of the request for substitution, the Engineer will request additional information or documentation necessary for evaluation of the request. Within 14 days of receipt of the request, or 14 days of receipt of the additional information or documentation, which ever is later, the Engineer will notify the Contractor of acceptance or rejection of the proposed substitution. If a decision on use of a proposed substitute cannot be made or obtained within the time allocated, use the product specified by name. Acceptance will be in the form of a Change Order.

## PART 2 - PRODUCTS

### 2.1 SUBSTITUTIONS

- A. Conditions: The Contractor's substitution request will be received and considered by the Engineer when one or more of the following conditions are satisfied, as determined by the Engineer; otherwise, requests will be returned without action except to record noncompliance with these requirements.

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1. Extensive revisions to Contract Documents are not required.
2. Proposed changes are in keeping with the general intent of Contract Documents.
3. The request is timely, fully documented and properly submitted.
4. The request is directly related to an "or equal" clause or similar language in the Contract Documents.
5. The specified product or method of construction cannot be provided within the Contract Time. The request will not be considered if the product or method cannot be provided as a result of failure to pursue the Work promptly or coordinate activities properly.
6. The specified product or method of construction cannot receive necessary approval by a governing authority, and the requested substitution can be approved.
7. A substantial advantage is offered the Owner, in terms of cost, time, energy conservation or other considerations of merit, after deducting offsetting responsibilities the Owner may be required to bear. Additional responsibilities for the Owner may include additional compensation to the Engineer for redesign and evaluation services, increased cost of other construction by the Owner or separate Contractors, and similar considerations.
8. The specified product or method of construction cannot be provided in a manner that is compatible with other materials, and where the Contractor certifies that the substitution will overcome the incompatibility.
9. The specified product or method of construction cannot be coordinated with other materials, and where the Contractor certifies that the proposed substitution can be coordinated.
10. The specified product or method of construction cannot provide a warranty required by the Contract Documents and where the Contractor certifies that the proposed substitution provide the required warranty.

The Contractor's submittal and Engineer's acceptance of Shop Drawings, Product Data or Samples that relate to construction activities not complying with the Contract Documents does not constitute an acceptable or valid request for substitution, nor does it constitute approval.

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION 012500

SECTION 012600 - MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements for handling and processing contract modifications.

1.3 MINOR CHANGES IN THE WORK

- A. The Engineer will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or Contract Time, on AIA Form G710, Architect's Supplemental Instructions.

1.4 CHANGE ORDER PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: The Engineer will issue a detailed description of proposed changes in the Work that will require adjustment to the Contract Sum or Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
- B. Proposal requests issued by the Engineer are for information only. Do not consider them as an instruction either to stop work in progress or to execute the proposed change.
- C. Within 10 days of receipt of a proposal request, submit an estimate of cost necessary to execute the change to the Engineer for the Owner's review.
  - 1. Include a list of quantities of products required and unit costs, with the total amount of purchases to be made. Where requested, furnish survey data to substantiate quantities.
  - 2. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
  - 3. Include a statement indicating the effect the proposed change in the Work will have on the Contract Time.
- D. Contractor-Initiated Proposals: When latent or unforeseen conditions require modifications to the Contract, the Contractor may propose changes by submitting a request for a change to the Engineer.

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1. Include a statement outlining the reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and Contract Time.
2. Include a list of quantities of products required and unit costs, with the total amount of purchases to be made. Where requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Comply with requirements in Section 012500, "Product Substitutions" if the proposed change requires substitution of one product or system for a product or system specified.

E. Proposal Request Form: Use AIA Document G709 for Change Order Proposal Requests.

1.5 CONSTRUCTION CHANGE DIRECTIVE

- A. When the Owner and the Contractor disagree on the terms of a Proposal Request, the Engineer may issue a Construction Change Directive on AIA Form G714. The Construction Change Directive instructs the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
- B. The Construction Change Directive contains a complete description of the change in the Work. It also designates the method to be followed to determine change in the Contract Sum or Contract Time.
- C. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
- D. After completion of the change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

1.6 CHANGE ORDER PROCEDURES

- A. Upon the Owner's approval of a Proposal Request, the Engineer will issue a Change Order for signatures of the Owner and the Contractor on AIA Form G701.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION 012600

SECTION 013100 - PROJECT COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section specifies administrative and supervisory requirements necessary for Project coordination including, but not necessarily limited to:
  - 1. Coordination.
  - 2. Administrative and supervisory personnel.
  - 3. General installation provisions.
  - 4. Cleaning and protection.
- B. Progress meetings, coordination meetings and pre-installation conferences are included in Section 013119, "Project Meetings".
- C. Requirements for the Contractor's Construction Schedule are included in Section 013300, "Submittals".

1.3 COORDINATION

- A. Coordinate construction activities included under various Sections of these Specifications to assure efficient and orderly installation of each part of the Work. Coordinate construction operations included under different Sections of the Specifications that are dependent upon each other for proper installation, connection, and operation.
  - 1. Where installation of one part of the Work is dependent on installation of other components, either before or after its own installation, schedule construction activities in the sequence required to obtain the best results.
  - 2. Where availability of space is limited, coordinate installation of different components to assure maximum accessibility for required maintenance, service and repair.
  - 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Where necessary, prepare memoranda for distribution to each party involved outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.
  - 1. Prepare similar memoranda for the Owner and separate Contractors where coordination of their Work is required.

- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
  - 1. Preparation of schedules.
  - 2. Installation and removal of temporary facilities.
  - 3. Delivery and processing of submittals.
  - 4. Progress meetings.
  - 5. Project Close-out activities.

#### 1.4 SUBMITTALS

- A. Staff Names: Within 15 days of Notice to Proceed, submit a list of the Contractor's principal staff assignments, including the Superintendent and other personnel in attendance at the site; identify individuals, their duties and responsibilities; list their addresses and telephone numbers.
- B. Post copies of the list in the temporary field office.

#### PART 2 - PRODUCTS (NOT APPLICABLE)

#### PART 3 - EXECUTION

##### 3.1 GENERAL INSTALLATION PROVISIONS

- A. Inspection of Conditions: Require the Installer of each major component to inspect both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.
- B. Manufacturer's Instructions: Comply with manufacturer's installation instructions and recommendations, to the extent that those instructions and recommendations are more explicit or stringent than requirements contained in Contract Documents.
- C. Inspect materials or equipment immediately upon delivery and again prior to installation. Reject damaged and defective items.
- D. Provide attachment and connection devices and methods necessary for securing Work. Secure Work true to line and level. Allow for expansion and building movement.
- E. Visual Effects: Provide uniform joint widths in exposed Work. Arrange joints in exposed Work to obtain the best visual effect. Refer questionable choices to the Engineer for final decision.
- F. Recheck measurements and dimensions, before starting each installation.



- G. Install each component during weather conditions and Project status that will ensure the best possible results. Isolate each part of the completed construction from incompatible material as necessary to prevent deterioration.
- H. Coordinate temporary enclosures with required inspections and tests, to minimize the necessity of uncovering completed construction for that purpose.
- I. Mounting Heights: Where mounting heights are not indicated, install individual components at standard mounting heights recognized within the industry for the particular application indicated. Refer questionable mounting height decisions to the Engineer for final decision.

### 3.2 CLEANING AND PROTECTION

- A. During handling and installation, clean and protect construction in progress and adjoining materials in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- B. Clean and maintain completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- C. Limiting Exposures: Supervise construction activities to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period. Where applicable, such exposures include, but are not limited to, the following:
  - 1. Excessive static or dynamic loading.
  - 2. Excessive internal or external pressures.
  - 3. Excessively high or low temperatures.
  - 4. Thermal shock.
  - 5. Excessively high or low humidity.
  - 6. Air contamination or pollution.
  - 7. Water or ice.
  - 8. Solvents.
  - 9. Chemicals.
  - 10. Light.
  - 11. Radiation.
  - 12. Puncture.
  - 13. Abrasion.
  - 14. Heavy traffic.
  - 15. Soiling, staining and corrosion.
  - 16. Bacteria.
  - 17. Rodent and insect infestation.
  - 18. Combustion.
  - 19. Electrical current.
  - 20. High speed operation.
  - 21. Improper lubrication.

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22. Unusual wear or other misuse.
23. Contact between incompatible materials.
24. Destructive testing.
25. Misalignment.
26. Excessive weathering.
27. Unprotected storage.
28. Improper shipping or handling.
29. Theft.
30. Vandalism.

END OF SECTION 013100

SECTION 013119 - PROJECT MEETINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements for project meetings including but not limited to:
  - 1. Pre-Construction Conference.
  - 2. Progress Meetings.
- B. Construction schedules are specified in another Division-1 Section.

1.3 PRE-CONSTRUCTION CONFERENCE

- A. Schedule a pre-construction conference and organizational meeting at the Project site or other convenient location no later than 15 days after execution of the Agreement and prior to commencement of construction activities. Conduct the meeting to review responsibilities and personnel assignments.
- B. Attendees: The Owner, Engineer and their consultants, the Contractor and its superintendent, major subcontractors, manufacturers, suppliers and other concerned parties shall each be represented at the conference by persons familiar with and authorized to conclude matters relating to the Work.
- C. Agenda: Discuss items of significance that could affect progress, including such topics as:
  - 1. Tentative construction schedule.
  - 2. Critical Work sequencing.
  - 3. Designation of responsible personnel.
  - 4. Procedures for processing field decisions and Change Orders.
  - 5. Procedures for processing Applications for Payment.
  - 6. Distribution of Contract Documents.
  - 7. Submittal of Shop Drawings, Product Data and Samples.
  - 8. Preparation of record documents.
  - 9. Use of the premises.
  - 10. Office, Work and storage areas.
  - 11. Equipment deliveries and priorities.
  - 12. Safety procedures.

13. First aid.
14. Security.
15. Housekeeping.
16. Working hours.

- D. Reporting: No later than 7 days after the pre-construction conference date, the Engineer will distribute copies of minutes of the conference to each party present and to other parties concerned who were not present. Included will be summaries, in narrative form, of all discussions, agreements, decisions and matters concluded.

#### 1.4 PROGRESS MEETINGS

- A. Conduct progress meetings at the Project site at regularly scheduled every 2 weeks intervals. Coordinate dates of alternate meetings with preparation of the payment request. The Engineer or the Owner's Construction Program Manager will chair the meeting.
- B. Attendees: In addition to representatives of Owner and Engineer, each subcontractor, supplier or other entity concerned with current progress or involved in planning, coordination or performance of future activities shall be represented at these meetings by persons familiar with the Project and authorized to conclude matters relating to progress.
- C. Agenda: Review and correct or approve minutes of the previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to the current status of the Project, and topics required by the General Conditions.
- D. Contractor's Construction Schedule: Review progress since the last meeting. Determine where each activity is in relation to the Contractor's Construction Schedule, whether on time or ahead or behind 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.
- E. Review the present and future needs of each entity present, including such items as:
1. Interface requirements.
  2. Time.
  3. Sequences.
  4. Deliveries.
  5. Off-site fabrication problems.
  6. Access.
  7. Site utilization.
  8. Temporary facilities and services.
  9. Hours of Work.
  10. Hazards and risks.
  11. Housekeeping.
  12. Quality and Work standards.
  13. Change Orders.
  14. Documentation of information for payment requests.

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- F. Reporting: No later than 3 days after each progress meeting date the Engineer will distribute copies of minutes of the meeting to each party present and to other parties who should have been present. The Contractor shall provide a brief summary, in narrative form, of progress since the previous meeting and report, to be attached to the minutes.
  
- G. Schedule Updating: Revise the construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue the revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 PRECONSTRUCTION CONFERENCE FORMAT

- A. The format of the Agenda for the Preconstruction Conference shall generally be as follows:

**PRE-CONSTRUCTION CONFERENCE FORMAT**

PRE-CONSTRUCTION CONFERENCE FOR:

OWNER: \_\_\_\_\_  
PROJECT: \_\_\_\_\_  
LOCATION: \_\_\_\_\_  
COMM. NO.: \_\_\_\_\_ TIME: \_\_\_\_\_ DATE: \_\_\_\_\_

AGENDA AND MINUTES:

- 1. GENERAL
  - a. Introductions and Registrations of Attendees (sign attached sheet)
  - b. Conference Format and Agenda
  - c. Agreement, Performance and Payment Bonds and Insurance
  - d. Notice to Proceed
  - e. Responsibilities of Owner, Contractor, Engineer, and Inspector

2. PROJECT COMMUNICATION AND CORRESPONDENCE

a. With Contractor:

Field Superintendent will be: \_\_\_\_\_  
Company: \_\_\_\_\_  
Street: \_\_\_\_\_  
P.O. Box: (if any) \_\_\_\_\_  
City & Zip: \_\_\_\_\_  
Attention: \_\_\_\_\_  
Telephone: Office \_\_\_\_\_  
Field \_\_\_\_\_  
Cell \_\_\_\_\_

b. With Engineer:

Project Engineer will be: \_\_\_\_\_  
Company: \_\_\_\_\_  
Street: \_\_\_\_\_  
P.O. Box: (if any) \_\_\_\_\_  
City & Zip: \_\_\_\_\_  
Attention: \_\_\_\_\_  
Telephone: Office \_\_\_\_\_  
Field \_\_\_\_\_  
Cell \_\_\_\_\_

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- 1) For questions, information, etc., Attn: \_\_\_\_\_  
In the absence of Mr. \_\_\_\_\_, if necessary, contact first  
\_\_\_\_\_,  
and second \_\_\_\_\_.
  - 2) For shop drawings and other submittals, use:  
\_\_\_\_\_
  - 3) Discuss submittals and other points on shop drawings, samples, test data, brochures  
and other submittals.
- c. With Owner – Inspector will be \_\_\_\_\_.  
Project Manager: \_\_\_\_\_.
- 1) Copies of correspondence
  - 2) Through Inspector and Engineer
  - 3) Project Identification
- d. With material suppliers and subcontractors
- e. Other
3. SCHEDULE, ESTIMATES, CHANGE ORDERS, AND TIME EXTENSIONS
- a. Project Schedule: CPM, bar chart, other
  - b. Schedule of Values (Lump Sum Breakdown)
  - c. Monthly requests for payment
    - 1) Closing date
    - 2) Format
    - 3) Preliminary approval by Inspector and Engineer copy to Owner
    - 4) Work done and materials on hand
    - 5) Place and projection of materials on hand
    - 6) Conformance to schedule
  - d. List of subcontractors and major suppliers
  - e. Change Orders
    - 1) Request for Proposal and Response
    - 2) Acceptance by Engineer and Owner
    - 3) Change Order execution by Contractor, Engineer, and Owner
    - 4) Time extension, if any
    - 5) Not official until approved by Contractor and Owner
  - f. Time extensions (other than Change Orders) all are to be on change order request.
4. CONSTRUCTION

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- a. Manner of conducting the work
  - b. Construction plant area
    - 1) On-site
    - 2) Off-site
    - 3) Disposal of wastes
  - c. Project sign(s)
  - d. Temporary facilities
  - e. Traffic maintenance
  - f. Safety – Public, on-site, personnel
  - g. Contractor’s Quality Plan and Owner’s Quality Assurance Plan
    - 1) Certificates – mfg.
    - 2) Construction quality
5. PROJECT CLOSEOUT
- a. Final cleanup
  - b. Guarantees
  - c. Punch lists and final inspections
    - 1) Testing and Adjusting
    - 2) O & M instructions and manuals
  - d. Final payment, Affidavits for Payments of Debts and Claims, Consent of Surety, Release or Waiver of Liens
  - e. Record drawings
  - f. Assessment of Roles in Construction Project
  - g. Other
6. ADDED COMMENTS BY OWNER
7. ADDED COMMENTS BY CONTRACTOR
8. ADDED COMMENTS BY PRINCIPAL SUBCONTRACTORS

END OF SECTION 013119



SECTION 013300 - SUBMITTALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements for submittals required for performance of the Work, including;
  - 1. Contractor's Construction Schedule.
  - 2. Submittal Schedule.
  - 3. Daily Construction Reports.
  - 4. Shop Drawings.
  - 5. Product Data.
  - 6. Samples.
  - 7. Quality Assurance Submittals.
- B. Administrative Submittals: Refer to other Division-1 Sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to:
  - 1. Permits.
  - 2. Applications for Payment.
  - 3. Performance and Payment Bonds.
  - 4. Insurance Certificates.
  - 5. List of Subcontractors.

1.3 SUBMITTAL PROCEDURES

- A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.
- B. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals and related activities that require sequential activity.
- C. Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals concurrently for coordination.
  - 1. The Engineer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

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2. All samples, shop drawings, and product data for finish materials requiring color selection or verification by the Engineer shall be submitted as follows: All exterior finish materials shall be submitted at one time and the Engineer will take no action on any one submittal until all items have been submitted. All interior finish materials shall also be submitted at one time, and the Engineer will take no action on any one submittal until all items have been submitted.
- D. Processing: Allow sufficient review time so that installation will not be delayed as a result of the time required to process submittals, including time for re-submittals.
1. Allow 14 days for initial review. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. The Architect will promptly advise the Contractor when a submittal being processed must be delayed for coordination.
  2. If an intermediate submittal is necessary, process the same as the initial submittal.
  3. Allow 14 days for reprocessing each submittal.
  4. No extension of Contract Time will be authorized because of failure to transmit submittals to the Engineer sufficiently in advance of the Work to permit processing.
- E. General Contractor's Review: All submittals shall be reviewed and approved by the General Contractor for conformance to the Contract Requirements and coordination with the work of other trades prior to submission to the Engineer. **All submittals submitted without the General Contractor's stamp of approval will not be considered or reviewed by the Engineer** and will be returned to the General Contractor.
- F. Submittal Preparation: Place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block.
1. Provide a space approximately 4" x 5" on the label or beside the title block on Shop Drawings to record the Contractor's review and approval markings and the action taken.
  2. Include the following information on the label for processing and recording action taken.
    - a. Project name.
    - b. Date.
    - c. Transmittal Number.
    - d. Transmittal Item Number.
    - e. Name and address of Engineer.
    - f. Name and address of Contractor.
    - g. Name and address of subcontractor.
    - h. Name and address of supplier.
    - i. Name of manufacturer.
    - j. Number and title of appropriate Specification Section.
    - k. Drawing number and detail references, as appropriate.
- G. Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal from Contractor to Engineer using a transmittal form. Submittals received from sources other than the Contractor will be returned without action.

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1. On the transmittal record relevant information and requests for data. On the form, or separate sheet, record deviations from Contract Document requirements, including minor variations and limitations. Include Contractor's certification that information complies with Contract Document requirements.

H. Completion of transmittal form by the Contractor shall be as follows:

1. Transmittal Number: Number each form consecutively as submitted. Re-submittals shall bear the number of the original submission with a letter suffix (A) added to identify it as the first resubmission. The suffix letters (B), (C), etc. shall be used if additional resubmissions are necessary.
2. Date all transmittals.
3. Restrict use of each transmittal form to submittals for one section of Specifications per form.
4. Restrict each transmittal form to a submission in only one of the following categories:
  - a. For approval.
  - b. Resubmission for approval.
  - c. Substitution for approval.
5. Item Number: Number consecutively each item submitted with each transmittal form.
6. Specification section and/or drawing number which describes or requires the item(s) shall be included for each item submitted.
7. Subcontractor: Indicate the Subcontractor for items submitted on each transmittal form.
8. Contractor, or his authorized representative shall sign each transmittal form.

I. Transmittal Form: Use the sample form at the end of this Section for transmittal of submittals.

1.4 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Critical Path Method (CPM) Bar Chart Type Schedule: Prepare a fully developed, critical path method horizontal bar-chart type Contractor's Construction Schedule. Submit within 15 days of the date established for "Commencement of the Work".

1. Provide a separate time bar for each significant construction activity. Provide a continuous vertical line to identify the first working day of each week. Use the same breakdown of units of the Work as indicated in the "Schedule of Values".
2. Within each time bar indicate estimated completion percentage in 10 percent increments. As Work progresses, place a contrasting mark in each bar to indicate Actual Completion.
3. Prepare the schedule on a sheet, or series of sheets, of stable transparency, or other reproducible media, of sufficient width to show data for the entire construction period.
4. Secure time commitments for performing critical elements of the Work from parties involved. Coordinate each element on the schedule with other construction activities; include minor elements involved in the sequence of the Work. Show each activity in proper sequence. Indicate graphically sequences necessary for completion of related portions of the Work.

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5. Coordinate the Contractor's construction schedule with the Schedule of Values, list of subcontracts, submittal schedule, progress reports, payment requests and other schedules.
  6. Indicate completion in advance of the date established for Substantial Completion. Indicate Substantial Completion on the schedule to allow time for the Engineer's procedures necessary for certification of Substantial Completion.
- B. Distribution: Following response to the initial submittal, print and distribute copies to the Engineer, Owner, subcontractors, and other parties required to comply with scheduled dates. Post copies in the Project temporary field office.
1. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.
- C. Schedule Updating: Revise the schedule after each meeting or activity, where revisions have been recognized or made. Issue the updated schedule concurrently with report of each meeting.

#### 1.5 SUBMITTAL SCHEDULE

- A. After development and acceptance of the Contractor's Construction Schedule, prepare a complete schedule of submittals. Submit the schedule within 10 days of the date required for establishment of the Contractor's construction schedule.
- B. Coordinate submittal schedule with the list of subcontracts, schedule of values and the list of products as well as the Contractor's construction schedule.
- C. Prepare the schedule in chronological order; include submittals required during the first 30 days of construction. Provide the following information:
1. Scheduled date for the first submittal.
  2. Related Section number.
  3. Submittal category.
  4. Name of subcontractor.
  5. Description of the part of the Work covered.
  6. Scheduled date for re-submittal
  7. Scheduled date the Engineer's final release or approval.
- D. Distribution: Following response to initial submittal, print and distribute copies to the Engineer, Owner, subcontractors, and other parties required to comply with submittal dates indicated. Post copies in the Project and field office.
1. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.
- E. Schedule Updating: Revise the schedule after each meeting or activity, where revisions have been recognized or made. Issue the updated schedule concurrently with report of each meeting.

## 1.6 DAILY CONSTRUCTION REPORTS

- A. Prepare a daily construction report, recording the following information concerning events at the site; and submit copies to the Engineer and Owner at weekly intervals:
1. List of subcontractors at the site.
  2. Approximate count of personnel at the site.
  3. High and low temperatures, general weather conditions.
  4. Accidents and unusual events.
  5. Include measured amount of precipitation at project site, occurring daily during period since previous report.
  6. Meetings and significant decisions.
  7. Stoppages, delays, shortages, losses.
  8. Meter readings and similar recordings.
  9. Emergency procedures.
  10. Orders and requests of governing authorities.
  11. Change Orders received, implemented.
  12. Services connected, disconnected.
  13. Equipment or system tests and start-ups.
  14. Partial Completions, occupancies.
  15. Substantial Completions authorized.

## 1.7 SHOP DRAWINGS

- A. Submit newly prepared information, drawn to accurate scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not considered Shop Drawings.
- B. Shop Drawings include fabrication and installation drawings, setting diagrams, schedules, patterns, templates and similar drawings. Include the following information:
1. Dimensions.
  2. Identification of products and materials included.
  3. Compliance with specified standards.
  4. Notation of coordination requirements.
  5. Notation of dimensions established by field measurement.
- C. Sheet Size: Except for templates, patterns and similar full-size Drawings, submit Shop Drawings on sheets at least 8-1/2" x 11" but no larger than 30" x 40".
- D. Submittals: Submit sufficient number of shop drawings as determined by the Contractor. The Engineer shall retain one copy for his use and two copies for the Owner's use.
- E. Distribution: Furnish copies of final submittal to the installers, subcontractors, suppliers, manufacturers, fabricators, and others required for performance of construction activities. Show distribution on transmittal forms.

- F. Do not proceed with installation until a copy of applicable Shop Drawings is in the installer's possession.
- G. Do not use Shop Drawings without an appropriate final stamp indicating action taken in connection with construction.
- H. Engineer will make distribution to the Owner.

1.8 PRODUCT DATA

- A. Collect Product Data into a single submittal for each element of construction or system. Product Data includes printed information such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams and performance curves. Where Product Data must be specially prepared because standard printed data is not suitable for use, submit as "Shop Drawings."
- B. Mark each copy to show applicable choices and options. Where printed Product Data includes information on several products, some of which are not required, mark copies to indicate the applicable information. Include the following information:
  - 1. Manufacturer's printed recommendations.
  - 2. Compliance with recognized trade association standards.
  - 3. Compliance with recognized testing agency standards.
  - 4. Application of testing agency labels and seals.
  - 5. Notation of dimensions verified by field measurement.
  - 6. Notation of coordination requirements.
  - 7. Material Safety Data Sheets (MSDS).
- C. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.
- D. Submittals: Submit sufficient number of required submittals as determined by the Contractor. The Engineer shall retain one copy for his use and two copies for the Owner's use.
  - 1. Unless noncompliance with Contract Document provisions is observed, the submittal may serve as the final submittal.
- E. Distribution: Furnish copies of final submittal to the installers, subcontractors, suppliers, manufacturers, fabricators, and others required for performance of construction activities. Show distribution on transmittal forms.
- F. Do not proceed with installation until an applicable copy of Product Data is in the installer's possession.
- G. Do not permit use of unmarked copies of Product Data in connection with construction.
- H. Engineer will make distribution to the Owner.

1.9 SAMPLES

- A. Submit full-size, fully fabricated Samples cured and finished as specified and physically identical with the material or product proposed. Samples include partial sections of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches showing color, texture and pattern.
1. Mount, display, or package Samples in the manner specified to facilitate review of qualities indicated. Prepare Samples to match the Engineer's Sample. Include the following:
    - a. Generic description of the Sample.
    - b. Sample source.
    - c. Product name or name of manufacturer.
    - d. Compliance with recognized standards.
    - e. Availability and delivery time.
  2. 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 the final submittal and the actual component as delivered and installed.
  3. Where variation in color, pattern, texture or other characteristics are inherent in the material or product represented, submit multiple units (not less than 3), that show approximate limits of the variations.
  4. Refer to other Specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation and similar construction characteristics.
  5. Refer to other Sections for Samples to be returned to the Contractor for incorporation in the Work. Such Samples must be undamaged at time of use. On the transmittal, indicate special requests regarding disposition of Sample submittals.
- B. Preliminary submittals: Where Samples are for selection of color, pattern, texture or similar characteristics from a range of standard choices, submit a full set of choices for the material or product.
1. Preliminary submittals will be reviewed and returned with the Engineer's mark indicating selection and other action.
- C. Submittals: Except for Samples illustrating assembly details, workmanship, fabrication techniques, connections, operation and similar characteristics, submit four sets; one will be returned marked with the action taken.
- D. Maintain sets of Samples, as returned, at the Project site, for quality comparisons throughout the course of construction.
1. Unless noncompliance with Contract Document provisions is observed, the submittal may serve as the final submittal.

2. Sample sets may be used to obtain final acceptance of the construction associated with each set.
- E. Distribution of Samples: Prepare and distribute additional sets to subcontractors, manufacturers, fabricators, suppliers, installers, and others as required for performance of the Work. Show distribution on transmittal forms.
- F. Field Samples specified in individual Sections are special types of Samples. Field Samples are full-size examples erected on site to illustrate finishes, coatings, or finish materials and to establish the standard by which the Work will be judged.
- G. Comply with submittal requirements to the fullest extent possible. Process transmittal forms to provide a record of activity.
- H. Engineer will make distribution to the Owner.

#### 1.10 QUALITY ASSURANCE SUBMITTALS

- A. Submit quality-control submittals, including design data, certifications, manufacturer's instructions, manufacturer's field reports, and other quality-control submittals as required under other Sections of the Specifications.
- B. Certifications: Where other Sections of the Specifications require certification that a product, material, or installation complies with specified requirements, submit a notarized certification from the manufacturer certifying compliance with specified requirements.
  1. Signature: Certification shall be signed by an officer of the manufacturer or other individual authorized to sign documents on behalf of the company.
- C. Inspection and Test Reports: Requirements for submittal of inspection and test reports from independent testing agencies are specified in Division 1 Section "Quality Control."

#### 1.11 ENGINEER'S ACTION

- A. Except for submittals for record, information or similar purposes, where action and return is required or requested, the Engineer will review each submittal, mark to indicate action taken, and return promptly.
- B. Compliance with specified characteristics is the Contractor's responsibility.
- C. Action Stamp: The Engineer will stamp each submittal with a uniform, self-explanatory action stamp. The stamp will be appropriately marked, as follows, to indicate the action taken:
- D. Final Unrestricted Release: Where submittals are "FURNISH AS SUBMITTED," that part of the Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents; final acceptance will depend upon that compliance.



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- E. Final-But-Restricted Release: When submittals are marked "FURNISH AS CORRECTED," that part of the Work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents; final acceptance will depend on that compliance.
- F. Final-But-Restricted Release Requiring Resubmission: When submittals are marked "REVISE AND RESUBMIT", that part of the Work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents; final acceptance will depend on that compliance. Revise or prepare new submittal in accordance with the notations; resubmit without delay.
- G. Returned for Re-submittal: When submittal is marked "REJECTED," do not proceed with that part of the Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal in accordance with the notations; resubmit without delay. Repeat if necessary to obtain a different action mark.
  - 1. Do not permit submittals marked "REJECTED" to be used at the Project site, or elsewhere where Work is in progress.
- H. Other Action: Where a submittal is primarily for information or record purposes, special processing or other activity, the submittal will be returned, marked "RECEIPT ACKNOWLEDGED".
- I. Unsolicited Submittals: The Engineer will return unsolicited submittals to the sender without action.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION 013300

# HAMPTON ROADS AREA STATEMENT OF SPECIAL INSPECTIONS

**PROJECT**

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**PERMIT APPLICANT**

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**PRIMARY RDP OF RECORD**

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**STRUCTURAL ENGINEER OF RECORD**

McPherson Design Group

\_\_\_\_\_

192 Ballard Court, #102

\_\_\_\_\_

Virginia Beach, VA 23462

\_\_\_\_\_

This Statement of Special Inspections is submitted as a condition for permit issuance in accordance with the International Building Code (IBC) as stated in the Virginia Uniform Statewide Building Code (USBC). It includes a Schedule of Special Inspections applicable to this project as well as the name of the Special Inspector, and the identity of other testing laboratories or agencies intended to be retained for conducting these inspections or tests.

The Special Inspector shall keep records of all inspections, and shall furnish inspection reports to the Building Official, appropriate Registered Design Professional(s) (RDP(s)), Owner and Contractor. All discrepancies shall be brought to the immediate attention of the Contractor for correction. If the discrepancies are not corrected, the discrepancies shall be brought to the attention of the Building Official and appropriate RDP(s). Interim reports shall be submitted to the Building Official, Owner, Contractor, and the appropriate RDP(s) according to the *Hampton Roads Regional Special Inspection Guidelines and Procedures*.

Jobsite safety is solely the responsibility of the contractor. Materials and activities to be inspected are not to include the contractor's equipment and methods used to erect or install the materials listed. **All fees/costs related to the performance of Special Inspections shall be the responsibility of the Owner. Additionally, the undersigned (RDP or SER) are only acknowledging that the items enumerated on the Schedule of Special Inspections are consistent with the required design elements, the applicable sections of the Uniform Statewide Building Code, and their area of expertise.**

**REVIEW, AUTHORIZATION & ACCEPTANCE**

**Permit Applicant (If not Owner):**

Signature / date: \_\_\_\_\_

Printed Name: \_\_\_\_\_

**Owner's Authorization (If other than Applicant):**

Signature / date: \_\_\_\_\_

Printed Name: \_\_\_\_\_

**Primary RDP of Record:  
(Review and Acceptance of Schedule)**

Signature / date: \_\_\_\_\_

Printed Name: \_\_\_\_\_

**SER of Record:  
(Review and Acceptance of Schedule)**

Signature / date: Marcos Freeman

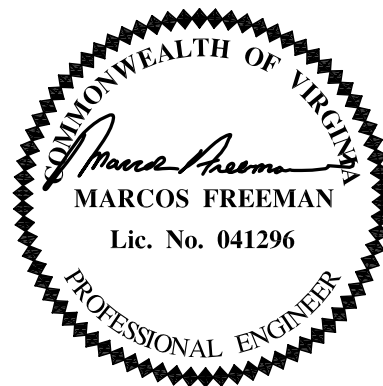
Printed Name: \_\_\_\_\_

**Building Official's Acceptance:**

Signature / date: \_\_\_\_\_

Printed Name: \_\_\_\_\_

**SCHEDULE OF SI PREPARED BY:**



Virginia RDP Seal of SSI Preparer

Printed Name of the Preparer of the Schedule (on line above)

**Special Inspector:**

Signature / date: Marcos Freeman

Printed Name: \_\_\_\_\_

SI Company Name: McPherson Design Group

## SCHEDULE OF SPECIAL INSPECTIONS

MATERIAL/ACTIVITY	TYPE OF INSPECTION	APPLICABLE TO THIS PROJECT			
		Y/C/P/N	EXTENT/REFERENCE	AGENT	COMPLETED
<b>GENERAL</b>					
Pre-construction conference	Meeting with parties listed in Section 6 of HRRSIGP to discuss Special Inspection procedures		Scheduled by SI with the Contractor prior to commencement of work; VCC 113.4	1,2	
<b>EARTHWORK</b>					
Site preparation (structure)	Field testing and inspection		Field Review; VCC 1705.6	2	
Fill material (structure)	Review submittals, field testing and inspection		Field Review; VCC 1705.6	2	
Fill compaction (structure)	In-place density tests, lift thickness		Field Review; VCC 1705.6	2	
Excavation	Field inspection and verification of proper depth		Field Review; VCC 1705.6	2	
Foundation sub-grade (structure)	Field inspection of foundation subgrade prior to placement of concrete		Field Review; VCC 1705.6	2	
<b>DEEP FOUNDATION ELEMENTS</b>					
Materials	Review product, sizes, and lengths		Submittal and Field Review; VCC 1705.7, 1705.8, 1705.9	1	
Test piles	Monitor driving of test piles		Field Review; VCC 1705.8, 1704.9 or 1704.10	2	
Installation	Monitor drilling, placement, plumbness, driving of piles, including recording blows per foot, cut off, and tip elevation		Field Review; VCC 1705.2, 1705.3, 1705.7	2	
Load test	Monitor pile load test		Field Review; VCC 1705.8, 1704.9 or 1704.10	2	
<b>CONCRETE</b>					
Materials	Review product supplied versus certificates of compliance and mix design		Submittal & Field Review; ACI 318: Ch. 19, 26.4.3, 26.4.4; VCC 1705.3, 1903.2, 1908.2, 1903.4	1	
Installation of reinforcing steel, including welding, as well as prestress tendons, anchor bolts, and fiber-reinforcement	Field inspection of placement		Submittal and Field Review; ACI 318: Ch. 20, 25.2, 25.3, 26.5.1-26.5.3; AWS D1.4; VCC 1705.3, 1901.3, 1908.4	1 and 2	
Formwork installation	Field inspection		Field Review; ACI 318; VCC 1705.3	1	
Concreting operations and placement	Field inspection of placement/sampling		Field Review; ACI 318: 26.5.2, 26.12.3; ASTM C 172, C 31; VCC 1705.3, 1908.6, 1908.7, 1908.8, 1908.10	2	
Concrete curing	Field inspection of curing process		Field Review; ACI 318: 26.5.3, 26.5.4; VCC 1705.3, 1908.9	1 and 2	
Concrete strength	Evaluation of concrete strength		Laboratory Testing; ACI 318: 26.12; VCC 1705.3	2	

MATERIAL/ACTIVITY	TYPE OF INSPECTION	APPLICABLE TO THIS PROJECT			
		Y/C/P/N	EXTENT/REFERENCE	AGENT	COMPLETED
Application of forces for prestressed concrete	Field inspection		Field Review; ACI 318: 26.10.2 (c); VCC 1705.3	1	
Grouting of prestress tendons	Field inspection		Field Review; ACI 318: 19.4.1, 20.6.4, 26.13.3.2(b); VCC 1705.3	2	
<b>PRECAST CONCRETE</b>					
Verify fabrication/quality control procedures	In-plant inspection of fabrication/quality control procedures**		Submittal or Field Review; VCC 1705.3	1	
Erection and installation	Review submittals and as-built assemblies; Field inspection of in-place precast		Submittal and Field Review; ACI 318; VCC Table 1705.3	1	
<b>MASONRY (Level ____; Building Risk Category ____)</b>					
Materials	Review of products supplied versus certificate of compliance and material submitted		Submittal & Field Review; ACI 530/ASCE 5; ACI 530.1/ASCE 6; VCC 1705.4, 1709	1	
Strength	Testing/review of strength		Submittal & Field Review; ACI 530/ASCE 5; ACI 530.1/ASCE 6; VCC 1705.4, 2105.	2	
Mortar and Grout	Inspection of proportioning and mixing. Placement of mortar only.		Submittal & Field Review; VCC 1705.4; ACI 530/ASCE 5; ACI 530.1/ASCE 6	2	
Grout placement, including prestressing grout	Verification to ensure compliance		Field Review; VCC 1705.4; ACI 530/ASCE 5; ACI 530.1/ASCE 6	2	
Grout space	Verification to ensure compliance		Field Review; VCC 1705.4; ACI 530/ASCE 5; ACI 530.1/ASCE 6; TMS 602	2	
Mortar, grout, and prism specimens	Observe Preparation		Field Review; VCC 1705.4, ACI 530.1; ASCE 6	2	
Reinforcement, prestressing tendons, and connections	Inspect condition, size, location, and spacing		Field Review; VCC 1705.4; ACI 530/ASCE 5; ACI 530.1/ASCE 6	1	
Welding of reinforcing bars	Inspection and testing of welds		Field Review; VCC 1705.3.1, 1705.4; ACI 530/ASCE 5; ACI 530.1/ASCE 6	2	
Prestressing force	Verify application and measurement		Field Review; VCC 1705.4; ACI 530/ASCE 5; ACI 530.1/ASCE 6	1	
Protection	Inspect procedures for protection during cold and hot weather		Field Review; VCC 1705.4; ACI 530/ASCE 5; ACI 530.1/ASCE 6	1 and 2	
Anchorage	Inspection of anchorages		Field Review; VCC 1705.4; ACI 530.1/ASCE 6; ACI 530/ASCE 5	1	
Masonry installation	Inspection of placement of masonry and joints		Field Review; VCC 1705.4; ACI 530/ASCE 5; ACI 530.1/ASCE 6	1 and 2	
<b>STRUCTURAL STEEL</b>					
Verify fabrication/quality control procedures	In-plant inspection of fabrication/quality control procedures** or submit Certificate of Compliance		Submittal or Field Review; VCC 1704.2.5, 1704.2.5.1, 1705.2	1	
Bolts, nuts, and washers – materials	Material identification markings; Review of Certificate of Compliance		Submittal & Field Review; VCC 1705.2.1, 1706; ASTM; AISC 360, Section A3.3	1	

MATERIAL/ACTIVITY	TYPE OF INSPECTION	APPLICABLE TO THIS PROJECT			
		Y/C/P/N	EXTENT/REFERENCE	AGENT	COMPLETED
Bolts, nuts, washers – installation	Inspection of in-place high-strength bolts, snug-tight joints, pre-tensioned and bearing type, and slip critical connections		Submittal & Field Review; VCC 1705.2.1, 2204.2; AISC 360 Section M2.5	1 or 2	
Structural steel – materials	Material identification markings and review of Certificate of Compliance		Submittal & Field Review; VCC 1705.2.1, 1706; ASTM A6, A568; AISC 360 Section A3.1	1	
Structural steel details – installation	Inspection of member locations, structural details for bracing, connections, and stiffening		Submittal & Field Review; VCC 1705.2.1, 1705.2.2, AISC 360	1 and 2	
Open-web steel joists and joist girders – installation	Inspection of end connections and bridging		Submittal & Field Review; VCC 1705.2.3	1 and 2	
Weld filler materials and welder certification	Review of identification markings, certificate of compliance, and welder certifications		Submittal & Field Review; ASTM; AISC 360 A3.5	1	
Welds	Inspection and testing of welds		Field Review; VCC 1705.2, 2204.1; AWS D1.1, D1.3	1	
Cold-formed metal deck – materials	Review of identification marking manufacturer’s certified test results		Submittal & Field Review; VCC 1705.2.2; ASTM	1	
Cold-formed metal deck – installation	Review laps and welds		Submittal & Field Review; IBC 1705.2.2, AWS D1.3	1 and 2	
Cold-formed light frame construction – welds	Review welding operation		Field Review; VCC 1705.11, 1705.11.2, 1705.11.3	2	
Cold form light frame construction wind resistance – screws	Review screw attachment bolting, anchoring hold downs, bracing, diaphragms, struts		Field Review; VCC 1705.11, 1705.11.2, 1705.11.3	1	
Cold-formed steel trusses spanning 60’ or greater	Inspection of temporary and permanent restraints/bracing		Submittal & Field Review; VCC 1705.2.4	1	
<b>WOOD</b>					
Verify fabrication/quality control procedures	In-plant inspection of fabrication/quality control procedures** or submit Certificate of Compliance		Submittal or Field Review; VCC 1704.2.5, 1704.2.5.1, 1705.5	1	
Metal plate connected wood/metal trusses spanning 60’ or more	Review approved submittal and installation of restraint/bracing		Submittal & Field Review; VCC 1704.2.5, 1704.2.5.1, 1705.5, 1705.5.2	1	
Joist Hangers – Materials/Installation	Review manufacturer’s material and test standards,		Field Review; ASTM D 1761	1	
High-Load Diaphragms - Installation	Review submittal and as-built assemblies; Inspection of sheathing, framing size, nail and staple diameter and length, number of fastener lines, and fastener spacing.		Submittal & Field Review; VCC 1705.5, 1705.5.1	1	
Wood Shear Walls – installation	Review nailing, bolting, anchoring, fastening, diaphragms, struts, braces, and hold downs when fasteners are $\leq 4'$ on center.		Field Review; VCC 1705.11.1	1	

MATERIAL/ACTIVITY	TYPE OF INSPECTION	APPLICABLE TO THIS PROJECT			
		Y/C/P/N	EXTENT/REFERENCE	AGENT	COMPLETED
<b>MAIN WIND FORCE RESISTING SYSTEM</b>					
Wind requirements	Review of the system components and installation for wood construction, cold-formed steel light frame construction, components, and cladding		Submittal & Field Review; VCC 1609.1.2, 1704.6.2, 1705.11, 1709	1	
<b>SEISMIC FORCE RESISTING SYSTEMS</b>					
Seismic requirements	Review of the designated seismic systems and seismic force resistance systems		Submittal & Field Review; VCC 1613, 1704.6.1, 1705.12, 1705.13; ASCE 7	1	
<b>SMOKE CONTROL</b>					
Special Inspection of smoke control systems	Leakage testing and recording of device location; pressure difference testing, flow measurement and detection, and control verification		Field Review; VCC 1705.18, 1705.18.1, 1705.18.2	3	
<b>SPRAYED FIRE RESISTIVE MATERIAL, FIRE RESISTANT PENETRATIONS; JOINTS, MASTIC AND INTERMESCENT FIRE RESISTANT COATING</b>					
Structural member surface conditions	Field review of surface conditions prior to application		AWCI 12-B; VCC 1705.14, 1705.14.1, 1705.14.2	2	
Application/thickness/density/bond strength	Field review of application operations, thickness, and density		ASTM E605, AWCI 12-B; VCC 1705.14.1, 1705.14.2, 1705.14.3, 1705.14.4, 1705.14.5, 1705.14.6	2	
Mastic & Intumescent Fire Resistant Coating	Field review of application operations and thickness		AWCI 12-B; VCC 1705.15	2	
<b>EXTERIOR INSULATION AND FINISH SYSTEMS (EIFS)</b>					
Application	Field Review of application/installation		ASTM E2570, VCC 1705.16	2	
<b>SPECIAL CASES</b>					
Retaining Walls	Field review of installation of pre-manufactured structural components		Field Review; VCC 113.4, 1705.1.1	1 or 2	
Sprinkler system hangers/supports	Field review of placement and anchorage		Field Review; VCC 903.3.1.1, 1705.1.1; NFPA 13: 9.2	1 or 2	
Alternative Materials and Systems	As requested by Building Official, review system and installation		VCC 113.4, 1705.1.1	1 or 2 or 3	
<b>INSPECTION AGENTS</b>		<b>FIRM</b>		<b>ADDRESS</b>	
1. Special Inspector:		McPherson Design Group		192 Ballard Court, #102 Virginia Beach, VA 23462	
2. Materials and Testing Laboratory:					
3. Special Inspector Smoke Control System:					
4. (Additional Agents)					

Note: \* The Qualifications of the Special Inspector and Testing Laboratories are subject to the Approval of the Building Official.

\*\* Inspection of quality control procedures required only if fabricator is not regularly inspected by an Approved independent inspection agency.

\*\*\*For construction projects in seismic regions, the Schedule of Special Inspections shall be expanded to include Architectural, Mechanical, and Electric components, as well as Storage Racks and Isolation Systems. Items in VCC Section 1705.12

# FINAL REPORT OF SPECIAL INSPECTIONS

**PROJECT**

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**PERMIT APPLICANT**

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**PRIMARY RDP OF RECORD**

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**STRUCTURAL ENGINEER OF RECORD**

McPherson Design Group  
192 Ballard Court, #102  
Virginia Beach, VA 23462

To the best of my information, knowledge, and belief, the Special Inspections required for this project, and itemized in the Statement of Special Inspections submitted for permit, have been completed.

Respectfully submitted,

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Type or Print Name (**Agent 1**)

Seal of SI

**Upon completion of all Special Inspections and testing, the SI shall submit a Final Report of Special Inspections to Building Official for review and approval. The Building Official review and approval is required prior to final building inspection approval or issuance of a Certificate of Occupancy.**

SECTION 014219 - REFERENCE STANDARDS AND DEFINITIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DEFINITIONS

- A. General: Basic Contract definitions are included in the General Conditions.
- B. Indicated: The term "indicated" refers to graphic representations, notes, or schedules on the Drawings, other paragraphs or schedules in the Specifications, and similar requirements in the Contract Documents. Where terms such as "shown," "noted," "scheduled," and "specified" are used, it is to help the reader locate the reference; no limitation on location is intended.
- C. Directed: Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted" mean "directed by the Engineer," "requested by the Engineer," and similar phrases.
- D. Approve: The term "approved," where used in conjunction with the Engineer's action on the Contractor's submittals, applications, and requests, is limited to the Engineer's duties and responsibilities as stated in General and Supplementary Conditions.
- E. Regulation: The term "Regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. Furnish: The term "furnish" means supply and deliver to the Project Site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. Install: The term "install" is used to describe operations at project site including the actual "unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations".
- H. Provide: The term "provide" means "to furnish and install, complete and ready for the intended use".
- I. Installer: An "Installer" is the Contractor or an entity engaged by the Contractor, either as an employee, subcontractor, or sub-subcontractor, for performance of a particular construction activity, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform.



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- J. The term "experienced" when used with the term "Installer" means having a minimum of 5 previous Projects similar in size and scope to this Project, being familiar with the precautions required, and having complied with requirements of the authority having jurisdiction.
- K. Trades: Use of titles such as "carpentry" is not intended to 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 tradespersons of the corresponding generic name.
- L. Assignment of Specialists: Certain Sections of the Specifications require that specific construction activities shall be performed by specialists who are recognized experts in the operations to be performed. The specialists must be engaged for those activities, and assignments are requirements over which the Contractor has no choice or option. Nevertheless, the ultimate responsibility for fulfilling Contract requirements remains with the Contractor.
  - 1. This requirement shall not be interpreted to conflict with enforcement of building codes and similar regulations governing the Work. It is also not intended to interfere with local trade union jurisdictional settlements and similar conventions.
- M. Project Site is the space available to the Contractor for performance of construction activities, either exclusively or in conjunction with others performing other work as part of the Project. The extent of the Project Site is shown on the Drawings and may or may not be identical with the description of the land upon which the Project is to be built.
- N. Testing Laboratories: A "testing laboratory" is an independent entity engaged to perform specific inspections or tests, either at the Project Site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

1.3 SPECIFICATION FORMAT AND CONTENT EXPLANATION

- A. Specification Format: These Specifications are organized into Divisions and Sections based on the Construction Specifications Institute's 16-Division format and MASTERFORMAT numbering system.
- B. Specification Content: This Specification uses certain conventions in the use of language and the intended meaning of certain terms, words, and phrases when used in particular situations or circumstances. These conventions are explained as follows:
- C. Abbreviated Language: Language used in Specifications and other Contract Documents is the abbreviated type. Implied words and meanings will be appropriately interpreted. Singular words will be interpreted as plural and plural words interpreted as singular where applicable and the full context of the Contract Documents so indicates.
- D. Imperative and streamlined language is used generally in the Specifications. Requirements expressed in the imperative mood are to be performed by the Contractor. At certain locations in the text, for clarity, subjective language is used to describe responsibilities that must be fulfilled indirectly by the Contractor, or by others when so noted.

1. The words "shall be" shall be included by inference wherever a colon (:) is used within a sentence or phrase.

#### 1.4 INDUSTRY STANDARDS

- A. Applicability of Standards: Except where 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. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Where the date of issue of a referenced standard is not specified, comply with the standard in effect as of date of Contract Documents.
- 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, refer requirements that are different, but apparently equal, and uncertainties to the Engineer 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. In complying with these requirements, indicated numeric values are minimum or maximum, as appropriate for the context of the requirements. Refer uncertainties to the Engineer for a decision before proceeding.
- D. Copies of Standards: Each entity engaged in construction on the Project is required to be familiar with industry standards applicable to that entity's construction activity. Copies of applicable standards are not bound with the Contract Documents.
  1. Where copies of standards are needed for performance of a required construction activity, the Contractor shall obtain copies directly from the publication source.
- E. Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. Where such acronyms or abbreviations are used in the Specifications or other Contract Documents, they mean the recognized name of the trade association, standards generating organization, authority having jurisdiction, or other entity applicable to the context of the text provision. Refer to the "Encyclopedia of Associations," published by Gale Research Co., available in most libraries.

#### 1.5 GOVERNING REGULATIONS/AUTHORITIES

- A. The Engineer has contacted authorities having jurisdiction where necessary to obtain information necessary for preparation of Contract Documents; that information may or may not be of significance to the Contractor. Contact authorities having jurisdiction directly for information and decisions having a bearing on the Work.

1.6 SUBMITTALS

- A. Permits, Licenses, and Certificates: For the Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, and similar documents, correspondence, and records established in conjunction with compliance with standards and regulations bearing upon performance of the Work.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION 014219

SECTION 015000 - TEMPORARY FACILITIES AND PROTECTION OF PROPERTY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section specifies requirements for temporary services and facilities, including utilities, construction and support facilities, security and protection of property.
- B. Temporary utilities required include but are not limited to:
  - 1. Use of electric power and water.
  - 2. Provision of telephone and fax.
  - 3. Sanitary facilities, including drinking water.
- C. Temporary construction and support facilities required include but are not limited to:
  - 1. Temporary job office.
  - 2. Waste disposal services.
  - 3. Construction aids and miscellaneous services and facilities.
- D. Security and protection facilities required include but are not limited to:
  - 1. Staging and storage areas.
  - 2. Temporary fire protection.
  - 3. Barricades, warning signs, lights.
  - 4. Protection of installed work.
  - 5. Security against theft and vandalism.

1.3 SUBMITTALS

- A. Drawings: Submit partial site plans that indicate the following:
  - 1. Proposed locations of fenced temporary storage areas for material and equipment.
  - 2. Dimensions of fenced storage locations indicating gates.
  - 3. Location of job office.
  - 4. Contractor parking area.
  - 5. Proposed crane access for setting of roof mounted equipment.

#### 1.4 QUALITY ASSURANCE

- A. Regulations: Comply with industry standards and applicable laws and regulations if authorities having jurisdiction, including but not limited to:
  - 1. Building Code requirements.
  - 2. Health and safety regulations.
  - 3. Utility company regulations.
  - 4. Police, Fire Department and Rescue Squad rules.
  - 5. Environmental protection regulations.
- B. Standards: Comply with NFPA Code 241, "Building Construction and Demolition Operations", ANSI-A10 Series standards for "Safety Requirements for Construction and Demolition".

#### 1.5 PROJECT CONDITIONS

- A. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Take necessary fire prevention measures. Do not overload facilities, or permit them to interfere with progress. Do not allow hazardous dangerous or unsanitary conditions, or public nuisances to develop or persist on the site.
- B. Maintain security against theft and vandalism for the site and the building at all times until the date of Substantial Completion.

#### 1.6 DESCRIPTION OF REQUIREMENTS

- A. Definitions: Specific administrative and procedure minimum actions are specified in this section, as extensions of provisions in General Conditions and other contract documents. These requirements have been included for special purposes as indicated. Nothing in this section is intended to limit types and amount of temporary work required, and no omission from this section will be recognized as an indication by the Engineer that such temporary activity is not required for successful completion of the work and compliance with requirements of contract documents. Provisions of this section are applicable to, but not limited to utility services, construction facilities, security/protection provisions and support facilities.
- B. It shall be the responsibility of the Contractor to determine the applicable requirements to initiate and maintain all required safety and health programs, and to follow the recommendations of Federal, State and Local officials.

#### 1.7 JOB OFFICE

- A. Provide job office for the resident superintendent and his assistants to be located in an Owner approved location. Maintain during the entire construction period. Maintain construction and record documents at the job office. Include the following as a minimum in the office:
  - 1. Work table, minimum size 36" x 72".

2. Telephone and fax machine.
3. Air conditioning, ventilation, and lighting.

#### 1.8 TEMPORARY ELECTRIC POWER AND WATER

- A. The contractor may utilize existing permanent electric power and water within the facility during the construction phase of the work. Coordinate connection requirements with Owner's representative. All connection costs shall be borne by the Contractor. Usage costs shall be borne by the Owner. Contractor's use of Owner's existing permanent power and water shall in no way limit availability of these utilities to the Owner's facilities. Contractor shall restore Owner's permanent utilities to pre-construction conditions after removal of temporary utility connections.

#### 1.9 TEMPORARY TELEPHONE AND FAX

- A. Provide a job telephone and fax machine through the completion of all punch list items until Substantial Completion and Owner occupancy.
- B. Pay for installation, maintenance, removal, and local service charges.
- C. Long-distance calls shall be paid by the party who places the call.

#### 1.10 SANITARY FACILITIES

- A. Provide and maintain temporary toilets as necessary for use of all construction personnel. Place toilets in convenient locations, and maintain in sanitary condition. Provide portable container or sanitary bubbler drinking fountains.
- B. Provide adequate washing facilities for all construction personnel. Place in convenient locations.
- C. Existing toilet facilities shall not be used by construction personnel.
- D. Sanitary facilities shall be located as directed by Owner. Provide sanitary facilities for the duration of the project including the punch list period.

#### 1.11 SIGNS

- A. A project sign may be provided in accordance with the Owner's standards.

#### 1.12 FIRE PROTECTION

- A. Provide temporary fire protection as required by authorities having jurisdiction throughout the entire construction period. Maintain access to the site and to the building at all times for Fire Department apparatus and personnel. Maintain access to fire protection devices at all times.

#### 1.13 STAGING AND STORAGE AREAS

- A. Locate staging and storage areas within areas designated or approved by the Owner. Provide gates, double gates, fencing and locks as required to secure all construction materials and protect from vandalism. Remove any potentially hazardous or flammable materials, including all welding materials, from the site at the end of each workday. Materials which will be installed in the project area shall not be stored in uncontrolled exterior locations where they may be susceptible to temperature, humidity, rain, dirt, and dust.
- B. Provide and maintain weathertight storage as required.

#### 1.14 PROTECTION OF INSTALLED WORK

- A. Protect installed work from elevated temperature and humidity, dust, and dirt. Provide special protection where specified in individual Specification Sections.
- B. Provide protective coverings at openings in air-handling units, ductwork, chases, walls, and other items of construction to prevent damage, contamination by dust, and transmission of dust to other spaces.
- C. Provide temporary and removable protection for installed products. Control activity in immediate work area to minimize damage.
- D. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- E. Use all means necessary to protect the site, the building, and all materials stored or installed at all times, including the employment of a watchman or guard when required.
- F. Provide weather protection as described in this specification for any penetrations made in the existing building.
- G. Where mechanical and other construction work is performed from the roof, the immediate area or as indicated shall be protected with plywood, particle board, or other approved protection board. Where construction workers are likely to walk, protect similarly. Protection shall be secured in an approved manner to prevent damage to roof. Remove protection board from the site upon completion of the work.

#### 1.15 REMOVAL

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- A. Remove all temporary facilities from the site and leave the site and affected off-site areas in a clean and finished condition prior to final acceptance.

1.16 OSHA (Occupational Safety and Health Act)

- A. Comply with all requirements of the Occupational Safety and Health Act for job safety and health standards.

1.17 CONSTRUCTION AIDS

- A. Provide all temporary stairs, ladders, ramps, runways, hoists, chutes, and other facilities necessary for the proper execution of the work. Provide guard rails and warning lights as required for job safety.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Provide materials suitable for the use intended.

2.2 EQUIPMENT

- A. General: Provide equipment suitable for use intended.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Use qualified personnel for installation of temporary facilities. Locate facilities where they will serve the Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.
- B. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed, or are replaced by authorized use of completed permanent facilities.
- C. Temporary Lighting: Whenever overhead floor or roof deck has been installed, provide temporary lighting with local switching.
- D. Install and operate temporary lighting that will fulfill security and protection requirements, without operating the entire system, and will provide adequate illumination for construction operations and traffic conditions.



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- E. Telephones: Provide cellular telephone service for all personnel engaged in construction activities, throughout the construction period, until final completion.
- F. Sanitary facilities include temporary toilets, wash facilities and drinking water fixtures. Comply with regulations and health codes for the type, number, location, operation and maintenance of fixtures and facilities. Install where facilities will best serve the Project's needs.
- G. Provide toilet tissue, paper towels, paper cups and similar disposable materials for each facility. Provide covered waste containers for used material.
- H. Toilets: Install self-contained toilet units. Shield toilets to ensure privacy. Use of pit-type privies will not be permitted.
- I. Wash Facilities: Install wash facilities supplied with potable water at convenient locations for personnel involved in handling materials that require wash-up for a healthy and sanitary condition. Dispose of drainage properly. Supply cleaning compounds appropriate for each condition.
- J. Drinking Water Facilities: Provide containerized tap-dispenser bottled-water type drinking water units, including paper supply.

3.2 TEMPORARY CONSTRUCTION AND SUPPORT FACILITIES INSTALLATION

- A. Maintain temporary construction and support facilities until near Substantial Completion. Remove prior to Substantial Completion, unless otherwise indicated. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to the Owner.
- B. Temporary Enclosures: Provide temporary enclosure for protection of construction in progress and completed, from exposure, foul weather, other construction operations and similar activities.
- C. Install tarpaulins securely, with incombustible wood framing and other materials. Close openings of 25 square feet or less with plywood or similar materials.
- D. Close openings through floor or roof decks and horizontal surfaces with load-bearing wood-framed construction.
- E. Temporary Lifts and Hoists: Provide facilities for hoisting materials and employees. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.
- F. Project Identification and Temporary Signs: Signs are not permitted.
- G. Collection and Disposal of Debris and Waste: Collect debris and waste from construction areas and elsewhere daily. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce requirements strictly. Do not hold materials more than 7

days during normal weather or 3 days when the temperature is expected to rise above 80 deg F (27 deg C). Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material in a lawful manner.

- H. Burying of waste materials on the site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.
- I. Provide rodent proof containers located convenient to areas of construction.
- J. Provide a dumpster for use by all subcontractors.

### 3.3 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Except for use of permanent fire protection as soon as available, do not change over from use of temporary security and protection facilities to permanent facilities until Substantial Completion, or longer as requested by the Engineer.
- B. Temporary Fire Protection: Until fire protection needs are supplied by permanent facilities, install and maintain temporary fire protection facilities of the types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 10 "Standard for Portable Fire Extinguishers," and NFPA 241 "Standard for Safeguarding Construction, Alterations and Demolition Operations."
  - 1. Locate fire extinguishers where convenient and effective for their intended purpose, but not less than one extinguisher on each floor at or near each usable stairwell.
  - 2. Store combustible materials in containers in fire-safe locations.
  - 3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities, stairways and other access routes for fighting fires. Prohibit smoking in hazardous fire exposure areas.
- C. Provide supervision of welding operations, combustion type temporary heating units, and similar sources of fire ignition.
- D. Barricades, Warning Signs and Lights: Comply with standards and code requirements for erection of structurally adequate barricades. Paint with appropriate colors, graphics and warning signs to inform personnel and the public of the hazard being protected against. Where appropriate and needed provide lighting, including flashing red or amber lights.
- E. Security Enclosure and Lockup: Install substantial temporary enclosure of partially completed areas of construction. Provide locking entrances to prevent unauthorized entrance, vandalism, theft and similar violations of security.
- F. Storage: Where materials and equipment must be stored, and are of value or attractive for theft, provide a secure lockup. Enforce discipline in connection with the installation and release of material to minimize the opportunity for theft and vandalism.
- G. Environmental Protection: Provide protection, operate temporary facilities and conduct construction in ways and by methods that comply with environmental regulations, and

minimize the possibility that air, waterways and subsoil might be contaminated or polluted, or that other undesirable effects might result. Avoid use of tools and equipment which produce harmful noise. Restrict use of noise making tools and equipment to hours that will minimize complaints from persons or firms near the site.

### 3.4 OPERATION, TERMINATION AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.
- B. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage by freezing temperatures and similar elements.
  - 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation and similar facilities on a 24-hour day basis where required to achieve indicated results and to avoid possibility of damage.
  - 2. Protection: Prevent water filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.
- C. Termination and Removal: Unless the Engineer requests that it be maintained longer, remove each temporary facility when the need has ended, or when replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with the temporary facility. Repair damaged Work, clean exposed surfaces and replace construction that cannot be satisfactorily repaired.
- D. Materials and facilities that constitute temporary facilities are property of the Contractor. The Owner reserves the right to take possession of Project identification signs.
- E. Repair or replace street paving, curbs and sidewalks damaged by construction activities to match surrounding conditions.
- F. Seed the staging and storage areas within construction fences and any other areas on the school property where damage has occurred due to trucks, cranes, excavations, or other construction activities.
- G. A satisfactory stand of turf from the seeding operation is defined as a minimum of 15 grass plants per square foot. Bare spots can be no larger than 6" square. Total bare spots must be less than 2% of the total seeded area.
- H. Contractor is responsible for maintenance of seeded area until acceptance by Owner.

END OF SECTION 015000

SECTION 017000 - PROJECT CLOSEOUT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements for project closeout, including but not limited to:
  - 1. Punch List procedures.
  - 2. Project record document submittal.
  - 3. Operating and maintenance manual submittal.
  - 4. Submittal of warranties.
  - 5. Final cleaning.
- B. Closeout requirements for specific construction activities are included in the appropriate Sections in Divisions 1 through 26.

1.3 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting punch list for certification of Substantial Completion, complete the following. List exceptions in the request.
  - 1. In the Application for Payment that coincides with, or first follows, the date Substantial Completion is claimed, show 100% completion for the portion of the Work claimed as substantially complete. Include supporting documentation for completion as indicated in these Contract Documents and a statement showing an accounting of changes to the Contract Sum.
    - a. If 100% completion cannot be shown, include a list of incomplete items, the value of incomplete construction, and reasons the Work is not complete.
  - 2. Advise Owner of pending insurance change-over requirements.
  - 3. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications and similar documents.
  - 4. Obtain and submit releases enabling the Owner unrestricted use of the Work and access to services and utilities; include occupancy permits, operating certificates and similar releases.

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5. Submit record drawings, operations and maintenance manuals, and similar final record information. Operations and maintenance manuals shall be furnished to Owner 14 days before date operation and maintenance instructions and demonstrations are to occur.
  6. Deliver tools, spare parts, extra stock, and similar items.
  7. Make final changeover of permanent locks and transmit keys to the Owner. Advise the Owner's personnel of changeover in security provisions.
  8. Complete start-up testing of systems, and instruction of the Owner's operating and maintenance personnel.
  9. Discontinue or change over and remove temporary facilities from the site, along with construction tools, mock-ups, and similar elements.
  10. Complete final clean up requirements, including touch-up painting. Touch-up and otherwise repair and restore marred exposed finishes.
- B. Contractor's Punch List Report: Prepare a complete list of all work remaining to be completed, deficiencies to be corrected, and any other items or requirements not yet fulfilled.
- C. Punch List Procedures: On receipt of a request for Punch List and the Contractor's Punch List Report, the Engineer will either proceed with Punch List or advise the Contractor of unfulfilled requirements. The Engineer will prepare the Certificate of Substantial Completion following Punch List, or advise the Contractor of construction that must be completed or corrected before the certificate will be issued.
- D. The Engineer will repeat Punch List when requested and assured that the Work has been substantially completed.
- E. Results of the completed Punch List will form the basis of requirements for final acceptance.

#### 1.4 FINAL ACCEPTANCE

- A. Preliminary Procedures: Before requesting final Punch List for certification of final acceptance and final payment, complete the following. List exceptions in the request.
1. Submit the final payment request with releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.
  2. Submit an updated final statement, accounting for final additional changes to the Contract Sum.
  3. Submit a certified copy of the Engineer's final Punch List of items to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance and the list has been endorsed and dated by the Engineer.
  4. Submit final meter readings for utilities, a measured record of stored fuel, and similar data as of the date of Substantial Completion, or when the Owner took possession of and responsibility for corresponding elements of the Work.
  5. Submit Consent of Surety to Final Payment.
  6. Submit a final liquidated damages settlement statement.
  7. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
  8. See Project Closeout Checklist at the end of this Section for additional requirements.

- B. Punch List Backcheck Procedure: The Engineer will backcheck the Work upon receipt of notice that the Work, including Punch List items from earlier Punch Lists, has been completed, except items whose completion has been delayed because of circumstances acceptable to the Engineer.
1. Upon completion of backcheck, the Engineer will prepare a certificate of final acceptance or advise the Contractor of Work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance.
  2. Only if absolutely necessary, will the Punch List backcheck procedure be repeated. It is the Contractor's responsibility to inspect the Work and have all items completed prior to requesting a Punch List backcheck. All Engineer's costs incurred beyond the initial Punch List backcheck shall be borne by the Contractor.

#### 1.5 RECORD DOCUMENT SUBMITTALS

- A. General: Refer to Section 017839, "Project Record Documents", for additional requirements. Do not use record documents for construction purposes; protect from deterioration and loss in a secure, fire-resistive location; provide access to record documents for the Engineer's reference during normal working hours.
- B. Maintenance Manuals: Refer to Section 017823, "Operation and Maintenance Data" for submittal requirements.

#### PART 2 - PRODUCTS (NOT APPLICABLE)

#### PART 3 - EXECUTION

##### 3.1 CLOSEOUT PROCEDURES

- A. Operating and Maintenance Instructions: Arrange for each installer of equipment that requires regular maintenance to meet with the Owner's personnel to provide instruction in proper operation and maintenance. If installers are not experienced in procedures, provide instruction by manufacturer's representatives. Two weeks prior to all demonstrations, such as the mechanical and electrical controls and equipment, plumbing, and, fire alarm, the Owner shall have in his possession all related manuals of operation and maintenance for the system. The Owner shall be notified one week in advance of intended time and date of all above demonstrations. Include a detailed review of the following items:
1. Maintenance manuals.
  2. Record documents.
  3. Spare parts and materials.
  4. Tools.
  5. Lubricants.
  6. Fuels.

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7. Identification systems.
8. Control sequences.
9. Hazards.
10. Cleaning.
11. Warranties and bonds.
12. Maintenance agreements and similar continuing commitments.

B. 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.
8. Trouble-shooting procedures and corrections (explain most frequent causes of failure).

P R O J E C T C L O S E O U T C H E C K L I S T

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The following items must be submitted prior to processing Final Application and Certificate for Payment and Closeout of Project.

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<u>ITEM</u>	<u>STATUS</u>
Certificate of Substantial Completion	Engineer will provide
Letter from Contractor indicating that items on the Punch List have been completed, corrected and accepted by the Engineer	Contractor will provide
Consent of the Surety Company to final payment General Release from Contractor	Contractor will provide
Release of Liens from Major Subcontractors	Contractor will provide
Affidavit of the Contractor that all Subcontractors and material men have been paid in full	Contractor will provide
Written certification from the Contractor to the Engineer and Owner that no asbestos containing materials or products were included in the Project	Contractor will provide
Record Drawings	Contractor will provide
Record Specifications	Contractor will provide
Operations and Maintenance Manuals	Contractor will provide
Standard Warranty from Contractor	Contractor will provide
Special Warranties from Materials & Equipment Suppliers	Contractor will provide
Cost proposals for all outstanding changes in the Contract.	Contractor will provide
Final Application and Certificate for Payment	Contractor will provide

END OF SECTION 017000



SECTION 017400 - FINAL CLEANING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements for final cleaning at Substantial Completion.
- B. Special cleaning requirements for specific elements of the Work area included in appropriate Sections of Divisions 1 through 16.
- C. General Project closeout requirements are included in Section 017000, "Project Closeout".
- D. General cleanup and waste removal requirements are included in Section 015000, "Temporary Facilities".
- E. Environmental Requirements: Conduct cleaning and waste disposal operations in compliance with local laws and ordinances. Comply fully with federal and local environmental and anti-pollution regulations.
  - 1. Do not dispose of volatile wastes such as mineral spirits, oil or paint thinner in storm or sanitary drains.
  - 2. Burying of debris, rubbish or other waste material on the premises will not be permitted.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by the 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 FINAL CLEANING

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- A. General: Provide final cleaning operations when indicated. Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit of Work to the condition expected from a commercial building cleaning and maintenance program. Comply with manufacturer's instructions.
- B. Complete the following cleaning operations before requesting inspection for Certification of Substantial Completion for the entire Project or a portion of the Project.
- C. Clean the Project site, yard and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste materials, litter and foreign substances. Sweep paved areas broom clean. Remove petro-chemical spills, stains and other foreign deposits. Rake grounds that are neither planted nor paved, to a smooth even-textured surface.
- D. Remove tools, construction equipment, machinery and surplus material from the site.
- E. 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.
- F. Remove debris and surface dust from limited access spaces, including roofs, plenums, and similar spaces.
- G. Remove labels that are not permanent labels.
- H. Touch-up and otherwise repair and restore marred exposed finishes and surfaces. Replace finishes and surfaces that can not be satisfactorily repaired or restored, or that show evidence of repair or restoration. Do not paint over "UL" and similar labels, including mechanical and electrical name plates.
- I. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication, paint and mortar droppings and other foreign substances.
- J. Leave the Project clean and ready for occupancy.
- K. Removal of Temporary Protection: Remove temporary protection and facilities installed during construction to protect previously completed installations during the remainder of the construction period.
- L. Compliances: Comply with governing regulations and safety standards for cleaning operations. Remove waste materials from the site and dispose of in a lawful manner.
- M. Where extra materials of value remain after completion of associated construction have become the Owner's property, dispose of these materials as directed.

END OF SECTION 017400

SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DESCRIPTION

- A. Work Included: To aid the continued instruction of operating and maintenance personnel, and to provide a positive source of information regarding the products incorporated into the work, furnish and deliver the data described in this section and in pertinent other sections of these Specifications.
- B. Related Work: Required contents of submittals also may be amplified in pertinent other sections of these Specifications.

1.3 QUALITY ASSURANCE

- A. In preparing data required by this Section, use only personnel who are thoroughly trained and experienced in the operation and maintenance of the described items, completely familiar with the requirements of this Section, and skilled in communicating the essential data.

1.4 SUBMITTALS

- A. Unless otherwise directed in other sections or in writing by the Engineer, submit three copies of the final manual to the Engineer for approval prior to indoctrination of operation and maintenance personnel.

PART 2 - PRODUCTS

2.1 INSTRUCTION MANUALS

- A. Where instruction manuals are required to be submitted under other Sections of these Specifications, prepare in accordance with the provisions of this Section.
- B. Format:
  - 1. Size: 8-1/2" x11"
  - 2. Paper: White bond, at least 20-lb. weight.

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3. Text: Typed (Hand printed or written is not acceptable)
  4. Drawings: 11" x 8" preferable; bind in with text; foldouts are acceptable; larger drawings are acceptable if folded to fit within the manual and provide a drawing pocket inside rear cover or bind in with text.
  5. Fly Sheets: Separate each portion of the manual with neatly prepared Fly Sheets or tabbed index sheets briefly describing the contents of the ensuing portion. Fly Sheets or index tabs may be in color.
  6. Binding: Use heavy-duty plastic covers with binding mechanism concealed inside the manual; 3-ring binders or GBC binding is acceptable. All binding is subject to the Engineer's approval.
- C. Provide front and back covers for each manual, using durable plastic material approved by the Engineer, and clearly identified on the front cover with at least the following information:

OPERATING AND MAINTENANCE INSTRUCTIONS

FOR

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(Name, addresses, and telephone numbers of Contractor and Subcontractors)

(name and address of Engineer)

(Engineer's approval and date approved)

- D. Contents:
1. Neatly prepared and typewritten detailed table of contents.
  2. Complete instructions regarding operation and maintenance of all equipment involved, including lubrication, disassembly, and re-assembly.
  3. Complete nomenclature of all parts of all equipment.
  4. Complete nomenclature and part number of all replaceable parts, name and address of nearest vendor, and all other data pertinent to procurement procedures.
  5. Copy of all guarantees and warranties issued.
  6. Manufacturer's bulletin, cuts, and descriptive data, where pertinent, clearly indicating the precise items included in this installation and deleting, or otherwise clearly indicating, all manufacturers' data with which this installation is not concerned.
  7. Equipment inventory, refer to specification sections 230100 and 260100.
  8. Such other data as required in pertinent Sections of these Specifications.

### PART 3 - EXECUTION

#### 3.1 INSTRUCTION MANUALS

- A. Final Manuals: Complete the Manuals in strict accordance with the Specifications and the Engineer's review comments.

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- B. Submit one copy of the manual to Engineer for review.
- C. Revisions: Following the indoctrination and instruction of operation and maintenance personnel, review all proposed revisions of the Manual with the Engineer.
- D. Submit three copies of the manual and a CD containing an electronic version of the Manual in PDF format to the Engineer after completion of reviews.

END OF SECTION 017823

SECTION 017836 - WARRANTIES AND BONDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section specifies general administrative and procedural requirements for warranties and bonds required by the Contract Documents, including manufacturers' standard warranties on products and special warranties.
- B. Refer to the General Conditions for terms of the Contractor's special warranty of workmanship and materials.
- C. General closeout requirements are included in Section 017000, "Project Closeout".
- D. Specific requirements for warranties for the Work and products and installations that are specified to be warranted are included in the individual Sections of Divisions 1 through 26.
- E. Certifications and other commitments and agreements for continuing services to Owner are specified elsewhere in the Contract Documents.
- F. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

1.3 DEFINITIONS

- A. Standard Product Warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.
- B. Special Warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.

1.4 WARRANTY REQUIREMENTS

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- A. Related Damages and Losses: When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.
- B. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
- C. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.
- D. Owner's Recourse: Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.
- E. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.
- F. The Owner reserves the right to refuse to accept Work for the Project where a special warranty, certification, or similar commitment is required on such Work or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.

1.5 SUBMITTALS

- A. Submit written warranties directly to the Owner, with copies to the Engineer prior to the date of final payment.
- B. When a designated portion of the Work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Engineer within fifteen days of completion of that designated portion of the Work.
- C. Form of Submittal: At Final Completion compile three copies of each required warranty and bond properly executed by the Contractor, or by the Contractor's subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Project Manual.
- D. Bind warranties and bonds in heavy-duty, commercial quality, durable 3-ring vinyl covered loose-leaf binders, one for each set, thickness as necessary to accommodate contents, and sized to receive 8-1/2" by 11" paper.

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1. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address and telephone number of the installer.
  2. Identify each binder on the front and the spine with the typed or printed title "WARRANTIES AND BONDS", the Project title or name, and the name of the Contractor.
- E. When operating and maintenance manuals are required for warranted construction, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION 017836



SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DESCRIPTION

- A. Work Included:
  - 1. Throughout progress of the work, maintain an accurate record of changes in the Contract Documents, as described in this Section.
  - 2. Upon completion of the work, transfer the recorded changes to a set of Record Documents, as described in this Section. Cross reference all changes to addenda, change orders, etc.

1.3 QUALITY ASSURANCE

- A. Assign the responsibility for maintenance of Record Documents to one person on the Contractor's staff as approved by the Engineer.
- B. Accuracy of Records:
  - 1. Thoroughly coordinate changes within the Record Documents, making adequate and proper entries on each page of the Specifications and each sheet of drawings and other documents where such entry is required to show the change properly.
  - 2. Accuracy of records shall be such that future search for items shown in the Contract Documents may rely reasonably on information obtained from the approved Project Record Documents.
- C. Make entries within 24 hours after receipt of information that the change has occurred.

1.4 SUBMITTALS

- A. The Engineer's approval of the current status of Project Record Documents is a prerequisite to the Engineer's approval of requests for progress payment and request for final payment under the Contract.
- B. Prior to submitting each request for progress payment, secure the Engineer's approval of the current status of the Project Record Documents.

- C. Prior to submitting request for final payment, submit the final Project Record Documents to the Engineer and secure his approval.

#### 1.5 PRODUCT HANDLING

- A. Maintain the job set of Record Documents completely protected from deterioration and from loss and damage until completion of the work and transfer of all recorded data to the final Project Record Documents.
- B. In the event of loss of the recorded data, use means necessary to again secure the data to the Engineer's approval.
  - 1. Such means shall include, if necessary in the opinion of the Engineer, removal and replacement of concealed materials.
  - 2. In such case, provide replacements to the standards originally required by the Contract Documents.

#### 1.6 MAINTENANCE OF JOB SET

- A. Identify each of the job set documents with the title, "RECORD DOCUMENTS - JOB SET".
- B. Preservation of Documents:
  - 1. Considering the Contract completion time, the probable number of occasions upon which the job set must be taken out for new entries and for examination, and the conditions under which these activities will be performed, devise a suitable method for protecting the job set suitable to the Engineer.
  - 2. Do not use the job set for any purpose except entry of new data and for review by the Engineer, until start of transfer of data to the final Project Record Documents.
  - 3. Maintain the job set at the site of work as that site is designated by the Engineer.
- C. Making Entries on Drawings:
  - 1. Using an erasable colored pencil (not ink or indelible pencil), clearly describe the change by graphic line and note as required. Colors that are not reproducible using standard printing procedures shall not be used.
  - 2. Date all entries.
  - 3. Call attention to the entry by drawing a box or other shape in a manner that avoids confusion with the original shapes and elements on the drawing around the area or areas affected.
  - 4. In the event of overlapping changes, use different colors for the overlapping changes.
- D. Make entries in the pertinent other documents as approved by the Engineer.
- E. Conversion of Schematic Layouts:

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1. In some cases on the drawings, arrangements of conduits, circuits, piping, ducts, and similar items, are shown schematically and are not intended to portray precise physical layout.
  - a. Final physical arrangement is determined by the Contractor, subject to the Engineer's approval.
  - b. However, design of future modifications of the facility may require accurate information as to the final physical layout of items which are shown only schematically on the drawings.
2. The Engineer may waive the requirements for conversion of schematic layouts where, in the Engineer's judgment, conversion served no useful purpose. However, do not rely upon waivers being issued except as specifically issued in writing by the Engineer.

1.7 FINAL PROJECT RECORD DOCUMENTS

- A. The purpose of the final Project Record Documents is to provide factual information regarding all aspects of the work, both concealed and visible, to enable future modification of the work to proceed without lengthy and expensive site measurement, investigation, and examination.
- B. Review and Submittal:
  1. Submit the completed set of Project Record Documents to the Engineer for approval.
  2. Make required changes and promptly deliver the final Project Record Documents to the Engineer.

1.8 CHANGES SUBSEQUENT TO ACCEPTANCE

- A. The Contractor has no responsibility for recording changes in the work subsequent to final completion, except for changes resulting from work performed under warranty.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 017839

SECTION 018700 - MATERIALS AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 QUALITY ASSURANCE

- A. Source Limitations: To the fullest extent possible, provide products of the same kind, from a single source.
- B. Compatibility of Options: When the Contractor is given the option of selecting between two or more products for use on the Project, the product selected shall be compatible with products previously selected, even if previously selected products were also options.
- C. Nameplates: Except for required labels and operating data, do not attach or imprint manufacturer's or producer's nameplates or trademarks on exposed surfaces of products which will be exposed to view in occupied spaces or on the exterior.
- D. Labels: Locate required product labels and stamps on a concealed surface or, where required for observation after installation, on an accessible surface that is not conspicuous.
- E. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on an easily accessible surface which is inconspicuous in occupied spaces. The nameplate shall contain the following information and other essential operating data:
  - 1. Name of product and manufacturer.
  - 2. Model and serial number.
  - 3. Capacity.
  - 4. Speed.
  - 5. Ratings.

1.3 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle products in accordance with the manufacturer's recommendations, using means and methods that will prevent damage, deterioration and loss, including theft.
- B. Schedule delivery to minimize long-term storage at the site and to prevent overcrowding of construction spaces.

HVAC REPLACEMENT  
NEWSOME PARK ELEMENTARY SCHOOL  
NEWPORT NEWS PUBLIC SCHOOLS

- C. 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.
- D. Deliver products to the site in the manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting and installing.
- E. Inspect products upon delivery to ensure compliance with the Contract Documents, and to ensure that products are undamaged and properly protected.
- F. Store products at the site in a manner that will facilitate inspection and measurement of quantity or counting of units.
- G. Store heavy materials away from the Project structure in a manner that will not endanger the supporting construction.
- H. Store products subject to damage by the elements above ground, under cover in a weathertight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instructions.

## PART 2 - PRODUCTS

### 2.1 PRODUCT SELECTION

- A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, unused at the time of installation.
- B. Provide products complete with all accessories, trim, finish, safety guards and other devices and details needed for a complete installation and for the intended use and effect.
- C. Standard Products: Where available, provide standard products of types that have been produced and used successfully in similar situations on other projects.
- D. Product Selection Procedures: Product selection is governed by the Contract Documents and governing regulations, not by previous Project experience. Procedures governing product selection include the following:
- E. Semi-proprietary Specification Requirements: Where three or more products or manufacturers are named, provide one of the products indicated. No substitutions will be permitted.
- F. Where products or manufacturers are specified by name, accompanied by the term "or equal" or "or approved equal" comply with the Contract Document provisions concerning "substitutions" to obtain approval for use of an unnamed product.
- G. Non-Proprietary Specifications: When the Specifications list products or manufacturers that are available and may be incorporated in the Work, but do not restrict the Contractor to use of these products only, the Contractor may propose any available product that complies with Contract

requirements. Comply with Contract Document provisions concerning "substitutions" to obtain approval for use of an unnamed product.

- H. Descriptive Specification Requirements: Where Specifications describe a product or assembly, listing exact characteristics required, with or without use of a brand or trade name, provide a product or assembly that provides the characteristics and otherwise complies with Contract requirements.
- I. Performance Specification Requirements: Where Specifications require compliance with performance requirements, provide products that comply with these requirements, and are recommended by the manufacturer for the application indicated. General overall performance of a product is implied where the product is specified for a specific application.
  - 1. Manufacturer's recommendations may be contained in published product literature, or by the manufacturer's certification of performance.
- J. Compliance with Standards, Codes and Regulations: Where the Specifications only require compliance with an imposed code, standard or regulation, select a product that complies with the standards, codes or regulations specified.
- K. Visual Matching: Where Specifications require matching an established Sample, the Engineer's decision will be final on whether a proposed product matches satisfactorily.
  - 1. Where no product available within the specified category matches satisfactorily and also complies with other specified requirements, comply with provisions of the Contract Documents concerning "substitutions" for selection of a matching product in another product category, or for noncompliance with specified requirements.
- L. Visual Selection: Where specified product requirements include the phrase "...as selected from manufacturer's standard colors, patterns, textures..." or a similar phrase, select a product and manufacturer that complies with other specified requirements. The Engineer will select the color, pattern and texture from the product line selected.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION OF PRODUCTS

- A. Comply with manufacturer's instructions and recommendations for installation of products in the applications indicated. Anchor each product securely in place, accurately located and aligned with other Work.
- B. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

END OF SECTION 018700



**Marine Chemist Service, Inc.**

11850 TUG BOAT LANE  
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FAX: (757) 873-1074 · NORFOLK (757) 625-5696  
[www.MarineChemist.com](http://www.MarineChemist.com)

Credentials	Agency	Scope
Approval	DOD-US Navy	Resin
Accreditation	ABS	Hull Thickness
Accreditation	AIHA-LAP, LLC	<u>Laboratory ID: 100551</u>
	ELLAP	Paint, Soil, Wipe & Air
	EMLAP	Direct Examination: Air & Tape
	IHLAP	Asbestos: PCM
		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	<u>Laboratory Code: 200628-0</u>
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	<u>Laboratory No: 460257</u>
	NELAC	RCRA 8 Metals: TCLP & NPW
Virginia Laboratory	DGS - DPOR	<u>License No.: 3333 000004</u>
		Asbestos: PLM & PCM

NOTE: Laboratory Credentials cover only to the scopes listed above.

May 18, 2021

Newport News Public Schools  
12580 Patrick Henry Drive  
Newport News, Virginia 23606

Attention: Pennie Boyack

Reference: (Classrooms 27-43 and Kitchen through Auditorium)  
Newsome Park Elementary School  
4200 Marshall Avenue  
Newport News, Virginia  
MCS Job #21-049S

Dear Mrs. Boyack:

Please find enclosed the Asbestos Inspection Report including Lab Analysis for the above referenced job site.

If you have any questions, please do not hesitate to contact us.

Sincerely,

Shawn Cowden  
Virginia Asbestos Inspector  
License #3303 004066

**PARTIAL ASBESTOS INSPECTION REPORT  
OF  
NEWSOME PARK ELEMENTARY SCHOOL  
4200 MARSHALL AVENEUE  
NEWPORT NEWS, VIRGINIA  
(CLASSROOMS 27-43 AND KITCHEN THROUGH AUDITORIUM)  
MCS JOB #21-049S**



**Marine Chemist Service, Inc.**  
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Marine Chemist Service, Inc.

**Partial Asbestos Inspection Report**

**of**

**Newsome Park Elementary School  
4200 Marshall Avenue  
Newport News, Virginia  
(Classrooms 27-43 and Kitchen through Auditorium)**

**on**

**April 5, 2021**

**Prepared For:**

**Pennie Boyack  
Newport News Public Schools  
12580 Patrick Henry Boulevard  
Newport News, Virginia, 23606  
MCS Job #21-049S**

**By**

**Shawn Cowden  
Virginia Asbestos Inspector License #3303 004066  
Marine Chemist Service, Inc.  
11850 Tug Boat Lane  
Newport News, Virginia 23606  
(757) 873-0933**

May 25, 2021

Date

Inspector Signature

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SECTION 7 -----Inspection Information

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Marine Chemist Service, Inc.

# SECTION 1

## Partial Asbestos Inspection Report

**PARTIAL ASBESTOS INSPECTION OF NEWSOME PARK ELEMENTARY SCHOOL  
4200 MARSHALL AVENUE  
NEWPORT NEWS, VIRGINIA  
(CLASSROOMS 27-43, KITCHEN THROUGH AUDITORIUM)**

**INTRODUCTION**

**Background and Purpose**

There has been a growing public awareness of the link between the inhalation of asbestos fibers and various diseases such as asbestosis, mesothelioma, lung, and other cancers. As a result, the Asbestos Hazard Emergency Response Act (AHERA 40 CFR Part 763) for schools grades K through 12 was established by EPA.

The necessary components of an AHERA inspection require the accredited inspector to visually inspect and assess the condition of all known or assumed friable asbestos containing building materials (ACBM); to visually inspect non - friable ACBM and touch it to determine friability, and to identify homogeneous areas of friable materials.

EPA's National Emission Standards for Hazardous Air Pollutants (NESHAPS) require thorough inspections for asbestos in structures before the renovation or demolition of those structures.

Virginia law requires that if the initial building permit was issued prior to January 1, 1985, an asbestos inspection must be performed prior to the local authorities issuing a building permit.

In order to comply with NESHAPS, buildings to be renovated or demolished must be thoroughly inspected for asbestos containing building materials. Marine Chemist Service, Inc. follows the AHERA sampling protocol for interior surveys and the Virginia standard for roof surveys.

The purpose of this survey was to provide information for this property concerning the location and type of accessible and/or visible asbestos containing materials prior to renovation.

In compliance with Virginia Regulations, Marine Chemist Service Inc. performed asbestos sampling and a partial asbestos inspection of classrooms 27-43 and kitchen through auditorium at Newsome Park Elementary School, 4200 Marshall Avenue, located in Newport News, Virginia on April 5, 2021.

## **General Information**

Marine Chemist Service, Inc. was hired by Pennie Boyack, on April 5, 2021 to conduct asbestos bulk sampling for suspect asbestos-containing building materials at Newsome Park Elementary School, located in Newport News, Virginia.

## **Authorization**

Authorization to perform this testing was provided in the form of a phone call notice to proceed by Pennie Boyack on April 1, 2021. The building was unoccupied at the time of the inspection.

## **Warranty**

This visual inspection and laboratory report has been prepared in accordance with AHERA and Virginia requirements and current accepted professional practices. A minimum number of bulk asbestos samples were collected to determine the presence or absence of asbestos. This inspection has been performed to provide the client with information concerning the presence of accessible and/or exposed suspect asbestos containing building materials. Destructive testing was performed during the inspection. This inspection documents conditions at the time of the inspection only. No other warranties are implied or expressed.

## **SURVEY METHODS**

### **Inspection Methods**

The asbestos survey was performed by a Virginia licensed asbestos inspector. A visual walk through inspection was performed to identify suspect asbestos containing materials and homogeneous areas.

### **Sampling Methods**

The Virginia licensed asbestos inspector sampled the identified suspect materials within the homogeneous areas following the visual inspection. Sampling was not performed on any inaccessible materials and did not involve destructive testing of building components. Sample locations were selected randomly.

## **LABORATORY METHODS**

### **Analysis Methods**

The bulk sample was first visually observed and described. The sample was mounted onto a slide, covered with dispersion staining oil and a cover slip, and observed under a polarized light microscope (PLM). The asbestos and non-asbestos materials in the sample are identified by this method.

The PLM microscopist estimates the amounts of asbestos and non-asbestos components by determining visually the relative volume of each to the total volume of the sample.

## ASBESTOS INSPECTION

### Document Review and On-Site Survey

Blueprints were provided for the inspection and a sketch was made upon which sample/asbestos material locations were marked.

### Identification of Suspect Asbestos Containing Materials

A visual inspection was performed on the suspect asbestos containing materials found in the surveyed areas. The suspect asbestos containing materials are as follows:

1. 12" Floor Tile
2. Base Cove/ Adhesive
3. Sink Undercoating
4. Drywall
5. Plaster
6. Block Sealer
7. Pipe Sealer
8. Carpet Adhesive
9. 2' Ceiling Tile

## **Bulk Sampling**

Bulk sampling was performed on all suspect asbestos-containing materials found in the areas and the minimum number of samples were taken as required in the AHERA Standards.

Bulk samples were taken penetrating all layers of the material. The samples were at least one cubic centimeter and were placed in a sealed container at the time of collection. All precautions were taken to prevent exposure to those present in or around the facility during the collection of samples. All sampling locations were patched with an encapsulant after the sampling was complete.

Samples listed below are grouped into homogeneous areas. Homogeneous areas are areas, which are uniform by color, texture, construction/application date, and general appearance.

Some sample results in the % asbestos column may be displayed in this report with a slash between two numbers, (#/#). The first number represents the first material listed under the material location/description and the second number represents the second material listed.

When N/A is placed in the friable category it means the sample tested negative - (0) or less than one percent - ( $\leq 1\%$ ) for asbestos and the friable description does not apply.

Samples were analyzed utilizing Polarized Light Microscopy (PLM) with dispersion staining by a NVLAP accredited laboratory (Marine Chemist Service, Inc. NVLAP Lab Code 200628-0). The results are in section 6.





## SECTION 2

# Sample Summary Table



Newsome Park Elementary School

4200 Marshall Avenue

Newport News, Virginia

(Classrooms 27-43, Kitchen through Auditorium)

Sample #	Lab Sample #	Material Location and Description	% Asbestos	Friable Y/N
NPS-1	0132663-001	Room 42, White 12" Floor Tile	0/0	N/A
NPS-2	0132663-002	Auditorium, White 12" Floor Tile	0/0	N/A
NPS-3	0132663-003	Room 39, White 12" Floor Tile	0/0/5/10	N
NPS-4	0132663-004	Room 42, Blue, 12" Floor Tile	0	N/A
NPS-5	0132663-005	Room 40, Blue 12" Floor Tile	0/0	N/A
NPS-6	0132663-006	Cafeteria, Blue 12" Floor Tile	0/5	N
NPS-7	0132663-007	Room 37, Beige 12" Floor Tile	5/10	N
NPS-8	0132663-008	Room 35, Beige 12" Floor Tile	5/10/0	N
NPS-9	0132663-009	Cafeteria, Beige 12" Floor Tile	0/10	N
NPS-10	0132663-010	Room 37, Brown 12" Floor Tile	0/5	N
NPS-11	0132663-011	Room 36, Brown 12" Floor Tile	0/5	N
NPS-12	0132663-012	Room 34, Brown 12" Floor Tile	0/5	N
NPS-13	0132663-013	Room 37, Pink 12" Floor Tile	0/0	N/A
NPS-14	0132663-014	Room 35, Pink 12" Floor Tile	0/5	N
NPS-15	0132663-015	Room 34, Pink 12" Floor Tile	0/10	N
NPS-16	0132663-016	Room 35, Gray 12" Floor Tile	0/0/0/5	N
NPS-17	0132663-017	Room 35, Gray 12" Floor Tile	0/0	N/A
NPS-18	0132663-018	Room 35, Gray 12" Floor Tile	0/0/0/5	N
NPS-19	0132663-019	Room 36, Black 12" Floor Tile	0/0	N/A
NPS-20	0132663-020	Room 28, Black 12" Floor Tile	0/0	N/A
NPS-21	0132663-021	Staff Lounge, Black 12" Floor Tile	0/10	N
NPS-22	0132663-022	Room 29, Off-White 12" Floor Tile	10/0/0	N
NPS-23	0132663-023	Room 27, Off-White 12" Floor Tile	0/10	N
NPS-24	0132663-024	Staff Lounge, Off-White 12" Floor Tile	0/10	N
NPS-25	0132663-025	Room 42, Black 4" Base Cove/Adhesive	0	N/A
NPS-26	0132663-026	Cafeteria, Black 4" Base Cove/Adhesive	0/0	N/A
NPS-27	0132663-027	Auditorium, Blue 4" Base Cove/Adhesive	0/0	N/A
NPS-28	0132663-028	Room 43, Blue 4" Base Cove/Adhesive	0/0	N/A
NPS-29	0132663-029	Room 37, Brown 4" Base Cove/Adhesive	0	N/A
NPS-30	0132663-030	Room 32, Brown 4" Base Cove/Adhesive	0/0	N/A
NPS-31	0132663-031	Room 42, Sink Undercoating	3	N
NPS-32	0132663-032	Room 34, Sink Undercoating	5	N



Sample #	Lab Sample #	Material Location and Description	% Asbestos	Friable Y/N
NPS-33	0132663-033	Room 29, Drywall	0/0/0	N/A
NPS-34	0132663-034	Library Hall, Drywall	0	N/A
NPS-35	0132663-035	Hall at Room 34, Drywall	0	N/A
NPS-36	0132663-036	Kitchen Bathroom Ceiling, Plaster	0	N/A
NPS-37	0132663-037	Kitchen Closet Ceiling, Plaster	0	N/A
NPS-38	0132663-038	Kitchen Back Hall Ceiling, Plaster	0	N/A
NPS-39	0132663-039	Auditorium, Block Sealer	0	N/A
NPS-40	0132663-040	Room 43, Block Sealer	0	N/A
NPS-41	0132663-041	Cafeteria, Block Sealer	0	N/A
NPS-42	0132663-042	Stage, Pipe Sealer	0/0	N/A
NPS-43	0132663-043	Closet at Auditorium Entrance, Pipe Sealer	0/0	N/A
NPS-44	0132663-044	Cafeteria Overhead, Pipe Sealer	0/0	N/A
NPS-45	0132663-045	Main Office, Green 12" Floor Tile	0/0	N/A
NPS-46	0132663-046	Main Office, Green 12" Floor Tile	0/0/0/10	N
NPS-47	0132663-047	Main Office, Green 12" Floor Tile	0/0/0/5	N
NPS-48	0132663-048	Main Office, Carpet Adhesive	3	N
NPS-49	0132663-049	Main Office, Carpet Adhesive	3	N
NPS-50	0132663-050	Main Office, Carpet Adhesive	3	N
NPS-51	0132663-051	Room 42, 2' Ceiling Tile, Pinwheel	0	N/A
NPS-52	0132663-052	Room 37, 2' Ceiling Tile, Pinwheel	0	N/A
NPS-53	0132663-053	Room 33, 2' Ceiling Tile, Pinwheel	0	N/A
NPS-54	0132663-054	Hall at Cafeteria, 2' Ceiling Tile, Wormed	0	N/A
NPS-55	0132663-055	Hall at Room 34, 2' Ceiling Tile, Wormed	0	N/A
NPS-56	0132663-056	Room 29, 2' Ceiling Tile, Wormed	0	N/A
NPS-57	0132663-057	Cafeteria, 2' Ceiling Tile, Dotted	0	N/A
NPS-58	0132663-058	Main Office 2, 2' Ceiling Tile, Dotted	0	N/A
NPS-59	0132663-059	Hall at Room 32, 2' Ceiling Tile, Dotted	0	N/A

**Comments**

1. The following sampled materials tested positive for asbestos:
  - Rooms 34 through 37: 12” Beige Floor Tile/Mastic, and Mastics under 12” Pink and Brown Floor Tiles
  - Rooms 38 and 39: 12” Beige Floor Tile/Mastic under 12” White Floor Tile
  - Rooms 29, 27, and Teacher/Staff Lounge: Mastic under 12” Off-White and Black Floor Tiles
  - Cafeteria: Mastic under 12” Beige and Blue Floor Tiles
  - Main Office: Mastic under Carpet
  - Main Office: Mastic under 12” Green Floor Tile
  - Rooms 30 through 43: Sink Undercoating
  
2. Asbestos might be found within the walls, ceiling and/ or pipe chases during the renovation or demolition of the building. If any suspect materials are found, they should be treated as asbestos or tested for asbestos.

**Approximate Quantities of Asbestos Materials**

<b><u>ASBESTOS CONTAINING MATERIALS</u></b>	<b><u>QUANTITY</u></b>
Rooms 34 through 37: 12” Beige Floor Tile/Mastic, and Mastic under 12” Pink and Brown Floor Tiles	~2,800 sq. ft.
Rooms 38 and 39: 12” Beige Floor Tile/Mastic under 12” White Floor Tile	~1,200 sq. ft.
Rooms 29, 27, and Teacher/Staff Lounge: Mastic under 12” Off-White and Black Floor Tiles	~2,000 sq. ft.
Cafeteria: Mastic under 12” Beige and Blue Floor Tiles	~5,000 sq. ft.
Main Office: Mastic under Carpet	~800 sq. ft.
Main Office: Mastic under 12” Green Floor Tile	~350 sq. ft.
Rooms 30 through 43: Sink Undercoating	14



Marine Chemist Service, Inc.

## SECTION 3 General Legend and Notes

### **GENERAL LEGEND**

**O** - Sample number/location - non-asbestos

**△** - Sample number/location - contains asbestos

### **GENERAL NOTES**

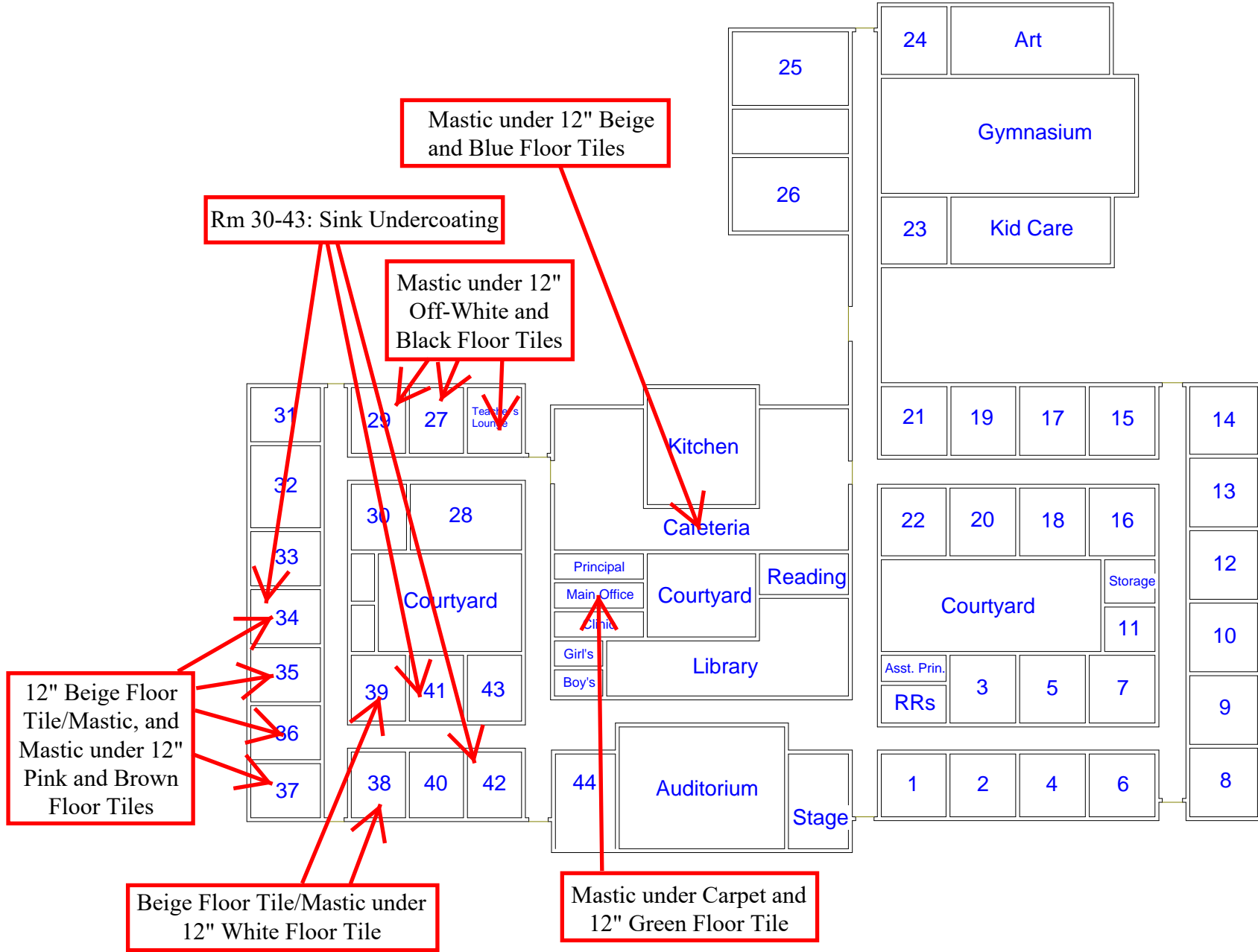
1. The EPA's definition of a friable material is one that contains more than 1% asbestos by weight and can be crumbled, pulverized or reduced to a powder by hand pressure when dry, or which under normal use or maintenance emits or can be expected to emit asbestos fibers into the air.
2. All quantities are approximate.



Marine Chemist Service, Inc.

## SECTION 4

# Asbestos Containing Material Sketches

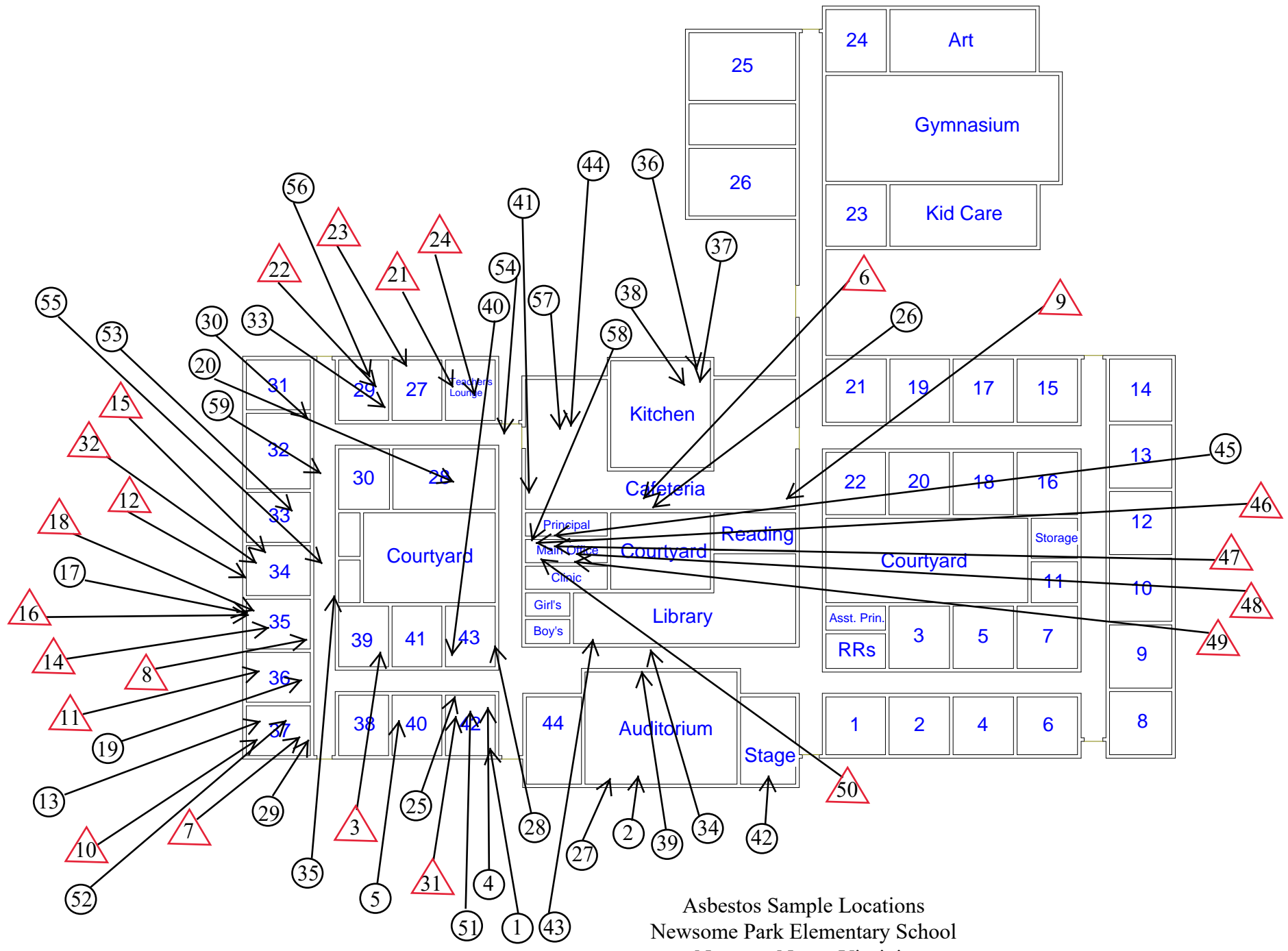


Asbestos Positive Materials Locations  
 Newsome Park Elementary School  
 Newport News, Virginia



## SECTION 5

### Survey Sample Location Sketches



Asbestos Sample Locations  
 Newsome Park Elementary School  
 Newport News, Virginia



Marine Chemist Service, Inc.

## SECTION 6 Reports of Analysis



**Marine Chemist Service, Inc.**  
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[www.MarineChemist.com](http://www.MarineChemist.com)

<b>Credentials</b>	<b>Agency</b>	<b>Scope</b>
Approval	DOD-US Navy	Resin
Accreditation	ABS	Hull Thickness
Accreditation	AIHA-LAP, LLC	<u>Laboratory ID: 100551</u>
	ELLAP	Paint, Soil, Wipe & Air
	EMLAP	Direct Examination: Air & Tape
	IHLAP	Asbestos: PCM
		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	<u>Laboratory Code: 200628-0</u>
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	<u>Laboratory No: 460257</u>
	NELAC	RCRA 8 Metals: TCLP & NPW
Virginia Laboratory	DGS - DPOR	<u>License No.: 3333 000004</u>
		Asbestos: PLM & PCM

NOTE: Laboratory Credentials cover only to the scopes listed above.

Plant Services - NNPS  
 Attn: Pennie Robbins Boyack  
 12580 Patrick Henry Dr.  
 Newport News VA 23602

**MCS Report No.:** 0132663  
**Report Date:** 04/30/2021  
**MCS Job No.:** 21-049S  
**Customer PO No.:**

**Date Sampled:** 04/05/2021  
**Sampled By:** Shawn Cowden  
**Job Location:** Newsome Park Elementary, NN

**Date Received:** 04/06/2021  
**Received By:** JAS  
**Sample Matrix:** BULK  
**Date Analyzed:** 04/19/2021

**Method of Analysis:** Polarized Light Microscopy (PLM) using Environmental Protection Agency (EPA) Methods: EPA - 40 CFR Appendix E to Subpart E of Part 763 and EPA 600/R93-116, July 1993.

## REPORT OF ANALYSIS

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type	(%)	Non-Asbestos Components	(%)
0132663-001 NPS-1	Rm 42, White 12" Floor Tile					
	Floor Tile, White	LAYER 1 90%	None Detected		Non-Fibrous Material	100%
	Mastic, Yellow	LAYER 2 10%	None Detected		Cellulose Fiber Non-Fibrous Material	5% 95%
<b>Asbestos Present: No</b>		<b>Total % Asbestos:</b>		<b>No Asbestos Detected</b>		
0132663-002 NPS-2	Auditorium, White 12" Floor Tile					
	Floor Tile, White	LAYER 1 90%	None Detected		Non-Fibrous Material	100%
	Mastic, Yellow	LAYER 2 10%	None Detected		Cellulose Fiber Non-Fibrous Material	5% 95%
<b>Asbestos Present: No</b>		<b>Total % Asbestos:</b>		<b>No Asbestos Detected</b>		



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 NEWPORT NEWS, VA 23606-2527  
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[www.MarineChemist.com](http://www.MarineChemist.com)

<b>Credentials</b>	<b>Agency</b>	<b>Scope</b>
Approval	DOD-US Navy	Resin
Accreditation	ABS	Hull Thickness
Accreditation	AIHA-LAP, LLC	<u>Laboratory ID: 100551</u>
	ELLAP	Paint, Soil, Wipe & Air
	EMLAP	Direct Examination: Air & Tape
	IHLAP	Asbestos: PCM
		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	<u>Laboratory Code: 200628-0</u>
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	<u>Laboratory No: 460257</u>
	NELAC	RCRA 8 Metals: TCLP & NPW
Virginia Laboratory	DGS - DPOR	<u>License No.: 3333 000004</u>
		Asbestos: PLM & PCM

NOTE: Laboratory Credentials cover only to the scopes listed above.

Plant Services - NNPS  
 Attn: Pennie Robbins Boyack  
 12580 Patrick Henry Dr.  
 Newport News VA 23602

**MCS Report No.:** 0132663  
**Report Date:** 04/30/2021  
**MCS Job No.:** 21-049S  
**Customer PO No.:**

**Date Sampled:** 04/05/2021  
**Sampled By:** Shawn Cowden  
**Job Location:** Newsome Park Elementary, NN

**Date Received:** 04/06/2021  
**Received By:** JAS  
**Sample Matrix:** BULK  
**Date Analyzed:** 04/19/2021

**Method of Analysis:** Polarized Light Microscopy (PLM) using Environmental Protection Agency (EPA) Methods: EPA - 40 CFR Appendix E to Subpart E of Part 763 and EPA 600/R93-116, July 1993.

## REPORT OF ANALYSIS

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type	(%)	Non-Asbestos Components	(%)
0132663-003 NPS-3	Rm 39, White 12" Floor Tile					
	Floor Tile, White	LAYER 1 30%	None Detected		Non-Fibrous Material	100%
	Mastic, Beige	LAYER 2 20%	None Detected		Cellulose Fiber	5%
	Floor Tile, Beige	LAYER 3 30%	Chrysotile	5%	Non-Fibrous Material	95%
	Mastic, Black	LAYER 4 20%	Chrysotile	10%	Cellulose Fiber	5%
					Non-Fibrous Material	85%
	<b>Asbestos Present: Yes</b>		<b>Total % Asbestos:</b>	<b>4%</b>		
0132663-004 NPS-4	Rm 42, Blue 12" Floor Tile					
	Floor Tile, Blue	LAYER 1 100%	None Detected		Non-Fibrous Material	100%
	<b>Asbestos Present: No</b>		<b>Total % Asbestos:</b>	<b>No Asbestos Detected</b>		
0132663-005 NPS-5	Rm 40, Blue 12" Floor Tile					
	Floor Tile, Blue	LAYER 1 90%	None Detected		Non-Fibrous Material	100%
	Mastic, Yellow	LAYER 2 10%	None Detected		Cellulose Fiber	5%
					Non-Fibrous Material	95%
	<b>Asbestos Present: No</b>		<b>Total % Asbestos:</b>	<b>No Asbestos Detected</b>		





**Marine Chemist Service, Inc.**  
 11850 TUG BOAT LANE  
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[www.MarineChemist.com](http://www.MarineChemist.com)

<b>Credentials</b>	<b>Agency</b>	<b>Scope</b>
Approval	DOD-US Navy	Resin
Accreditation	ABS	Hull Thickness
Accreditation	AIHA-LAP, LLC	<u>Laboratory ID: 100551</u>
	ELLAP	Paint, Soil, Wipe & Air
	EMLAP	Direct Examination: Air & Tape
	IHLAP	Asbestos: PCM
		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	<u>Laboratory Code: 200628-0</u>
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	<u>Laboratory No: 460257</u>
	NELAC	RCRA 8 Metals: TCLP & NPW
Virginia Laboratory	DGS - DPOR	<u>License No.: 3333 000004</u>
		Asbestos: PLM & PCM

NOTE: Laboratory Credentials cover only to the scopes listed above.

Plant Services - NNPS  
 Attn: Pennie Robbins Boyack  
 12580 Patrick Henry Dr.  
 Newport News VA 23602

**MCS Report No.:** 0132663  
**Report Date:** 04/30/2021  
**MCS Job No.:** 21-049S  
**Customer PO No.:**

**Date Sampled:** 04/05/2021  
**Sampled By:** Shawn Cowden  
**Job Location:** Newsome Park Elementary, NN

**Date Received:** 04/06/2021  
**Received By:** JAS  
**Sample Matrix:** BULK  
**Date Analyzed:** 04/19/2021

**Method of Analysis:** Polarized Light Microscopy (PLM) using Environmental Protection Agency (EPA) Methods: EPA - 40 CFR Appendix E to Subpart E of Part 763 and EPA 600/R93-116, July 1993.

## REPORT OF ANALYSIS

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type	(%)	Non-Asbestos Components	(%)
0132663-006 NPS-6	Cafeteria, Blue 12" Floor Tile	LAYER 1 80%	None Detected		Non-Fibrous Material	100%
	Floor Tile, Blue					
	Mastic, Black and Yellow	LAYER 2 20%	Chrysotile	5%	Cellulose Fiber Non-Fibrous Material	5% 90%
<b>Asbestos Present: Yes</b>		<b>Total % Asbestos:</b>		<b>1%</b>		
0132663-007 NPS-7	Rm 37, Beige 12" Floor Tile	LAYER 1 80%	Chrysotile	5%	Non-Fibrous Material	95%
	Floor Tile, Beige					
	Mastic, Black	LAYER 2 20%	Chrysotile	10%	Cellulose Fiber Non-Fibrous Material	5% 85%
<b>Asbestos Present: Yes</b>		<b>Total % Asbestos:</b>		<b>6%</b>		
0132663-008 NPS-8	Rm 35, Beige 12" Floor Tile	LAYER 1 70%	Chrysotile	5%	Non-Fibrous Material	95%
	Floor Tile, Beige					
	Mastic, Black	LAYER 2 20%	Chrysotile	10%	Cellulose Fiber Non-Fibrous Material	5% 85%
	Flooring Material, Gray	LAYER 3 10%	None Detected		Cellulose Fiber Non-Fibrous Material	5% 95%
<b>Asbestos Present: Yes</b>		<b>Total % Asbestos:</b>		<b>6%</b>		



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<b>Credentials</b>	<b>Agency</b>	<b>Scope</b>
Approval	DOD-US Navy	Resin
Accreditation	ABS	Hull Thickness
Accreditation	AIHA-LAP, LLC	<u>Laboratory ID: 100551</u>
	ELLAP	Paint, Soil, Wipe & Air
	EMLAP	Direct Examination: Air & Tape
	IHLAP	Asbestos: PCM
		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	<u>Laboratory Code: 200628-0</u>
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	<u>Laboratory No: 460257</u>
	NELAC	RCRA 8 Metals: TCLP & NPW
Virginia Laboratory	DGS - DPOR	<u>License No.: 3333 000004</u>
		Asbestos: PLM & PCM

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**Sample Matrix:** BULK  
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**Method of Analysis:** Polarized Light Microscopy (PLM) using Environmental Protection Agency (EPA) Methods: EPA - 40 CFR Appendix E to Subpart E of Part 763 and EPA 600/R93-116, July 1993.

## REPORT OF ANALYSIS

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type	(%)	Non-Asbestos Components	(%)
0132663-009 NPS-9	Cafeteria, Beige 12" Floor Tile	LAYER 1 80%	None Detected		Non-Fibrous Material	100%
	Floor Tile, Gray					
	Mastic, Black and Beige	LAYER 2 20%	Chrysotile	10%	Cellulose Fiber Non-Fibrous Material	5% 85%
<b>Asbestos Present: Yes</b>		<b>Total % Asbestos:</b>		<b>2%</b>		
0132663-010 NPS-10	Rm 37, Brown 12" Floor Tile	LAYER 1 80%	None Detected		Non-Fibrous Material	100%
	Floor Tile, Brown					
	Mastic, Black and Beige	LAYER 2 20%	Chrysotile	5%	Cellulose Fiber Non-Fibrous Material	5% 90%
<b>Asbestos Present: Yes</b>		<b>Total % Asbestos:</b>		<b>1%</b>		
0132663-011 NPS-11	Rm 36, Brown 12" Floor Tile	LAYER 1 80%	None Detected		Non-Fibrous Material	100%
	Floor Tile, Brown					
	Mastic, Black and Beige	LAYER 2 20%	Chrysotile	5%	Cellulose Fiber Non-Fibrous Material	5% 90%
<b>Asbestos Present: Yes</b>		<b>Total % Asbestos:</b>		<b>1%</b>		



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<b>Credentials</b>	<b>Agency</b>	<b>Scope</b>
Approval	DOD-US Navy	Resin
Accreditation	ABS	Hull Thickness
Accreditation	AIHA-LAP, LLC	<u>Laboratory ID: 100551</u>
	ELLAP	Paint, Soil, Wipe & Air
	EMLAP	Direct Examination: Air & Tape
	IHLAP	Asbestos: PCM
		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	<u>Laboratory Code: 200628-0</u>
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	<u>Laboratory No: 460257</u>
	NELAC	RCRA 8 Metals: TCLP & NPW
Virginia Laboratory	DGS - DPOR	<u>License No.: 3333 000004</u>
		Asbestos: PLM & PCM

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**Date Analyzed:** 04/19/2021

**Method of Analysis:** Polarized Light Microscopy (PLM) using Environmental Protection Agency (EPA) Methods: EPA - 40 CFR Appendix E to Subpart E of Part 763 and EPA 600/R93-116, July 1993.

## REPORT OF ANALYSIS

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type	(%)	Non-Asbestos Components	(%)
0132663-012 NPS-12	Rm 34, Brown 12" Floor Tile					
	Floor Tile, Brown	LAYER 1 80%	None Detected		Non-Fibrous Material	100%
	Mastic, Black	LAYER 2 20%	Chrysotile	5%	Cellulose Fiber Non-Fibrous Material	5% 90%
<b>Asbestos Present: Yes</b>		<b>Total % Asbestos:</b>		<b>1%</b>		
0132663-013 NPS-13	Rm 37, Pink 12" Floor Tile					
	Floor Tile, Pink	LAYER 1 80%	None Detected		Non-Fibrous Material	100%
	Mastic, Beige	LAYER 2 20%	None Detected		Cellulose Fiber Non-Fibrous Material	5% 95%
<b>Asbestos Present: No</b>		<b>Total % Asbestos:</b>		<b>No Asbestos Detected</b>		
0132663-014 NPS-14	Rm 35, Pink 12" Floor Tile					
	Floor Tile, Pink	LAYER 1 80%	None Detected		Non-Fibrous Material	100%
	Mastic, Black and Beige	LAYER 2 20%	Chrysotile	5%	Cellulose Fiber Non-Fibrous Material	5% 90%
<b>Asbestos Present: Yes</b>		<b>Total % Asbestos:</b>		<b>1%</b>		





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<b>Credentials</b>	<b>Agency</b>	<b>Scope</b>
Approval	DOD-US Navy	Resin
Accreditation	ABS	Hull Thickness
Accreditation	AIHA-LAP, LLC	<u>Laboratory ID: 100551</u>
	ELLAP	Paint, Soil, Wipe & Air
	EMLAP	Direct Examination: Air & Tape
	IHLAP	Asbestos: PCM
		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	<u>Laboratory Code: 200628-0</u>
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	<u>Laboratory No: 460257</u>
	NELAC	RCRA 8 Metals: TCLP & NPW
Virginia Laboratory	DGS - DPOR	<u>License No.: 3333 000004</u>
		Asbestos: PLM & PCM

NOTE: Laboratory Credentials cover only to the scopes listed above.

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**Sampled By:** Shawn Cowden  
**Job Location:** Newsome Park Elementary, NN

**Date Received:** 04/06/2021  
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**Sample Matrix:** BULK  
**Date Analyzed:** 04/19/2021

**Method of Analysis:** Polarized Light Microscopy (PLM) using Environmental Protection Agency (EPA) Methods: EPA - 40 CFR Appendix E to Subpart E of Part 763 and EPA 600/R93-116, July 1993.

## REPORT OF ANALYSIS

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type	(%)	Non-Asbestos Components	(%)
0132663-015 NPS-15	Rm 34, Pink 12" Floor Tile					
	Floor Tile, Pink	LAYER 1 90%	None Detected		Non-Fibrous Material	100%
	Mastic, Black	LAYER 2 10%	Chrysotile	10%	Cellulose Fiber Non-Fibrous Material	5% 85%
	<b>Asbestos Present: Yes</b>	<b>Total % Asbestos:</b>		<b>1%</b>		
0132663-016 NPS-16	Rm 35, Gray 12" Floor Tile					
	Floor Tile, Gray	LAYER 1 40%	None Detected		Non-Fibrous Material	100%
	Mastic, Yellow	LAYER 2 10%	None Detected		Cellulose Fiber Non-Fibrous Material	3% 97%
	Floor Tile, Pink	LAYER 3 30%	None Detected		Non-Fibrous Material	100%
	Mastic, Black	LAYER 4 20%	Chrysotile	5%	Non-Fibrous Material	95%
<b>Asbestos Present: Yes</b>	<b>Total % Asbestos:</b>		<b>1%</b>			



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<b>Credentials</b>	<b>Agency</b>	<b>Scope</b>
Approval	DOD-US Navy	Resin
Accreditation	ABS	Hull Thickness
Accreditation	AIHA-LAP, LLC	<u>Laboratory ID: 100551</u>
	ELLAP	Paint, Soil, Wipe & Air
	EMLAP	Direct Examination: Air & Tape
	IHLAP	Asbestos: PCM
		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	<u>Laboratory Code: 200628-0</u>
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	<u>Laboratory No: 460257</u>
	NELAC	RCRA 8 Metals: TCLP & NPW
Virginia Laboratory	DGS - DPOR	<u>License No.: 3333 000004</u>
		Asbestos: PLM & PCM

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**Sample Matrix:** BULK  
**Date Analyzed:** 04/19/2021

**Method of Analysis:** Polarized Light Microscopy (PLM) using Environmental Protection Agency (EPA) Methods: EPA - 40 CFR Appendix E to Subpart E of Part 763 and EPA 600/R93-116, July 1993.

## REPORT OF ANALYSIS

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type	(%)	Non-Asbestos Components	(%)
0132663-017 NPS-17	Rm 35, Gray 12" Floor Tile					
	Floor Tile, Gray	LAYER 1 90%	None Detected		Non-Fibrous Material	100%
	Mastic, Yellow	LAYER 2 10%	None Detected		Cellulose Fiber Non-Fibrous Material	5% 95%
<b>Asbestos Present: No</b>		<b>Total % Asbestos:</b>		<b>No Asbestos Detected</b>		
0132663-018 NPS-18	Rm 35, Gray 12" Floor Tile					
	Floor Tile, Gray	LAYER 1 40%	None Detected		Non-Fibrous Material	100%
	Mastic, Yellow	LAYER 2 10%	None Detected		Cellulose Fiber Non-Fibrous Material	5% 95%
	Floor Tile, Pink	LAYER 3 30%	None Detected		Non-Fibrous Material	100%
	Mastic, Black	LAYER 4 20%	Chrysotile	10%	Cellulose Fiber Non-Fibrous Material	5% 85%
<b>Asbestos Present: Yes</b>		<b>Total % Asbestos:</b>		<b>2%</b>		



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Approval	DOD-US Navy	Resin
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		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	<u>Laboratory Code: 200628-0</u>
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	<u>Laboratory No: 460257</u>
	NELAC	RCRA 8 Metals: TCLP & NPW
Virginia Laboratory	DGS - DPOR	<u>License No.: 3333 000004</u>
		Asbestos: PLM & PCM

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**Method of Analysis:** Polarized Light Microscopy (PLM) using Environmental Protection Agency (EPA) Methods: EPA - 40 CFR Appendix E to Subpart E of Part 763 and EPA 600/R93-116, July 1993.

## REPORT OF ANALYSIS

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type	(%)	Non-Asbestos Components	(%)
0132663-019 NPS-19	Rm 36, Black 12" Floor Tile					
	Floor Tile, Black	LAYER 1 80%	None Detected		Non-Fibrous Material	100%
	Mastic, Yellow	LAYER 2 20%	None Detected		Cellulose Fiber Non-Fibrous Material	5% 95%
<b>Asbestos Present: No</b>		<b>Total % Asbestos:</b>		<b>No Asbestos Detected</b>		
0132663-020 NPS-20	Rm 28, Black 12" Floor Tile					
	Floor Tile, Black	LAYER 1 80%	None Detected		Non-Fibrous Material	100%
	Mastic, Yellow and Beige	LAYER 2 20%	None Detected		Cellulose Fiber Non-Fibrous Material	5% 95%
<b>Asbestos Present: No</b>		<b>Total % Asbestos:</b>		<b>No Asbestos Detected</b>		
0132663-021 NPS-21	Staff Lounge, Black 12" Floor Tile					
	Floor Tile, Black	LAYER 1 90%	None Detected		Non-Fibrous Material	100%
	Mastic, Black and Yellow	LAYER 2 10%	Chrysotile	10%	Cellulose Fiber Non-Fibrous Material	5% 85%
<b>Asbestos Present: Yes</b>		<b>Total % Asbestos:</b>		<b>1%</b>		





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Approval	DOD-US Navy	Resin
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		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	<u>Laboratory Code: 200628-0</u>
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	<u>Laboratory No: 460257</u>
	NELAC	RCRA 8 Metals: TCLP & NPW
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## REPORT OF ANALYSIS

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type	(%)	Non-Asbestos Components	(%)
0132663-022 NPS-22	Rm 29, Off-White 12" Floor Tile					
	Mastic, Black	LAYER 1 20%	Chrysotile	10%	Non-Fibrous Material	90%
	Floor Tile, White	LAYER 2 60%	None Detected		Non-Fibrous Material	100%
	Mastic, Yellow	LAYER 3 20%	None Detected		Cellulose Fiber Non-Fibrous Material	5% 95%
<b>Asbestos Present: Yes</b>		<b>Total % Asbestos:</b>		<b>2%</b>		
0132663-023 NPS-23	Rm 27, Off-White 12" Floor Tile					
	Floor Tile, White	LAYER 1 80%	None Detected		Non-Fibrous Material	100%
	Mastic, Black and Beige	LAYER 2 20%	Chrysotile	10%	Cellulose Fiber Non-Fibrous Material	5% 85%
<b>Asbestos Present: Yes</b>		<b>Total % Asbestos:</b>		<b>2%</b>		
0132663-024 NPS-24	Staff Lounge, Off-White 12" Floor Tile					
	Floor Tile, White	LAYER 1 80%	None Detected		Non-Fibrous Material	100%
	Mastic, Black and Beige	LAYER 2 20%	Chrysotile	10%	Cellulose Fiber Non-Fibrous Material	5% 85%
<b>Asbestos Present: Yes</b>		<b>Total % Asbestos:</b>		<b>2%</b>		



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Approval	DOD-US Navy	Resin
Accreditation	ABS	Hull Thickness
Accreditation	AIHA-LAP, LLC	<u>Laboratory ID: 100551</u>
	ELLAP	Paint, Soil, Wipe & Air
	EMLAP	Direct Examination: Air & Tape
	IHLAP	Asbestos: PCM
		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	<u>Laboratory Code: 200628-0</u>
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	<u>Laboratory No: 460257</u>
	NELAC	RCRA 8 Metals: TCLP & NPW
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**Method of Analysis:** Polarized Light Microscopy (PLM) using Environmental Protection Agency (EPA) Methods: EPA - 40 CFR Appendix E to Subpart E of Part 763 and EPA 600/R93-116, July 1993.

## REPORT OF ANALYSIS

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type	(%)	Non-Asbestos Components	(%)
0132663-025 NPS-25	Rm 42, Black 4" Base Cove/ Adhesive Base Cove, Black	LAYER 1 100%	None Detected		Non-Fibrous Material	100%
<b>Asbestos Present: No</b>		<b>Total % Asbestos:</b>		<b>No Asbestos Detected</b>		
0132663-026 NPS-26	Cafeteria, Black 4" Base Cove/ Adhesive Base Cove, Black	LAYER 1 80%	None Detected		Non-Fibrous Material	100%
	Mastic, Beige	LAYER 2 20%	None Detected		Cellulose Fiber Non-Fibrous Material	5% 95%
<b>Asbestos Present: No</b>		<b>Total % Asbestos:</b>		<b>No Asbestos Detected</b>		
0132663-027 NPS-27	Auditorium, Blue 4" Base Cove/ Adhesive Base Cove, Blue	LAYER 1 80%	None Detected		Non-Fibrous Material	100%
	Mastic, Beige	LAYER 2 20%	None Detected		Cellulose Fiber Non-Fibrous Material	5% 95%
<b>Asbestos Present: No</b>		<b>Total % Asbestos:</b>		<b>No Asbestos Detected</b>		





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<b>Credentials</b>	<b>Agency</b>	<b>Scope</b>
Approval	DOD-US Navy	Resin
Accreditation	ABS	Hull Thickness
Accreditation	AIHA-LAP, LLC	<u>Laboratory ID: 100551</u>
	ELLAP	Paint, Soil, Wipe & Air
	EMLAP	Direct Examination: Air & Tape
	IHLAP	Asbestos: PCM
		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	<u>Laboratory Code: 200628-0</u>
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	<u>Laboratory No: 460257</u>
	NELAC	RCRA 8 Metals: TCLP & NPW
Virginia Laboratory	DGS - DPOR	<u>License No.: 3333 000004</u>
		Asbestos: PLM & PCM

NOTE: Laboratory Credentials cover only to the scopes listed above.

Plant Services - NNPS  
 Attn: Pennie Robbins Boyack  
 12580 Patrick Henry Dr.  
 Newport News VA 23602

**MCS Report No.:** 0132663  
**Report Date:** 04/30/2021  
**MCS Job No.:** 21-049S  
**Customer PO No.:**

**Date Sampled:** 04/05/2021  
**Sampled By:** Shawn Cowden  
**Job Location:** Newsome Park Elementary, NN

**Date Received:** 04/06/2021  
**Received By:** JAS  
**Sample Matrix:** BULK  
**Date Analyzed:** 04/19/2021

**Method of Analysis:** Polarized Light Microscopy (PLM) using Environmental Protection Agency (EPA) Methods: EPA - 40 CFR Appendix E to Subpart E of Part 763 and EPA 600/R93-116, July 1993.

## REPORT OF ANALYSIS

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type	(%)	Non-Asbestos Components	(%)
0132663-028 NPS-28	Rm 43, Blue 4" Base Cove/ Adhesive					
	Base Cove, Blue	LAYER 1 80%	None Detected		Non-Fibrous Material	100%
	Mastic, Beige and Brown	LAYER 2 20%	None Detected		Cellulose Fiber Non-Fibrous Material	5% 95%
<b>Asbestos Present: No</b>		<b>Total % Asbestos:</b>		<b>No Asbestos Detected</b>		
0132663-029 NPS-29	Rm 37, Brown 4" Base Cove/ Adhesive					
	Base Cove, Brown	LAYER 1 100%	None Detected		Non-Fibrous Material	100%
<b>Asbestos Present: No</b>		<b>Total % Asbestos:</b>		<b>No Asbestos Detected</b>		
0132663-030 NPS-30	Rm 32, Brown 4" Base Cove/ Adhesive					
	Base Cove, Brown	LAYER 1 80%	None Detected		Non-Fibrous Material	100%
	Plaster-Like Material, White	LAYER 2 20%	None Detected		Cellulose Fiber Non-Fibrous Material	3% 97%
<b>Asbestos Present: No</b>		<b>Total % Asbestos:</b>		<b>No Asbestos Detected</b>		
0132663-031 NPS-31	Rm 42, Sink Undercoating					
	Undercoating, Black	LAYER 1 100%	Chrysotile	3%	Non-Fibrous Material	97%
<b>Asbestos Present: Yes</b>		<b>Total % Asbestos:</b>		<b>3%</b>		



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Accreditation	ABS	Hull Thickness
Accreditation	AIHA-LAP, LLC	<u>Laboratory ID: 100551</u>
	ELLAP	Paint, Soil, Wipe & Air
	EMLAP	Direct Examination: Air & Tape
	IHLAP	Asbestos: PCM
		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	<u>Laboratory Code: 200628-0</u>
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	<u>Laboratory No: 460257</u>
	NELAC	RCRA 8 Metals: TCLP & NPW
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**REPORT OF ANALYSIS**

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type	(%)	Non-Asbestos Components	(%)
0132663-032 NPS-32	Rm 34, Sink Undercoating	LAYER 1 100%	Chrysotile	5%	Non-Asbestos Residue	95%
	Undercoating, Pink and White					
	<b>Asbestos Present: Yes</b>					
0132663-033 NPS-33	Rm 29, Drywall	LAYER 1 10%	None Detected		Non-Fibrous Material	100%
	Joint Compound, White					
	Paper, Brown	LAYER 2 40%	None Detected		Cellulose Fiber	90%
	Drywall, Gray	LAYER 3 50%	None Detected		Cellulose Fiber	5%
<b>Asbestos Present: No</b>	<b>Total % Asbestos: No Asbestos Detected</b>					
0132663-034 NPS-34	Library Hall, Drywall	LAYER 1 100%	None Detected		Non-Fibrous Material	100%
	Joint Compound and Paint, White					
<b>Asbestos Present: No</b>	<b>Total % Asbestos: No Asbestos Detected</b>					
0132663-035 NPS-35	Hall at Rm 34, Drywall	LAYER 1 100%	None Detected		Non-Fibrous Material	100%
	Joint Compound and Paint, White					
<b>Asbestos Present: No</b>	<b>Total % Asbestos: No Asbestos Detected</b>					





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Approval	DOD-US Navy	Resin
Accreditation	ABS	Hull Thickness
Accreditation	AIHA-LAP, LLC	<u>Laboratory ID: 100551</u>
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	EMLAP	Direct Examination: Air & Tape
	IHLAP	Asbestos: PCM
		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	<u>Laboratory Code: 200628-0</u>
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	<u>Laboratory No: 460257</u>
	NELAC	RCRA 8 Metals: TCLP & NPW
Virginia Laboratory	DGS - DPOR	<u>License No.: 3333 000004</u>
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**REPORT OF ANALYSIS**

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type	(%)	Non-Asbestos Components	(%)
0132663-036 NPS-36	Kitchen Bathroom Ceiling, Plaster Plaster and Paint, White	LAYER 1 100%	None Detected		Non-Fibrous Material	100%
<b>Asbestos Present: No</b>		<b>Total % Asbestos:</b>		<b>No Asbestos Detected</b>		
0132663-037 NPS-37	Kitchen Closet Ceiling, Plaster Plaster and Paint, White	LAYER 1 100%	None Detected		Cellulose Fiber Non-Fibrous Material	3% 97%
<b>Asbestos Present: No</b>		<b>Total % Asbestos:</b>		<b>No Asbestos Detected</b>		
0132663-038 NPS-38	Kitchen Back Hall Ceiling, Plaster Plaster and Paint, White	LAYER 1 100%	None Detected		Non-Fibrous Material	100%
<b>Asbestos Present: No</b>		<b>Total % Asbestos:</b>		<b>No Asbestos Detected</b>		
0132663-039 NPS-39	Auditorium, Block Sealer Block Sealer and Paint, White	LAYER 1 100%	None Detected		Non-Fibrous Material	100%
<b>Asbestos Present: No</b>		<b>Total % Asbestos:</b>		<b>No Asbestos Detected</b>		





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Approval	DOD-US Navy	Resin
Accreditation	ABS	Hull Thickness
Accreditation	AIHA-LAP, LLC	<u>Laboratory ID: 100551</u>
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	EMLAP	Direct Examination: Air & Tape
	IHLAP	Asbestos: PCM
		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	<u>Laboratory Code: 200628-0</u>
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	<u>Laboratory No: 460257</u>
	NELAC	RCRA 8 Metals: TCLP & NPW
Virginia Laboratory	DGS - DPOR	<u>License No.: 3333 000004</u>
		Asbestos: PLM & PCM

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## REPORT OF ANALYSIS

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type	(%)	Non-Asbestos Components	(%)
0132663-040 NPS-40	Rm 43, Block Sealer Paint, Beige and Green	LAYER 1 100%	None Detected		Non-Fibrous Material	100%
<b>Asbestos Present: No</b>		<b>Total % Asbestos:</b>		<b>No Asbestos Detected</b>		
0132663-041 NPS-41	Cafeteria, Block Sealer Paint, Gray and Blue	LAYER 1 100%	None Detected		Non-Fibrous Material	100%
<b>Asbestos Present: No</b>		<b>Total % Asbestos:</b>		<b>No Asbestos Detected</b>		
0132663-042 NPS-42	Stage, Pipe Sealer Jacket, White	LAYER 1 80%	None Detected		Cellulose Fiber Fibrous Glass Non-Fibrous Material	60% 20% 20%
	Insulation, Yellow	LAYER 2 20%	None Detected		Fibrous Glass Non-Fibrous Material	90% 10%
<b>Asbestos Present: No</b>		<b>Total % Asbestos:</b>		<b>No Asbestos Detected</b>		



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	IHLAP	Asbestos: PCM
		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	<u>Laboratory Code: 200628-0</u>
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	<u>Laboratory No: 460257</u>
	NELAC	RCRA 8 Metals: TCLP & NPW
Virginia Laboratory	DGS - DPOR	<u>License No.: 3333 000004</u>
		Asbestos: PLM & PCM

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**REPORT OF ANALYSIS**

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type	(%)	Non-Asbestos Components	(%)
0132663-043 NPS-43	Closet at Auditorium Entrance, Pipe Sealer Tar, Black	LAYER 1 20%	None Detected		Cellulose Fiber Fibrous Glass Non-Fibrous Material	20% 10% 70%
	Jacket and Paint, White	LAYER 2 80%	None Detected		Cellulose Fiber Fibrous Glass Non-Fibrous Material	80% 10% 10%
<b>Asbestos Present: No</b>		<b>Total % Asbestos:</b>		<b>No Asbestos Detected</b>		
0132663-044 NPS-44	Cafeteria Overhead, Pipe Sealer Jacket and Paint, White	LAYER 1 40%	None Detected		Cellulose Fiber Fibrous Glass Non-Fibrous Material	40% 20% 40%
	Insulation, Yellow	LAYER 2 60%	None Detected		Fibrous Glass Non-Fibrous Material	90% 10%
<b>Asbestos Present: No</b>		<b>Total % Asbestos:</b>		<b>No Asbestos Detected</b>		
0132663-045 NPS-45	Main Office, Green 12" Floor Tile Floor Tile, Green	LAYER 1 80%	None Detected		Non-Fibrous Material	100%
	Mastic, Yellow	LAYER 2 20%	None Detected		Cellulose Fiber Non-Fibrous Material	3% 97%
<b>Asbestos Present: No</b>		<b>Total % Asbestos:</b>		<b>No Asbestos Detected</b>		



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		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	<u>Laboratory Code: 200628-0</u>
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	<u>Laboratory No: 460257</u>
	NELAC	RCRA 8 Metals: TCLP & NPW
Virginia Laboratory	DGS - DPOR	<u>License No.: 3333 000004</u>
		Asbestos: PLM & PCM

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**REPORT OF ANALYSIS**

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type	(%)	Non-Asbestos Components	(%)
0132663-046 NPS-46	Main Office, Green 12" Floor Tile	LAYER 1	None Detected		Non-Fibrous Material	100%
	Floor Tile, Green	40%			Cellulose Fiber	5%
	Mastic, Yellow	LAYER 2	None Detected		Non-Fibrous Material	95%
	20%					
0132663-047 NPS-47	Main Office, Green 12" Floor Tile	LAYER 3	None Detected		Non-Fibrous Material	100%
	Floor Tile, Green	20%			Non-Fibrous Material	95%
	Mastic, Yellow	LAYER 4	Chrysotile	10%	Non-Fibrous Material	90%
	20%					
<b>Asbestos Present: Yes</b>		<b>Total % Asbestos:</b>		<b>2%</b>		
0132663-047 NPS-47	Main Office, Green 12" Floor Tile	LAYER 1	None Detected		Non-Fibrous Material	100%
	Floor Tile, Green	40%			Cellulose Fiber	5%
	Mastic, Yellow	LAYER 2	None Detected		Non-Fibrous Material	95%
	20%					
0132663-047 NPS-47	Main Office, Green 12" Floor Tile	LAYER 3	None Detected		Non-Fibrous Material	100%
	Floor Tile, Green	20%			Non-Fibrous Material	95%
	Mastic, Yellow	LAYER 4	Chrysotile	5%	Non-Fibrous Material	95%
	20%					
<b>Asbestos Present: Yes</b>		<b>Total % Asbestos:</b>		<b>1%</b>		





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**REPORT OF ANALYSIS**

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type	(%)	Non-Asbestos Components	(%)
0132663-048 NPS-48	Main Office, Carpet Adhesive Mastic, Black and Yellow	LAYER 1 100%	Chrysotile	3%	Cellulose Fiber Non-Fibrous Material	3% 94%
<b>Asbestos Present: Yes</b>		<b>Total % Asbestos:</b>		<b>3%</b>		
0132663-049 NPS-49	Main Office, Carpet Adhesive Mastic, Black and Yellow	LAYER 1 100%	Chrysotile	3%	Cellulose Fiber Non-Fibrous Material	3% 94%
<b>Asbestos Present: Yes</b>		<b>Total % Asbestos:</b>		<b>3%</b>		
0132663-050 NPS-50	Main Office, Carpet Adhesive Mastic, Black and Yellow	LAYER 1 100%	Chrysotile	3%	Cellulose Fiber Non-Fibrous Material	3% 94%
<b>Asbestos Present: Yes</b>		<b>Total % Asbestos:</b>		<b>3%</b>		
0132663-051 NPS-51	Rm 42, 2' Ceiling Tile - Pinwheel Ceiling Tile, Gray	LAYER 1 100%	None Detected		Fibrous Glass Cellulose Fiber Non-Fibrous Material	50% 40% 10%
<b>Asbestos Present: No</b>		<b>Total % Asbestos:</b>		<b>No Asbestos Detected</b>		



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Accreditation	ABS	Hull Thickness
Accreditation	AIHA-LAP, LLC	<u>Laboratory ID: 100551</u>
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**Method of Analysis:** Polarized Light Microscopy (PLM) using Environmental Protection Agency (EPA) Methods: EPA - 40 CFR Appendix E to Subpart E of Part 763 and EPA 600/R93-116, July 1993.

## REPORT OF ANALYSIS

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type	(%)	Non-Asbestos Components	(%)
0132663-052 NPS-52	Rm 37, 2' Ceiling Tile - Pinwheel Ceiling Tile, Gray	LAYER 1 100%	None Detected		Fibrous Glass Cellulose Fiber Non-Fibrous Material	50% 40% 10%
<b>Asbestos Present: No</b>		<b>Total % Asbestos:</b>		<b>No Asbestos Detected</b>		
0132663-053 NPS-53	Rm 33, 2' Ceiling Tile - Pinwheel Ceiling Tile, Gray	LAYER 1 100%	None Detected		Fibrous Glass Cellulose Fiber Non-Fibrous Material	50% 40% 10%
<b>Asbestos Present: No</b>		<b>Total % Asbestos:</b>		<b>No Asbestos Detected</b>		
0132663-054 NPS-54	Hall at Cafeteria, 2' Ceiling Tile - Wormed Ceiling Tile, Gray	LAYER 1 100%	None Detected		Cellulose Fiber Fibrous Glass Non-Fibrous Material	50% 40% 10%
<b>Asbestos Present: No</b>		<b>Total % Asbestos:</b>		<b>No Asbestos Detected</b>		
0132663-055 NPS-55	Hall at Rm 34, 2' Ceiling Tile - Wormed Ceiling Tile, Gray	LAYER 1 100%	None Detected		Cellulose Fiber Fibrous Glass Non-Fibrous Material	50% 40% 10%
<b>Asbestos Present: No</b>		<b>Total % Asbestos:</b>		<b>No Asbestos Detected</b>		





**Marine Chemist Service, Inc.**

11850 TUG BOAT LANE  
 NEWPORT NEWS, VA 23606-2527  
 TEL: (757) 873-0933 · NORFOLK (757) 640-1122  
 FAX: (757) 873-1074 · NORFOLK (757) 625-5696  
[www.MarineChemist.com](http://www.MarineChemist.com)

<b>Credentials</b>	<b>Agency</b>	<b>Scope</b>
Approval	DOD-US Navy	Resin
Accreditation	ABS	Hull Thickness
Accreditation	AIHA-LAP, LLC	<u>Laboratory ID: 100551</u>
	ELLAP	Paint, Soil, Wipe & Air
	EMLAP	Direct Examination: Air & Tape
	IHLAP	Asbestos: PCM
		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	<u>Laboratory Code: 200628-0</u>
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	<u>Laboratory No: 460257</u>
	NELAC	RCRA 8 Metals: TCLP & NPW
Virginia Laboratory	DGS - DPOR	<u>License No.: 3333 000004</u>
		Asbestos: PLM & PCM

NOTE: Laboratory Credentials cover only to the scopes listed above.

Plant Services - NNPS  
 Attn: Pennie Robbins Boyack  
 12580 Patrick Henry Dr.  
 Newport News VA 23602

**MCS Report No.:** 0132663  
**Report Date:** 04/30/2021  
**MCS Job No.:** 21-049S  
**Customer PO No.:**

**Date Sampled:** 04/05/2021  
**Sampled By:** Shawn Cowden  
**Job Location:** Newsome Park Elementary, NN

**Date Received:** 04/06/2021  
**Received By:** JAS  
**Sample Matrix:** BULK  
**Date Analyzed:** 04/19/2021

**Method of Analysis:** Polarized Light Microscopy (PLM) using Environmental Protection Agency (EPA) Methods: EPA - 40 CFR Appendix E to Subpart E of Part 763 and EPA 600/R93-116, July 1993.

**REPORT OF ANALYSIS**

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type	(%)	Non-Asbestos Components	(%)
0132663-056 NPS-56	Rm 29, 2' Ceiling Tile - Wormed Ceiling Tile, Gray	LAYER 1 100%	None Detected		Cellulose Fiber Fibrous Glass Non-Fibrous Material	50% 40% 10%
<b>Asbestos Present: No</b>		<b>Total % Asbestos:</b>		<b>No Asbestos Detected</b>		
0132663-057 NPS-57	Cafeteria, 2' Ceiling Tile - Dotted Ceiling Tile, Gray	LAYER 1 100%	None Detected		Cellulose Fiber Fibrous Glass Non-Fibrous Material	50% 40% 10%
<b>Asbestos Present: No</b>		<b>Total % Asbestos:</b>		<b>No Asbestos Detected</b>		
0132663-058 NPS-58	Main Office, 2' Ceiling Tile - Dotted Ceiling Tile, Gray	LAYER 1 100%	None Detected		Cellulose Fiber Fibrous Glass Non-Fibrous Material	50% 40% 10%
<b>Asbestos Present: No</b>		<b>Total % Asbestos:</b>		<b>No Asbestos Detected</b>		
0132663-059 NPS-59	Hall at Rm 32, 2' Ceiling Tile - Dotted Ceiling Tile, Gray	LAYER 1 100%	None Detected		Cellulose Fiber Fibrous Glass Non-Fibrous Material	50% 40% 10%
<b>Asbestos Present: No</b>		<b>Total % Asbestos:</b>		<b>No Asbestos Detected</b>		



**Marine Chemist Service, Inc.**  
 11850 TUG BOAT LANE  
 NEWPORT NEWS, VA 23606-2527  
 TEL: (757) 873-0933 · NORFOLK (757) 640-1122  
 FAX: (757) 873-1074 · NORFOLK (757) 625-5696  
[www.MarineChemist.com](http://www.MarineChemist.com)

Credentials	Agency	Scope
Approval	DOD-US Navy	Resin
Accreditation	ABS	Hull Thickness
Accreditation	AIHA-LAP, LLC	<u>Laboratory ID: 100551</u>
	ELLAP	Paint, Soil, Wipe & Air
	EMLAP	Direct Examination: Air & Tape
	IHLAP	Asbestos: PCM
		Dust: Gravimetry
		Metals: Air
Accreditation	NIST	<u>Laboratory Code: 200628-0</u>
	NVLAP	Asbestos Bulk: PLM
Virginia Certification	VELAP	<u>Laboratory No: 460257</u>
	NELAC	RCRA 8 Metals: TCLP & NPW
Virginia Laboratory	DGS - DPOR	<u>License No.: 3333 000004</u>
		Asbestos: PLM & PCM

NOTE: Laboratory Credentials cover only to the scopes listed above.

Plant Services - NNPS  
 Attn: Pennie Robbins Boyack  
 12580 Patrick Henry Dr.  
 Newport News VA 23602

**MCS Report No.:** 0132663  
**Report Date:** 04/30/2021  
**MCS Job No.:** 21-049S  
**Customer PO No.:**

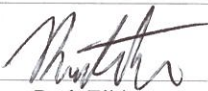
**Date Sampled:** 04/05/2021  
**Sampled By:** Shawn Cowden  
**Job Location:** Newsome Park Elementary, NN

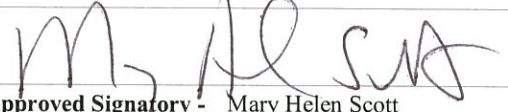
**Date Received:** 04/06/2021  
**Received By:** JAS  
**Sample Matrix:** BULK  
**Date Analyzed:** 04/19/2021

**Method of Analysis:** Polarized Light Microscopy (PLM) using Environmental Protection Agency (EPA) Methods: EPA - 40 CFR Appendix E to Subpart E of Part 763 and EPA 600/R93-116, July 1993.

## REPORT OF ANALYSIS

MCS Sample No. Field Sample ID	Sample Location Description	Layer No. Layer %	Asbestos Type	(%)	Non-Asbestos Components	(%)
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 Analyst - Ruth Elkins

  
 Approved Signatory - Mary Helen Scott  
 Laboratory Supervisor

Method Detection Limit: = <1%

- \* Fiber concentrations were determined by visually estimating the area percentage for each type.
- \* Asbestos fibers may not be detected by PLM in certain samples because of their size (<5um) or being bound with non-friable organic matrix. In such cases an alternative method of analysis may be necessary.
- \* Analyzed only readily discernable layers.
- \* All laboratory test results meet the applicable quality control requirements unless otherwise mentioned.
- \* MCS, Inc. can not attest to nor be held responsible for the proper collection of samples and/or accuracy of the sample information provided by customers for samples not collected by MCS, Inc.
- \* Test report relates only to the items tested.
- \* The samples will be stored at the MCS, Inc. laboratory for a period of thirty days after the analysis. At the end of the period, it will be our policy to dispose of the samples unless prior arrangements have been made for a longer storage period.
- \* This report shall not be reproduced, except in full, without the written approval of this laboratory.
- \* The Report must not be used by the customer to claim product certification, approval or endorsement by NVLAP, NIST or any agency of the Federal Government.
- \* The Report includes Chain of Custody.





Marine Chemist Service, Inc.

11850 Tug Boat Lane • Newport News, VA 23606

(757) 873-0933 • (757) 873-1074 (fax)

www.MarineChemist.com

Customer: NNS

Address: \_\_\_\_\_

Email: \_\_\_\_\_

Attention: Denise Boych

Phone: 803-1192 Fax: \_\_\_\_\_

MCS Job #: 21-0495 Customer PO: \_\_\_\_\_

BULK Chain of Custody Form

(use separate form for each matrix)

Job Location: Newsome Park Elementary, NN

- Building Material
- Paint
- Soil
- Other \_\_\_\_\_

Requested Turnaround Time (markup)

- Same Day (100%)
- 1-Day (75%)
- 2-Day (50%)
- 3-Day (25%)
- 4-Day (12.5%)
- 5-Day (standard)

RESULTS DUE BY: 4/13/21

ANALYSIS: PCM

**MCS Use Only**

Special Instructions: \_\_\_\_\_

MCS Project Manager: \_\_\_\_\_

DO NOT MAIL  Give Report To: \_\_\_\_\_

Email: \_\_\_\_\_ @ \_\_\_\_\_

MCS Lab Report No. 0132663 26 4/6/21

Samples Acceptable to Lab  Yes  No By \_\_\_\_\_

Date \_\_\_\_\_ If "No" Reason \_\_\_\_\_

Field ID	Sample Location	Sample Description	MCS Sample No.
<i>example</i>	<i>room or area</i>	<i>size / color / material</i>	<i>lab use only</i>
NPS-1	Rm 42	White 12" Floor Tile	0132663-001
NPS-2	<del>Rm 40</del> Auditorium	White 12" Floor Tile	0132663-002
NPS-3	Rm 39	White 12" Floor Tile	0132663-003
NPS-4	Rm 42	<del>Blue</del> 12" Floor Tile	0132663-004
NPS-5	Rm 40	<del>Blue</del> 12" Floor Tile	0132663-005
NPS-6	Cafeteria	<del>Blue</del> 12" Floor Tile	0132663-006
NPS-7	Rm 37	Beige 12" Floor Tile	0132663-007
NPS-8	Rm 35	Beige 12" Floor Tile	0132663-008
NPS-9	<del>Rm 35</del> Cafeteria	Beige 12" Floor Tile	0132663-009
NPS-10	Rm 37	Brown 12" Floor Tile	0132663-010
NPS-11	Rm 36	Brown 12" Floor Tile	0132663-011
NPS-12	Rm 34	Brown 12" Floor Tile	0132663-012
NPS-13	Rm 37	Pink 12" Floor Tile	0132663-013
NPS-14	Rm 35	Pink 12" Floor Tile	0132663-014
NPS-15	Rm 34	Pink 12" Floor Tile	0132663-015
NPS-16	Rm 35	Gray 12" Floor Tile	0132663-016
NPS-17	Rm 35	Gray 12" Floor Tile	0132663-017
NPS-18	Rm 35	Gray 12" Floor Tile	0132663-018
NPS-19	Rm 36	Black 12" Floor Tile	0132663-019
NPS-20	Rm 28	Black 12" Floor Tile	0132663-020

Shawn Gordon  
Sampled by (Print)

Shawn Gordon  
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Jennie Swain  
Received by (Print)

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**OFFICE USE ONLY:**

Verbal \_\_\_\_\_

Faxed \_\_\_\_\_

Copied \_\_\_\_\_

Emailed \_\_\_\_\_

(date and initial above areas)

Mailed  Billing





**Marine Chemist Service, Inc.**  
 11850 Tug Boat Lane • Newport News, VA 23606  
 (757) 873-0933 • (757) 873-1074 (fax)  
 www.MarineChemist.com

Customer: NNECS  
 Address: \_\_\_\_\_  
 Email: \_\_\_\_\_  
 Attention: Rennie Boyack  
 Phone: 503-1192 Fax: \_\_\_\_\_  
 MCS Job #: 2-0495 Customer PO: \_\_\_\_\_

**BULK Chain of Custody Form**

(use separate form for each matrix)

Job Location: Newsume Park Elementary

Requested Turnaround Time (markup)

<input checked="" type="checkbox"/> Building Material	<input type="checkbox"/> Same Day (100%)
<input type="checkbox"/> Paint	<input type="checkbox"/> 1-Day (75%)
<input type="checkbox"/> Soil	<input type="checkbox"/> 2-Day (50%)
<input type="checkbox"/> Other _____	<input type="checkbox"/> 3-Day (25%)
	<input type="checkbox"/> 4-Day (12.5%)
	<input checked="" type="checkbox"/> 5-Day (standard)

RESULTS DUE BY: \_\_\_\_\_  
 ANALYSIS: PCM

**MCS Use Only**

Special Instructions: \_\_\_\_\_

MCS Project Manager: \_\_\_\_\_

DO NOT MAIL  Give Report To: \_\_\_\_\_

Email: \_\_\_\_\_ @ \_\_\_\_\_

MCS Lab Report No. \_\_\_\_\_

Samples Acceptable to Lab  Yes  No By \_\_\_\_\_

Date \_\_\_\_\_ If "No" Reason \_\_\_\_\_

Field ID	Sample Location	Sample Description	MCS Sample No.
<i>example</i>	<i>room or area</i>	<i>size / color / material</i>	<i>lab use only</i>
NRS-21	Staff Lounge	Black 12" Floor Tile	0132663-021
NRS-22	Rm 29	off-white 12" Floor Tile	0132663-022
NRS-23	Rm 27	off-white 12" Floor Tile	0132663-023
NRS-24	Staff Lounge	off white 12" Floor Tile	0132663-024
NRS-25	Rm 42	Black 4" Base Cove / Adhesive	0132663-025
NRS-26	Cafeteria	Black 4" Base Cove / Adhesive	0132663-026
NRS-27	Auditorium	Blue 4" Base Cove / Adhesive	0132663-027
NRS-28	Rm 43	blue 4" base Cove / Adhesive	0132663-028
NRS-29	Rm 37	Brown 4" Base Cove / Adhesive	0132663-029
NRS-30	Rm 32	Brown 4" Base Cove / Adhesive	0132663-030
NRS-31	Rm 42	Sink undercoating	0132663-031
NRS-32	Rm 39	Sink undercoating	0132663-032
NRS-33	Rm 29	Drywall	0132663-033
NRS-34	Library Hall	Drywall	0132663-034
NRS-35	Hall at Rm 34	Drywall	0132663-035
NRS-36	Kitchen Bathroom Ceiling	plaster	0132663-036
NRS-37	Kitchen Closet Ceiling	plaster	0132663-037
NRS-38	Kitchen Back Hall Ceiling	plaster	0132663-038
NRS-39	Auditorium	Block Sealer	0132663-039
NRS-40	Rm 43	Block Sealer	0132663-040

Shawn Conder  
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 Shawn Conder  
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 Jennie Swan  
 Received by (Print)

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**OFFICE USE ONLY:**

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 Emailed \_\_\_\_\_  
 (date and initial above areas)

Mailed  Billing





Marine Chemist Service, Inc.

11850 Tug Boat Lane • Newport News, VA 23606

(757) 873-0933 • (757) 873-1074 (fax)

www.MarineChemist.com

Customer: NNS Page 3 of 3

Address: \_\_\_\_\_

Email: \_\_\_\_\_

Attention: Leanne Boyach

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_

MCS Job #: 21-0495 Customer PO: \_\_\_\_\_

BULK Chain of Custody Form

(use separate form for each matrix)

Job Location: Newport Park Elementary

- Building Material
- Paint
- Snail
- Other \_\_\_\_\_

Requested Turnaround Time (markup)

- Same Day (100%)
- 1-Day (75%)
- 2-Day (50%)
- 3-Day (25%)
- 4-Day (12.5%)
- 5-Day (standard)

RESULTS DUE BY: \_\_\_\_\_

ANALYSIS: Run

**MCS Use Only**

Special Instructions: \_\_\_\_\_

MCS Project Manager: \_\_\_\_\_

DO NOT MAIL  Give Report To: \_\_\_\_\_

Email: \_\_\_\_\_ @ \_\_\_\_\_

MCS Lab Report No. \_\_\_\_\_

Samples Acceptable to Lab  Yes  No By \_\_\_\_\_

Date \_\_\_\_\_ If "No" Reason \_\_\_\_\_

Field ID	Sample Location	Sample Description	MCS Sample No.
<i>example</i>	<i>room or area</i>	<i>size / color / material</i>	<i>lab use only</i>
NPS-41	Cafeteria	Black Sealer	0132663-041
NPS-42	Stage	Pipe Sealer	0132663-042
NPS-43	Closet at Auditorium Entrance	Pipe Sealer	0132663-043
NPS-44	Cafeteria overhead	Pipe Sealer	0132663-044
NPS-45	Main office	Green 1/2" Floor Tile	0132663-045
NPS-46	Main office	Green 1/2" Floor Tile	0132663-046
NPS-47	Main office	Green 1/2" Floor Tile	0132663-047
NPS-48	Main office	Carpet Adhesive	0132663-048
NPS-49	Main office	Carpet Adhesive	0132663-049
NPS-50	Main office	Carpet Adhesive	0132663-050
NPS-51	Rm 42	2" Ceiling Tile - Pinwheel	0132663-051
NPS-52	Rm 37	2" Ceiling Tile - Pinwheel	0132663-052
NPS-53	Rm 33	2" Ceiling Tile - Pinwheel	0132663-053
NPS-54	Hall at Cafeteria	2" Ceiling Tile - Worned	0132663-054
NPS-55	Hall at Rm 34	2" Ceiling Tile - Worned	0132663-055
NPS-56	Rm 29	2" Ceiling Tile - Worned	0132663-056
NPS-57	Cafeteria	2" Ceiling Tile - Dotted	0132663-057
NPS-58	Main office	2" Ceiling Tile - Dotted	0132663-058
NPS-59	Hall at Rm 32	2" Ceiling Tile - Dotted	0132663-059

Shawn Gordon  
Sampled by (Print)

Shawn Gordon  
Transported by (Print)

Jennie Swain  
Received by (Print)

[Signature] 9/15/21  
Signature Date/Time

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Signature Date/Time

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Signature Date/Time

**OFFICE USE ONLY:**

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(date and initial above areas)

Mailed  Billing



Marine Chemist Service, Inc.

## SECTION 7 Inspection Information

### **Inspection Information**

The survey contractor for the inspection of Newsome Park Elementary School, 4200 Marshall Avenue, located in Newport News, Virginia is:

**Marine Chemist Service, Inc.**  
**11850 Tug Boat Lane**  
**Newport News, Virginia 23606**  
**[www.MarineChemist.com](http://www.MarineChemist.com)**

The team leader responsible for quality control coordination of inspection and adherence to inspection protocol is:

**Patrick Studley - CIH**  
**Marine Chemist Service, Inc.**  
**11850 Tug Boat Lane**  
**Newport News, Virginia 23606**  
**[PStudley@MarineChemist.com](mailto:PStudley@MarineChemist.com)**

The AIHA and NVLAP Accredited laboratory selected to analyze the bulk samples for asbestos content by PLM, using the "Interim Method for the Determination of Asbestos in Bulk Insulation Samples" (Appendix A to Subpart F in 40 CFR Part 763) is:

**Marine Chemist Service, Inc.**  
**Virginia Asbestos Analytical Laboratory License 3333 000004**  
**11850 Tug Boat Lane**  
**Newport News, Virginia 23606**  
**(757) 873-0933**

The inspector who physically inspected the building and who has received EPA-Approved Training is:

**Shawn Cowden**  
**Virginia Asbestos Inspector License 3303 004066**  
**[SCowden@MarineChemist.com](mailto:SCowden@MarineChemist.com)**

The Industrial Hygiene Inspector is employed by:

**Marine Chemist Service, Inc.**  
**11850 Tug Boat Lane**  
**Newport News, Virginia 23606**



Marine Chemist Service, Inc.

## SECTION 8 Credentials



**american board of industrial hygiene®**

**organized to improve the practice of industrial hygiene  
proclaims that**

*Patrick Gene Studley*

**having met all requirements of  
education, experience and examination,  
is hereby certified in the**

**COMPREHENSIVE PRACTICE  
of  
INDUSTRIAL HYGIENE**

**and has the right to use the designations**

**CERTIFIED INDUSTRIAL HYGIENIST**

**CIH**

<b>Certificate Number</b>	<b>11321 CP</b>
<b>Awarded:</b>	<b>May 31, 2017</b>
<b>Expiration Date:</b>	<b>December 1, 2022</b>



  
\_\_\_\_\_  
**Chair, ABIH**

  
\_\_\_\_\_  
**Chief Executive Officer, ABIH**







Marine Chemist Service, Inc.



**COMMONWEALTH of VIRGINIA**  
 Department of Professional and Occupational Regulation  
 9960 Mayland Drive, Suite 400, Richmond, VA 23233  
 Telephone: (804) 367-8500

**EXPIRES ON**  
06-30-2021

**NUMBER**  
3303004066

**BOARD FOR ASBESTOS, LEAD, AND HOME INSPECTORS**  
**ASBESTOS INSPECTOR LICENSE**

**SHAWN LUKE COWDEN**

*Maury Brock-Vasghan*  
Maury Brock-Vasghan, Director

Status can be verified at <http://www.dpor.virginia.gov>

(SEE REVERSE SIDE FOR PRIVILEGES AND INSTRUCTIONS)

DPOR-LIC (02/2017)



**COMMONWEALTH of VIRGINIA**  
 Department of Professional and Occupational Regulation  
 9960 Mayland Drive, Suite 400, Richmond, VA 23233  
 Telephone: (804) 367-8500

**EXPIRES ON**  
08-31-2021

**NUMBER**  
3333000004

**BOARD FOR ASBESTOS, LEAD, AND HOME INSPECTORS**  
**ASBESTOS ANALYTICAL LABORATORY LICENSE**  
**PCM PLM**

**MARINE CHEMIST SERVICE INC**  
 11850 TUG BOAT LANE  
 NEWPORT NEWS, VA 23606-0000

*Maury Brock-Vasghan*  
Maury Brock-Vasghan, Director

Status can be verified at <http://www.dpor.virginia.gov>

(SEE REVERSE SIDE FOR PRIVILEGES AND INSTRUCTIONS)

DPOR-LIC (02/2017)





Marine Chemist Service, Inc.

**\*This Page May Be Removed Prior to Bid Submittal\***

<b><u>ASBESTOS CONTAINING MATERIALS</u></b>	<b><u>QUANTITY</u></b>	<b><u>COST PER UNIT</u></b>	<b><u>REMOVAL COST</u></b>
Rooms 34 through 37: 12" Beige Floor Tile/Mastic and Mastic under 12" Pink and Brown Floor Tiles	~2,800 sq. ft.	\$4.25	<b>\$11,900.00</b>
Rooms 38 and 39: 12" Beige Floor Tile/Mastic under 12" White Floor Tile	~1,200 sq. ft.	\$4.25	<b>\$5,100.00</b>
Rooms 29, 27 and Teacher/Staff Lounge: Mastic under 12" Off-White and Black Floor Tiles	~2,000 sq. ft.	\$4.25	<b>\$8,500.00</b>
Cafeteria: Mastic under 12" Beige and Blue Floor Tile	~5,000 sq. ft.	\$4.25	<b>\$21,250.00</b>
Main Office: Mastic under Carpet	~800 sq. ft.	\$4.25	<b>\$3,400.00</b>
Main Office: Mastic under 12" Green Floor Tile	~350 sq. ft.	\$4.25	<b>\$1,487.50</b>
Rooms 30 through 43: Sink Undercoating	14	\$150.00	<b>\$2,100.00</b>
<b>Total</b>			<b>\$54,162.50</b>

\*The abatement contractor may require a mobilization fee of approximately \$1,600.00 in addition to removal costs. Prices may vary depending on volume of abatement that needs to be accomplished, difficulty of set up requirement, work hours, work days and accessibility of materials.



Marine Chemist Service, Inc.

XRF Lead Based Paint Inspection

of

Newsome Park Elementary School  
4200 Marshall Avenue  
Newport News, Virginia

on

August 10, 2016

Prepared for

Mrs. Pennie Boyack  
Environmental Health & Safety  
761 Hogan Drive  
Newport News, Virginia 23606

Prepared by

Angela Mulleano  
Lead Risk Assessor Virginia State License No. 3356-000460  
Marine Chemist Service, Inc  
11850 Tug Boat Lane  
Newport News Virginia 23606  
Office (757) 873-0933  
MCS Job #16-029X

September 6, 2016

Date

Lead Risk Assessor



## XRF INSPECTION FOR LEAD CONTAINING PAINT

Inorganic lead has been identified by the US Department of Health and Human Services (H.H.S) as the number one environmental pollutant that threatens public health in the United States. In an effort to address this danger, the US Congress, EPA, CPSC, OSHA, NIOSH and HUD have enacted various legislation, regulations and recommendations.

In 1978 the Consumer Product Safety Commission, recognizing the dangers of lead exposure especially for children, promulgated regulations limiting the amount of lead permissible in residential paint to 600 parts per million (0.06%).

To protect families from exposure to lead in paint, dust and soil, Congress passed the Residential Lead-Based Hazard Reduction Act of 1992, also known as Title X. Under Title X, EPA and other federal agencies are developing a national program and policies to prevent and reduce lead-based paint exposures and hazards.

The HUD Guidelines of June 1995 and EPA Guidance of July 14, 1994 provide directions on inspections and sampling of paint, soil and wipes. HUD considers paint containing 0.5% or greater (laboratory analysis) or 1.0-mg/cm<sup>2</sup> or greater (XRF) as lead based paint. HUD is concerned with target housing, child occupied facilities, and therefore its guidelines are very stringent. Inspections performed in accordance with the HUD Guidelines are required to test every painted surface/substrate combination. Since the HUD sampling guidelines are intended to protect children, a certified lead inspector may use his professional judgment to determine sample locations and numbers in other situations such as commercial buildings.

The OSHA Lead in Construction Standard (29 CFR 1926.62) does not define lead based paint in terms of lead quantity; therefore, compliance with the OSHA standard may be required for paint with detectable quantities of lead. OSHA is concerned with what will be done to that surface and how much lead dust will be generated. A contractor who will be disturbing a painted surface must know the concentration of lead in order to properly protect his workers.

As requested by Mrs. Boyack of Newport News Public Schools. Marine Chemist Service, Inc performed a XRF Lead-Based Paint Inspection at Newsome Park Elementary School, located at 4200 Marshall Avenue, Newport News Virginia, on August 10, 2016. Angela Mulleano, a Lead Risk Assessor (Virginia License No.3356-000460) conducted the XRF Lead-Based Paint Inspection. This lead-based paint inspection was not conducted to HUD guidelines. Lead-based paint was identified on all door casings, Auditorium handrails and roof ladder inside of custodian's office. All light pink, light green, blue, beige, white and yellow ceramic wall tiles throughout the school contain lead.



## DESCRIPTION

The building, located at 4200 Marshall Avenue, Newport News Virginia, consists of a one-story brick School Building. The building and its painted components were in good condition throughout. Lead-based paint was identified on all door casings, Auditorium handrails and roof ladder inside of custodian's office. All light pink, light green, blue, beige, white and yellow ceramic wall tiles throughout the school contain lead. Detectable levels of lead were found on components throughout the building.

### STRUCTURAL COMPONENTS LISTED BY LEAD CONTENT

Marine Chemist Services, Inc uses the Niton XLp Model 300 X-Ray Fluorescence (XRF) Spectrum Analyzer, Serial Number 12533 operating under Virginia Radioactive Material License #700-135-1. All necessary documentation, licenses, certificates, and operating procedures are carried by the registered operator and maintained with the unit. The results of the XRF readings are displayed in the columns with the heading Pb-L or Pb-K and Pb-C (lead-mg/cm<sup>2</sup>).

The results of the XRF inspection indicate that lead-based paint, in amounts  $\geq 1.00$ -mg/cm<sup>2</sup>, for lead-based paint and within the parameters of this document Does Exist. Lead-based paint was identified on all door casings, Auditorium handrails and roof ladder inside of custodian's office. All light pink, light green, blue, beige, white and yellow ceramic wall tiles throughout the school contain lead

Detectable levels of lead were also found in painted components as detailed in the *Lead Paint Content in Descending Order* spreadsheet. The spreadsheet lead content is identified under the following columns:

- Pb-L:** This row is for: Any value above  $\geq 1.00$ -mg/cm<sup>2</sup> indicates a lead content in surface lead.
- Pb-K:** This row is for: Any value above  $\geq 1.00$ -mg/cm<sup>2</sup> indicates a lead content in buried lead.
- Pb-C:** This row is for: Any value from Pb-L (surface lead) and Pb-K (buried lead) above  $\geq 1.00$ -mg/cm<sup>2</sup> to indicate a combination of the highest levels of surface or buried lead content. “
- Example:** If your Pb-L level tested below 1.00-mg/cm<sup>2</sup> (example; 0.24mg/cm<sup>2</sup>) but your Pb-K tested above  $\geq 1.00$ -mg/cm<sup>2</sup> (example; 1.39mg/cm<sup>2</sup>) the Pb-C results for this signifies a positive reading for lead-based paint.

All structural components do not require testing when components are of like structural material and share the same maintenance history.



**XRF READINGS SUMMARY**

In accordance with HUD, EPA, and the Commonwealth of Virginia, paint containing more than one milligram of lead per square centimeter (1.00-mg/cm<sup>2</sup>) of dry film is lead-based paint.

Disturbing paint films with NITON XRF readings between 0.00-mg/cm<sup>2</sup> and 1.00-mg/cm<sup>2</sup> may come under OSHA’s Lead in Construction Standard (29 CFR 1926.62) as lead activity depending upon what is done to that surface (i.e. hand scraping, hand sanding, etc.).

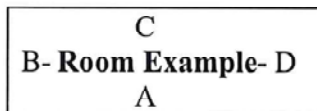
The results of the XRF readings are displayed in the column with the heading Pb L (mg/cm<sup>2</sup>).

- If the reading is greater 1.00-mg/cm<sup>2</sup>, then the paint is considered lead-based paint.
- If the reading is between 0.00-mg/cm<sup>2</sup> and 1.00-mg/cm<sup>2</sup>, work on this painted surface may come under OSHA’s Lead Standard.

**Descriptions to the abbreviations at the top of the sheet:**

- XRF No. - Reading number
- Room - Room # in which readings were taken
- Side - Indicates which side of building / room the reading is taken. Each wall of each room of a building is labeled. The labeling runs clockwise starting at the front of each apartment, the A side being the front door.

**Sides Identified:**



**Front of Building**





Component	-	Indicates type of building component being analyzed
Substrate		The material of which the building component is composite.
Color	-	Color of the paint
Condition		Condition of the paint
Pb-L (mg/cm <sup>2</sup> )-		L – shell reading indicates surface lead content In milligrams / centimeter squared
Pb-K (mg/cm <sup>2</sup> )-		K – shell reading indicates a buried lead content. In milligrams / centimeter squared
Pb-C (mg/cm <sup>2</sup> )-		C- shell reading indicates a combination of the highest levels of surface or buried lead content. In milligrams / centimeter squared.

**Definitions:**

1. **Lead-Based Paint:** Any painted or surface coating that contains lead equal to or exceeding 1.0 milligram per square centimeter ( $\leq 1.00\text{-mg/cm}^2$ ); or 0.5 percent by weight; or 5,000 parts per million.
2. **Detectable Levels of Lead:** Detectable levels of lead in paint are levels below that of lead-based paint. Detectable levels of lead pose potential health hazards as lead dust. Perform work on these lead-containing surfaces in accordance with OSHA's regulations.
3. **Lead-Based Paint Hazard:** Any condition that causes exposure to lead from dust-lead hazards, soil-lead hazards, or lead-based paint that is deteriorated or present in chewable surfaces, or impact surfaces, and that would result in adverse human health effects.
4. **Deteriorated Paint:** Any interior or exterior paint or coating that is peeling, chipping, chalking or cracking, or any paint or coating located on an interior or exterior surface or fixture that is otherwise damaged or separating from the substrate.

Newsome Park Elementary School  
 4200 Marshall Avenue  
 Newport News Virginia

Lead Contents in Paint in Descending Order Per Room Location

Marine Chemist Service, Inc.  
 11850 Tug Boat Lane  
 Newport News, VA 23607  
 757-873-0933

NNPS  
 4200 Marshall Ave Newport News VA  
 MCS Job No: 16-029X

XRF Reading	Results	Lead-mg/cm2			Component	Building Components			Color
		Pb-L	Pb-K	Pb-C		Substrate	Side	Condition	
<b>Classroom-1</b>									
7	Positive	1.3	0.9	1.3	Door Casing	Metal	A	Intact	Green
10	Negative	0.14	-0.35	0.14	HVAC Casing	Wood	A	Intact	Beige
11	Negative	0.06	-0.23	0.06	Book Shelf	Wood	B	Intact	Beige
9	Negative	0.02	-0.45	0.02	Cabinet Casing	Wood	A	Intact	Beige
12	Negative	0	0.09	0	Pin-Up Board	Wood	B	Intact	White
5	Negative	0	0.01	0	Door	Wood	A	Intact	Varnish
8	Negative	0	-0.08	0	Wall	Cinder Block	B	Intact	White
13	Negative	0	-0.34	0	File Cabinet	Metal	C	Intact	Green
<b>Women's Bathroom</b>									
17	Positive	1.8	2.5	1.8	Lower Wall	Tile	B	Intact	Lt. Pink
15	Positive	1.6	0.7	1.6	Door Casing	Metal	C	Intact	Green
19	Negative	0.11	0.3	0.3	Mirror Casing	Wood	C	Intact	Green
21	Negative	0.01	0.18	0.01	Ceiling	Plaster		Intact	White
18	Negative	0.01	-0.62	0.01	Lower Wall	Tile	B	Intact	Pink
16	Negative	0	-0.43	0	Upper Wall	Cinder Block	B	Intact	White
14	Negative	0	-0.71	0	Door	Wood	C	Intact	Varnish

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XRF Reading	Results	Lead-mg/cm <sup>2</sup>			Component	Building Components			
		Pb-L	Pb-K	Pb-C		Substrate	Side	Condition	Color
<b>Classroom-2</b>									
29	Positive	2.8	2.8	2.8	Closet Door Casing	Metal	B	Intact	Green
23	Positive	2.6	2.4	2.6	Door Casing	Metal	A	Intact	Green
28	Negative	0.5	0.16	0.5	Cabinet Casing	Wood	B	Intact	Beige
27	Negative	0.28	0.3	0.28	Book Shelf	Wood	D	Intact	Beige
26	Negative	0.21	0.26	0.21	HVAC Casing	Wood	A	Intact	Beige
24	Negative	0	-0.2	0	Wall	Cinder Block	D	Intact	White
25	Negative	0	-0.21	0	Cabinet Casing	Wood	A	Intact	Beige
22	Negative	0	-0.28	0	Door	Wood	A	Intact	Varnish
<b>Classroom-3</b>									
37	Positive	2	2.4	2	Closet Door Casing	Metal	B	Intact	Green
31	Positive	1.3	1	1.3	Door Casing	Metal	C	Intact	Green
36	Negative	0.3	0.18	0.3	Cabinet Casing	Wood	B	Intact	Beige
35	Negative	0.3	0.15	0.3	Book Shelf	Wood	D	Intact	Beige
34	Negative	0.15	0.27	0.15	HVAC Casing	Wood	C	Intact	Beige
32	Negative	0.01	-0.05	0.01	Wall	Cinder Block	D	Intact	White
33	Negative	0	0.3	0	Cabinet Casing	Wood	C	Intact	Beige
38	Negative	0	-0.08	0	Closet Shelf	Wood	B	Intact	White
30	Negative	0	-0.21	0	Door	Wood	C	Intact	Varnish



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XRF Reading	Lead-mg/cm2			Building Components				Color	
	Results	Pb-L	Pb-K	Pb-C	Component	Substrate	Side		Condition
<b>Classroom-4</b>									
46	Positive	2.4	2.5	2.4	Closet Door Casing	Metal	D	Intact	Green
40	Positive	1.5	1.2	1.5	Door Casing	Metal	A	Intact	Green
45	Negative	0.4	0.5	0.4	Cabinet Casing	Wood	D	Intact	Beige
44	Negative	0.4	0.14	0.4	Book Shelf	Wood	B	Intact	Beige
43	Negative	0.28	0.9	0.28	HVAC Casing	Wood	A	Intact	Beige
42	Negative	0.26	-0.44	0.26	Cabinet Casing	Wood	A	Intact	Beige
39	Negative	0	-0.15	0	Door	Wood	A	Intact	Varnish
41	Negative	0	-0.22	0	Wall	Cinder Block	B	Intact	White
<b>Classroom-5</b>									
48	Positive	2.2	1.7	2.2	Door Casing	Metal	C	Intact	Green
53	Positive	1.9	1.7	1.9	Closet Door Casing	Metal	D	Intact	Green
52	Negative	0.5	0.6	0.5	Cabinet Casing	Wood	D	Intact	Beige
50	Negative	0.4	-0.32	0.4	Cabinet Casing	Wood	C	Intact	Beige
51	Negative	0.3	0.22	0.3	HVAC Casing	Wood	C	Intact	Beige
49	Negative	0.01	-0.34	0.01	Wall	Cinder Block	B	Intact	White
54	Negative	0	0.06	0	Closet Shelf	Wood	D	Intact	White
47	Negative	0	-0.06	0	Door	Wood	C	Intact	Varnish

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 MCS Job No: 16-029X

XRF Reading	Lead-mg/cm2			Component	Building Components			Color	
	Results	Pb-L	Pb-K		Pb-C	Substrate	Side		Condition
<b>Classroom-6</b>									
61	Negative	0.5	0.3	0.5	Book Shelf	Wood	D	Intact	Beige
60	Negative	0.4	0.5	0.4	HVAC Casing	Wood	A	Intact	Beige
62	Negative	0.27	0.11	0.27	Cabinet Casing	Wood	B	Intact	Beige
56	Negative	0.13	0.08	0.13	Door Casing	Metal	A	Intact	Green
57	Negative	0.13	-0.06	0.13	Door Casing	Metal	A	Intact	Green
58	Negative	0.02	-0.08	0.02	Wall	Cinder Block	D	Intact	White
59	Negative	0	0.03	0	Cabinet Casing	Wood	A	Intact	Beige
55	Negative	0	-0.37	0	Door	Wood	A	Intact	Varnish
<b>Classroom-6 Bathroom</b>									
63	Negative	0.16	-0.1	0.16	Door Casing	Metal	C	Intact	Green
66	Negative	0.04	-0.64	0.04	Lower Wall	Tile	C	Intact	White
67	Negative	0.01	0.4	0.01	Ceiling	Plaster		Intact	White
64	Negative	0	0.3	0	Upper Wall	Cinder Block	C	Intact	White
<b>Classroom-7</b>									
75	Negative	0.6	0.6	0.6	Book Shelf	Wood	D	Intact	White
73	Negative	0.6	0.5	0.6	Book Shelf	Wood	D	Intact	Beige
74	Negative	0.5	0.11	0.5	Cabinet Casing	Wood	B	Intact	Beige
69	Negative	0.3	0.5	0.3	Door Casing	Metal	C	Intact	Green
76	Negative	0.25	0.03	0.25	Closet Door Casing	Metal	B	Intact	Green
72	Negative	0.25	0.01	0.25	HVAC Casing	Wood	C	Intact	Beige
77	Negative	0	0.2	0	Closet shelf	Wood	B	Intact	White
71	Negative	0	0.07	0	Cabinet Casing	Wood	C	Intact	Beige
70	Negative	0	0.03	0	Wall	Cinder Block	D	Intact	White
68	Negative	0	-0.26	0	Door	Wood	C	Intact	Varnish

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XRF Reading	Lead-mg/cm2				Building Components				
	Results	Pb-L	Pb-K	Pb-C	Component	Substrate	Side	Condition	Color
<b>Classroom-7 Bathroom</b>									
78	Negative	0.3	-0.13	0.3	Door Casing	Metal	A	Intact	Green
80	Negative	0.04	0.5	0.04	Lower Wall	Tile	A	Intact	White
81	Negative	0	0.11	0	Ceiling	Plaster		Intact	White
79	Negative	0	0.03	0	Upper Wall	Cinder Block	A	Intact	White
<b>Hallway-Classroom 6</b>									
82	Negative	0	-0.1	0	Upper Wall	Cinder Block	C	Intact	White
83	Negative	0	-0.26	0	Lower Wall	Tile	C	Intact	Tan
<b>Classroom-8</b>									
92	Negative	0.5	0.3	0.5	Cabinet Casing	Wood	C	Intact	White
88	Negative	0.4	0.6	0.4	Book Shelf	Wood	A	Intact	White
90	Negative	0.4	0.5	0.4	HVAC Casing	Wood	D	Intact	White
91	Negative	0.24	0.5	0.24	HVAC Casing	Wood	C	Intact	White
93	Negative	0.22	-0.33	0.22	Closet Door Casing	Metal	C	Intact	Green
86	Negative	0.17	-0.08	0.17	Door Casing	Metal	D	Intact	Green
87	Negative	0.01	-0.06	0.01	Wall	Cinder Block	A	Intact	White
85	Negative	0	0.12	0	Door	Wood	D	Intact	Varnish
89	Negative	0	-0.21	0	Cabinet Casing	Wood	D	Intact	White
<b>Classroom-8 Bathroom</b>									
94	Negative	0.3	0.5	0.3	Door Casing	Metal	B	Intact	Green
96	Negative	0.02	-0.97	0.02	Lower Wall	Tile	B	Intact	White
95	Negative	0	0.5	0	Upper Wall	Cinder Block	B	Intact	White
97	Negative	0	0.19	0	Ceiling	Plaster		Intact	White



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XRF Reading	Lead-mg/cm2				Building Components				
	Results	Pb-L	Pb-K	Pb-C	Component	Substrate	Side	Condition	Color
<b>Classroom-9</b>									
100	Negative	0.5	0.4	0.5	Book Shelf	Wood	C	Intact	Beige
102	Negative	0.4	0.2	0.4	HVAC Casing	Wood	D	Intact	Beige
103	Negative	0.4	0.1	0.4	Cabinet Casing	Wood	A	Intact	Beige
98	Negative	0.4	-0.22	0.4	Door Casing	Metal	D	Intact	Green
104	Negative	0.3	0.3	0.3	Closet Door Casing	Metal	A	Intact	Green
101	Negative	0.3	-0.01	0.3	Cabinet Casing	Wood	D	Intact	Beige
99	Negative	0	-0.37	0	Wall	Cinder Block	C	Intact	White
<b>Classroom-9 Bathroom</b>									
105	Negative	0.24	0.6	0.24	Door Casing	Metal	B	Intact	Green
107	Negative	0.03	0.3	0.03	Lower Wall	Tile	B	Intact	White
106	Negative	0	-0.04	0	Upper Wall	Cinder Block	B	Intact	White
108	Negative	0	-0.25	0	Ceiling	Plaster		Intact	White
<b>Classroom-10</b>									
111	Negative	0.8	0.9	0.8	Book Shelf	Wood	A	Intact	Beige
112	Negative	0.6	0.6	0.6	Cabinet Casing	Wood	D	Intact	White
113	Negative	0.5	0.07	0.5	HVAC Casing	Wood	D	Intact	White
109	Negative	0.23	-0.36	0.23	Door Casing	Metal	D	Intact	Green
115	Negative	0.2	1	0.2	Door Casing Closet	Metal	C	Intact	Green
116	Negative	0.01	0.22	0.01	Closet shelf	Wood	C	Intact	White
114	Negative	0	0.17	0	Cabinet Casing	Wood	C	Intact	White
110	Negative	0	0.05	0	Wall	Cinder Block	A	Intact	White

Newsome Park Elementary School  
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757-873-0933

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MCS Job No: 16-029X

XRF Reading	Lead-mg/cm2				Building Components				
	Results	Pb-L	Pb-K	Pb-C	Component	Substrate	Side	Condition	Color
<b>Classroom-10-Bathroom</b>									
117	Negative	0.4	0.28	0.4	Door Casing	Metal	B	Intact	Green
120	Negative	0.04	-0.07	0.04	Lower Wall	Tile	B	Intact	White
121	Negative	0	0.03	0	Ceiling	Plaster		Intact	White
118	Negative	0	-0.51	0	Upper Wall	Cinder Block	B	Intact	White
<b>Classroom-11</b>									
122	Negative	0.5	0.6	0.5	Door Casing	Metal	B	Intact	Green
126	Negative	0.01	-0.04	0.01	Book Shelf	Wood	B	Intact	White
124	Negative	0.01	-0.07	0.01	Book Shelf	Wood	A	Intact	White
123	Negative	0	0.3	0	Wall	Cinder Block	D	Intact	White
127	Negative	0	0.09	0	Book Shelf	Wood	C	Intact	White
<b>Storage(Electrical Equip)</b>									
133	Negative	0.4	0.7	0.4	Electric panel cover	Wood	D	Intact	White
128	Negative	0.25	0.7	0.25	Door Casing	Metal	B	Intact	Green
130	Negative	0	0.03	0	Wall Shelf	Wood	A	Intact	White
129	Negative	0	-0.15	0	Wall	Cinder Block	A	Intact	White
132	Negative	0	-0.36	0	Wall Shelf	Wood	C	Intact	White
<b>Classroom-12</b>									
140	Negative	0.7	0.6	0.7	Closet Door Casing	Metal	A	Intact	Green
139	Negative	0.6	0.4	0.6	Cabinet Casing	Wood	A	Intact	Beige
136	Negative	0.5	0.4	0.5	Book Shelf	Wood	C	Intact	Beige
138	Negative	0.4	-0.05	0.4	HVAC Casing	Wood	D	Intact	Beige
134	Negative	0.2	-0.37	0.2	Door Casing	Metal	D	Intact	Green
135	Negative	0	0.4	0	Wall	Cinder Block	C	Intact	White
137	Negative	0	0.26	0	Cabinet Casing	Wood	D	Intact	Beige

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XRF Reading	Lead-mg/cm <sup>2</sup>			Building Components				Color	
	Results	Pb-L	Pb-K	Pb-C	Component	Substrate	Side		Condition
<b>Classroom-12 Bathroom</b>									
141	Negative	0.2	0.5	0.2	Door Casing	Metal	B	Intact	Green
143	Negative	0.05	-0.27	0.05	Lower Wall	Tile	B	Intact	White
142	Negative	0	-0.04	0	Upper Wall	Cinder Block	B	Intact	White
144	Negative	0	-0.24	0	Ceiling	Plaster		Intact	White
<b>Classroom-12</b>									
145	Negative	0.4	0.3	0.4	Exit Door	Metal	D	Intact	Green
146	Negative	0.4	0.2	0.4	Exit Door Casing	Metal	D	Intact	Green
<b>Classroom-13</b>									
150	Negative	0.4	0.8	0.4	Book Shelf	Wood	A	Intact	White
152	Negative	0.3	0.3	0.3	HVAC Casing	Wood	D	Intact	White
148	Negative	0.3	0.1	0.3	Door Casing	Metal	D	Intact	Green
154	Negative	0.22	0.03	0.22	Closet Door Casing	Metal	C	Intact	Green
153	Negative	0	0.5	0	Cabinet Casing	Wood	C	Intact	White
151	Negative	0	0.3	0	Cabinet Casing	Wood	D	Intact	White
149	Negative	0	-0.12	0	Wall	Cinder Block	A	Intact	White
147	Negative	0	-0.26	0	Door	Wood	D	Intact	Varnish
<b>Classroom-13-Bathroom</b>									
155	Negative	0.3	0.18	0.3	Door Casing	Metal	B	Intact	Green
157	Negative	0.07	-0.72	0.07	Lower Wall	Cinder Block	B	Intact	White
158	Negative	0	0.08	0	Ceiling	Plaster		Intact	White
156	Negative	0	-0.19	0	Upper Wall	Cinder Block	B	Intact	White



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XRF Reading	Lead-mg/cm2			Component	Building Components				
	Pb-L	Pb-K	Pb-C		Substrate	Side	Condition	Color	
<b>Hallway-Classroom 13</b>									
159	Negative	0.6	0.8	0.6	Exit Door	Metal	D	Intact	Green
160	Negative	0.3	0.5	0.3	Exit Door Casing	Metal	D	Intact	Green
162	Negative	0.01	-0.14	0.01	Lower Wall	Tile	D	Intact	Tan
161	Negative	0	0.15	0	Upper Wall	Cinder Block	D	Intact	White
<b>Classroom-15</b>									
165	Negative	0.8	0.5	0.8	Book Shelf	Wood	D	Intact	Beige
164	Negative	0.4	0.19	0.4	Door Casing	Metal	C	Intact	Green
169	Negative	0.18	0.26	0.18	Closet Door Casing	Metal	B	Intact	Green
168	Negative	0.15	0.4	0.15	Cabinet Casing	Wood	B	Intact	White
166	Negative	0	0.3	0	Wall	Cinder Block	C	Intact	White
163	Negative	0	0.21	0	Door	Wood	C	Intact	Varnish
167	Negative	0	-0.13	0	Cabinet Casing	Wood	C	Intact	White
<b>Classroom-15 Bathroom</b>									
170	Negative	0.2	0.12	0.2	Door Casing	Metal	A	Intact	Green
172	Negative	0.03	-0.37	0.03	Lower Wall	Tile	A	Intact	White
173	Negative	0	0.18	0	Ceiling	Plaster		Intact	White
171	Negative	0	-0.04	0	Upper Wall	Cinder Block	A	Intact	White

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Lead Contents in Paint in Descending Order Per Room Location

Marine Chemist Service, Inc.  
 11850 Tug Boat Lane  
 Newport News, VA 23607  
 757-873-0933

NNPS  
 4200 Marshall Ave Newport News VA  
 MCS Job No: 16-029X

XRF Reading	Lead-mg/cm2				Building Components				Color	
	Results	Pb-L	Pb-K	Pb-C	Component	Substrate	Side	Condition		
<b>Classroom-16</b>										
180	Negative	0.7	0.4	0.7	HVAC Casing	Wood	A	Intact	Beige	
178	Negative	0.6	0.7	0.6	Book Shelf	Wood	D	Intact	Beige	
181	Negative	0.3	0.4	0.3	Cabinet Casing	Wood	B	Intact	Beige	
175	Negative	0.25	0.1	0.25	Door Casing	Metal	A	Intact	Green	
182	Negative	0.23	0.14	0.23	Closet Door Casing	Metal	B	Intact	Green	
176	Negative	0.01	0.27	0.01	Wall	Cinder Block	D	Intact	White	
179	Negative	0	-0.05	0	Cabinet Casing	Wood	A	Intact	Beige	
<b>Classroom-16 Bathroom</b>										
183	Negative	0.3	0.4	0.3	Door Casing	Metal	C	Intact	Green	
185	Negative	0.03	-0.28	0.03	Lower Wall	Tile	C	Intact	White	
186	Negative	0	0.22	0	Ceiling	Plaster		Intact	White	
184	Negative	0	0.2	0	Upper Wall	Cinder Block	C	Intact	White	
<b>Classroom-17</b>										
190	Negative	0.4	-0.23	0.4	Cabinet Casing	Wood	C	Intact	Beige	
189	Negative	0.21	0.14	0.21	Book Shelf	Wood	B	Intact	Beige	
191	Negative	0.18	0.08	0.18	HVAC Casing	Wood	C	Intact	Beige	
187	Negative	0.1	-0.02	0.1	Door Casing	Metal	C	Intact	Green	
193	Negative	0.09	-0.37	0.09	Closet Door Casing	Metal	D	Intact	Green	
192	Negative	0	0.08	0	Cabinet Casing	Wood	D	Intact	Beige	
188	Negative	0	-0.53	0	Wall	Cinder Block	B	Intact	White	



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XRF Reading	Lead-mg/cm2				Building Components				
	Results	Pb-L	Pb-K	Pb-C	Component	Substrate	Side	Condition	Color
<b>Classroom-17 Bathroom</b>									
194	Negative	0.4	0.14	0.4	Door Casing	Metal	A	Intact	Green
196	Negative	0.03	-0.99	0.03	Lower Wall	Tile	A	Intact	White
195	Negative	0.01	-0.14	0.01	Upper Wall	Cinder Block	A	Intact	White
197	Negative	0	0.3	0	Ceiling	Plaster		Intact	White
<b>Classroom-18</b>									
201	Negative	0.5	-0.07	0.5	Book Shelf	Wood	B	Intact	Beige
204	Negative	0.3	0.5	0.3	Cabinet Casing	Wood	D	Intact	Beige
203	Negative	0.3	0.24	0.3	HVAC Casing	Wood	A	Intact	Beige
202	Negative	0.3	0.15	0.3	Cabinet Casing	Wood	B	Intact	Beige
199	Negative	0.3	0.12	0.3	Door Casing	Metal	A	Intact	Green
205	Negative	0.16	-0.03	0.16	Closet Door Casing	Metal	D	Intact	Green
200	Negative	0	0.16	0	Wall	Cinder Block	B	Intact	White
<b>Classroom-18 Bathroom</b>									
206	Negative	0.11	-0.18	0.11	Door Casing	Metal	C	Intact	Green
208	Negative	0.05	-0.36	0.05	Lower Wall	Tile	C	Intact	White
209	Negative	0.04	-0.13	0.04	Lower Wall	Tile	C	Intact	Blue
207	Negative	0.01	-0.19	0.01	Upper Wall	Cinder Block	C	Intact	White
210	Negative	0	-0.44	0	Ceiling	Plaster		Intact	White

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XRF Reading	Lead-mg/cm2			Building Components			Color		
	Results	Pb-L	Pb-K	Pb-C	Component	Substrate		Side	Condition
<b>Classroom-20</b>									
211	Negative	0.5	-0.29	-0.29	Door Casing	Metal	A	Intact	Green
216	Negative	0.4	0.25	0.4	Cabinet Casing	Wood	B	Intact	Beige
214	Negative	0.4	0.08	0.4	Cabinet Casing	Wood	A	Intact	Beige
213	Negative	0.3	-0.18	0.3	Book Shelf	Wood	D	Intact	Beige
215	Negative	0.26	-0.18	0.26	HVAC Casing	Wood	A	Intact	Beige
217	Negative	0.16	0.4	0.16	Closet Door Casing	Metal	B	Intact	Green
212	Negative	0	0.3	0	Wall	Cinder Block	D	Intact	White
218	Negative	0	-0.13	0	Closet Shelf	Wood	B	Intact	White
<b>Classroom-20 Bathroom</b>									
219	Negative	0.23	0.5	0.23	Door Casing	Metal	C	Intact	Green
222	Negative	0.08	-0.08	0.08	Lower Wall	Tile	C	Intact	White
220	Negative	0	0.17	0	Upper Wall	Cinder Block	C	Intact	White
223	Negative	0	0.17	0	Ceiling	Plaster		Intact	White
<b>Hallway-Classroom 20</b>									
225	Negative	0.02	-0.26	0.02	Lower Wall	Tile	A	Intact	Tan
224	Negative	0	-0.29	0	Upper Wall	Cinder Block	A	Intact	White
<b>Cafeteria</b>									
227	Positive	1.6	1.6	1.6	Door Casing	Metal	B	Intact	Green
230	Negative	0.02	0.23	0.02	Water Fountain Wall	Tile	B	Intact	White
234	Negative	0	0.3	0	Duct Enclosure	Drywall		Intact	White
228	Negative	0	0.21	0	Upper Wall	Cinder Block	B	Intact	White
229	Negative	0	-0.08	0	Lower Wall	Cinder Block	B	Intact	Green
226	Negative	0	-0.1	0	Door	Wood	B	Intact	Varnish
231	Negative	0	-0.38	0	Water Fountain Wall	Tile	B	Intact	Black

By: Angela Mulleano  
 Lead Risk Assessor  
 VA State # 3356-000460

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XRF Reading	Lead-mg/cm2				Building Components				Color	
	Results	Pb-L	Pb-K	Pb-C	Component	Substrate	Side	Condition		
<b>Kitchen</b>										
237	Positive	3.2	4.3	3.2	Lower Wall	Tile	A	Intact	Beige	
238	Positive	2.5	3.9	2.5	Lower Wall	Tile	B	Intact	Blue	
235	Positive	1.4	1.5	1.4	Door Casing	Metal	B	Intact	Green	
242	Negative	0.09	0.4	0.09	Mop Sink Room Door Casing	Metal	D	Intact	Green	
239	Negative	0.02	0.12	0.02	Office Door Casing	Wood	D	Intact	Green	
243	Negative	0.01	-0.03	0.01	Mop Sink Room Wall	Cinder Block	D	Intact	White	
240	Negative	0.01	-0.05	0.01	Office Lower Wall	Wood	D	Intact	Green	
241	Negative	0	-0.03	0	Electric Panel Box	Metal	D	Intact	Green	
236	Negative	0	-0.16	0	Upper Wall	Cinder Block	A	Intact	White	
<b>Kitchen Bathroom</b>										
246	Positive	3.5	4.5	3.5	Lower Wall	Tile	A	Intact	White	
244	Negative	0.07	-0.09	0.07	Door Casing	Metal	C	Intact	Green	
248	Negative	0.01	0.7	0.01	Baseboard	Tile	D	Intact	White	
249	Negative	0	0.6	0	Floor	Tile		Intact	Black	
245	Negative	0	0.16	0	Upper Wall	Cinder Block	A	Intact	White	
247	Negative	0	0.05	0	Shelf	Wood	D	Intact	Red	
<b>Hallway-Cafeteria</b>										
257	Negative	0.06	-0.24	-0.24	Door Casing	Metal	C	Intact	Green	
260	Negative	0.01	-0.3	0.01	Door Casing	Metal	B	Intact	Beige	
259	Negative	0	-0.46	0	Wall	Cinder Block	B	Intact	Beige	
258	Negative	0	-0.51	0	Wall	Brick	D	Intact	Beige	



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XRF Reading	Lead-mg/cm2			Building Components				Color	
	Results	Pb-L	Pb-K	Pb-C	Component	Substrate	Side		Condition
<b>Classroom-23</b>									
262	Negative	0	0.3	0	Wall	Cinder Block	B	Intact	White
261	Negative	0	-0.67	0	Door Casing	Metal	D	Intact	Green
<b>Men's Bathroom</b>									
265	Negative	0.02	-0.32	0.02	Baseboard	Tile	A	Intact	Tan
264	Negative	0	-0.22	0	Wall	Cinder Block	A	Intact	White
263	Negative	0	-0.34	0	Door Casing	Metal	B	Intact	Green
<b>Classroom-25</b>									
269	Negative	0.29	-0.26	0.29	Cabinet Casing	Wood	C	Intact	Blue
268	Negative	0.01	-0.36	0.01	Wall	Cinder Block	A	Intact	Blue
266	Negative	0	0.06	0	Door Casing	Metal	B	Intact	Green
267	Negative	0	-0.44	0	Wall	Cinder Block	C	Intact	White
<b>Classroom-26</b>									
272	Negative	0.5	-0.25	0.5	Book Shelf	Wood	B	Intact	White
270	Negative	0	-0.73	0	Door Casing	Metal	C	Intact	Green
271	Negative	0	-0.82	0	Wall	Cinder Block	C	Intact	White
<b>Classroom-26A</b>									
274	Negative	0	-0.33	0	Wall	Drywall	D	Intact	White
275	Negative	0	-0.4	0	Wall	Cinder Block	B	Intact	White
273	Negative	0	-0.52	0	Door Casing	Metal	A	Intact	Green
<b>Storage Room</b>									
276	Negative	0.22	-0.11	0.22	Door Casing	Metal	B	Intact	Green
279	Negative	0.01	0.15	0.01	Cabinet Shelf	Wood	C	Intact	Green
278	Negative	0.01	-0.52	0.01	Wall	Brick	C	Intact	Green
277	Negative	0	-0.24	0	Wall	Cinder Block	A	Intact	Green

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XRF Reading	Lead-mg/cm2			Building Components			Color		
	Results	Pb-L	Pb-K	Pb-C	Component	Substrate		Side	Condition
<b>Assistant Principals Office</b>									
283	Negative	0.5	-0.29	0.5	Cabinet Casing	Wood	D	Intact	White
280	Negative	0.22	0.24	0.22	Door Casing	Metal	C	Intact	Green
284	Negative	0	0.12	0	Cabinet Casing	Wood	B	Intact	Tan
281	Negative	0	-0.18	0	Wall	Cinder Block	B	Intact	White
282	Negative	0	-0.56	0	Wall	Brick	C	Intact	White
<b>Stage Storage</b>									
285	Negative	0.2	-0.04	-0.04	Door Casing	Metal	C	Intact	Green
286	Negative	0	0.02	0	Wall	Cinder Block	D	Intact	White
<b>Stage</b>									
289	Positive	1.2	0.9	1.2	Hand Rail	Metal	D	Intact	White
287	Negative	0.5	1.2	0.5	Hand Rail	Metal	D	Intact	White
290	Negative	0	-0.61	0	Lower Wall	Drywall	A	Intact	White
<b>Auditorium</b>									
296	Positive	1.2	1.1	1.2	Hand Rail	Metal	C	Intact	White
291	Negative	0	-0.47	0	Middle Wall	Cinder Block	C	Intact	Green
292	Negative	0	-0.7	0	Lower Wall	Cinder Block	C	Intact	White
<b>Library</b>									
297	Positive	1.3	0.5	1.3	Door Casing	Metal	C	Intact	Green
300	Negative	0.4	-0.28	0.4	Cabinet Casing	Wood	B	Intact	Green
299	Negative	0.21	-0.29	0.21	Book Shelf	Wood	B	Intact	Green
298	Negative	0.01	-0.61	0.01	Wall	Cinder Block	C	Intact	White

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XRF Reading	Results	Lead-mg/cm2			Component	Building Components			Color
		Pb-L	Pb-K	Pb-C		Substrate	Side	Condition	
<b>Custodians Office</b>									
304	Positive	1.2	1.2	1.2	ladder	Metal	A	Intact	Red
302	Negative	0.21	0.7	0.21	Door Casing	Metal	A	Intact	Green
301	Negative	0.07	0.05	0.07	Door Casing	Metal	A	Intact	Green
303	Negative	0	-0.29	0	Wall	Cinder Block	A	Intact	White
<b>Auditorium Hallway</b>									
308	Positive	3.7	4.3	3.7	Lower Wall	Tile	C	Intact	Beige
307	Positive	3.2	3.3	3.2	Lower Wall	Tile	A	Intact	Blue
306	Negative	0.13	-0.59	0.13	Lower Wall	Tile	A	Intact	Red
305	Negative	0	-0.52	0	Upper Wall	Cinder Block	A	Intact	White
<b>Classroom-44</b>									
309	Negative	0.6	0.7	0.6	Door Casing	Metal	A	Intact	Green
313	Negative	0.4	0.12	0.4	Cabinet Casing	Wood	A	Intact	Gray
312	Negative	0.16	-0.12	0.16	Book Shelf	Wood	A	Intact	Gray
311	Negative	0.05	-0.21	0.05	Wall	Cinder Block	B	Intact	White

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XRF Reading	Lead-mg/cm2				Component	Building Components			
	Results	Pb-L	Pb-K	Pb-C		Substrate	Side	Condition	Color
<b>Classroom-44 Lobby</b>									
323	Negative	0.05	-0.35	0.05	Lower Wall	Tile	A	Intact	White
317	Negative	0.05	-0.62	0.05	Lower Wall	Tile	B	Intact	Tan
315	Negative	0.01	-0.38	-0.38	Door Casing	Metal	A	Intact	Green
318	Negative	0.01	-0.55	0.01	Upper Wall	Brick	D	Intact	White
316	Negative	0	-0.02	0	Upper Wall	Cinder Block	B	Intact	White
314	Negative	0	-0.16	0	Door	Metal	A	Intact	Green
322	Negative	0	-0.32	0	Center wall Baseboard	Tile	D	Intact	Black
324	Negative	0	-0.35	0	Lower Wall	Tile	A	Intact	Beige
320	Negative	0	-0.45	0	Baseboard	Tile	D	Intact	Tan
319	Negative	0	-0.51	0	Lower Wall	Brick	D	Intact	Green
321	Negative	0	-0.6	0	Center wall	Brick	D	Intact	White
<b>Men's Bathroom</b>									
326	Positive	2.6	2.9	2.6	Door Casing	Metal	D	Intact	Green
329	Positive	1.7	2.1	1.7	Lower Wall	Tile	D	Intact	Green Lt.
328	Negative	0.07	0.07	0.07	Lower Wall	Tile	A	Intact	Green
327	Negative	0.01	-0.16	0.01	Upper Wall	Cinder Block	A	Intact	White
330	Negative	0	0.3	0	Mirror Casing	Wood	A	Intact	Green
325	Negative	0	-0.01	0	Door	Wood	D	Intact	Varnish
331	Negative	0	-0.43	0	Ceiling	Plaster		Intact	White



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XRF Reading	Lead-mg/cm2				Building Components				Color	
	Results	Pb-L	Pb-K	Pb-C	Component	Substrate	Side	Condition		
<b>Women's Bathroom</b>										
335	Positive	3.9	4.7	3.9	Lower Wall	Tile	B	Intact	Yellow	
333	Positive	3.3	2.2	3.3	Door Casing	Metal	D	Intact	Green	
336	Negative	0.02	-0.52	0.02	Lower Wall	Tile	A	Intact	White	
337	Negative	0	-0.51	0	Ceiling	Plaster		Intact	White	
334	Negative	0	-0.53	0	Upper Wall	Cinder Block	B	Intact	White	
<b>Nurses Office</b>										
339	Negative	0.3	-0.09	-0.09	Door Casing	Metal	D	Intact	Green	
340	Negative	0	-0.1	0	Wall	Cinder Block	A	Intact	White	
338	Negative	0	-0.44	0	Door	Wood	D	Intact	Varnish	
<b>Nurses Office Bathroom</b>										
343	Positive	1.9	2	1.9	Lower Wall	Tile	A	Intact	White	
341	Negative	0.7	0.3	0.7	Door Casing	Metal	D	Intact	Green	
342	Negative	0	-0.47	0	Upper Wall	Cinder Block	A	Intact	White	
<b>Main Office</b>										
344	Positive	2.1	1.2	2.1	Door Casing	Metal	D	Intact	Green	
348	Negative	0	-0.02	0	Cabinet Casing	Wood	D	Intact	Beige	
346	Negative	0	-0.06	0	Wall	Drywall	D	Intact	Beige	
347	Negative	0	-0.17	0	Wall	Cinder Block	D	Intact	Beige	
345	Negative	0	-0.28	0	Wall	Cinder Block	B	Intact	White	
<b>Principals Office</b>										
350	Positive	1.3	1.3	1.3	Door Casing	Metal	C	Intact	Green	
351	Negative	0	-0.18	0	Wall	Cinder Block	A	Intact	White	
349	Negative	0	-0.69	0	Door	Wood	C	Intact	Varnish	



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XRF Reading	Lead-mg/cm2			Building Components			Color		
	Results	Pb-L	Pb-K	Pb-C	Component	Substrate		Side	Condition
<b>Principals Office Bathroom</b>									
352	Positive	2	2.6	2	Door Casing	Metal	A	Intact	Green
354	Positive	1.9	1.6	1.9	Lower Wall	Tile	A	Intact	White
353	Negative	0	-0.63	0	Upper Wall	Cinder Block	A	Intact	White
<b>Mail Room</b>									
355	Negative	0.4	0.22	0.4	Door Casing	Metal	D	Intact	Green
357	Negative	0	-0.31	0	Cabinet Casing	Wood	D	Intact	Beige
356	Negative	0	-0.33	0	Wall	Cinder Block	D	Intact	White
<b>Classroom-28</b>									
359	Positive	2	1.8	2	Door Casing	Metal	A	Intact	Green
361	Negative	0.24	-0.58	0.24	Cabinet Casing	Wood	A	Intact	Beige
362	Negative	0.2	-0.23	0.2	HVAC	Wood	A	Intact	Beige
363	Negative	0	0.01	0	Cabinet Casing	Wood	B	Intact	Beige
358	Negative	0	-0.72	0	Door	Wood	A	Intact	Varnish
360	Negative	0	-0.73	0	Wall	Cinder Block	D	Intact	White
<b>Classroom-31</b>									
369	Negative	0.4	-0.03	0.4	HVAC	Wood	B	Intact	Beige
365	Negative	0.28	0.04	0.28	Door Casing	Metal	B	Intact	Green
368	Negative	0	0.14	0	Cabinet Casing	Wood	B	Intact	Beige
366	Negative	0	-0.5	0	Wall	Cinder Block	C	Intact	White
367	Negative	0	-0.58	0	Wall	Drywall	C	Intact	White
364	Negative	0	-0.61	0	Door	Wood	B	Intact	Varnish

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	Results	Pb-L	Pb-K	Pb-C	Component	Substrate	Side		Condition
<b>Classroom-31 Storage Room</b>									
370	Negative	0.28	-0.32	0.28	Door Casing	Metal	A	Intact	Green
372	Negative	0	-0.27	0	Book Shelf	Wood	A	Intact	White
371	Negative	0	-0.53	0	Wall	Cinder Block	A	Intact	White
<b>Classroom-32</b>									
376	Negative	0.29	0.24	0.29	HVAC	Wood	B	Intact	Beige
373	Negative	0.19	0.08	0.08	Door Casing	Metal	B	Intact	Green
375	Negative	0	0.09	0	Cabinet Casing	Wood	B	Intact	Beige
374	Negative	0	-0.34	0	Wall	Cinder Block	A	Intact	White
<b>Classroom-34</b>									
381	Negative	0.5	0.19	0.5	HVAC	Wood	B	Intact	Beige
377	Negative	0.4	0.4	0.4	Door Casing	Metal	B	Intact	Green
382	Negative	0.3	-0.11	0.3	Book Shelf	Wood	A	Intact	Beige
384	Negative	0.3	-0.19	0.3	Exit Door	Metal	A	Intact	Green
385	Negative	0.24	0.5	0.24	Exit Door Casing	Metal	A	Intact	Green
383	Negative	0.13	-0.22	0.13	Cabinet Casing Upper	Wood	D	Intact	Beige
379	Negative	0	-0.03	0	Pin up board	Wood	C	Intact	White
380	Negative	0	-0.22	0	Cabinet Casing	Wood	B	Intact	Beige
378	Negative	0	-0.36	0	Wall	Cinder Block	C	Intact	White
<b>Classroom-34 Boys Bathroom</b>									
386	Negative	0.29	1.4	0.29	Door Casing	Metal	D	Intact	Green
388	Negative	0.14	-0.52	0.14	Lower Wall	Tile	D	Intact	White
387	Negative	0	0.03	0	Upper Wall	Cinder Block	D	Intact	White

Newsome Park Elementary School  
 4200 Marshall Avenue  
 Newport News Virginia

Lead Contents in Paint in Descending Order Per Room Location

Marine Chemist Service, Inc.  
 11850 Tug Boat Lane  
 Newport News, VA 23607  
 757-873-0933

NNPS  
 4200 Marshall Ave Newport News VA  
 MCS Job No: 16-029X

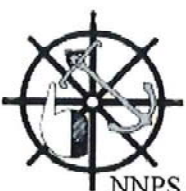
XRF Reading	Results	Lead-mg/cm2			Building Components				Color	
		Pb-L	Pb-K	Pb-C	Component	Substrate	Side	Condition		
<b>Classroom-38</b>										
389	Positive	2.9	2.3	2.9	Door Casing	Metal	A	Intact	Green	
394	Positive	2.5	2.4	2.5	Door Casing Closet	Metal	B	Intact	Green	
393	Negative	0.3	-0.04	0.3	Cabinet Casing	Wood	B	Intact	Beige	
391	Negative	0.3	-0.44	0.3	Cabinet Casing	Wood	A	Intact	Beige	
392	Negative	0.3	-0.51	0.3	HVAC	Wood	A	Intact	Beige	
390	Negative	0	-0.56	0	Wall	Cinder Block	D	Intact	White	
<b>Classroom-42</b>										
400	Positive	2.9	2.6	2.9	Closet Door Casing	Metal	B	Intact	Green	
395	Negative	0.8	0.18	0.8	Door Casing	Metal	A	Intact	Green	
399	Negative	0.4	-0.26	0.4	Cabinet Casing	Wood	B	Intact	Beige	
397	Negative	0.24	0.25	0.24	Book Shelf	Wood	A	Intact	Beige	
398	Negative	0.22	-0.25	0.22	HVAC	Wood	A	Intact	Beige	
401	Negative	0	-0.25	0	Book Shelf	Wood	C	Intact	White	
396	Negative	0	-0.79	0	Wall	Cinder Block	D	Intact	White	



NOT TO SCALE

**NEWSOME PARK ELEMENTARY SCHOOL  
NEWPORT NEWS, VIRGINIA**





Newsome Park Elem. School NN

Reading No	Room Equivalent	Component	Substrate	Side	Condition	Color	Results	PbC	PbL	PbK
1	Shutter-Ca							5.47 ± 0.00	0.91 ± 0.00	0.00 ± 0.00
2	Ca-1						Positive	1.40 ± 0.10	1.40 ± 0.10	1.20 ± 0.40
3	Ca-2						Positive	1.40 ± 0.10	1.40 ± 0.10	0.90 ± 0.40
4	Ca-3						Positive	1.40 ± 0.10	1.40 ± 0.10	0.70 ± 0.40
5	Classroom-1	Door	Wood	A	Intact	Varnish	Negative	0.00 ± 0.02	0.00 ± 0.02	0.01 ± 1.28
6	Classroom-1	Door Casing Void	Metal	A	Intact	Green	Null	1.10 ± 0.20	1.10 ± 0.20	1.00 ± 0.70
7	Classroom-1	Door Casing	Metal	A	Intact	Green	Positive	1.30 ± 0.30	1.30 ± 0.30	0.90 ± 1.00
8	Classroom-1	Wall	Cinder Block	B	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.08 ± 0.92
9	Classroom-1	Cabinet Casing	Wood	A	Intact	Beige	Negative	0.02 ± 0.10	0.02 ± 0.10	-0.45 ± 1.24
10	Classroom-1	HVAC Casing	Wood	A	Intact	Beige	Negative	0.14 ± 0.15	0.14 ± 0.15	-0.35 ± 1.42
11	Classroom-1	Book Shelf	Wood	B	Intact	Beige	Negative	0.06 ± 0.12	0.06 ± 0.12	-0.23 ± 1.34
12	Classroom-1	Pin-Up Board	Wood	B	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	0.09 ± 1.20
13	Classroom-1	File Cabinet	Metal	C	Intact	Green	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.34 ± 1.44
14	Womens Bathroom	Door	Wood	C	Intact	Varnish	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.71 ± 1.59
15	Womens Bathroom	Door Casing	Metal	C	Intact	Green	Positive	1.60 ± 0.40	1.60 ± 0.40	0.70 ± 1.20
16	Womens Bathroom	Upper Wall	Cinder Block	B	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.43 ± 1.82
17	Womens Bathroom	Lower Wall	Tile	B	Intact	Li. Pink	Positive	1.80 ± 0.50	1.80 ± 0.50	2.50 ± 2.80
18	Womens Bathroom	Lower Wall	Tile	B	Intact	Pink	Negative	0.01 ± 0.02	0.01 ± 0.02	-0.62 ± 0.94
19	Womens Bathroom	Mirror Casing	Wood	C	Intact	Green	Negative	0.30 ± 0.50	0.11 ± 0.17	0.30 ± 0.50
20	Womens Bathroom	Ceiling Void	Plaster		Intact	White	Null	0.05 ± 0.47	0.05 ± 0.47	-0.29 ± 6.83
21	Womens Bathroom	Ceiling	Plaster		Intact	White	Negative	0.01 ± 0.03	0.01 ± 0.03	0.18 ± 0.88
22	Classroom-2	Door	Wood	A	Intact	Varnish	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.28 ± 0.58
23	Classroom-2	Door Casing	Metal	A	Intact	Green	Positive	2.60 ± 0.50	2.60 ± 0.50	2.40 ± 1.10
24	Classroom-2	Wall	Cinder Block	D	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.20 ± 1.08
25	Classroom-2	Cabinet Casing	Wood	A	Intact	Beige	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.21 ± 0.47
26	Classroom-2	HVAC Casing	Wood	A	Intact	Beige	Negative	0.21 ± 0.21	0.21 ± 0.21	0.26 ± 1.62
27	Classroom-2	Book Shelf	Wood	D	Intact	Beige	Negative	0.28 ± 0.25	0.28 ± 0.25	0.30 ± 1.83
28	Classroom-2	Cabinet Casing	Wood	B	Intact	Beige	Negative	0.50 ± 0.30	0.50 ± 0.30	0.16 ± 0.88
29	Classroom-2	Cosset Door Casing	Metal	B	Intact	Green	Positive	2.80 ± 0.90	2.80 ± 0.90	2.80 ± 3.10
30	Classroom-3	Door	Wood	C	Intact	Varnish	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.21 ± 1.79
31	Classroom-3	Door Casing	Metal	C	Intact	Green	Positive	1.30 ± 0.20	1.30 ± 0.20	1.00 ± 1.00
32	Classroom-3	Wall	Cinder Block	D	Intact	White	Negative	0.01 ± 0.03	0.01 ± 0.03	-0.05 ± 0.98



NNPS

4200 Marshall Ave Newport News VA  
MCS Job No: 16-029X

Marine Chemist Service, Inc.  
11850 Tug Boat Lane  
Newport News Virginia 23606

Newsome Park Elem. School NN

Reading No	Room Equivalent	Component	Substrate	Side	Condition	Color	Results	PbC	PbL	PbK
33	Classroom-3	Cabinet Casing	Wood	C	Intact	Beige	Negative	0.00 ± 0.02	0.00 ± 0.02	0.30 ± 1.31
34	Classroom-3	HVAC Casing	Wood	C	Intact	Beige	Negative	0.15 ± 0.16	0.15 ± 0.16	0.27 ± 1.63
35	Classroom-3	Book Shelf	Wood	D	Intact	Beige	Negative	0.30 ± 0.27	0.30 ± 0.27	0.15 ± 1.51
36	Classroom-3	Cabinet Casing	Wood	B	Intact	Beige	Negative	0.30 ± 0.21	0.30 ± 0.21	0.18 ± 1.59
37	Classroom-3	Closest Door Casing	Metal	B	Intact	Green	Positive	2.00 ± 0.60	2.00 ± 0.60	2.40 ± 2.50
38	Classroom-3	Closest Shelf	Wood	B	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.08 ± 1.67
39	Classroom-4	Door	Wood	A	Intact	Varnish	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.15 ± 1.38
40	Classroom-4	Door Casing	Metal	A	Intact	Green	Positive	1.50 ± 0.30	1.50 ± 0.30	1.20 ± 1.20
41	Classroom-4	Wall	Cinder Block	B	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.22 ± 1.02
42	Classroom-4	Cabinet Casing	Wood	A	Intact	Beige	Negative	0.25 ± 0.20	0.26 ± 0.20	-0.44 ± 1.47
43	Classroom-4	HVAC Casing	Wood	A	Intact	Beige	Negative	0.28 ± 0.28	0.28 ± 0.28	0.90 ± 2.10
44	Classroom-4	Book Shelf	Wood	B	Intact	Beige	Negative	0.40 ± 0.30	0.40 ± 0.30	0.14 ± 0.85
45	Classroom-4	Cabinet Casing	Wood	D	Intact	Beige	Negative	0.40 ± 0.30	0.40 ± 0.30	0.50 ± 1.50
46	Classroom-4	Closest Door Casing	Metal	D	Intact	Green	Positive	2.40 ± 0.70	2.40 ± 0.70	2.50 ± 2.60
47	Classroom-5	Door	Wood	C	Intact	Varnish	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.06 ± 1.63
48	Classroom-5	Door Casing	Metal	C	Intact	Green	Positive	2.20 ± 0.90	2.20 ± 0.90	1.70 ± 2.50
49	Classroom-5	Wall	Cinder Block	B	Intact	White	Negative	0.01 ± 0.02	0.01 ± 0.02	-0.34 ± 1.07
50	Classroom-5	Cabinet Casing	Wood	C	Intact	Beige	Negative	0.40 ± 0.30	0.40 ± 0.30	-0.32 ± 0.84
51	Classroom-5	HVAC Casing	Wood	C	Intact	Beige	Negative	0.30 ± 0.33	0.30 ± 0.33	0.22 ± 2.06
52	Classroom-5	Cabinet Casing	Wood	D	Intact	Beige	Negative	0.50 ± 0.20	0.50 ± 0.20	0.60 ± 0.60
53	Classroom-5	Closest Door Casing	Metal	D	Intact	Green	Positive	1.90 ± 0.70	1.90 ± 0.70	1.70 ± 2.50
54	Classroom-5	Closest Shelf	Wood	D	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	0.06 ± 1.52
55	Classroom-6	Door	Wood	A	Intact	Varnish	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.37 ± 1.47
56	Classroom-6	Door Casing	Metal	A	Intact	Green	Negative	0.13 ± 0.14	0.13 ± 0.14	0.08 ± 2.05
57	Classroom-6	Door Casing	Metal	A	Intact	Green	Negative	0.13 ± 0.14	0.13 ± 0.14	-0.06 ± 2.16
58	Classroom-6	Wall	Cinder Block	D	Intact	White	Negative	0.02 ± 0.04	0.02 ± 0.04	-0.08 ± 1.01
59	Classroom-6	Cabinet Casing	Wood	A	Intact	Beige	Negative	0.00 ± 0.02	0.00 ± 0.02	0.03 ± 0.46
60	Classroom-6	HVAC Casing	Wood	A	Intact	Beige	Negative	0.40 ± 0.30	0.40 ± 0.30	0.50 ± 1.50
61	Classroom-6	Book Shelf	Wood	D	Intact	Beige	Negative	0.50 ± 0.30	0.50 ± 0.30	0.30 ± 1.54
62	Classroom-6	Cabinet Casing	Wood	B	Intact	Beige	Negative	0.27 ± 0.17	0.27 ± 0.17	0.11 ± 1.49
63	Classroom-6 Bathroom	Door Casing	Metal	C	Intact	Green	Negative	0.16 ± 0.14	0.16 ± 0.14	-0.10 ± 2.39
64	Classroom-6 Bathroom	Upper Wall	Cinder Block	C	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	0.30 ± 0.96





NNPS

4200 Marshall Ave Newport News VA  
MCS Job No: 16-029X

Marine Chemist Service, Inc.  
11850 Tug Boat Lane  
Newport News Virginia 23606

Newsome Park Elem. School NN

Reading No	Room Equivalent	Component	Substrate	Side	Condition	Color	Results	PbC	PbL	PbK
55	Classroom-6 Bathroom	Lower Wall Void	Tile	C	Intact	White	Null	0.02 ± 0.07	0.02 ± 0.07	0.18 ± 4.69
56	Classroom-6 Bathroom	Lower Wall	Tile	C	Intact	White	Negative	0.04 ± 0.08	0.04 ± 0.08	-0.64 ± 2.12
57	Classroom-6 Bathroom	Ceiling	Plaster		Intact	White	Negative	0.01 ± 0.02	0.01 ± 0.02	0.40 ± 0.80
58	Classroom-7	Door	Wood	C	Intact	Varnish	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.26 ± 1.56
59	Classroom-7	Door Casing	Metal	C	Intact	Green	Negative	0.30 ± 0.21	0.30 ± 0.21	0.50 ± 2.30
70	Classroom-7	Wall	Cinder Block	D	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	0.03 ± 0.98
71	Classroom-7	Cabinet Casing	Wood	C	Intact	Beige	Negative	0.00 ± 0.02	0.00 ± 0.02	0.07 ± 0.46
72	Classroom-7	HVAC Casing	Wood	C	Intact	Beige	Negative	0.25 ± 0.18	0.25 ± 0.18	0.01 ± 1.55
73	Classroom-7	Book Shelf	Wood	D	Intact	Beige	Negative	0.60 ± 0.30	0.60 ± 0.30	0.50 ± 1.30
74	Classroom-7	Cabinet Casing	Wood	B	Intact	Beige	Negative	0.50 ± 0.10	0.50 ± 0.10	0.11 ± 0.56
75	Classroom-7	Book Shelf	Wood	D	Intact	White	Negative	0.60 ± 0.20	0.60 ± 0.20	0.60 ± 0.90
76	Classroom-7	Closet Door Casing	Metal	B	Intact	Green	Negative	0.25 ± 0.16	0.25 ± 0.16	0.03 ± 2.16
77	Classroom-7	Closet shelf	Wood	B	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	0.20 ± 1.29
78	Classroom-7 Bathroom	Door Casing	Metal	A	Intact	Green	Negative	0.30 ± 0.20	0.30 ± 0.20	-0.13 ± 2.45
79	Classroom-7 Bathroom	Upper Wall	Cinder Block	A	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	0.03 ± 0.92
80	Classroom-7 Bathroom	Lower Wall	Tile	A	Intact	White	Negative	0.04 ± 0.09	0.04 ± 0.09	0.50 ± 2.40
81	Classroom-7 Bathroom	Ceiling	Plaster		Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	0.11 ± 0.94
82	Hallway-Classroom 6	Upper Wall	Cinder Block	C	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.10 ± 0.95
83	Hallway-Classroom 6	Lower Wall	Tile	C	Intact	Tan	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.26 ± 2.52
84	Classroom-8	Door Void	Wood	D	Intact	Varnish	Null	0.00 ± 0.03	0.00 ± 0.03	0.30 ± 4.65
85	Classroom-8	Door	Wood	D	Intact	Varnish	Negative	0.00 ± 0.02	0.00 ± 0.02	0.12 ± 1.39
86	Classroom-8	Door Casing	Metal	D	Intact	Green	Negative	0.17 ± 0.15	0.17 ± 0.15	-0.08 ± 2.14
87	Classroom-8	Wall	Cinder Block	A	Intact	White	Negative	0.01 ± 0.02	0.01 ± 0.02	-0.06 ± 0.99
88	Classroom-8	Book Shelf	Wood	A	Intact	White	Negative	0.40 ± 0.10	0.40 ± 0.10	0.60 ± 0.60
89	Classroom-8	Cabinet Casing	Wood	D	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.21 ± 1.19
90	Classroom-8	HVAC Casing	Wood	D	Intact	White	Negative	0.40 ± 0.30	0.40 ± 0.30	0.50 ± 1.70
91	Classroom-8	HVAC Casing	Wood	C	Intact	White	Negative	0.24 ± 0.17	0.24 ± 0.17	0.50 ± 1.60
92	Classroom-8	Cabinet Casing	Wood	C	Intact	White	Negative	0.50 ± 0.10	0.50 ± 0.10	0.30 ± 0.65
93	Classroom-8	Closet Door Casing	Metal	C	Intact	Green	Negative	0.22 ± 0.18	0.22 ± 0.18	-0.33 ± 2.11
94	Classroom-8 Bathroom	Door Casing	Metal	B	Intact	Green	Negative	0.30 ± 0.25	0.30 ± 0.25	0.50 ± 2.20
95	Classroom-8 Bathroom	Upper Wall	Cinder Block	B	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	0.50 ± 0.90
96	Classroom-8 Bathroom	Lower Wall	Tile	B	Intact	White	Negative	0.02 ± 0.04	0.02 ± 0.04	-0.97 ± 1.99





NNPS

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11850 Tug Boat Lane  
Newport News Virginia 23606

Newsome Park Elem. School NN

Reading No	Room Equivalent	Component	Substrate	Side	Condition	Color	Results	PbC	PbL	PbK
97	Classroom-8 Bathroom	Ceiling	Plaster		Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	0.19 ± 0.84
98	Classroom-9	Door Casing	Metal	D	Intact	Green	Negative	0.40 ± 0.30	0.40 ± 0.30	-0.22 ± 2.14
99	Classroom-9	Wall	Cinder Block	C	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.37 ± 1.60
100	Classroom-9	Book Shelf	Wood	C	Intact	Beige	Negative	0.50 ± 0.20	0.50 ± 0.20	0.40 ± 0.70
101	Classroom-9	Cabinet Casing	Wood	D	Intact	Beige	Negative	0.30 ± 0.10	0.30 ± 0.10	-0.01 ± 0.52
102	Classroom-9	HVAC Casing	Wood	D	Intact	Beige	Negative	0.40 ± 0.30	0.40 ± 0.30	0.20 ± 1.31
103	Classroom-9	Cabinet Casing	Wood	A	Intact	Beige	Negative	0.40 ± 0.30	0.40 ± 0.30	0.10 ± 2.00
104	Classroom-9	Closet/Door Casing	Metal	A	Intact	Green	Negative	0.30 ± 0.08	0.30 ± 0.08	0.30 ± 0.86
105	Classroom-9 Bathroom	Door Casing	Metal	B	Intact	Green	Negative	0.24 ± 0.16	0.24 ± 0.16	0.60 ± 2.10
106	Classroom-9 Bathroom	Upper Wall	Cinder Block	B	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.04 ± 0.94
107	Classroom-9 Bathroom	Lower Wall	Tile	B	Intact	White	Negative	0.03 ± 0.07	0.03 ± 0.07	0.30 ± 2.18
108	Classroom-9 Bathroom	Ceiling	Plaster		Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.25 ± 1.60
109	Classroom-10	Door Casing	Metal	D	Intact	Green	Negative	0.23 ± 0.21	0.23 ± 0.21	-0.36 ± 2.07
110	Classroom-10	Wall	Cinder Block	A	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	0.05 ± 0.91
111	Classroom-10	Book Shelf	Wood	A	Intact	Beige	Negative	0.80 ± 0.20	0.80 ± 0.20	0.90 ± 0.60
112	Classroom-10	Cabinet Casing	Wood	D	Intact	White	Negative	0.60 ± 0.20	0.60 ± 0.20	0.60 ± 0.70
113	Classroom-10	HVAC Casing	Wood	D	Intact	White	Negative	0.50 ± 0.20	0.50 ± 0.20	0.07 ± 1.41
114	Classroom-10	Cabinet Casing	Wood	C	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	0.17 ± 1.15
115	Classroom-10	Door Casing/Closet	Metal	C	Intact	Green	Negative	0.20 ± 0.15	0.20 ± 0.15	1.00 ± 2.20
116	Classroom-10	Closet shelf	Wood	C	Intact	White	Negative	0.01 ± 0.03	0.01 ± 0.03	0.22 ± 1.28
117	Classroom-10-Bathroom	Door Casing	Metal	B	Intact	Green	Negative	0.40 ± 0.20	0.40 ± 0.20	0.28 ± 2.16
118	Classroom-10-Bathroom	Upper Wall	Cinder Block	B	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.51 ± 1.68
119	Classroom-10-Bathroom	Lower Wall Void	Tile	B	Intact	White	Null	0.02 ± 0.05	0.02 ± 0.05	-0.10 ± 2.18
120	Classroom-10-Bathroom	Lower Wall	Tile	B	Intact	White	Negative	0.04 ± 0.03	0.04 ± 0.03	-0.07 ± 0.84
121	Classroom-10-Bathroom	Ceiling	Plaster		Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	0.03 ± 1.48
122	Classroom-11	Door Casing	Metal	B	Intact	Green	Negative	0.50 ± 0.20	0.50 ± 0.20	0.60 ± 1.00
123	Classroom-11	Wall	Cinder Block	D	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	0.30 ± 0.92
124	Classroom-11	Book Shelf	Wood	A	Intact	White	Negative	0.01 ± 0.02	0.01 ± 0.02	-0.07 ± 1.20
125	Classroom-11	Book Shelf Void	Wood	B	Intact	White	Null	0.00 ± 0.03	0.00 ± 0.03	-0.23 ± 2.72
126	Classroom-11	Book Shelf	Wood	B	Intact	White	Negative	0.01 ± 0.03	0.01 ± 0.03	-0.04 ± 1.60
127	Classroom-11	Book Shelf	Wood	C	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	0.09 ± 1.40
128	Storage(Electrical Equip)	Door Casing	Metal	B	Intact	Green	Negative	0.25 ± 0.21	0.25 ± 0.21	0.70 ± 2.10



NNPS

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Newsome Park Elem. School NN

Reading No	Room Equivalent	Component	Substrate	Side	Condition	Color	Results	PbC	PbL	PbK
129	Storage(Electrical Equip)	Wall	Cinder Block	A	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.15 ± 0.94
130	Storage(Electrical Equip)	Wall Shelf	Wood	A	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	0.03 ± 1.15
131	Storage(Electrical Equip)	Wall Shelf/Void	Wood	C	Intact	White	Null	0.00 ± 0.02	0.00 ± 0.02	0.60 ± 4.00
132	Storage(Electrical Equip)	Wall Shelf	Wood	C	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.36 ± 1.23
133	Storage(Electrical Equip)	Electric panel cover	Wood	D	Intact	White	Negative	0.40 ± 0.30	0.40 ± 0.30	0.70 ± 2.40
134	Classroom-12	Door Casing	Metal	D	Intact	Green	Negative	0.20 ± 0.20	0.20 ± 0.20	-0.37 ± 2.68
135	Classroom-12	Wall	Cinder Block	C	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	0.40 ± 0.90
136	Classroom-12	Book Shelf	Wood	C	Intact	Beige	Negative	0.50 ± 0.10	0.50 ± 0.10	0.40 ± 0.60
137	Classroom-12	Cabinet Casing	Wood	D	Intact	Beige	Negative	0.00 ± 0.02	0.00 ± 0.02	0.26 ± 1.51
138	Classroom-12	HVAC Casing	Wood	D	Intact	Beige	Negative	0.40 ± 0.30	0.40 ± 0.30	-0.05 ± 1.25
139	Classroom-12	Cabinet Casing	Wood	A	Intact	Beige	Negative	0.60 ± 0.20	0.60 ± 0.20	0.40 ± 0.70
140	Classroom-12	Closet Door Casing	Metal	A	Intact	Green	Negative	0.70 ± 0.20	0.70 ± 0.20	0.60 ± 1.00
141	Classroom-12 Bathroom	Door Casing	Metal	B	Intact	Green	Negative	0.20 ± 0.17	0.20 ± 0.17	0.50 ± 2.50
142	Classroom-12 Bathroom	Upper Wall	Cinder Block	B	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.04 ± 0.89
143	Classroom-12 Bathroom	Lower Wall	Tile	B	Intact	White	Negative	0.05 ± 0.05	0.05 ± 0.05	-0.27 ± 1.03
144	Classroom-12 Bathroom	Ceiling	Plaster	Intact	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.24 ± 1.47
145	Classroom-12	Exit Door	Metal	D	Intact	Green	Negative	0.40 ± 0.20	0.40 ± 0.20	0.30 ± 1.71
146	Classroom-12	Exit Door Casing	Metal	D	Intact	Green	Negative	0.40 ± 0.30	0.40 ± 0.30	0.20 ± 2.17
147	Classroom-13	Door	Wood	D	Intact	Varnish	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.26 ± 1.49
148	Classroom-13	Door Casing	Metal	D	Intact	Green	Negative	0.30 ± 0.26	0.30 ± 0.26	0.10 ± 2.11
149	Classroom-13	Wall	Cinder Block	A	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.12 ± 1.61
150	Classroom-13	Book Shelf	Wood	A	Intact	White	Negative	0.40 ± 0.40	0.40 ± 0.40	0.80 ± 1.80
151	Classroom-13	Cabinet Casing	Wood	D	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	0.30 ± 0.37
152	Classroom-13	HVAC Casing	Wood	D	Intact	White	Negative	0.30 ± 0.24	0.30 ± 0.24	0.30 ± 1.55
153	Classroom-13	Cabinet Casing	Wood	C	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	0.50 ± 1.10
154	Classroom-13	Closet Door Casing	Metal	C	Intact	Green	Negative	0.22 ± 0.16	0.22 ± 0.16	0.03 ± 2.13
155	Classroom-13-Bathroom	Door Casing	Metal	B	Intact	Green	Negative	0.30 ± 0.21	0.30 ± 0.21	0.18 ± 2.10
156	Classroom-13-Bathroom	Upper Wall	Cinder Block	B	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.19 ± 1.64
157	Classroom-13-Bathroom	Lower Wall	Cinder Block	B	Intact	White	Negative	0.07 ± 0.14	0.07 ± 0.14	-0.72 ± 1.89
158	Classroom-13-Bathroom	Ceiling	Plaster	Intact	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	0.08 ± 0.80
159	Hallway-Classroom 13	Exit Door	Metal	D	Intact	Green	Negative	0.60 ± 0.20	0.60 ± 0.20	0.80 ± 1.60
160	Hallway-Classroom 13	Exit Door Casing	Metal	D	Intact	Green	Negative	0.30 ± 0.19	0.30 ± 0.19	0.50 ± 2.20





NNPS

4200 Marshall Ave Newport News VA  
 MCS Job No: 16-029X

Newsome Park Elem. School NN

Reading No	Room Equivalent	Component	Substrate	Side	Condition	Color	Results	PbC	PbL	PbK
161	Hallway-Classroom 13	Upper Wall	Cinder Block	D	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	0.15 ± 0.88
162	Hallway-Classroom 13	Lower Wall	Tile	D	Intact	Tan	Negative	0.01 ± 0.04	0.01 ± 0.04	-0.14 ± 2.34
163	Classroom-15	Door	Wood	C	Intact	Varnish	Negative	0.00 ± 0.02	0.00 ± 0.02	0.21 ± 1.22
164	Classroom-15	Door Casing	Metal	C	Intact	Green	Negative	0.40 ± 0.20	0.40 ± 0.20	0.19 ± 1.91
165	Classroom-15	Book Shelf	Wood	D	Intact	Beige	Negative	0.80 ± 0.20	0.80 ± 0.20	0.50 ± 0.60
166	Classroom-15	Wall	Cinder Block	C	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	0.30 ± 0.62
167	Classroom-15	Cabinet Casing	Wood	C	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.13 ± 1.24
168	Classroom-15	Cabinet Casing	Wood	B	Intact	White	Negative	0.15 ± 0.18	0.15 ± 0.18	0.40 ± 1.40
169	Classroom-15	Door Casing	Metal	B	Intact	Green	Negative	0.18 ± 0.15	0.18 ± 0.15	0.26 ± 2.32
170	Classroom-15 Bathroom	Door Casing	Metal	A	Intact	Green	Negative	0.20 ± 0.19	0.20 ± 0.19	0.12 ± 1.92
171	Classroom-15 Bathroom	Upper Wall	Cinder Block	A	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.04 ± 0.92
172	Classroom-15 Bathroom	Lower Wall	Tile	A	Intact	White	Negative	0.03 ± 0.07	0.03 ± 0.07	-0.37 ± 2.31
173	Classroom-15 Bathroom	Ceiling	Plaster		Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	0.18 ± 0.79
174	Classroom-16	Door Casing Void	Metal	A	Intact	Green	Null	0.40 ± 0.70	0.40 ± 0.70	0.24 ± 4.17
175	Classroom-16	Door Casing	Metal	A	Intact	Green	Negative	0.25 ± 0.20	0.25 ± 0.20	0.10 ± 2.07
176	Classroom-16	Wall	Cinder Block	D	Intact	White	Negative	0.01 ± 0.03	0.01 ± 0.03	0.27 ± 0.89
177	Classroom-16	Book Shelf Void	Wood	D	Intact	Beige	Null	0.70 ± 0.30	0.70 ± 0.30	0.80 ± 1.30
178	Classroom-16	Book Shelf	Wood	D	Intact	Beige	Negative	0.60 ± 0.30	0.60 ± 0.30	0.70 ± 1.30
179	Classroom-16	Cabinet Casing	Wood	A	Intact	Beige	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.05 ± 0.93
180	Classroom-16	HVAC Casing	Wood	A	Intact	Beige	Negative	0.70 ± 0.20	0.70 ± 0.20	0.40 ± 0.70
181	Classroom-16	Cabinet Casing	Wood	B	Intact	Beige	Negative	0.30 ± 0.25	0.30 ± 0.25	0.40 ± 1.40
182	Classroom-16	Closet Door Casing	Metal	B	Intact	Green	Negative	0.23 ± 0.20	0.23 ± 0.20	0.14 ± 2.09
183	Classroom-16 Bathroom	Door Casing	Metal	C	Intact	Green	Negative	0.30 ± 0.24	0.30 ± 0.24	0.40 ± 2.40
184	Classroom-16 Bathroom	Upper Wall	Cinder Block	C	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	0.20 ± 0.93
185	Classroom-16 Bathroom	Lower Wall	Tile	C	Intact	White	Negative	0.03 ± 0.03	0.03 ± 0.03	-0.28 ± 1.07
186	Classroom-16 Bathroom	Ceiling	Plaster		Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	0.22 ± 0.88
187	Classroom-17	Door Casing	Metal	C	Intact	Green	Negative	0.10 ± 0.11	0.10 ± 0.11	-0.02 ± 1.85
188	Classroom-17	Wall	Cinder Block	B	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.53 ± 0.99
189	Classroom-17	Book Shelf	Wood	B	Intact	Beige	Negative	0.21 ± 0.16	0.21 ± 0.16	0.14 ± 1.74
190	Classroom-17	Cabinet Casing	Wood	C	Intact	Beige	Negative	0.40 ± 0.30	0.40 ± 0.30	-0.23 ± 1.45
191	Classroom-17	HVAC Casing	Wood	C	Intact	Beige	Negative	0.18 ± 0.17	0.18 ± 0.17	0.08 ± 1.53
192	Classroom-17	Cabinet Casing	Wood	D	Intact	Beige	Negative	0.00 ± 0.02	0.00 ± 0.02	0.08 ± 0.44

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NNPS

4200 Marshall Ave Newport News VA  
MCS Job No: 16-029X

Miarne Chemist Service, Inc.  
11850 Tug Boat Lane  
Newport News Virginia 23606

Newsome Park Elem. School NN

Reading No	Room Equivalent	Component	Substrate	Side	Condition	Color	Results	PbC	PbL	PbK
193	Classroom-17	Closet Door Casing	Metal	D	Intact	Green	Negative	0.09 ± 0.11	0.09 ± 0.11	-0.37 ± 2.25
194	Classroom-17 Bathroom	Door Casing	Metal	A	Intact	Green	Negative	0.40 ± 0.30	0.40 ± 0.30	0.14 ± 2.57
195	Classroom-17 Bathroom	Upper Wall	Cinder Block	A	Intact	White	Negative	0.01 ± 0.02	0.01 ± 0.02	-0.14 ± 0.94
196	Classroom-17 Bathroom	Lower Wall	Tile	A	Intact	White	Negative	0.03 ± 0.08	0.03 ± 0.08	-0.99 ± 2.60
197	Classroom-17 Bathroom	Ceiling	Plaster		Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	0.30 ± 0.90
198	Classroom-18	Door Casing Void	Metal	A	Intact	Green	Null	0.70 ± 0.50	0.70 ± 0.50	-0.16 ± 2.39
199	Classroom-18	Door Casing	Metal	A	Intact	Green	Negative	0.30 ± 0.09	0.30 ± 0.09	0.12 ± 0.80
200	Classroom-18	Wall	Cinder Block	B	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	0.16 ± 0.90
201	Classroom-18	Book Shelf	Wood	B	Intact	Beige	Negative	0.50 ± 0.40	0.50 ± 0.40	-0.07 ± 1.47
202	Classroom-18	Cabinet Casing	Wood	B	Intact	Beige	Negative	0.30 ± 0.13	0.30 ± 0.13	0.15 ± 0.65
203	Classroom-18	HVAC Casing	Wood	A	Intact	Beige	Negative	0.30 ± 0.31	0.30 ± 0.31	0.24 ± 1.34
204	Classroom-18	Cabinet Casing	Wood	D	Intact	Beige	Negative	0.30 ± 0.29	0.30 ± 0.29	0.50 ± 1.40
205	Classroom-18	Closet Door Casing	Metal	D	Intact	Green	Negative	0.16 ± 0.14	0.16 ± 0.14	-0.03 ± 1.89
206	Classroom-18 Bathroom	Door Casing	Metal	C	Intact	Green	Negative	0.11 ± 0.13	0.11 ± 0.13	-0.18 ± 2.34
207	Classroom-18 Bathroom	Upper Wall	Cinder Block	C	Intact	White	Negative	0.01 ± 0.02	0.01 ± 0.02	-0.19 ± 1.01
208	Classroom-18 Bathroom	Lower Wall	Tile	C	Intact	White	Negative	0.05 ± 0.12	0.05 ± 0.12	-0.36 ± 1.95
209	Classroom-18 Bathroom	Lower Wall	Tile	C	Intact	Blue	Negative	0.04 ± 0.05	0.04 ± 0.05	-0.13 ± 0.95
210	Classroom-18 Bathroom	Ceiling	Plaster		Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.44 ± 1.63
211	Classroom-20	Door Casing	Metal	A	Intact	Green	Negative	-0.29 ± 1.04	0.50 ± 0.20	-0.29 ± 1.04
212	Classroom-20	Wall	Cinder Block	D	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	0.30 ± 0.93
213	Classroom-20	Book Shelf	Wood	D	Intact	Beige	Negative	0.30 ± 0.25	0.30 ± 0.25	-0.18 ± 1.46
214	Classroom-20	Cabinet Casing	Wood	A	Intact	Beige	Negative	0.40 ± 0.30	0.40 ± 0.30	0.08 ± 1.42
215	Classroom-20	HVAC Casing	Wood	A	Intact	Beige	Negative	0.26 ± 0.08	0.26 ± 0.08	-0.18 ± 0.60
216	Classroom-20	Cabinet Casing	Wood	B	Intact	Beige	Negative	0.40 ± 0.10	0.40 ± 0.10	0.25 ± 0.66
217	Classroom-20	Closet Door Casing	Metal	B	Intact	Green	Negative	0.16 ± 0.15	0.16 ± 0.15	0.40 ± 2.00
218	Classroom-20	Ceiling Shelf	Wood	B	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.13 ± 1.26
219	Classroom-20 Bathroom	Door Casing	Metal	C	Intact	Green	Negative	0.23 ± 0.16	0.23 ± 0.16	0.50 ± 2.40
220	Classroom-20 Bathroom	Upper Wall	Cinder Block	C	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	0.17 ± 0.91
221	Classroom-20 Bathroom	Lower Wall Void	Tile	C	Intact	White	Null	0.08 ± 0.22	0.08 ± 0.22	-0.35 ± 2.95
222	Classroom-20 Bathroom	Lower Wall	Tile	C	Intact	White	Negative	0.08 ± 0.24	0.08 ± 0.24	-0.08 ± 2.20
223	Classroom-20 Bathroom	Ceiling	Plaster		Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	0.17 ± 0.92
224	Hallway-Classroom 20	Upper Wall	Cinder Block	A	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.29 ± 1.04





NNPS

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Marine Chemist Service, Inc.  
11850 Tug Boat Lane  
Newport News Virginia 23606

Newsome Park Elem. School NN

Reading No	Room Equivalent	Component	Substrate	Side	Condition	Color	Results	PbC	PbL	PbK
225	Hallway-Classroom 20	Lower Wall	Tile	A	Intact	Tan	Negative	0.02 ± 0.04	0.02 ± 0.04	-0.26 ± 2.49
226	Cafeteria	Door	Wood	B	Intact	Varnish	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.10 ± 1.64
227	Cafeteria	Door Casing	Metal	B	Intact	Green	Positive	1.60 ± 0.40	1.60 ± 0.40	1.60 ± 1.10
228	Cafeteria	Upper Wall	Cinder Block	B	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	0.21 ± 0.94
229	Cafeteria	Lower Wall	Cinder Block	B	Intact	Green	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.08 ± 1.63
230	Cafeteria	Water Fountain Wall	Tile	B	Intact	White	Negative	0.02 ± 0.08	0.02 ± 0.08	0.23 ± 2.29
231	Cafeteria	Water Fountain Wall	Tile	B	Intact	Black	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.38 ± 0.95
232	Cafeteria	Duct Enclosure Void	Drywall	Intact	Intact	White	Null	0.03 ± 0.17	0.03 ± 0.17	0.50 ± 2.50
233	Cafeteria	Duct Enclosure Void	Drywall	Intact	Intact	White	Null	0.00 ± 0.02	0.00 ± 0.02	0.40 ± 1.60
234	Cafeteria	Duct Enclosure	Drywall	Intact	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	0.30 ± 0.87
235	Kitchen	Door Casing	Metal	B	Intact	Green	Positive	1.40 ± 0.40	1.40 ± 0.40	1.50 ± 1.10
236	Kitchen	Upper Wall	Cinder Block	A	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.16 ± 1.00
237	Kitchen	Lower Wall	Tile	A	Intact	Beige	Positive	3.20 ± 0.90	3.20 ± 0.90	4.30 ± 3.60
238	Kitchen	Lower Wall	Tile	B	Intact	Blue	Positive	2.50 ± 0.70	2.50 ± 0.70	3.90 ± 2.90
239	Kitchen	Office Door Casing	Wood	D	Intact	Green	Negative	0.02 ± 0.07	0.02 ± 0.07	0.12 ± 1.11
240	Kitchen	Office Lower Wall	Wood	D	Intact	Green	Negative	0.01 ± 0.04	0.01 ± 0.04	-0.05 ± 1.17
241	Kitchen	Electric Panel Box	Metal	D	Intact	Green	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.03 ± 0.85
242	Kitchen	Mop Sink Room Door Casing	Metal	D	Intact	Green	Negative	0.09 ± 0.11	0.09 ± 0.11	0.40 ± 2.10
243	Kitchen	Mop Sink Room Wall	Cinder Block	D	Intact	White	Negative	0.01 ± 0.02	0.01 ± 0.02	-0.03 ± 0.91
244	Kitchen Bathroom	Door Casing	Metal	C	Intact	Green	Negative	0.07 ± 0.10	0.07 ± 0.10	-0.09 ± 2.34
245	Kitchen Bathroom	Upper Wall	Cinder Block	A	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	0.16 ± 0.95
246	Kitchen Bathroom	Lower Wall	Tile	A	Intact	White	Positive	3.50 ± 1.10	3.50 ± 1.10	4.50 ± 3.60
247	Kitchen Bathroom	Shelf	Wood	D	Intact	Red	Negative	0.00 ± 0.02	0.00 ± 0.02	0.05 ± 1.25
248	Kitchen Bathroom	Baseboard	Tile	D	Intact	White	Negative	0.01 ± 0.03	0.01 ± 0.03	0.70 ± 2.60
249	Kitchen Bathroom	Floor	Tile	Intact	Intact	Black	Negative	0.00 ± 0.02	0.00 ± 0.02	0.60 ± 1.00
250	4 Hour Cal-1						Positive	1.50 ± 0.10	1.50 ± 0.10	1.10 ± 0.40
251	4 Hour Cal-2						Positive	1.50 ± 0.10	1.50 ± 0.10	1.10 ± 0.40
252	4 Hour Cal-3						Positive	1.40 ± 0.10	1.40 ± 0.10	1.20 ± 0.40
253	Shutter-Cal	4 Hour Cal						5.60 ± 0.00	0.73 ± 0.00	0.00 ± 0.00
254	4 Hour Cal-4						Positive	1.50 ± 0.10	1.50 ± 0.10	0.80 ± 0.40
255	4 Hour Cal-5						Positive	1.40 ± 0.10	1.40 ± 0.10	0.90 ± 0.40
256	4 Hour Cal-6						Positive	1.40 ± 0.10	1.40 ± 0.10	0.80 ± 0.40



NNPS

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11850 Tug Boat Lane  
Newport News Virginia 23606

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Reading No	Room Equivalent	Component	Substrate	Side	Condition	Color	Results	PbC	PbL	PbK
257	Hallway- Cafeteria	Door Casing	Metal	C	Intact	Green	Negative	-0.24 ± 0.84	0.06 ± 0.04	-0.24 ± 0.84
258	Hallway- Cafeteria	Wall	Brick	D	Intact	Beige	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.51 ± 1.13
259	Hallway- Cafeteria	Wall	Cinder Block	B	Intact	Beige	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.46 ± 0.73
260	Hallway- Cafeteria	Door Casing	Metal	B	Intact	Beige	Negative	0.01 ± 0.03	0.01 ± 0.03	-0.30 ± 2.44
261	Classroom-23	Door Casing	Metal	D	Intact	Green	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.67 ± 0.81
262	Classroom-23	Wall	Cinder Block	B	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	0.30 ± 0.91
263	Mens Bathroom	Door Casing	Metal	B	Intact	Green	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.34 ± 2.33
264	Mens Bathroom	Wall	Cinder Block	A	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.22 ± 0.98
265	Mens Bathroom	Baseboard	Tile	A	Intact	Tan	Negative	0.02 ± 0.03	0.02 ± 0.03	-0.32 ± 1.00
266	Classroom-25	Door Casing	Metal	B	Intact	Green	Negative	0.00 ± 0.02	0.00 ± 0.02	0.06 ± 0.78
267	Classroom-25	Wall	Cinder Block	C	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.44 ± 1.70
268	Classroom-25	Wall	Cinder Block	A	Intact	Blue	Negative	0.01 ± 0.02	0.01 ± 0.02	-0.36 ± 1.66
269	Classroom-25	Cabinet Casing	Wood	C	Intact	Blue	Negative	0.29 ± 0.20	0.29 ± 0.20	-0.26 ± 1.67
270	Classroom-26	Door Casing	Metal	C	Intact	Green	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.73 ± 1.14
271	Classroom-26	Wall	Cinder Block	C	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.82 ± 1.02
272	Classroom-26	Book Shelf	Wood	B	Intact	White	Negative	0.50 ± 0.30	0.50 ± 0.30	-0.25 ± 1.59
273	Classroom-26A	Door Casing	Metal	A	Intact	Green	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.52 ± 0.79
274	Classroom-26A	Wall	Drywall	D	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.33 ± 1.22
275	Classroom-26A	Wall	Cinder Block	B	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.40 ± 1.67
276	Storage Room	Door Casing	Metal	B	Intact	Green	Negative	0.22 ± 0.19	0.22 ± 0.19	-0.11 ± 2.39
277	Storage Room	Wall	Cinder Block	A	Intact	Green	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.24 ± 1.05
278	Storage Room	Wall	Brick	C	Intact	Green	Negative	0.01 ± 0.02	0.01 ± 0.02	-0.52 ± 1.11
279	Storage Room	Cabinet Shelf	Wood	C	Intact	Green	Negative	0.01 ± 0.05	0.01 ± 0.05	0.15 ± 1.57
280	Assistant Principals Office	Door Casing	Metal	C	Intact	Green	Negative	0.22 ± 0.07	0.22 ± 0.07	0.24 ± 0.91
281	Assistant Principals Office	Wall	Cinder Block	B	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.18 ± 0.94
282	Assistant Principals Office	Wall	Brick	C	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.56 ± 1.24
283	Assistant Principals Office	Cabinet Casing	Wood	D	Intact	White	Negative	0.50 ± 0.30	0.50 ± 0.30	-0.29 ± 1.50
284	Assistant Principals Office	Cabinet Casing	Wood	B	Intact	Tan	Negative	0.00 ± 0.02	0.00 ± 0.02	0.12 ± 1.17
285	Stage Storage	Door Casing	Metal	C	Intact	Green	Negative	-0.04 ± 0.91	0.20 ± 0.11	-0.04 ± 0.91
286	Stage Storage	Wall	Cinder Block	D	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	0.02 ± 0.95
287	Stage	Hand Rail	Metal	D	Intact	White	Negative	0.50 ± 0.30	0.50 ± 0.30	1.20 ± 1.90
288	Stage	Hand Rail Void	Metal	D	Intact	White	Null	1.20 ± 0.20	1.20 ± 0.20	1.50 ± 1.10

September 9, 2016





NNPS

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11850 Tug Boat Lane  
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Reading No	Room Equivalent	Component	Substrate	Side	Condition	Color	Results	PbC	PbL	PbK
289	Stage	Hand Rail	Metal	D	Intact	White	Positive	1.20 ± 0.20	1.20 ± 0.20	0.90 ± 0.80
290	Stage	Lower Wall	Drywall	A	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.61 ± 1.22
291	Auditorium	Middle Wall	Cinder Block	C	Intact	Green	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.47 ± 1.05
292	Auditorium	Lower Wall	Cinder Block	C	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.70 ± 1.17
293	Auditorium	Hand Rail Void	Metal	C	Intact	White	Null	0.90 ± 0.10	0.90 ± 0.10	0.60 ± 0.50
294	Auditorium	Hand Rail Void	Metal	C	Intact	White	Null	0.90 ± 0.10	0.90 ± 0.10	0.90 ± 0.80
295	Auditorium	Hand Rail Void	Metal	C	Intact	White	Null	0.90 ± 0.10	0.90 ± 0.10	0.80 ± 0.70
296	Auditorium	Hand Rail	Metal	C	Intact	White	Positive	1.20 ± 0.20	1.20 ± 0.20	1.10 ± 1.00
297	Library	Door-Casing	Metal	C	Intact	Green	Positive	1.30 ± 0.30	1.30 ± 0.30	0.50 ± 1.10
298	Library	Wall	Cinder Block	C	Intact	White	Negative	0.01 ± 0.02	0.01 ± 0.02	-0.61 ± 1.10
299	Library	Book Shelf	Wood	B	Intact	Green	Negative	0.21 ± 0.17	0.21 ± 0.17	-0.29 ± 1.77
300	Library	Cabinet Casing	Wood	B	Intact	Green	Negative	0.40 ± 0.50	0.40 ± 0.50	-0.28 ± 1.85
301	Custodians Office	Door Casing	Metal	A	Intact	Green	Negative	0.07 ± 0.09	0.07 ± 0.09	0.05 ± 2.28
302	Custodians Office	Door Casing	Metal	A	Intact	Green	Negative	0.21 ± 0.16	0.21 ± 0.16	0.70 ± 2.30
303	Custodians Office	Wall	Cinder Block	A	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.29 ± 0.87
304	Custodians Office	Ladder	Metal	A	Intact	Red	Positive	1.20 ± 0.10	1.20 ± 0.10	1.20 ± 0.80
305	Auditorium Hallway	Upper Wall	Cinder Block	A	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.52 ± 1.11
306	Auditorium Hallway	Lower Wall	Tile	A	Intact	Red	Negative	0.13 ± 0.37	0.13 ± 0.37	-0.59 ± 2.67
307	Auditorium Hallway	Lower Wall	Tile	A	Intact	Blue	Positive	3.20 ± 1.00	3.20 ± 1.00	3.30 ± 3.70
308	Auditorium Hallway	Lower Wall	Tile	C	Intact	Beige	Positive	3.70 ± 1.00	3.70 ± 1.00	4.30 ± 3.30
309	Classroom-44	Door Casing	Metal	A	Intact	Green	Negative	0.60 ± 0.20	0.60 ± 0.20	0.70 ± 1.30
310	Classroom-44	Wall Void	Cinder Block	B	Intact	White	Null	0.01 ± 0.03	0.01 ± 0.03	-0.42 ± 2.61
311	Classroom-44	Wall	Cinder Block	B	Intact	White	Negative	0.05 ± 0.05	0.05 ± 0.05	-0.21 ± 1.04
312	Classroom-44	Book Shelf	Wood	A	Intact	Gray	Negative	0.16 ± 0.15	0.16 ± 0.15	-0.12 ± 1.66
313	Classroom-44	Cabinet Casing	Wood	A	Intact	Gray	Negative	0.40 ± 0.20	0.40 ± 0.20	0.12 ± 0.76
314	Classroom-44 Lobby	Door	Metal	A	Intact	Green	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.16 ± 0.83
315	Classroom-44 Lobby	Door Casing	Metal	A	Intact	Green	Negative	-0.38 ± 1.02	0.01 ± 0.03	-0.38 ± 1.02
316	Classroom-44 Lobby	Upper Wall	Cinder Block	B	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.02 ± 0.98
317	Classroom-44 Lobby	Lower Wall	Tile	B	Intact	Tan	Negative	0.05 ± 0.06	0.05 ± 0.06	-0.62 ± 1.01
318	Classroom-44 Lobby	Upper Wall	Brick	D	Intact	White	Negative	0.01 ± 0.03	0.01 ± 0.03	-0.55 ± 1.25
319	Classroom-44 Lobby	Lower Wall	Brick	D	Intact	Green	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.51 ± 1.12
320	Classroom-44 Lobby	Baseboard	Tile	D	Intact	Tan	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.45 ± 2.23

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4200 Marshall Ave Newport News VA  
MCS Job No: 16-029X

Marine Chemist Service, Inc.  
11850 Tug Boat Lane  
Newport News Virginia 23606

Newsome Park Elem. School NN

Reading No	Room Equivalent	Component	Substrate	Side	Condition	Color	Results	PbC	PbL	PbK
321	Classroom-44 Lobby	Center wall	Brck	D	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.60 ± 1.23
322	Classroom-44 Lobby	Center wall Baseboard	Tile	D	Intact	Black	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.32 ± 1.28
323	Classroom-44 Lobby	Lower Wall	Tile	A	Intact	White	Negative	0.05 ± 0.14	0.05 ± 0.14	-0.35 ± 2.73
324	Classroom-44 Lobby	Lower Wall	Tile	A	Intact	Beige	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.35 ± 2.68
325	Mens Bathroom	Door	Wood	D	Intact	Varnish	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.01 ± 1.67
326	Mens Bathroom	Door Casing	Metal	D	Intact	Green	Positive	2.60 ± 0.50	2.60 ± 0.50	2.90 ± 1.10
327	Mens Bathroom	Upper Wall	Cinder Block	A	Intact	White	Negative	0.01 ± 0.02	0.01 ± 0.02	-0.16 ± 1.00
328	Mens Bathroom	Lower Wall	Tile	A	Intact	Green	Negative	0.07 ± 0.19	0.07 ± 0.19	0.07 ± 2.38
329	Mens Bathroom	Lower Wall	Tile	D	Intact	Green Lt.	Positive	1.70 ± 0.50	1.70 ± 0.50	2.10 ± 2.90
330	Mens Bathroom	Mirror Casing	Wood	A	Intact	Green	Negative	0.00 ± 0.02	0.00 ± 0.02	0.30 ± 1.52
331	Mens Bathroom	Ceiling	Plaster		Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.43 ± 1.77
332	Womens Bathroom	Door Casing Void	Metal	D	Intact	Green	Null	3.40 ± 3.90	3.40 ± 3.90	-1.05 ± 10.50
333	Womens Bathroom	Door Casing	Metal	D	Intact	Green	Positive	3.30 ± 1.30	3.30 ± 1.30	2.20 ± 2.80
334	Womens Bathroom	Upper Wall	Cinder Block	B	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.53 ± 1.02
335	Womens Bathroom	Lower Wall	Tile	B	Intact	Yellow	Positive	3.90 ± 0.50	3.90 ± 0.50	4.70 ± 1.50
336	Womens Bathroom	Lower Wall	Tile	A	Intact	White	Negative	0.02 ± 0.05	0.02 ± 0.06	-0.52 ± 1.28
337	Womens Bathroom	Ceiling	Plaster		Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.51 ± 1.75
338	Nurses Office	Door	Wood	D	Intact	Varnish	Negative	-0.09 ± 1.01	0.30 ± 0.25	-0.44 ± 1.69
339	Nurses Office	Door Casing	Metal	D	Intact	Green	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.09 ± 1.01
340	Nurses Office	Wall	Cinder Block	A	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.10 ± 1.00
341	Nurses Office Bathroom	Door Casing	Metal	D	Intact	Green	Negative	0.70 ± 0.10	0.70 ± 0.10	0.30 ± 0.93
342	Nurses Office Bathroom	Upper Wall	Cinder Block	A	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.47 ± 1.04
343	Nurses Office Bathroom	Lower Wall	Tile	A	Intact	White	Positive	1.90 ± 0.30	1.90 ± 0.30	2.00 ± 1.10
344	Main Office	Door Casing	Metal	D	Intact	Green	Positive	2.10 ± 0.60	2.10 ± 0.60	1.20 ± 1.40
345	Main Office	Wall	Cinder Block	B	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.28 ± 1.01
346	Main Office	Wall	Drywall	D	Intact	Beige	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.06 ± 1.34
347	Main Office	Wall	Cinder Block	D	Intact	Beige	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.17 ± 0.96
348	Main Office	Cabinet Casing	Wood	D	Intact	Beige	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.02 ± 0.51
349	Principals Office	Door	Wood	C	Intact	Varnish	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.69 ± 1.05
350	Principals Office	Door Casing	Metal	C	Intact	Green	Positive	1.30 ± 0.20	1.30 ± 0.20	1.30 ± 1.10
351	Principals Office	Wall	Cinder Block	A	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.18 ± 0.98
352	Principals Office Bathroom	Door Casing	Metal	A	Intact	Green	Positive	2.00 ± 0.70	2.00 ± 0.70	2.60 ± 2.70



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Reading No	Room Equivalent	Component	Substrate	Side	Condition	Color	Results	PbC	PbL	PbK
353	Principals Office Bathroom	Upper Wall	Cinder Block	A	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.63 ± 1.97
354	Principals Office Bathroom	Lower Wall	Tile	A	Intact	White	Positive	1.90 ± 0.60	1.90 ± 0.60	1.60 ± 2.70
355	Mail Room	Door Casing	Metal	D	Intact	Green	Negative	0.40 ± 0.10	0.40 ± 0.10	0.22 ± 0.90
356	Mail Room	Wall	Cinder Block	D	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.33 ± 1.03
357	Mail Room	Cabinet Casing	Wood	D	Intact	Beige	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.31 ± 1.21
358	Classroom-28	Door	Wood	A	Intact	Varnish	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.72 ± 0.68
359	Classroom-28	Door Casing	Metal	A	Intact	Green	Positive	2.00 ± 0.30	2.00 ± 0.30	1.80 ± 1.00
360	Classroom-28	Wall	Cinder Block	D	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.73 ± 1.12
361	Classroom-28	Cabinet Casing	Wood	A	Intact	Beige	Negative	0.24 ± 0.27	0.24 ± 0.27	-0.58 ± 2.01
362	Classroom-28	HVAC	Wood	A	Intact	Beige	Negative	0.20 ± 0.17	0.20 ± 0.17	-0.23 ± 1.68
363	Classroom-28	Cabinet Casing	Wood	B	Intact	Beige	Negative	0.00 ± 0.02	0.00 ± 0.02	0.01 ± 1.20
364	Classroom-31	Door	Wood	B	Intact	Varnish	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.61 ± 1.71
365	Classroom-31	Door Casing	Metal	B	Intact	Green	Negative	0.28 ± 0.21	0.28 ± 0.21	0.04 ± 2.17
366	Classroom-31	Wall	Cinder Block	C	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.50 ± 0.98
367	Classroom-31	Wall	Drywall	C	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.58 ± 1.35
368	Classroom-31	Cabinet Casing	Wood	B	Intact	Beige	Negative	0.00 ± 0.02	0.00 ± 0.02	0.14 ± 1.35
369	Classroom-31	HVAC	Wood	B	Intact	Beige	Negative	0.40 ± 0.30	0.40 ± 0.30	-0.03 ± 1.54
370	Classroom-31 Storage Room	Door Casing	Metal	A	Intact	Green	Negative	0.28 ± 0.17	0.28 ± 0.17	-0.32 ± 2.21
371	Classroom-31 Storage Room	Wall	Cinder Block	A	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.53 ± 1.69
372	Classroom-31 Storage Room	Book Shelf	Wood	A	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.27 ± 1.60
373	Classroom-32	Door Casing	Metal	B	Intact	Green	Negative	0.08 ± 0.84	0.19 ± 0.07	0.08 ± 0.84
374	Classroom-32	Wall	Cinder Block	A	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.34 ± 1.11
375	Classroom-32	Cabinet Casing	Wood	B	Intact	Beige	Negative	0.00 ± 0.02	0.00 ± 0.02	0.09 ± 1.25
376	Classroom-32	HVAC	Wood	B	Intact	Beige	Negative	0.29 ± 0.11	0.29 ± 0.11	0.24 ± 0.61
377	Classroom-34	Door Casing	Metal	B	Intact	Green	Negative	0.40 ± 0.30	0.40 ± 0.30	0.40 ± 2.00
378	Classroom-34	Wall	Cinder Block	C	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.36 ± 0.97
379	Classroom-34	Pin up board	Wood	C	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.03 ± 1.18
380	Classroom-34	Cabinet Casing	Wood	B	Intact	Beige	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.22 ± 0.92
381	Classroom-34	HVAC	Wood	B	Intact	Beige	Negative	0.50 ± 0.30	0.50 ± 0.30	0.19 ± 1.57
382	Classroom-34	Book Shelf	Wood	A	Intact	Beige	Negative	0.30 ± 0.07	0.30 ± 0.07	-0.11 ± 0.63
383	Classroom-34	Cabinet Casing Upper	Wood	D	Intact	Beige	Negative	0.13 ± 0.11	0.13 ± 0.11	-0.22 ± 1.55
384	Classroom-34	Exit Door	Metal	A	Intact	Green	Negative	0.30 ± 0.21	0.30 ± 0.21	-0.19 ± 2.18





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Reading No	Room Equivalent	Component	Substrate	Side	Condition	Color	Results	PbC	PbL	PbK
385	Classroom-34	Exit Door Casing	Metal	A	Intact	Green	Negative	0.24 ± 0.15	0.24 ± 0.15	0.50 ± 2.30
386	Classroom-34 Boys Bathroom	Door Casing	Metal	D	Intact	Green	Negative	0.29 ± 0.16	0.29 ± 0.16	1.40 ± 2.40
387	Classroom-34 Boys Bathroom	Upper Wall	Cinder Block	D	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	0.03 ± 0.86
388	Classroom-34 Boys Bathroom	Lower Wall	Tile	D	Intact	White	Negative	0.14 ± 0.23	0.14 ± 0.23	-0.52 ± 1.25
389	Classroom-38	Door Casing	Metal	A	Intact	Green	Positive	2.90 ± 0.50	2.90 ± 0.50	2.30 ± 1.10
390	Classroom-38	Wall	Cinder Block	D	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.56 ± 1.15
391	Classroom-38	Cabinet Casing	Wood	A	Intact	Beige	Negative	0.30 ± 0.36	0.30 ± 0.36	-0.44 ± 2.16
392	Classroom-38	HVAC	Wood	A	Intact	Beige	Negative	0.30 ± 0.24	0.30 ± 0.24	-0.51 ± 1.61
393	Classroom-38	Cabinet Casing	Wood	B	Intact	Beige	Negative	0.30 ± 0.24	0.30 ± 0.24	-0.04 ± 1.81
394	Classroom-38	Door Casing Closet	Metal	B	Intact	Green	Positive	2.50 ± 0.80	2.50 ± 0.80	2.40 ± 3.00
395	Classroom-42	Door Casing	Metal	A	Intact	Green	Negative	0.80 ± 0.10	0.80 ± 0.10	0.18 ± 0.80
396	Classroom-42	Wall	Cinder Block	D	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.79 ± 0.84
397	Classroom-42	Book Shelf	Wood	A	Intact	Beige	Negative	0.24 ± 0.19	0.24 ± 0.19	0.25 ± 1.76
398	Classroom-42	HVAC	Wood	A	Intact	Beige	Negative	0.22 ± 0.19	0.22 ± 0.19	-0.25 ± 1.57
399	Classroom-42	Cabinet Casing	Wood	B	Intact	Beige	Negative	0.40 ± 0.30	0.40 ± 0.30	-0.26 ± 1.51
400	Classroom-42	Closet Door Casing	Metal	B	Intact	Green	Positive	2.90 ± 1.00	2.90 ± 1.00	2.60 ± 3.20
401	Classroom-42	Book Shelf	Wood	C	Intact	White	Negative	0.00 ± 0.02	0.00 ± 0.02	-0.25 ± 1.54
402	Cal-4						Positive	1.50 ± 0.10	1.50 ± 0.10	0.80 ± 0.40
403	Cal-5						Positive	1.50 ± 0.10	1.50 ± 0.10	0.80 ± 0.40
404	Cal-6						Negative	0.90 ± 0.10	0.90 ± 0.10	0.40 ± 0.40
405	Shutter-Cal	Shutter-Down						5.61 ± 0.00	0.64 ± 0.00	0.01 ± 0.00

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**Lead XRF Comments:**

1. Lead-based paint was identified on all door casings, Auditorium handrails and roof ladder inside of custodian's office. All light pink, light green, blue, beige, white and yellow ceramic wall tiles throughout the school contain lead.
2. Detectable levels of lead were also found in other painted components as detailed in the *Lead Paint Content in Descending Order* spreadsheet. This value is below the 1.00-mg/cm<sup>2</sup> standard. Sufficient disruption of even the lowest lead-containing surface can result in a lead dust hazard.
3. The XRF lead inspection was not performed in accordance with the HUD Guidelines, which are required to test every interior and exterior painted surface/substrate combination.
4. Servicing components containing lead based paint or any detectable level of lead can create a lead hazard. Lead dust can be released during any renovations if the painted surface becomes chafed through improper scraping or sanding. Sufficient accumulations of renovation generated lead dust can create an unhealthy environment even though no lead-based paint was identified.
5. The presence of lead based paint and detectable levels of lead should be considered in all repairs and maintenance work. Perform work on these lead-containing surfaces in accordance with OSHA's regulations.
6. Take precautions before you or your contractor begins renovations or construction that may disturb painted surfaces (such as scraping off paint or tearing out walls). Do not use a belt-sander, propane torch, heat gun, dry scraper, or dry sandpaper to remove lead-based paint. These actions create large amounts of lead dust and fumes. Lead dust can remain in your air long after the work is done.
7. Always hire a company with special training for correcting lead problems. Use someone that knows how to perform lead work safely and has the proper equipment to clean up thoroughly. Effective April 2010, all renovation involving lead-based paint (with some exceptions) must be performed by a certified renovator.



Marine Chemist Service, Inc.

**Inspection Information**

The survey contractor for the XRF Lead-Based Paint Inspection of Newsome Park Elementary School, 4200 Marshall Avenue, Newport News, Virginia is:

**MARINE CHEMIST SERVICES, INC.  
11850 Tug Boat Lane  
Newport News, Virginia 23606**

The team leader responsible for quality control coordination of inspection and adherence to inspection protocol is:

**Colleen Becker, CIH, CSP  
MARINE CHEMIST SERVICES, INC.  
11850 Tug Boat Lane  
Newport News, Virginia 23606**

The Virginia Licensed Lead Risk Assessor who performed this XRF lead inspection is:

**Angela Mulleano  
License # 3356-000460**

The lead risk assessor is employed by:

**MARINE CHEMIST SERVICE, INC.  
11850 TUG BOAT LANE  
NEWPORT NEWS, VIRGINIA 23606  
(757) 873-0933**

SECTION 024119 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Demolition and removal of selected portions of building or structure.

1.2 DEFINITIONS

- A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.
- B. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.
- C. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

1.3 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.

1.4 PREINSTALLATION MEETINGS

- A. Pre-demolition Conference: Conduct conference at Project site.

1.5 INFORMATIONAL SUBMITTALS

- A. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and, for noise control. Indicate proposed locations and construction of barriers.
- B. Schedule of Selective Demolition Activities: Indicate the following:
  1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity.
  2. Interruption of utility services. Indicate how long utility services will be interrupted.
  3. Coordination for shutoff, capping, and continuation of utility services.
  4. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.



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- C. Pre-demolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces, that might be misconstrued as damage caused by salvage and demolition operations. Comply with Section 013233 "Photographic Documentation." Submit before Work begins.
- D. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.
- E. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.

1.6 CLOSEOUT SUBMITTALS

- A. Inventory: Submit a list of items that have been removed and salvaged.

1.7 QUALITY ASSURANCE

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

1.8 FIELD CONDITIONS

- A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
  - 1. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

1.9 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials and using approved contractors so as not to void existing warranties.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
- B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.
- C. 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 and Owner.
- D. Engage a professional engineer to perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.
- E. Survey of Existing Conditions: Record existing conditions by use of measured drawings and preconstruction photographs.
- F. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.2 PREPARATION

- A. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
- B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.
  - 1. Arrange to shut off utilities with utility companies.

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2. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
3. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.
  - a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
  - b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
  - c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
  - d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
  - e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
  - f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
  - g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.
  - h. All remaining voids in wall from demolished penetrations to be prepared to match the material, color, and fire and or acoustical rating of the wall, whether newly designed or existing rated construction

### 3.4 PROTECTION

- A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
  1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
  2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
  3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
  4. Cover and protect furniture, furnishings, and equipment that have not been removed.
  5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 015000 "Temporary Facilities."
- B. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
  1. Strengthen or add new supports when required during progress of selective demolition.
- C. Remove temporary barricades and protections where hazards no longer exist.

### 3.5 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
1. 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. Temporarily cover openings to remain.
  2. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
  3. 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.
  4. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
  5. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
  6. Dispose of demolished items and materials promptly.
- 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.
- C. Removed and Salvaged Items:
1. Clean salvaged items.
  2. Pack or crate items after cleaning. Identify contents of containers.
  3. Store items in a secure area until delivery to Owner.
  4. Transport items to Owner's storage area designated by Owner.
  5. Protect items from damage during transport and storage.
- D. Removed and Reinstalled Items:
1. Clean and repair items to functional condition adequate for intended reuse.
  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.

### 3.6 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings."

B. Roofing: Remove no more existing roofing than what can be covered in one day by new roofing and so that building interior remains watertight and weathertight.

1. Remove existing roofing system down to substrate.

### 3.7 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.

1. Do not allow demolished materials to accumulate on-site.

2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

B. Burning: Do not burn demolished materials.

### 3.8 CLEANING

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

END OF SECTION 024119

## SECTION 061000 - ROUGH CARPENTRY

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Base wood blocking for rooftop equipment supports and roof curbs.
  - 2. Wood blocking cants, and nailers.

#### 1.3 DEFINITIONS

- A. Boards or Strips: Lumber of less than 2 inches nominal size in least dimension.
- B. Dimension Lumber: Lumber of 2 inches nominal size or greater but less than 5 inches nominal size in least dimension.
- C. Exposed Framing: Framing not concealed by other construction.

#### 1.4 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. Wood treatment data as follows including chemical treatment manufacturer's instructions for handling, storing, installation, and finishing of treated material:
  - 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 and net amount of preservative retained.
  - 2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
  - 3. Warranty of chemical treatment manufacturer for each type of treatment.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.



1.6 DELIVERY, STORAGE, AND HANDLING

- A. Stack wood products flat with spacers beneath and between each bundle to provide air circulation. Protect wood products from weather by covering with waterproof sheeting, securely anchored. 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 grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
  - 1. Factory mark each piece of lumber with grade stamp of grading agency.
  - 2. Dress lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content of Lumber: 19 percent for more than 2-inch nominal thickness or less; unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

- A. Preservative Treatment by Pressure Process: AWWA U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.
  - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC 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.

2.3 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

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1. Blocking.
2. Nailers.
3. Rooftop equipment bases and support curbs.
4. Cants.

B. Dimension Lumber Items: Construction or No. 2 grade lumber of any of the following species:

1. Mixed southern pine or southern pine; SPIB.
2. Spruce-pine-fir; NLGA.
3. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

C. Concealed Boards: 15 percent maximum moisture content and any of the following species and grades:

1. Mixed southern pine or southern pine; No. 2 grade; SPIB.
2. Hem-fir or hem-fir (north); Construction or No. 2 Common grade; NLGA, WCLIB, or WWPA.
3. Spruce-pine-fir (south) or spruce-pine-fir; Construction or No. 2 Common grade; NeLMA, NLGA, WCLIB, or WWPA.

D. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

E. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

## 2.4 FASTENERS

A. General: Fasteners shall be of size and type indicated and shall comply with requirements specified in this article for material and manufacture.

1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners of Type 304 stainless steel.

B. Except as otherwise noted, provide fasteners with a hot-dip zinc coating per ASTM A 153 or of AISI Type 304 stainless steel. All fasteners used shall be approved by manufacturer of treated wood prior to submitting to Architect for approval. Approval of manufacturer of treated wood shall be included in submittal of fasteners.

C. Screws for attaching roof blocking to roof blocking shall be Type 304 stainless steel and approved by the treated wood supplier. If not approved, provide screws as approved by treated wood manufacturer's recommendations

D. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

E. Wood Screws: ASME B18.6.1.

- F. Lag Bolts: ASME B18.2.1.
- G. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and where indicated, flat washers.
- H. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch. Provide where material adjacencies and joints require a separator material: at all joints adjacencies with dis-similar materials, corners, install to act as a separator changes in direction or other applications to bridge gaps in exterior envelope.
- I. Water-Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbamate, combined with an insecticide containing chloropyrifos as its active ingredient.
- J. Felts: Water and Ice Protection for separation of treated wood blocking from steel decking, where occurring. Provide felts or other approved separation sheet to separate other metal materials from exterior preservative treated lumber. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

## 2.5 PRESERVATIVE WOOD TREATMENT BY PRESSURE PROCESS

- A. General: Where lumber or plywood is indicated as preservative- treated wood or is specified herein to be treated, comply with applicable requirements of AWWPA Standards C2 (Lumber) and C9 (Plywood). Mark each treated item with the AWPB or SPIB Quality Mark Requirements.
- B. Pressure-treat above-ground items with water-borne preservatives in accordance with referenced standards. For interior uses, after treatment, kiln-dry lumber and plywood to a maximum moisture content, respectively, of 19 percent and 15 percent. Treat indicated items and the following:
  - 1. Wood nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
- C. Pressure-treat wood members in contact with the ground or fresh water with water-borne preservatives in accordance with referenced standards.
- D. Complete fabrication of treated items prior to treatment, where possible. If cut after treatment, coat cut surfaces to comply with AWWPA M4. Inspect each piece of lumber or plywood after drying and discard damaged or defective pieces.
- E. Warranty: Provide manufacturer's standard warranty but not less than twenty (20) years.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION, GENERAL

- A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- B. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction. Fit rough carpentry to other construction; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds, and similar supports to allow attachment of other construction. Comply with AF & PA's "Details for Conventional Wood Frame Construction" unless otherwise indicated.
- C. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
- D. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- E. Comply with AWP A M4 for applying field treatment to cut surfaces of preservative-treated lumber.
  - 1. Use inorganic boron for items that are continuously protected from liquid water.
  - 2. Use copper naphthenate for items not continuously protected from liquid water.
- F. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
- G. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
  - 1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code (IBC).
  - 2. ICC-ES evaluation report for fastener.
  - 3. exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting of wood; predrill as required.

#### 3.2 INSTALLATION OF WOOD BLOCKING AND NAILERS

- A. Install wood ground nailers, blocking, and sleepers where shown and where required for screeding or attachment of other work. Form to shapes as shown and cut as required for true line and level of work to be attached. Coordinate location with other work involved.

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- B. Attach to substrates as required to support applied loading. Countersink bolts and nuts flush with surfaces, unless otherwise indicated
- C. Install permanent grounds of dressed, preservative treated, key-beveled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material involved. Remove temporary grounds when no longer required.
- D. The thickness of blocking used in conjunction with the roofing system shall be as required to finish flush with the top of the roof insulation.
- E. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
- F. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet enough that moisture content exceeds that specified, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061000

## SECTION 072100 - THERMAL INSULATION

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Polyisocyanurate foam-plastic board insulation.
2. Glass-fiber blanket insulation.
3. Mineral-wool blanket insulation.

B. Related Requirements:

1. Section "075423 – Thermoplastic-Polyolefin (TPO) Roofing"

#### 1.2 ACTION SUBMITTALS

A. Product Data: For the following:

1. Polyisocyanurate foam-plastic board insulation.
2. Glass-fiber blanket insulation.
3. Mineral-wool blanket insulation.

#### 1.3 INFORMATIONAL SUBMITTALS

A. Installer's Certification: Listing type, manufacturer, and R-value of insulation installed in each element of the building thermal envelope.

1. Sign, date, and post the certification in a conspicuous location on Project site.

B. Product Test Reports: For each product, for tests performed by a qualified testing agency.

C. Research Reports: For foam-plastic insulation, from ICC-ES.

#### 1.4 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. Protect foam-plastic board insulation as follows:



1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site until just before installation time.
3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

## PART 2 - PRODUCTS

### 2.1 POLYISOCYANURATE FOAM-PLASTIC BOARD INSULATION

- A. Polyisocyanurate Board Insulation, Glass-Fiber-Mat Faced ASTM C1289, glass-fiber-mat faced, Type II, Class 2.
  1. 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. Atlas Polyiso Roof and Wall Insulation, a division of Atlas Roofing Corporation.
    - b. Carlisle Coatings & Waterproofing Inc.
    - c. Firestone Building Products.
    - d. Johns Manville; a Berkshire Hathaway company.
    - e. Rmax - A Business Unit of the Sika Corporation.

### 2.2 GLASS-FIBER BLANKET INSULATION

- A. Glass-Fiber Blanket Insulation, Unfaced: ASTM C665, Type I; passing ASTM E136 for combustion characteristics.
  1. 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. CertainTeed; SAINT-GOBAIN.
    - b. Johns Manville; a Berkshire Hathaway company.
    - c. Knauf Insulation.
    - d. Owens Corning.
  2. Flame-Spread Index: Not more than 25 when tested in accordance with ASTM E84.
  3. Smoke-Developed Index: Not more than 50 when tested in accordance with ASTM E84.
  4. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

### 2.3 MINERAL-WOOL BLANKET INSULATION

- A. Mineral-Wool Blanket Insulation, Unfaced: ASTM C665, Type I (blankets without membrane facing); consisting of fibers; passing ASTM E136 for combustion characteristics.
  - 1. 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. Johns Manville; a Berkshire Hathaway company.
    - b. Owens Corning.
    - c. ROCKWOOL.
  - 2. Flame-Spread Index: Not more than 25 when tested in accordance with ASTM E84.
  - 3. Smoke-Developed Index: Not more than 50 when tested in accordance with ASTM E84.
  - 4. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

### 2.4 INSULATION FASTENERS

- A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position with self-locking washer in place.
  - 1. Plate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
  - 2. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch in diameter; length to suit depth of insulation.
- B. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick galvanized-steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches square or in diameter.
- C. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates without damaging insulation, fasteners, or substrates.

### 2.5 ACCESSORIES

- A. Insulation for Miscellaneous Voids:
  - 1. Glass-Fiber Insulation: ASTM C764, Type II, loose fill; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E84.
- B. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

### PART 3 - EXECUTION

#### 3.1 PREPARATION

- A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or that interfere with insulation attachment.

#### 3.2 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Install insulation with manufacturer's R-value label exposed after insulation is installed.
- D. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- E. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

#### 3.3 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

- A. Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
  - 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
  - 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
  - 3. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
  - 4. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
- B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
  - 1. Glass-Fiber Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb./cu. ft.

3.4 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes.
- B. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 072100

SECTION 074213.19 - INSULATED METAL WALL PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
  - 1. Foamed-insulation-core metal wall panels.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.
- B. Shop Drawings:
  - 1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
  - 2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches.
- C. Samples for Initial Selection: For each type of metal panel indicated with factory-applied color finishes.
  - 1. Include similar Samples of trim and accessories involving color selection.
- D. Samples for Verification: For each type of exposed finish, prepared on Samples of size indicated below.
  - 1. Metal Panels: 12 inches long by actual panel width. Include fasteners, closures, and other metal panel accessories.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

- B. Product Test Reports: For each product, tests performed by a qualified testing agency.
- C. Sample Warranties: For special warranties.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For metal panels to include in maintenance manuals.

#### 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
  - 1. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, 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 horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Retain strippable protective covering on metal panels during installation.

#### 1.8 FIELD 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.

#### 1.9 COORDINATION

- A. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.



## 1.10 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems 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 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 panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
  - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
    - a. Color fading more than 5 Hunter units when tested according to ASTM D2244.
    - b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
    - 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 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E72:
  - 1. Wind Loads: As indicated on Drawings.
  - 2. Deflection Limits: For wind loads, no greater than 1/180 of the span.
- B. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. when tested according to ASTM E283 at the following test-pressure difference:
  - 1. Test-Pressure Difference: 6.24 lbf/sq. ft.
- C. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E331 at the following test-pressure difference:
  - 1. Test-Pressure Difference: 6.24 lbf/sq. ft.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint

sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

## 2.2 FOAMED-INSULATION-CORE METAL WALL PANELS

A. General: Provide factory-formed and -assembled metal wall panels fabricated from two metal facing sheets and insulation core foamed in place during fabrication, and with joints between panels designed to form weathertight seals. Include accessories required for weathertight installation.

1. Insulation Core: Modified isocyanurate or polyurethane foam using a non-CFC blowing agent, with maximum flame-spread and smoke-developed indexes of 25 and 450, respectively.
  - a. Closed-Cell Content: 90 percent when tested according to ASTM D6226.
  - b. Density: 2.0 to 2.6 lb./cu. ft. when tested according to ASTM D1622.
  - c. Compressive Strength: Minimum 20 psi when tested according to ASTM D1621.
  - d. Shear Strength: 26 psi when tested according to ASTM C273/C273M.

B. Exposed-Fastener, Foamed-Insulation-Core Metal Wall Panels: Formed with a raised, trapezoidal major rib at panel edge and two intermediate stiffening ribs symmetrically spaced between major rib and panel edge; designed for lapping side edges of adjacent panels and mechanically attaching to supports using exposed fasteners in side laps.

1. Metallic-Coated Steel Sheet: Facings of zinc-coated (galvanized) steel sheet complying with ASTM A653/A653M, G90 coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A792/A792M, Class AZ50 coating designation; structural quality. Pre-painted by the coil-coating process to comply with ASTM A755/A755M.
  - a. Nominal Thickness: 0.028 inch
  - b. Exterior Finish: Two-coat fluoropolymer.
    - 1) Color: As selected by Architect from manufacturer's full range.
  - c. Interior Finish: Siliconized polyester.
    - 1) Color: As selected by Architect from manufacturer's full range.
2. Thermal-Resistance Value (R-Value): 7 according to ASTM C1363.
3. Panel Thickness: 1.0 inch.

## 2.3 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Sub-framing and Furring: ASTM C645, cold-formed, metallic-coated steel

sheet, ASTM A653/A653M, G90 coating designation or ASTM A792/A792M, Class AZ50 aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.

- B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
- C. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are non-staining, and do not damage panel finish.
  - 1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, non-sag, nontoxic, non-staining tape 1/2 inch wide and 1/8 inch thick.
  - 2. Joint Sealant: ASTM C920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
  - 3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C1311.

## 2.4 FABRICATION

- A. General: Fabricate and finish metal panels and accessories at the factory, 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. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- C. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.
- D. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to 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. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
  - 3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
  - 4. Sealed Joints: Form non-expansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
  - 5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.

6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.
  - a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

## 2.5 FINISHES

- A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- 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 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. Aluminum Panels and Accessories:
  1. Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
  2. Siliconized Polyester: Epoxy primer and silicone-modified, polyester-enamel topcoat; with a dry film thickness of not less than 0.2 mil for primer and 0.8 mil for topcoat.

## 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 the Work.
- B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Miscellaneous Supports: Install sub-framing, furring, and other miscellaneous panel support members and anchorages according to ASTM C754 and metal panel manufacturer's written recommendations.

### 3.3 INSULATED METAL WALL PANEL INSTALLATION

- A. General: Apply continuous ribbon of sealant to panel joint on concealed side of insulated metal wall panels as vapor seal; apply sealant to panel joint on exposed side of panels for weather seal.
  - 1. Fasten foamed-insulation-core metal wall panels to supports with fasteners at each lapped joint at location and spacing and with fasteners recommended by manufacturer.
  - 2. Apply panels and associated items true to line for neat and weathertight enclosure. Avoid "panel creep" or application not true to line.
  - 3. Provide metal-backed washers under heads of exposed fasteners on weather side of insulated metal wall panels.
  - 4. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
  - 5. Provide sealant tape at lapped joints of insulated metal wall panels and between panels and protruding equipment, vents, and accessories.
  - 6. Apply a continuous ribbon of sealant tape to panel side laps and elsewhere as needed to make panels weathertight.
  
- B. Foamed-Insulation-Core Metal Wall Panels: Fasten metal wall panels to supports with concealed clips at each joint at location and spacing and with fasteners recommended by manufacturer. Fully engage tongue and groove of adjacent panels.
  - 1. Install clips to supports with self-tapping fasteners.

### 3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect completed metal wall panel installation, including accessories.
- B. Metal wall panels will be considered defective if they do not pass test and inspections.
- C. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.
- D. Prepare test and inspection reports.

### 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. After metal panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

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- C. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074213.19

SECTION 075200 - PATCHING & REPAIR OF MODIFIED BITUMINOUS MEMBRANE ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 SCOPE

- A. This Section shall apply to roofing work at existing low-slope roofing of the Building. Patching and repairs are required in conjunction with removal of existing HVAC system components and/or placement of new HVAC system components, equipment, structural supports, curbs, utility distribution and related accessories. Existing low-slope roof at all areas of the building was installed in 2010 and is under warranty. It is the intent under this contract for all patching materials to be compatible with existing modified bituminous roof membrane. It is also the intent to install new roof curbs, utility penetration housing(s), equipment and appurtenances in such a way that is certified by the roof system manufacturer/warrantor NOT to void or affect the current roof warranty. The Owner shall verify details of the current roof system's manufacturer and warranty. Interior of the building shall be kept watertight at the end of each day's work under this Contract.

This Section includes the following:

1. Roof membrane application:

- a. 2-ply Modified Bitumen roof, cold adhesive applied for slope equal or less than 1/4-inch/foot.
- 1) NRCA #MBS-2-I-L-M (SBS)

2. Roof flashing application.

3. Incorporation of sheet metal flashing components and roofing accessories into the roof system.

- B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 6 Section "Rough Carpentry" for sheathing, composite insulated sheathing, wood nailers, curbs, and wood cants.

1.3 REFERENCE STANDARDS

- A. References in these specifications to standards, test methods, codes etc., are implied to mean the latest edition of each such standard adopted. The following is an abbreviated list of associations, institutions, and societies which may be used as references throughout these specifications.



1. ASTM: American Society for Testing and Materials
2. FM: Factory Mutual Engineering and Research
3. NRCA: National Roofing Contractors Association
4. OSHA: Occupational Safety and Health Administrations
5. SMACNA: Sheet Metal and Air Conditioning Contractors National Association
6. UL: Underwriters Laboratories

#### 1.4 DESCRIPTION OF WORK

- A. The basic work descriptions (components, layering and attachment methods) required in this specification are referenced below. See also Parts 2 and 3 for specific products, preparation, application and details.

1. Project Type: Roof Patching and repairs
2. Roof Deck: Metal, above Two-Story Wing, Gypsum above the One-Story Wing.
3. Insulation: Minimum 2 layers of Polyisocyanurate: Mechanically attach first layer of insulation; secure subsequent layers of insulation and cover board with cold-applied adhesive in a thickness to match adjacent top of membrane.
4. Tapered Insulation: As required to provide positive drainage.
5. Cover Board: ASTM C 1177/C 1177M, glass-mat, 100% inorganic, water-resistant gypsum substrate, 5/8-inch (16 mm) thick.
  - a. Georgia-Pacific: DensDeck™ Glass Mat-faced Gypsum Roof Board (and as branded by others)
  - b. CertainTeed Corp.: GlasRoc™ Roof Board
  - c. Rockwool: TOPROCK™ DD Plus (2 inches thick, may be used as upper layer of insulation in lieu of conventional 1/2-inch or 5/8-inch thickness coverboard).
6. Insulation - Acoustic Steel for Deck: Sound absorbing strip of glass or mineral fiber for depth of deck, in Division 5 Section "Steel Deck."
7. MB Roof System (Primary): NRCA #MBS-2-I-L-M.
8. Existing Warranty: A 20-year roof warranty for roof membrane, flashings, roof edge, and fascia is in effect, issued in 2010. All work on the roof under this project must be accepted by the roofing system warrantor as having no-impact upon the roofing warranty.
9. Existing Roof System Manufacturer: The following manufacturer's products were installed in 2010, and is warranting the existing roof installation under an existing 20-year warranty which expires in 2030:
  - a. Manufacturer to be verified by NNPS.
  - b. Only installers certified by this manufacturer will be allowed to bid on this project and perform roofing-related work under this Contract.
  - c. Contractor shall submit evidence that that the roofing installer is authorized by the roofing manufacturer to perform work on its warranted roof system.

- d. Contractor shall submit the roofing system manufacturer's letter of final inspection attesting to the Owner that the existing roof warranty remains in force and full effect, including all new work performed under this Contract.

#### 1.5 PERFORMANCE REQUIREMENTS

- A. General Performance: Installed membrane roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Membrane roofing and base flashings shall remain watertight.
- B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing manufacturer based on testing and field experience.

#### 1.6 SUBMITTALS

- A. Submit concurrently with Division 7 Section "Sheet Metal Flashing and Trim" for roofing system components included under total system warranty.
- B. Product Data, including manufacturer's technical product data, installation instructions, and recommendations for each type of roofing product required. Include data substantiating that materials comply with requirements.
- C. Samples of the following:
  - 1. Roofing membrane base sheet.
  - 2. Membrane granular-surfaced cap sheet.
  - 3. Aluminum-foil surfaced flashing sheet.
  - 4. Liquid-applied roofing membrane for low-slope (positive drainage) applications.
  - 5. Roof insulation.
  - 6. Six insulation fasteners of each type, length, and finish.
- D. Provide evidence and description of manufacturer's quality control/quality assurance program for the primary roofing products supplied. The quality assurance program description shall include all methods of testing for physical and mechanical property values. Provide confirmation of manufacturer's certificate of analysis for reporting the tested values of the actual material being supplied for the project prior to issuance of the specified guarantee.
- E. Descriptive list of the materials proposed for use.
- F. Evidence of Underwriters' Laboratories Class A acceptance of the roofing system. No other testing agency approvals will be accepted.
- G. Letter from the primary roofing manufacturer that the repair made will meet the requirement for continued warranty.

- H. Complete list of material physical and mechanical properties for each sheet including: weights and thicknesses; low temperature flexibility; breaking load; ultimate elongation; dimensional stability; compound stability; granule embedment and resistance to thermal shock (foil faced products).
- I. Letter from the primary roofing manufacturer confirming that the installer is an acceptable Contractor authorized to install the proposed system and was an acceptable authorized contractor at date of bid.
- J. Submittals Prior to Project Close-Out:
  - 1. Provide a Certificate of Analysis from the testing laboratory of the primary roofing materials manufacturer, confirming the physical and mechanical properties of the roofing membrane components. Testing shall be performed in accordance with the parameters published in ASTM D 5147 and will indicate Quality Assurance/Quality Control data as required to meet the specified properties. A separate Certificate of Analysis is required for each production run of material and shall indicate the following information:
    - a. Material type
    - b. Lot number
    - c. Production date
    - d. Dimensions and Mass (indicate the lowest values recorded during the production run);
      - 1) Roll length
      - 2) Roll width
      - 3) Selvage width
      - 4) Total thickness
      - 5) Thickness at selvage
      - 6) Weight
    - e. Physical and Mechanical Properties:
      - 1) Low temperature flexibility
      - 2) Breaking load
      - 3) Ultimate elongation
      - 4) Dimensional stability
      - 5) Compound stability
      - 6) Granule embedment
      - 7) Resistance to thermal shock (foil faced products)

#### 1.7 QUALITY ASSURANCE

- A. Acceptable Products: Provide primary roofing products, including each type of sheet, all manufactured in the United States, supplied by a single manufacturer which has been successfully producing the specified types of primary products for not less than ten (10) years. Provide secondary or accessory products which are acceptable to the manufacturer of the primary roofing products.

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- B. Product Quality Assurance Program: Provide primary roofing materials manufactured under a quality control/quality assurance program. A certificate of analysis for reporting/confirming the tested values of the actual material being supplied for the project will be required prior to project close-out.
  - C. Agency Approvals: The proposed roof system shall conform to the following requirements. No other testing agency approvals will be accepted.
    - 1. Underwriters Laboratories Class A acceptance of the proposed roofing system .
  - D. Acceptable Contractor: Have a minimum of five (5) years' experience in successfully installing the proposed roofing materials and be certified in writing by the roofing materials manufacturer to install the primary roofing products.
  - E. Project Acceptance: Submit a completed manufacturer's application for roof guarantee form along with shop drawings of the roofs showing all dimensions, penetrations, and details. The form shall contain all the technical information applicable to the project including deck types, roof slopes, base sheet and/or insulation assemblies (with method of attachment, and fastener type), and manufacturer's membrane assembly proposed for installation. The form shall also contain accurate and complete information requested including proper names, addresses, zip codes and telephone numbers. The project must receive approval, through this process, prior to shipment of materials to the project site.
    - 1. The Manufacturer shall provide on-the-job inspections at a frequency of every other week and provide technical assistance, and application guidance as necessary.
  - F. Manufacturer Requirements: The roofing materials manufacturer shall provide direct trained company personnel to attend necessary job meetings, perform periodic inspections as necessary, and conduct a final inspection upon successful completion of the project.
  - G. Recommended Maintenance: In addition to the guarantee, furnish to the Owner the manufacturer's printed recommendations of proper maintenance of the specified roof system including inspection frequencies, penetration addition policies, temporary repairs, and leak call procedures.
- 1.8 PRODUCT DELIVERY STORAGE AND HANDLING
- A. Delivery: Deliver materials in the manufacturer's original sealed and labeled containers and in quantities required to allow continuity of application.
  - B. Storage: Store materials out of direct exposure to the elements. Store roll goods on a clean, flat and dry surface. All material stored on the roof overnight shall be stored on pallets. Rolls of roofing must be stored on ends. Store materials on the roof in a manner so as to preclude overloading of deck and building structure. Store materials such as solvents, adhesives and asphalt cutback products away from open flames, sparks or excessive heat. Cover all material using a breathable cover such as a canvas. Polyethylene or other non-breathable plastic coverings are not acceptable.

- C. Handling: Handle all materials in such a manner as to preclude damage and contamination with moisture or foreign matter. Handle rolled goods to prevent damage to edges or ends.
- D. Damaged Material: Any materials that are found to be damaged or stored in any manner other than stated above will be automatically rejected, removed and replaced at the Contractor's expense.

## 1.9 PROJECT/SITE CONDITIONS

### A. Requirements Prior to Job Start

1. Preliminary Roofing Conference: As soon as possible after award of modified bitumen roofing work, meet with Installer (Roofer), installers of substrate construction (decks) and other work adjoining roof system including penetrating work and rooftop units, Architect, Owner, and representatives of other entities directly concerned with performance of roofing system including (as applicable) Owner's insurers and test agencies. Provide a minimum of 72 hours advanced notice to participants prior to convening pre-roofing conference.
2. Review requirements for tear-off of existing membrane roofing and phasing requirements of project.
3. Review requirements of Contract Documents, submittals, status of coordinating work, availability of materials, and installation facilities and establish preliminary installation schedule. Review requirements for inspections, testing, certifications, forecasted weather conditions, governing regulations, insurance requirements, and proposed installation procedures.
4. Discuss roofing system protection requirements for construction period extending beyond roofing installation.
5. Record discussion, including agreement or disagreement on matters of significance; furnish copy of recorded discussions to each participant within 7 days following the meeting. If substantial disagreements exist at conclusion of conference, determine how disagreements will be resolved and set date for reconvening conference.
6. Notification: Give a minimum of five (5) days' notice to the Owner and manufacturer prior to commencing any work and notify both parties on a daily basis of any change in work schedule.
7. Safety: Familiarize every member of the application crew with all fire and safety regulations recommended by OSHA, NRCA and other industry or local governmental groups.

### B. Environmental Requirements

1. Precipitation: Do not apply roofing materials during precipitation or in the event there is a probability of precipitation during application. Take adequate precautions to ensure that materials, applied roofing, and building interiors are protected from possible moisture damage or contamination.

### C. Protection Requirements

1. Membrane Protection: Provide protection against staining and mechanical damage for newly applied roofing and adjacent surfaces throughout this project.
2. Limited Access: Prevent access by the public to materials, tools and equipment during the course of the project.
3. Debris Removal: Remove all debris daily from the project site and take to a legal dumping area authorized to receive such materials.
4. Site Condition: Complete, to the owner's satisfaction, all job site clean-up including building interior, exterior and landscaping where affected by the construction.

#### 1.10 GUARANTEE/WARRANTY

- A. Contractor's guarantees-Roofing Installer shall guarantee materials and workmanship of the finished installation to the full extent as that of the manufacturer's guarantee as outlined in this "Guarantee/Warranty" article.
  1. Installer warranty shall be two (2) years from date of Final Acceptance.
    - a. Warranty shall be signed by the installer and the General Contractor.

### PART 2 - PRODUCTS

#### 2.1 ROOFING SYSTEM ASSEMBLY

- A. Existing Roofing Membrane Assembly: A roof membrane assembly consisting of two (2) plies of a prefabricated, polyester-reinforced, homogeneous Styrene-Butadiene-Styrene (SBS) copolymer modified asphalt membrane secured to a prepared substrate. The modified bitumen base ply shall be fully adhered to the prepared substrate as specified herein, and shall possess waterproofing capability such that a phased roof application with only the modified bitumen base ply in place can be achieved for prolonged periods of time without detriment to the watertight integrity of the entire roof system, but shall not exceed the manufacturer's recommendations or a maximum of ninety (90) days extra. Provide roof system components meeting the following physical and mechanical requirements:
- B. Styrene-Butadiene-Styrene (SBS) Modified Bitumen Roof System, Cold-Applied:
  1. Modified Bitumen Base Ply: ASTM D6164/D6164M, Type II, Grade S, SBS-modified asphalt sheet, reinforced with polyester fabric, or ASTM D6162/D6162M, Type III, Grade S, hybrid polyester/fiberglass scrim/mat-reinforced; smooth surfaced; suitable for application method specified. Minimum 114 mil thickness.
  2. Modified Bitumen Cap Sheet: ASTM D6164/D6164M, Type I, Grade G, SBS-modified asphalt sheet reinforced with polyester fabric, or ASTM D6162/D6162M, Type I, Grade G, SBS-modified asphalt sheet, hybrid polyester/fiberglass scrim/mat-reinforced; white ceramic-coated granular surfaced; suitable for application method specified. Minimum 130 mil thickness.
  3. Stripping Ply: (Same as roof system base ply unless noted).
  4. Flashing Membrane Assembly: ASTM D 6298, aluminum-foil-faced SBS-modified asphalt sheet (reinforced with fiberglass scrim/mat), equal to "Veral" Aluminum; suitable

for application method specified. Flashings are to be installed in cold adhesive. No torching of base flashings is allowed.

5. Reinforcing Ply: Same as roof system base ply.

## 2.2 AUXILIARY ROOFING MEMBRANE MATERIALS

- A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with roofing membrane.
- B. Cold-Applied Adhesive: Roofing system manufacturer's standard asphalt-based, one- or two-part, asbestos-free, cold-applied adhesive specially formulated for compatibility and use with roofing membrane and base flashings.
  1. Adhesive for Roof Membrane: A cold-applied solvent based asphaltic adhesive meeting ASTM 4479 Type II. Typical coverage rate ranges from 1.5-2.5 gallons per square.
  2. Adhesive for Aluminum Faced Base Flashing Membrane: A single component cold-applied solvent free flashing adhesive. Typical coverage rate ranges from 2.0-2.5 gallons per square.
- C. Roofing Cement: Provide ASTM D 4586 asphalt roofing cement or roofing system manufacturer's modified asphalt roofing cement, asbestos free, of consistency required by roofing system manufacturer for application.
- D. Mastic Sealant: Polyisobutylene, plain or modified bitumen; non-hardening, non-migrating, non-skinning, and nondrying.
- E. Metal Flashing Sheet: Refer to Division 07 Section "Sheet Metal, Flashing and Trim."
- F. Roofing Granules: Ceramic-coated roofing granules, No. 11 screen size with 100 percent passing No. 8 sieve and 98 percent of mass retained on No. 40 sieve, color to match roofing membrane.
- G. Miscellaneous Accessories: Provide those recommended by roofing system manufacturer.

## 2.3 ROOF INSULATION

- A. General: Preformed roof insulation boards manufactured or approved by membrane roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated.
  1. Refer to Division 6 Section "Rough Carpentry" for composite nail base insulated sheathing for roof-side or parapet applications indicated.
- B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces.
- C. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches unless otherwise indicated.



## 2.4 INSULATION ACCESSORIES

- A. General: Furnish roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with membrane roofing.
- B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roofing membrane components to substrate; tested by manufacturer for required pullout strength, and acceptable to roofing system manufacturer.
  - 1. Metal Decks: Provide insulation mechanical fasteners and metal plates for metal decks that have been factory coated for corrosion resistance, and when subjected to 30 Kesternich cycles, must show less than 10 percent red rust, conforming to Factory Mutual 4470. Acceptable insulation fastener types for metal decks are listed below:
    - a. Dekfast #12 + Dekfast Steel Hexagonal Plates, by Construction Fasteners, Inc.
    - b. #12 Standard Roofing Fastener by Olympic Fasteners.
- C. Insulation Adhesive: Provide the following.
  - 1. Bead-Applied Insulation Adhesive: Insulation manufacturer's recommended bead-applied, low-rise, one-component or multi-component urethane adhesive formulated to attach roof insulation to substrate or to another insulation layer.
- D. Cover Board: ASTM C 1177/C 1177M, glass-mat, 100% inorganic, water-resistant gypsum substrate, 5/8-inch (16 mm) thick.
  - 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. Georgia-Pacific Corporation; DensDeck™ Roof Board.
    - b. National Gypsum Company; DEXcell™ FA Glass Mat Roof Board
    - c. CertainTeed Corp.: GlasRoc™ Roof Board
- E. Substrate Joint Tape: 6- or 8-inch- wide, coated, glass-fiber joint tape.
- F. Insulation – Acoustic Steel for Deck: Sound absorbing strip of glass or mineral fiber for depth of deck, is specified in Division 5 Section “Steel Deck.”

## 2.5 ROOF ACCESSORIES

- A. General: Provide the following roof accessories for managing roof penetrations and supporting rooftop-mounted mechanical equipment.
- B. Metal Materials:
  - 1. Galvanized Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coated.
  - 2. Aluminum Extrusions and Tubes: ASTM B 221 (ASTM B 221M), alloy and temper recommended by manufacturer for type of use, mill finished.

3. Stainless-Steel Shapes or Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304 or Type 316, No. 2D finish.
4. Steel Shapes: ASTM A 36/A 36M, hot-dip galvanized to comply with ASTM A 123/A 123M, unless otherwise indicated.
5. Galvanized Steel Tube: ASTM A 500, round tube, hot-dip galvanized to comply with ASTM A 123/A 123M.
6. Galvanized Steel Pipe: ASTM A 53/A 53M.

C. Miscellaneous Materials:

1. Fasteners: Same metal as metals being fastened, or nonmagnetic stainless steel or other noncorrosive metal as recommended by roof accessory manufacturer. Match finish of exposed fasteners with finish of material being fastened. Provide non-removable fastener heads to exterior exposed fasteners.
2. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, or PVC; or flat design of foam rubber, sponge neoprene, or cork.
3. Elastomeric Sealant: ASTM C 920, polyurethane sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
4. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant, polyisobutylene, plasticized, and heavy bodied for hooked-type expansion joints with limited movement.

D. Prefabricated Roof Equipment Curbs: Provide metal roof curbs, internally reinforced and capable of supporting superimposed live and dead loads, including equipment loads and other construction to be supported on roof curbs. Fabricate with welded or sealed mechanical corner joints, with integral formed mounting flange at perimeter bottom. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

1. Available Manufacturers:

- a. Colony Custom Curbs.
  - b. Commodity Products Company, Inc.
  - c. Conn-Fab Sales, Inc.
  - d. Curbs Plus Inc.
  - e. Custom Curb, Inc.
  - f. LM Curbs.
  - g. Loren Cook Company.
  - h. Metallic Products Corporation.
  - i. Pate Company (The).
  - j. Roof Products & Systems Corporation.
  - k. Roof Products, Inc.
  - l. ThyCurb; Div. of Thybar Corporation.
  - m. Uni-Curb, Inc.
  - n. Vent Products Company, Inc.
2. Material: Galvanized steel sheet, 0.079 inch (2.0 mm) thick.
  3. Liner: Same material as curb, of manufacturer's standard thickness and finish.
  4. Factory install wood nailers at tops of curbs.
  5. Factory insulate curbs with 1-1/2-inch- (38-mm-) thick, glass-fiber board insulation.

6. Curb height may be determined by adding thickness of roof insulation and minimum base flashing height recommended by roofing membrane manufacturer. Fabricate units to minimum height of 12 inches (300 mm), unless otherwise indicated.
- E. Prefabricated Pipe Supports: Provide adjustable piping support products as manufactured by Roof Top Blox, 500 Distribution Parkway, Collierville, TN 38017, Model RTB-01, or equal product(s) as submitted to, and approved by, the Architect. Salient features include:
1. Materials: Support base shall be manufactured from 25 PSI plastic with a base not less than 9 inches by 9 inches by 1-inch thickness (nominal). Plastic may be from recycled products. Supports shall be manufactured to permit secure insertion of an elevated, vertical, galvanized steel post or threaded rod. Post or rod shall be vertically-adjustable to permit alignment of supported element.
  2. Pipe Clamps for Natural Gas Piping and Refrigerant Line Piping: Provide single post or rod shall fitted with a circular, galvanized steel split-ring clamp to support and secure the pipe. For multiple pipes, two posts or rods may be fitted with a horizontal support bar with pre-drilled holes allowing for securing of pipes with inverted, threaded, galvanized steel U-clamps and nuts. Provide clamping assemblies that do not crush pipe insulation.
  3. Pipe Clamps for Condensate Piping: Provide single-pipe galvanized steel U-clamp assembly for secure attachment of PVC piping directly to the equipment support base.
  4. Provide manufacturer's standard roof adhesive for attaching the support base to the roof membrane. In lieu of an adhesive product by the pipe support manufacturer, substitute an adhesive approved for use by the roof membrane manufacturer.
- F. Pre-Fabricated Utility Penetration (Chase) Housing: Provide "Vault" products as manufactured by Roof Penetration Housings, LLC, P.O. Box 461024, San Antonio, TX 78246 (Ph 800-994-0945) or provide equal products by another manufacturer approved in advance by the Architect, based upon Medium" Vault Chase Housing," Model No. AWI/AW-201412.
1. Housing size: 21 ½ inches long by 14 ½ inches wide.
  2. Housing height (above curb): 14 inches.
  3. Curb height (without housing): 8 inches.
  4. Material: Welded powder coated aluminum.
  5. Seals: Provide manufacturer's pre-fabricated seals for power, controls and refrigerant lines as required at each location. Coordinate with mechanical and electrical requirements.
  6. Location: As shown on the Contract Drawings.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Provide roof for limited removal of roof membrane and substrate in accordance with the drawings and requirements of Section 024119, "Selective Demolition." Coordinate removal of roofing membrane and substrate carefully with provision and layout of new rooftop-mounted mechanical equipment and associated electrical utilities. Identify all existing roof structural members below prior to locating and laying out roof penetrations.

- B. General: Sweep or vacuum all surfaces, removing all loose aggregate and foreign substances prior to commencement of roofing. Coordinate disconnection removal reinstallation and reconnection of all roof top plumbing, mechanical, and electrical items that may have been connected or installed prior to roofing that requires roofing to be properly installed or flashed.

### 3.2 SUBSTRATE PREPARATION AND INSULATION INSTALLATION

- A. Insulation: Comply with insulation manufacturer's instructions and recommendations for the handling, installation, and bonding or anchorage of insulation to substrate. Examine substrate before starting work. Surfaces to receive insulation shall be clean, smooth, and dry. Verify that wood blocking has been installed at edges, walls, and other openings. Install insulation panels with end joints offset; edges of the panels shall be in moderate contact without forcing applied in strict accordance with the insulation manufacturer's requirements and the following instructions.
  - 1. Acoustical Steel Deck Sound-Absorbing Insulation: Install manufacturer's standard pre-molded roll or strip of mineral fiber into topside of deck prior to installation of base layer and tapered layers of roofing insulation.
- B. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation.
  - 1. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
- C. Install one or more layers of insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2 inches or greater, install 2 or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 12 inches in each direction.
  - 1. At sloping deck, provide two layers of 2 inch thickness polyisocyanurate. Install coverboard over this insulation. Crickets, cants, and tapered edge strips are also in addition to the polyisocyanurate insulation board thickness.
  - 2. At level decks, provide polyisocyanurate insulation thickness indicated, in two layers unless noted otherwise. Install coverboard over this insulation. Crickets, cants, and tapered edge strips are also in addition to the polyisocyanurate insulation board thickness for the primary roof planes.
- D. Mechanically Fastened and Adhered Insulation: Install first layer of insulation to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.
  - 1. Fasten first layer of insulation over entire area of roofing at spacing as required by FM for Windstorm Resistance Classification I-90. Run long joints for insulation in continuous straight lines, perpendicular to roof slope with end joints staggered between rows.
  - 2. Set each subsequent layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place. Provide adhesive bead spacing as required for uplift requirements at roof field, perimeter and corner applications. Stagger joints of second layer a minimum of 12 inches each direction from joints of first layer.

- E. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows, set in adhesive for full bond. Offset joints a minimum of 6 inches in each direction from joints of insulation below. Loosely butt cover boards together. Tape joints if required by roofing system manufacturer.
  - 1. Cricket Areas: Construct crickets of tapered polyisocyanurate panels between the roof drains. Install each cricket directly over the surface of the top layer of insulation to facilitate prompt and complete removal of water to each roof drain.
  - 2. Trim surface of insulation where necessary at roof drains so completed surface is flush with ring of drain.

### 3.3 ROOF MEMBRANE INSTALLATION

- A. Prime all lap areas prior to installation for the base sheet.
- B. Install roofing membrane system according to roofing system manufacturer's written instructions and applicable recommendations in ARMA/NRCA's "Quality Control Guidelines for the Application of Polymer Modified Bitumen Roofing."
  - 1. Install roofing system MBS-2-I-L-M, according to roof assembly identification matrix and roof assembly layout illustrations in "The NRCA Roofing and Waterproofing Manual" and to requirements in this Section.
- C. Coordinate installation of roofing system so insulation and other components of the roofing membrane system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.
  - 1. At end of each day's work, provide tie-offs to cover exposed roofing membrane sheets and insulation with a course of coated felt set in roofing cement, with joints and edges sealed.
  - 2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system.
  - 3. Remove and discard temporary seals before beginning work on adjoining roofing.
- D. Substrate-Joint Penetrations: Prevent adhesives from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction.
- E. Aesthetic Considerations: The overall appearance of the finished roof application is a standard requirement for this project. The Contractor shall make necessary preparations, utilize recommended application techniques, apply the specified materials (i.e., granules, metallic powder, etc.), and exercise care in ensuring that the finished application is acceptable to the Owner.
- F. The Manufacturer's Quality Control Representative shall visit the site every other week, and at conclusion of the project. Representative shall provide 24-hour notice to the Owner of all visits made to the site and shall submit to the Architect/Engineer, within 3 days following site visits, written reports of findings from their field visits. Failure to provide visits and reports shall be cause for withholding pay application for roofing materials and labor and shall be cause of removal of roofing contractor from project without further notice.

- G. Priming: Prime metal flanges (all jacks, edge metal, lead drain flashings, etc.) and concrete and masonry surfaces with a uniform coating of asphalt primer ASTM D 41.
- H. Adhesive Consistency: Cutting or alterations of adhesives, primer, and sealants will not be permitted.
- I. Roofing Application: Apply all layers of roofing free of wrinkles, creases or fishmouths. Exert sufficient pressure on the roll during application to ensure prevention of air pockets. Lap seams in the base ply layer should not coincide with the lap seams of the finish ply layer. Heat-weld lap seams in accordance with membrane manufacturer's recommendations. The courses should be staggered to ensure this.
1. Apply all layers of roofing perpendicular to the slope of the deck.
  2. Fully bond the base ply to the prepared substrate, having a minimum of three (3) inch side and end laps. Each sheet shall be applied directly in cold-applied adhesive.
  3. Fully bond the finish ply to the base ply, having a minimum of three (3) inch side and end laps. Each sheet shall be applied directly in cold-applied adhesive.
  4. Maximum sheet lengths and special fastening of the specified roof membrane system may be required at various slope increments where the roof deck slope exceeds one-half (1/2) inch per foot. The manufacturer shall provide acceptable sheet lengths and the required fastening schedule for all roofing sheet applications to applicable roof slopes.
- J. Liquid-Applied Roofing and Flashing Application: At low slope areas and membrane penetration flashing applications install in accordance with manufacturer's instructions. Provide primer or SBS membrane base-ply to the secured top surface of the completed modified bitumen roofing system as required by fluid-applied roofing system for warranted application. The polyester-reinforced liquid-applied roof membrane will be installed to the top surface of the prepared substrate.
1. Flash standard base flashings: Install polyester-reinforced liquid-applied flashings in areas shown on the details. Bond the flashings directly to the surface of the modified bitumen roofing system completed cap sheet.
  2. Flash with Polyester-Reinforced Liquid-Applied Flashings: Install the catalyzed flashing resin on the surface of the modified bitumen roofing system completed cap sheet and the vertical primed surface of the walls and penetrations. Place flashing resin on the back of the reinforcing fleece and install in place at the flashing. Coat the top layer of the fleece with an additional layer of flashing resin.
  3. Install Polyester-Reinforced Liquid-Applied Roof Membrane: When the flashing has set up, install the polyester-reinforced liquid-applied roof membrane resin directly to the top surface of the prepared substrate. Imbed the fleece in the resin, and topcoat with another layer of resin in accordance with manufacturer's instructions.
- K. Flashing Application: Use only cold applied adhesive. Flash curbs using the modified bitumen reinforcing sheet and the metal foil flashing membrane. The reinforcing sheet shall have minimum three (3) inch laps, extending a minimum of three (3) inches onto the base ply surface and on vertical wood or masonry substrate as indicated. After the finish ply has been applied to the top of the cant, prepare the surface area that is to receive flashing coverage by application of asphalt primer to foil surfaces; allowing primer to dry thoroughly. Adhesive apply the metal foil flashing into place using three-foot lengths (cut from the end of roll) and using the factory selvage

edge for laps, extending a minimum of four (4) inches beyond the toe of the cant onto the prepared surface of the finished roof. Exert pressure on the flashing sheet during application to ensure complete contact with the wall/roof surfaces, preventing air pockets; this can be accomplished by using a damp sponge or shop rag. Check and seal all loose laps and edges. Nail the top edge of the flashing on nine (9) inch centers. (See manufacturer's schematic for visual interpretation).

1. Heat-Welded Seams: Do not apply adhesive within two inches of edges of cap sheets. Heat weld underside of the exposed edge seam to substrate sheet below using a hand-held hot-knife or other appropriate heated tool as recommended by the roofing manufacturer.
- L. Water Cut-Off: At end of day's work, or when precipitation is imminent, construct water cut-off at all open edges. Cut-offs can be built using asphalt or plastic cement and roofing felts, constructed to withstand protracted periods of service. Cut-offs must be completely removed prior to the resumption of roofing.

### 3.4 ROOF SYSTEM INTERFACE WITH RELATED COMPONENTS

- A. The following is a list of verbal descriptions for correct installation of components integrated into the roof membrane assembly. In all cases, unless otherwise approved, incorporate flanged components into the system between the application of the base ply and the finish ply. The flange must be primed with a uniform coating of approved ASTM D 41 asphalt primer and allowed to dry thoroughly; all flanges must be set in approved mastic.
1. Metal flashings: Completely prime metal flanges and allow to dry prior to installation. After the base ply and continuous cleat (if applicable) have been installed, set the flange in mastic and stagger nail every three (3) inches on center. Strip-in the flange using the cap ply material, extending a minimum of four (4) inches beyond the edge of the flange.
  2. Sealant: Caulk all exposed finish ply edges at all flashings, with a smooth continuous bead of approved sealant.

### 3.5 INSTALLATION OF ROOF ACCESSORIES

- A. General: Install roof accessories according to manufacturer's written instructions. Anchor roof accessories securely in place and capable of resisting forces specified. Use fasteners, separators, sealants, and other miscellaneous items as required for completing roof accessory installation. Install roof accessories to resist exposure to weather without failing, rattling, leaking, and fastener disengagement.
- B. Install roof accessories to fit substrates and to result in watertight performance.
- C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
1. Coat concealed side of roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
  2. Bed flanges in thick coat of asphalt roofing cement where required by roof accessory manufacturers for waterproof performance.



- D. Install roof accessories level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil canning, buckling, or tool marks. Level all equipment supports and rails as required for proper installation and operation of mechanical or electrical equipment placed thereupon.
- E. Seal joints with elastomeric sealant as required by manufacturer of roof accessories. Apply sealants in strict accordance with manufacturer's installation instructions.

### 3.6 FIELD QUALITY CONTROL AND INSPECTIONS

- A. Site Condition: All areas around job site shall be free of debris, roofing materials, equipment and related items after completion of job.
- B. Notification of Completion: Contractor shall notify manufacturer by means of manufacturer's printed Notification of Completion form of job completion in order to schedule a final inspection date.
- C. Final Inspection:
  - 1. Post-Installation Meeting: Hold a meeting at the completion of the project, attended by all parties that were present at the pre-job conference. A punch list of items required for completion shall be compiled by the Contractor and the manufacturer's representative. Complete, sign, and mail the punch list form to the manufacturer's headquarters.
  - 2. Drain Verification: At final inspection of all work, verify that all drains, scuppers, etc., are functioning properly. Drains shall have adequate strainers.
- D. Issuance of the Guarantee: Complete all post installation procedures and meet the manufacturer's final endorsement for issuance of the specified guarantee.
- E. Within thirty (30) days of Substantial Completion roofing contractor shall perform an infrared survey to ascertain the presence of moisture in the roof system and submit copies to Contractor, Owner and Architect. Any finding of moisture shall be remedied and necessary repairs made in compliance with manufacturer's warranty requirements.
- F. Two-Year Inspection: Contact the manufacturer during the ninety (90) day period immediately preceding the two (2) year anniversary of the guarantee date to arrange for a mandatory two-year inspection. The inspection shall be attended by the Owner, Architect-Engineer, and Contractor and the manufacturer's representative. A two-year inspection punchlist shall be compiled by the manufacturer and submitted to the Contractor for his completion. Upon completion, sign and mail the punchlist form to the manufacturer's headquarters, verifying that all items are in accordance with the manufacturer's recommendations.

END OF SECTION 075200

SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-0 and Division 1 Specification sections, apply to work of this section.

1.2 SCOPE

- A. This Section includes the following:

1. Metal counter flashing and base flashing.
2. Miscellaneous sheet metal accessories.
3. Termination Bars

- B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Section 061000 "Rough Carpentry" for wood nailers, curbs, and blocking.
2. Section 075216 "Styrene-Butadiene-Styrene (SBS) Modified Bituminous Membrane Roofing"
3. Section 076200 "Joint Sealants" for field-applied sheet metal flashing and trim sealants.
4. All materials specified in this section shall be provided by the roofing system manufacturer or by a manufacturer approved by the roofing system manufacturer for use in the roofing system.
5. All materials specified in this section installed in conjunction with the roofing shall form part of the System Warranty required by Division 7, 075423 "Thermoplastic-Polyolefin (TPO) Roofing".

1.3 PERFORMANCE REQUIREMENTS

- A. Sheet metal flashing and trim assemblies, including cleats, anchors, and fasteners, are to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim are not to rattle, leak, or loosen, and are to remain watertight.

- B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

- C. Water Infiltration: Provide sheet metal flashing and trim that do not allow water infiltration to building interior.

#### 1.4 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product data, Flashing, Sheet Metal, and Accessories: Manufacturer's technical product data, installation instructions and general recommendations for each specified sheet material and fabricated product.
- C. Samples of the following flashing, sheet metal, and accessory items:
  - 1. 12-inch-long samples of factory-fabricated products exposed as finished work. Provide complete with specified factory finish.
- D. Shop drawings showing layout, profiles, methods of joining and turning directions/angles and anchorages details, including major counter flashings. Identify material, thickness, weight and finish for each item and location. Provide layouts at 1/4-inch scale and details at 3-inch scale.
- E. Samples for initial selection purposes in form of manufacturer's sample finishes showing full range of colors and textures available for those units with factory-applied color finishes.
- F. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:
  - 1. Sheet Metal Flashing: 12 inches long. Include fasteners, cleats, clips, closures, and other attachments.
  - 2. Trim: 12 inches long. Include fasteners and other exposed accessories. Accessories: Full-size Sample.
- G. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of complete projects with project names and addresses, names and addresses of architects and owners and other information specified.

#### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who has completed sheet metal flashing and trim work similar in material design, and extent to that indicated for this project and with a record of successful in-service performance.
- B. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual." Conform to dimensions and profiles shown unless more stringent requirements are indicated.

1. Copper Standard: Comply with CDA's "Copper in Architecture Handbook."

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver sheet metal flashing materials and fabrications undamaged. Protect sheet metal flashing and trim materials and fabrications during transportation and handling.
- B. Unload, store, and install sheet metal flashing materials and fabrications in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack materials on platforms or pallets, covered with suitable weathertight and ventilated covering. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage.

#### 1.7 COORDINATION

- A. Coordinate installation of sheet metal flashing and trim with interfacing and adjoining construction to provide a leakproof, secure, and noncorrosive installation.

#### 1.8 PROJECT CONDITIONS

- A. Coordinate work of this section with interfacing and adjoining work for proper sequencing of each installation. Ensure best possible weather resistance and durability of work and protection of materials and finishes.

### PART 2 - PRODUCTS

#### 2.1 SHEET METALS

- A. Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.

#### 2.2 MISCELLANEOUS SHEET METAL FABRICATIONS

- A. Equipment Support and Curb Flashing (Flashing at top of curb which terminates roofing membrane):
  1. Two-piece metal counter flashing assembly (counter-flashing with separate flashing receiver)
  2. Material selection:
    - a. Stainless Steel: 0.0188 inch thick.
    - b. Galvanized Steel: 0.028 inch thick.
    - c. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch thick.

3. Units of type, material, and profile required, both components of same metal, receiver formed to provide secure interlocking (snap-lock) of separate counterflashing piece, interlocking counterflashing occurring on exterior face with profile extending away from back side of assembly and returning to back side providing spring tension and pocket area for termination bar., compatible with other flashing components indicated, shop fabricated bent corners units and junctions (factory fabricated -mitered and -welded corners where premanufactured heavy gauge products are selected). Corners of flashing units shall not be field mitered and sealed with sealant. The profiles must turn the corners with no visible or exposed joints which permit the infiltration of moisture.

### 2.3 UNDERLAYMENT FLASHING MATERIALS

- A. Self-Adhering, High-Temperature Sheet Underlayment: Minimum 30 mils thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer in accordance with underlayment manufacturer's written instructions.
  1. Source Limitations: Obtain underlayment from single source from single manufacturer.
  2. Low-Temperature Flexibility: ASTM D1970/D1970M; passes after testing at minus 20 deg F or lower.

### 2.4 MISCELLANEOUS MATERIALS

- A. Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
  1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
    - a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
    - b. Blind Fasteners: High-strength aluminum or stainless steel rivets suitable for metal being fastened.
  2. Fasteners for Stainless Steel Sheet: Series 300 stainless steel.
  3. Fasteners for Zinc-Coated (Galvanized) and Aluminum-Zinc Alloy-Coated Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel in accordance with ASTM A153/A153M or ASTM F2329.

- C. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, non-sag, nontoxic, non-staining tape 1/2 inch wide and 1/8 inch thick.
- D. Elastomeric Sealant: ASTM C920, elastomeric polyurethane polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- E. Termination bar:
  - 1. Characteristics: 1 inch height minimum, fastener points shall be slots spaced at 8 inch maximum, 18 gauge minimum thickness, fabricated from stainless steel or aluminum alloy metal, continuous horizontal 1/4 inch sealant ledge (ledge lip), underside of main body (side facing substrate when installed) shall have multiple continuous horizontal ribs/projections (serrated) and the have the ability to compress (bite) material and mastic to achieve constant compression when fastened to material seeking to terminate.
  - 2. Termination bars to be installed in longest continuous lengths possible to minimize joints in the run. Where joints occur, provide brake metal alignment clips to straddle the termination bar joint, clips to be 22 ga., 6 inches wide, same material as term bar, fastening holes to be horizontal slots allowing for expansion and contraction of adjoining term bars and aligned with holes of termination bar behind, profile to wrap the front and back sides and conform to the termination bar profile.

## 2.5 FABRICATION, GENERAL

- A. Custom fabricate sheet metal flashing and trim to comply with details indicated and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required.
  - 1. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
  - 2. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
  - 3. Verify shapes and dimensions of surfaces to be covered and obtain field measurements for accurate fit before shop fabrication.
  - 4. Form sheet metal flashing and trim to fit substrates without excessive oil-canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
  - 5. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.
- B. Fabrication Tolerances:
  - 1. Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified.
- C. Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.

- D. Do not use graphite pencils to mark metal surfaces.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.
  - 1. Verify compliance with requirements for installation tolerances of substrates.
  - 2. Verify that substrate is sound, dry, smooth, clean, and securely anchored.
  - 3. Verify that the self-adhered water-resistant barrier underlayment flashing has been installed over roof curb, as indicated in the drawings, to prevent water penetration.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 INSTALLATION OF UNDERLAYMENT FLASHING

- A. Self-Adhering, High-Temperature Sheet Underlayment:
  - 1. Install self-adhering, high-temperature sheet underlayment; wrinkle free.
  - 2. Prime substrate if recommended by underlayment manufacturer.
  - 3. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures.
  - 4. Apply in few pieces as possible.
  - 5. Overlap side edges not less than 3-1/2 inches.
  - 6. Roll laps and edges with roller.
  - 7. Cover underlayment flashing within 14 days.

#### 3.3 INSTALLATION, GENERAL

- A. General: Except as otherwise indicated, comply with manufacturer's installation instructions and recommendations and with SMACNA "Architectural Sheet Metal Manual." Anchor units of work securely in place by methods indicated, providing for thermal expansion of metal units; conceal fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weatherproof.
- B. Install exposed sheet metal work that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.



- C. Separations: Separate metal from noncompatible metal or corrosive substrates by coating concealed surface, at locations of contact, with asphalt mastic or other permanent separation as recommended by manufacturer.
  - 1. Underlayment: Where stainless steel or aluminum is to be installed directly on wood substrates, install a slip sheet of red rosin paper and a course of polyethylene underlayment.
  - 2. Bed flanges of work in thick coat of roofing cement where required for waterproof performance.

### 3.4 INSTALLATION OF MISCELLANEOUS FLASHING

- A. Equipment Support and Roof Curb Flashing:
  - 1. Coordinate installation of equipment support curb flashing with installation of roofing and equipment.
  - 2. Where equipment manufacturer provides integral metal skirt flashing to comply with equipment warranty, coordinate installation of 2-piece metal counter flashing to be situated and installation compatible with the manufacturer and project requirements.
- B. Termination Bar:
  - 1. Allow 1/4" to 1/2" maximum spacing between bars, install runs so they are plumb and level. Fasten at 8" o.c. with fasteners made of same material as termination bar and at lengths required to reach anchoring and resist required forces.
  - 2. Utilize alignment clips at run joints.
  - 3. Apply lap sealant at top edge of bar and feather.

### 3.5 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces, removing substances that might cause corrosion of metal or deterioration of finishes.
- B. Protection: Provide required protection of flashings and sheet metal work during construction to ensure that work will be without damage or deterioration other than natural weathering at time of Substantial Completion and Final Acceptance.
- C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions.
- D. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended in writing by sheet metal flashing and trim manufacturer.
- E. Maintain sheet metal flashing and trim in clean condition during construction.

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- F. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures, as determined by Architect.

END OF SECTION 076200

## SECTION 078413 - PENETRATION FIRESTOPPING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:

- 1. Penetrations in fire-resistance-rated walls.
- 2. Penetrations in horizontal assemblies.
- 3. Penetrations in smoke barriers.

- B. Related Requirements:

- 1. Section 078443 "Joint Firestopping" for joints in or between fire-resistance-rated construction, and in smoke barriers.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

- B. Product Schedule: For each penetration firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing and inspecting agency.

- 1. Engineering Judgments: Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping system, submit illustration, with modifications marked, approved by penetration firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly. Obtain approval of authorities having jurisdiction prior to submittal.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

- B. Product Test Reports: For each penetration firestopping system, for tests performed by a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

- A. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that has been approved by FM Approval according to FM Approval 4991, "Approval Standard for Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install penetration firestopping system when ambient or substrate temperatures are outside limits permitted by penetration firestopping system manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.
- B. Install and cure penetration firestopping materials per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.8 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping systems can be installed according to specified firestopping system design.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping systems.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics:
  - 1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
  - 2. Test per testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:
    - a. Penetration firestopping systems shall bear classification marking of a qualified testing agency.
      - 1) UL in its "Fire Resistance Directory."

## 2.2 PENETRATION FIRESTOPPING SYSTEMS

- A. Penetration Firestopping Systems: Systems that resist spread of fire, 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: Penetration firestopping systems with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
  - 1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
- C. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
  - 1. F-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated.
  - 2. T-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
  - 3. W-Rating: Provide penetration firestopping systems showing no evidence of water leakage when tested according to UL 1479.
- D. Penetrations in Smoke Barriers: Penetration firestopping systems with ratings determined per UL 1479, based on testing at a positive pressure differential of 0.30-inch wg.
  - 1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at and no more than 50-cfm cumulative total for any 100 sq. ft. at both ambient and elevated temperatures.
- E. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, per ASTM E84.
- F. 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 system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.
  - 1. Permanent forming/damming/backing materials.
  - 2. Substrate primers.
  - 3. Collars.
  - 4. 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 sleeve lined with an intumescent strip, a 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 intumescent elastomeric sheet bonded to galvanized-steel sheet.
- E. Intumescent Putties: Nonhardening, water-resistant, intumescent putties containing no solvents or inorganic fibers.
- 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.

## 2.4 MIXING

- A. Penetration Firestopping Materials: For those products requiring mixing before application, comply with penetration firestopping system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Surface Cleaning: Before installing penetration firestopping systems, clean out openings immediately 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 materials.
  - 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping materials. Remove loose particles remaining from cleaning operation.
  - 3. Remove laitance and form-release agents from concrete.
- B. 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.

### 3.3 INSTALLATION

- A. General: Install penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.
- 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.
  - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.
- C. Install fill materials by proven techniques to produce the following results:
  - 1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.
  - 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. Wall Identification: Permanently label walls containing penetration firestopping systems with the words "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," using lettering not less than 3 inches high and with minimum 0.375-inch strokes.
  - 1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 feet from end of wall and at intervals not exceeding 30 feet.



- B. Penetration Identification: Identify each penetration firestopping system with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of penetration firestopping system edge so labels are visible to anyone seeking to remove penetrating items or firestopping systems. 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 according to ASTM E2174.
- B. Where deficiencies are found or penetration firestopping system is damaged or removed because of testing, repair or replace penetration firestopping system to comply with requirements.
- C. Proceed with enclosing penetration firestopping systems 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 system manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping systems are 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 material and install new materials to produce systems complying with specified requirements.

END OF SECTION 078413

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. The extent of each form and type of joint sealer is indicated on drawings and by provisions of this section.
- B. The applications for joint sealers as work of this section include but is not limited to the following:
  - 1. Flashing joints.
  - 2. All joints indicated to be caulked.
  - 3. All joints not specifically indicated, but necessary to obtain complete weathertight construction.
- C. Section Includes:
  - 1. Silicone joint sealants.
  - 2. Urethane joint sealants.
- D. Related Sections:
  - 1. Division 7 Section 076200 "Sheet Metal Flashing and Trim" for sealing joints sheet metal laps.
- E. General Performance: Except as otherwise indicated, joint sealers are required to establish and maintain airtight and waterproof continuous seals on a permanent basis, within recognized limitations of wear and aging as indicated for each application. Failures of installed sealers to comply with this requirement will be recognized as failures of materials and workmanship.

1.3 PRECONSTRUCTION TESTING

- A. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
  - 1. Use ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.

2. Submit not fewer than four pieces of each kind of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
5. Testing will not be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

#### 1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's product specifications, handling/installation/curing instructions, and performance tested data sheets for each elastomeric product required.
- B. Sustainable Design Submittals
  1. Product Data: For sealants and sealant primers used inside the weatherproofing system, including printed statement of VOC content.
  2. Laboratory Test Reports: For sealants, indicating compliance with requirements for low emitting materials.
- C. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view. Provide custom colors where required and herein specified.'
- D. Certified Tests: With product data, submit certified test reports for elastomeric sealants on aged performances as specified, including hardness, stain resistance, adhesion, cohesion or tensile strength, elongation, low-temperature flexibility, compression set, modulus of elasticity, water absorption, and resistance (aging, weight loss, deterioration) to heat and exposures to ozone and ultraviolet.
  1. Qualification Data: For qualified testing agency.
- E. Samples: Submit actual samples of sealants for color approval. Submit 6 inch lengths of product in in cardboard backer.
- F. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.
- G. Product Test Reports: Based on evaluation of comprehensive tests performed or witnessed by a qualified testing agency, indicating that sealants comply with requirements.
- H. Preconstruction Field-Adhesion-Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.
- I. Field-Adhesion-Test Reports: For each sealant application tested.

- J. Sample Warranties: For special warranties.
- K. Preconstruction Laboratory Test Schedule: Include the following information for each joint sealant and substrate material to be tested.
  - 1. Joint-sealant location and designation.
  - 2. Manufacturer and product name.
  - 3. Type of substrate material
  - 4. Proposed test.
  - 5. Number of samples required.
  - 6. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
- L. Joint-Sealant Schedule: Include the following information:
  - 1. Joint-sealant application, joint location, and designation.
  - 2. Joint-sealant manufacturer and product name.
  - 3. Joint-sealant formulation.
  - 4. Joint-sealant color.

#### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this project.
- B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.
- C. Product Testing: Test joint sealants using a qualified testing agency
  - 1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
- D. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

#### 1.6 PRECONSTRUCTION TESTING

- A. Preconstruction Laboratory Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
  - 1. Adhesion Testing: Use ASTM C 794 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
  - 2. Compatibility Testing: Use ASTM C 1087 to determine sealant compatibility when in contact with glazing and gasket materials.

3. Stain Testing: Use ASTM C 1248 to determine stain potential of sealant when in contact with stone or masonry substrates.
4. Submit manufacturer's recommended number of pieces of each type of material, including joint substrates, joint-sealant backings, and miscellaneous materials.
5. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
6. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures, including use of specially formulated primers.
7. Testing will not be required if joint-sealant manufacturers submit data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, staining of, and compatibility with joint substrates and other materials matching those submitted.

B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates as follows:

1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.
2. Conduct field tests for each kind of sealant and joint substrate.
3. Notify Architect seven days in advance of dates and times when test joints will be erected.
4. Arrange for tests to take place with joint-sealant manufacturer's technical representative present.
  - a. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1.1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
    - 1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
5. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

## 1.7 FIELD CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer.
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

5. Where joint widths have not been cleaned of all obstructing materials.

## 1.8 WARRANTY

- A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
  1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
  1. Warranty Period: Five years from date of Substantial Completion.
- C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
  1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
  2. Disintegration of joint substrates from causes exceeding design specifications.
  3. Mechanical damage caused by individuals, tools, or other outside agents.
  4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

## PART 2 - PRODUCTS

### 2.1 JOINT SEALANTS, GENERAL

- A. General Sealer Requirements:
  1. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
  2. Provide colors indicated or, if not otherwise indicated, as selected by Architect/Engineer. Color of sealant for joints in face brick or face brick adjacent to existing window frame shall be custom mixed to exactly match the color of the brick or existing aluminum window frame per Architect choice.
  3. Where color is indicated to match adjacent surface, sealant color will be selected by Architect/Engineer from manufacturer's standard colors. If no standard color is an acceptable match, sealant color shall be custom mixed to obtain acceptable color match at no additional cost to the Owner. Colors shall match adjacent surface color unless otherwise indicated or selected by Architect.
  4. Sealant materials shall not contain mercury, lead, or asbestos.

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- B. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- C. VOC Content of Interior Sealants: Provide sealants and sealant primers for use inside the weather proofing system that 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 shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- D. Colors of Exposed Joint Sealants: Shall be custom colors.
- E. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

## 2.2 SEALANTS

- A. All interior joints, including saw joints in concrete floors where applied finish will be tile or terrazzo, expansion joints, and exterior wall control joints shall be caulked with two component urethane type, ASTM C 920, Type M, Grade NS, Class 50, for Use T unless otherwise noted. Color to match lighter of adjacent painted surfaces.
- B. N/A this project: All joints in ceramic tile or quarry tile areas shall be caulked with single component mildew resistant silicone rubber type, ASTM C 920, type S, Grade NS, Class 50, for Use NT unless otherwise noted. Color shall match grout color.
  - 1. All joints in ceramic tile and quarry tile in a horizontal plane subject to foot traffic shall be caulked with mildew resistant silicone rubber type, ASTM C 920, type M, Grade NS, Class 25, for Use T. Color shall match grout color.
- C. Caulking Compound or Sealants:
  - 1. Expansion joints, control joints, and exterior window and door frames shall be caulked with two component urethane type, ASTM C 920, Type M, Grade NS, Class 50, for Use NT. Color to match color of brick where caulking occurs in brick masonry work and color of frames at exterior aluminum doors and windows.
- D. Acoustical sealant shall be Hilti CP 506 Smoke and Acoustic Sealant; Grabber Acoustical Sealant GSC; STI Spec Seal Smoke N Sound Caulk; BOSS 824 Acoustical Sound Sealant or approved equal.



### 2.3 URETHANE JOINT SEALANTS

- A. Urethane, M, NS, 50, NT: Multicomponent, nonsag, plus 50 percent and minus 50 percent movement capability nontraffic-use, urethane joint sealant; ASTM C 920, Type M, Grade NS, Class 50, Use NT.

### 2.4 JOINT-SEALANT BACKING AND JOINT FILLERS

- A. General: Provide sealant backings of material 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. Cellular/Foam Joint Fillers and Sealant Backers for building expansion joint fillers and concrete expansion joint material (preformed joint filler, compressible filler, expansion joint material):
  - 1. Expanded Polyethylene Joint Filler: Provide flexible, compressible, closed-cell, polyethylene of not less than 10 psi compression deflection (25%); except provide higher compression deflection strength as may be necessary to withstand installation forces and provide proper support for sealants; surface water absorption of not more than 0.1 pounds per square foot.
  - 2. Bond Breaker Tape: Provide polyethylene tape or plastic tape as recommended by sealant manufacturer, to be applied to sealant-contact surfaces where bond to substrate or joint filler must be avoided for proper performance of sealant. Provide self-adhesive tape where applicable.
- C. Cylindrical Sealant Backings (Backer Rod): ASTM C 1330, Type C (closed-cell material with a surface skin), or as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

### 2.5 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated. Provide type of joint primer/sealant recommended by sealant manufacturer for joint surfaces to be primed or sealed in accordance with ASTM C 1087.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

## 2.6 ACCEPTABLE MANUFACTURERS

- A. Manufacturer: Subject to compliance with requirements, provide sealants from one of the following:
1. Sonneborne Inc.
  2. Hilti, Inc.
  3. Pecora Inc.
  4. Sika Corporation.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine joints, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance. Installer must examine substrates, (joint surfaces) and conditions under which joint sealer work is to be performed, and installer must notify Contractor in writing of unsatisfactory conditions. Do not proceed with joint sealer work until unsatisfactory conditions have been corrected in a manner acceptable to Installer. Verify that masonry expansion and control joints have been raked and are clear of mortar.
1. Where two-part sealants are used, sealants shall be mixed on site from original containers.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
  2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Etch concrete and masonry joint surfaces as recommended by sealant manufacturer. Roughen vitreous and glazed joint surfaces as recommended by sealant manufacturer. Porous joint substrates include, but are not limited to:
    - a. Concrete.
    - b. Masonry.

- c. Unglazed surfaces of ceramic tile.
  - d. Exterior insulation and finish systems.
3. Remove laitance and form-release agents from concrete.
  4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include, but are not limited to the following:
    - a. Metal.
    - b. Glass.
    - c. Porcelain enamel.
    - d. Glazed surfaces of ceramic tile.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

### 3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements are shown or specified, except where manufacturer's technical representative directs otherwise and is approved by the Architect. Sealant shall be required in all control (CJ), fire control (FCJ), and expansion (EJ) joints regardless of whether the control joint, fire control joint, or expansion joint is concealed or not, i.e., full height of wall, above and below ceilings, concealed and not concealed.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
  1. Do not leave gaps between ends of sealant backings.
  2. Do not stretch, twist, puncture, or tear sealant backings.
  3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

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1. Place sealants so they directly contact and fully wet joint substrates.
  2. Completely fill recesses in each joint configuration.
  3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
  4. Install acoustical sealant in accordance with ASTM C 919.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
1. Remove excess sealant from surfaces adjacent to joints.
  2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
  3. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.
  4. Provide flush joint profile at locations indicated on Drawings according to Figure 8B in ASTM C 1193.
  5. Provide recessed joint configuration of recess depth and at locations indicated on Drawings according to Figure 8C in ASTM C 1193.
    - a. Use masking tape to protect surfaces adjacent to recessed tooled joints.
- G. Install liquid-applied sealant to depths as shown or, if not shown, as recommended by sealant manufacturer
- H. Spillage: Do not allow sealants or compounds to overflow from confines of joints, or to spill onto adjoining work, or to migrate into voids of exposed finishes. Clean adjoining surfaces to eliminate evidence of spillage.
- I. Caulk solidly around entire perimeter of openings using a nozzle of proper size to fit joints. Use sufficient pressure to fill all voids and joints solid.
- J. Set sills and thresholds in a full bed of caulking compound.
- K. Remove excess compound, after sill or threshold is set and point.
- L. Finish all caulked joints with the proper tool and remove caulking compound from all adjacent surfaces. Exposed caulking shall have a smooth even finish and be free from wrinkles.
- M. All caulked joints shall be watertight.
- N. Caulk joint between metal door frames and masonry construction.
- O. Follow manufacturer's direction for each type of joint.
- P. Caulk around entire perimeter of all windows on both the exterior side and the interior side.
- Q. Control joints in cavity wall CMU shall be caulked prior to application of dampproofing and sprayed urethane foam insulation.

### 3.4 FIELD QUALITY CONTROL

#### A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed and cured sealant joints as follows:
  - a. Perform 10 tests for the first 1000 feet (300 m) of joint length for each kind of sealant and joint substrate.
  - b. Perform one test for each 1000 feet (300 m) of joint length thereafter or one test per each floor per elevation.
2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
  - a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
3. Inspect tested joints and report on the following:
  - a. Whether sealants filled joint cavities and are free of voids.
  - b. Whether sealant dimensions and configurations comply with specified requirements.
  - c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion complies with sealant manufacturer's field-adhesion hand-pull test criteria.
4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant material, sealant configuration, and sealant dimensions.
5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

#### B. Evaluation of Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

### 3.5 CLEANING

- #### A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.6 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work. Cure sealants and caulking compounds in compliance with manufacturer's instructions and recommendations, to obtain high early bond strength, internal cohesive strength and surface durability. Advise Contractor of procedures required for cure and protection of joint sealers during construction period, so that they will be without deterioration or damage (other than normal wear and weathering) at time of Substantial Completion. Cure and protect sealants in a manner which will minimize increases in modulus of elasticity and other accelerated aging effects. Replace or restore sealants which are damaged or deteriorated during construction period.

END OF SECTION 079200

SECTION 083323 - OVERHEAD COILING DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Insulated service doors.

- B. Related Requirements:

- 1. Section 055000 "Metal Fabrications" for miscellaneous steel supports, door-opening framing, corner guards, and bollards.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type and size of overhead coiling door and accessory.

- 1. Include construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.
- 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.

- B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.

- 1. Include plans, elevations, sections, and mounting details.
- 2. Include details of equipment assemblies, and indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
- 3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
- 4. For exterior components, include details of provisions for assembly expansion and contraction and for excluding and draining moisture to the exterior.
- 5. Show locations of controls, locking devices, and other accessories.
- 6. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and testing and inspecting agency.



- B. Sample Warranty: For special warranty.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Special warranty.
- B. Maintenance Data: For overhead coiling doors to include in maintenance manuals.

#### 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.
  - 1. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site.

#### 1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of doors that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: Two years from date of Substantial Completion.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Source Limitations: Obtain overhead coiling doors from single source from single manufacturer.
  - 1. Obtain operators and controls from overhead coiling-door manufacturer.

#### 2.2 PERFORMANCE REQUIREMENTS

- A. Accessibility Standard: Comply with applicable provisions in ICC A117.1.
  - 1. Deflection Limits: Design overhead coiling doors to withstand design wind load without evidencing permanent deformation or disengagement of door components.
- B. Windborne-Debris Impact Resistance: Provide overhead coiling doors that pass ASTM E1886 missile-impact and cyclic-pressure tests according to ASTM E1996 for Wind Zone 4 for enhanced protection.
  - 1. Large-Missile Test: For overhead coiling doors located within 30 ft. of grade.

## 2.3 DOOR ASSEMBLY

- A. Insulated Service Door: Overhead coiling door formed with curtain of interlocking metal slats.
  - 1. 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. Cookson; a Cornell Cookson company.
    - b. Cornell; a Cornell Cookson company.
    - c. Overhead Door Corporation.
    - d. Raynor Garage Doors.
    - e. Wayne Dalton; a division of Overhead Door Corporation.
- B. Operation Cycles: Door components and operators capable of operating for not less than 20,000. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.
- C. Air Infiltration: Maximum rate of 1.0 cfm/sq. ft. at 15 and 25 mph when tested according to ASTM E283.
- D. Insulated Door Curtain R-Value: 7.7 deg F x h x sq. ft./Btu.
- E. Door Curtain Material: Galvanized steel.
- F. Door Curtain Slats: Flat profile slats of 2-5/8-inch center-to-center height.
  - 1. Insulated-Slat Interior Facing: Metal.
  - 2. Gasket Seal. Manufacturer's standard continuous gaskets between slats.
- G. Bottom Bar: Two angles, each not less than 1-1/2 by 1-1/2 by 1/8 inch thick; fabricated from hot-dip galvanized steel and finished to match door.
- H. Curtain Jamb Guides: Galvanized steel with exposed finish matching curtain slats.
- I. Hood: Match curtain material and finish.
  - 1. Shape: Manufacturer's standard.
  - 2. Mounting: As indicated on Drawings.
- J. Locking Devices: Equip door with slide bolt for padlock and chain lock keeper.
- K. Curtain Accessories: Equip door with weather seals.
- L. Door Finish:
  - 1. Baked-Enamel or Powder-Coated Finish: Color as indicated on drawings.
  - 2. Interior Curtain-Slat Facing: Match finish of exterior curtain-slat face.

## 2.4 MATERIALS, GENERAL

- 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.

## 2.5 DOOR CURTAIN MATERIALS AND CONSTRUCTION

- A. Door Curtains: Fabricate overhead coiling-door curtain of interlocking metal slats, designed to withstand wind loading indicated, in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:
  - 1. Steel Door Curtain Slats: Zinc-coated (galvanized), cold-rolled structural-steel sheet; complying with ASTM A653/A653M, with G90 zinc coating; nominal sheet thickness (coated) of 0.028 inch; and as required.
  - 2. Insulation: Fill slats for insulated doors with manufacturer's standard thermal insulation complying with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E84 or UL 723. Enclose insulation completely within slat faces.
  - 3. Metal Interior Curtain-Slat Facing: Match metal of exterior curtain-slat face, with minimum steel thickness of 0.010 inch.
- B. Curtain Jamb Guides: Manufacturer's standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain, and a continuous bar for holding windlocks.

## 2.6 HOODS

- A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.
  - 1. Galvanized Steel: Nominal 0.028-inch-thick, hot-dip galvanized-steel sheet with G90 zinc coating, complying with ASTM A653/A653M.

## 2.7 LOCKING DEVICES

- A. Slide Bolt: Fabricate with side-locking bolts to engage through slots in tracks for locking by padlock, located on both left and right jamb sides, operable from coil side.
- B. Chain Lock Keeper: Suitable for padlock.

- C. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

## 2.8 CURTAIN ACCESSORIES

- A. Weatherseals for Exterior Doors: Equip each exterior door with weather-stripping gaskets fitted to entire exterior perimeter of door for a weather-resistant installation unless otherwise indicated.
  - 1. At door head, use 1/8-inch-thick, replaceable, continuous-sheet baffle secured to inside of hood or field-installed on the header.
  - 2. At door jambs, use replaceable, adjustable, continuous, flexible, 1/8-inch-thick seals of flexible vinyl, rubber, or neoprene.

## 2.9 COUNTERBALANCE MECHANISM

- A. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.
- B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, seamless or welded 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. of span under full load.
- C. Counterbalance Spring: 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. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.
- D. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.
- E. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

## 2.10 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM/NOMMA 500 for recommendations for applying and designating finishes.
- B. 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.

2.11 STEEL AND GALVANIZED-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.

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. Examine locations of electrical connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Install overhead coiling doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.
- B. Install overhead coiling doors, hoods, controls, 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 the accessibility standard.
- D. Power-Operated Doors: Install according to UL 325.

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections and to furnish reports to Architect.
- B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
  - 1. Test door release, closing, and alarm operations when activated by smoke detector or building's fire-alarm system. Test manual operation of closed door. Reset door-closing mechanism after successful test.
- C. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.

- D. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.

#### 3.4 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
  - 1. Complete installation and startup checks according to manufacturer's written instructions.
  - 2. After electrical circuitry has been energized, operate doors to confirm proper motor rotation and door performance.
  - 3. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

#### 3.5 ADJUSTING

- A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.
  - 1. Adjust exterior doors and components to be weather resistant.
- B. Lubricate bearings and sliding parts as recommended by manufacturer.
- C. Adjust seals to provide tight fit around entire perimeter.

#### 3.6 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of coiling-door Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
  - 1. Perform maintenance, including emergency callback service, during normal working hours.

#### 3.7 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain overhead coiling doors.

END OF SECTION 083323

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Interior gypsum board.

- B. Related Requirements:

- 1. Section 092216 "Non-Structural Metal Framing" for non-structural steel framing and suspension systems that support gypsum board panels.

1.3 ACTION SUBMITTALS

- A. Product Data: For the following:

- 1. Gypsum wallboard.
- 2. Interior trim.
- 3. Joint treatment materials.

1.4 QUALITY ASSURANCE (NOT USED)

1.5 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.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C840 requirements or gypsum board manufacturer's written instructions, 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, 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.

## PART 2 - PRODUCTS

### 2.1 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.

### 2.2 INTERIOR GYPSUM BOARD

- A. Gypsum Wallboard: ASTM C1396/C1396M.
  - 1. Thickness: 5/8 inch.
  - 2. Long Edges: Tapered.

### 2.3 TRIM ACCESSORIES

- A. Interior Trim: ASTM C1047.
  - 1. Material: Galvanized or aluminum-coated steel sheet.
  - 2. Shapes:
    - a. LC-Bead: J-shaped; exposed long flange receives joint compound.
    - b. L-Bead: L-shaped; exposed long flange receives joint compound.
    - c. Expansion (control) joint.

### 2.4 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C475/C475M.
- B. Joint Tape:
  - 1. Interior Gypsum Board: Paper.
- 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 and damaged surface areas, use setting-type taping compound.



2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
  - a. Use setting-type compound for installing paper-faced metal trim accessories.
3. Fill Coat: For second coat, use drying-type, all-purpose compound.
4. Finish Coat: For third coat, use drying-type, all-purpose compound.

## 2.5 AUXILIARY MATERIALS

- A. Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
- 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 INSTALLATION OF INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
  1. Ceiling Type: As indicated on Drawings.
- 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 horizontally (perpendicular to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
    - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.

### 3.3 INSTALLATION OF 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. Interior Trim: Install in the following locations:
  - 1. Cornerbead: Use at outside corners.
  - 2. L-Bead: Use where indicated.

### 3.4 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 C840:
  - 1. Level 3.

### 3.5 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 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
  - 1. Thermoset-rubber base.
  - 2. Rubber transition strips.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples for Verification: For each type of product indicated and for each color, texture, and pattern required in manufacturer's standard-size Samples, but not less than 3 inches long.

1.4 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. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer.

1.6 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer in spaces to receive resilient products during the following periods:
  - 1. 48 hours before installation.
  - 2. During installation.

3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer.
- C. Install resilient products after other finishing operations, including painting, have been completed.

## PART 2 - PRODUCTS

### 2.1 THERMOSET-RUBBER BASE (RB1)

- A. Acceptable Manufacturers:
  1. Roppe
  2. Tarkett
  3. Mannington Commercial
  4. Or equal
- B. Product Standard: ASTM F1861, Type TS (rubber, vulcanized thermoset), Group I (solid, homogeneous).
  - a. Style B, Cove
- C. Thickness: 0.125 inch
- D. Height: Match existing.
- E. Corners: Job formed or preformed
- F. Colors: Match existing.

### 2.2 RUBBER TRANSITION STRIPS (RT1)

- A. Acceptable Manufacturers:
  1. Roppe
  2. Tarkett
  3. Mannington Commercial
  4. Or approved equal
- B. Description: Rubber transition strips
- C. Profile and Dimensions: Match existing style, to be confirmed during pre-bid walk-thru. Assume transition with lip over carpet side for installation with existing flooring on other side.
- D. Colors and Patterns: Match existing.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
  - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
  - 1. Installation of resilient products indicates acceptance of surfaces and conditions.

#### 3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- C. Do not install resilient products until materials are the same temperature as space where they are to be installed.
- D. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

#### 3.3 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Where drawings indicate entire rooms to receive new base, install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned. Provide in full lengths where drawings indicate only to patch.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.
- F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

- G. If using preformed corners, install preformed corners before installing straight pieces.
- H. If using job-formed corners, use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.
  - 1. Form without producing discoloration (whitening) at bends.
  - 2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.
    - a. Miter or cope corners to minimize open joints.

#### 3.4 RESILIENT ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient accessories.
- B. Comply with ADA threshold requirements.
- C. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed. Center molding under door in closed position.

#### 3.5 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.
- B. Perform the following operations immediately after completing resilient-product installation:
  - 1. Remove adhesive and other blemishes from surfaces.
- C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 096513

SECTION 096519 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
  - 1. Vinyl composition floor tile.

1.3 ACTION SUBMITTALS

- A. Installer Qualifications: Engage an installer who employs workers for this Project who are trained or certified by floor tile manufacturer for installation techniques required. Provide certification certificates for all installers.
- B. Product Data: For each type of product.
- C. Shop Drawings: Indicate understanding of scope of work by differentiating between all flooring and wall base materials to be installed. Indicate installation patterns. Shop drawings for all flooring and resilient base may be submitted as one submittal.
- D. Samples for Verification: Full-size units of each color and pattern of floor tile required.
- E. Test Results: For testing methods indicated.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of floor tile to include in maintenance manuals.

1.5 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. Floor Tile: Furnish one box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C). Store floor tiles on flat surfaces.

1.7 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), in spaces to receive floor tile during the following periods:
  - 1. 48 hours before installation.
  - 2. During installation.
  - 3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).
- C. Close spaces to traffic during floor tile installation.
- D. Close spaces to traffic for 48 hours after floor tile installation.
- E. Install floor tile after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For resilient floor tile, as determined by testing identical products according to ASTM E648 or NFPA 253 by a qualified testing agency.
  - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

2.2 VINYL COMPOSITION FLOOR TILE

- A. Acceptable Manufacturers:
  - 1. Armstrong Flooring
  - 2. Approved equal
- B. Tile Standard: ASTM F1066, Class 2, through pattern
- C. Wearing Surface: Smooth



- D. Thickness: 0.125 inch (3.2 mm)
- E. Size: 12 by 12 inches (305 by 305 mm)
- F. Colors and Patterns: Match existing

### 2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, Portland-cement-based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.
- C. Floor Polish: Protective, liquid floor-polish products recommended by floor tile manufacturer.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
  - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F710.
  - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
  - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
  - 3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.

- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install floor tiles until materials are the same temperature as space where they are to be installed.
  - 1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

### 3.3 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.
- B. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
- C. Lay tiles in pattern indicated on drawings.
- D. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.
- E. Adhere floor tiles to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

### 3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.
- B. Perform the following operations immediately after completing floor tile installation:
  - 1. Remove adhesive and other blemishes from surfaces.
  - 2. Sweep and vacuum surfaces thoroughly.
  - 3. Damp-mop surfaces to remove marks and soil.
- C. Protect floor tile from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Floor Polish: Remove soil, adhesive, and blemishes from floor tile surfaces before applying liquid floor polish. Coordinate with other disciplines' order of work. Polish may need to be completed before other disciplines restrict access to the floor.

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1. Apply minimum two coats or manufacturer's recommendation.
- E. Cover floor tile until Substantial Completion.

END OF SECTION 096519

SECTION 096813 - TILE CARPETING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
  - 1. Modular carpet tile.

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 manufacturer's written installation recommendations for each type of substrate.
  - 3. Transition details to other flooring materials if not as indicated on drawings.
- B. Samples for Verification: 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: 6-inch long samples as required by drawings.
- C. Shop drawings: Indicate understanding of scope of work by differentiating between all flooring and wall base materials to be installed. Indicate installation patterns. Shop drawings for all flooring and resilient base may be submitted as one submittal.

1.4 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For special warranty.
- B. Moisture Test Reports: Provide one or more test reports as required per paragraph below.
- C. Installer Qualifications: Engage an experienced installer who is certified by the International Certified Floorcovering Installers Association at the Commercial II certification level.

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.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Comply with the Carpet and Rug Institute's CRI 104.

1.8 FIELD CONDITIONS

- A. Comply with the Carpet and Rug Institute's CRI 104 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 levels planned for building occupants during the remainder of the construction period.

1.9 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, the following:
    - a. More than 10 percent edge raveling, snags, and runs.
    - b. Dimensional instability.
    - c. Excess static discharge.
    - d. Loss of tuft-bind strength.
    - e. Loss of face fiber.
    - f. Delamination.

3. Warranty Period: 10 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 CARPET TILE (CPT1)

- A. Acceptable Manufacturers:
  1. Patcraft
  2. Mannington Commercial
  3. Shaw Industries
- B. Color: Match existing.
- C. Dye Method: 100% Solution Dyed
- D. Pattern: Match existing.
- E. Density: To meet or exceed that of basis of design indicated on drawings.
- F. Tufted Yarn Face Weight: To meet or exceed that of basis of design indicated on drawings.
- G. Primary and Secondary Backing/Backcoating: Manufacturer's standard materials
- H. Soil-Resistance Treatment: Manufacturer's standard treatment
- I. Appearance Retention Rating: Severe traffic, 3.5 according to ASTM D7330.
- J. Critical Radiant Flux Classification: To meet or exceed that of basis of design indicated on drawings.
- K. Dry Breaking Strength: Not less than 100 lbf (445 N) according to ASTM D2646.
- L. Electrostatic Propensity: Less than 2 kV according to AATCC 134.

### 2.2 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.
- B. Adhesives: Water-resistant, mildew-resistant, non-staining, pressure-sensitive type to suit products and subfloor conditions indicated, that comply with flammability requirements for installed carpet tile, and are recommended by carpet tile manufacturer for releasable installation.

### 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.
- B. Examine carpet tile for type, color, pattern, and potential defects.
- C. Concrete Slabs: Contractor to prepare slab as required to comply with manufacturer's requirements and to ensure that surfaces are free of cracks, ridges, depressions, scale, and foreign deposits.
  - 1. Moisture Testing: Perform tests so that each test area does not exceed 100 sq. ft. and perform at least one test in building. Perform test in additional areas if unsatisfactory results are found in the first area.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. General: Comply with the Carpet and Rug Institute's CRI 104 and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile.
- 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. Concrete Substrates: 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 adhesive and carpet tile manufacturers.
- D. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

#### 3.3 INSTALLATION

- A. General: Comply with the Carpet and Rug Institute's CRI 104, Section 10, "Carpet Tile," and with carpet tile manufacturer's written installation instructions.
- B. Installation Method: Glue down; install every tile with full-spread, releasable, pressure-sensitive adhesive.

- C. Maintain dye-lot integrity. Do not mix dye lots in same area.
- D. Maintain pile-direction patterns: As indicated on Drawings.
- E. 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.
- F. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on carpet tile as marked on subfloor. Use nonpermanent, non-staining marking device.

### 3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after installing carpet tile:
  - 1. Remove excess adhesive 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 the Carpet and Rug Institute's CRI 104, Section 13.7.
- 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 099124 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes surface preparation and the application of paint systems on the following interior substrates:
  - 1. Concrete substrates, nontraffic surfaces.
  - 2. Concrete masonry units (CMUs).
  - 3. Gypsum board and plaster substrates.

1.3 DEFINITIONS

- A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D523.
- B. MPI Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D523.
- C. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D523.
- D. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D523.
- E. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D523.
- F. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D523.
- G. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D523.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
  - 1. Indicate VOC content.

- B. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.
  - 1. Submit Samples on rigid backing, 8 inches (200 mm) square.
  - 2. Apply coats on Samples in steps to show each coat required for system.
  - 3. Label each coat of each Sample.
  - 4. Label each Sample for location and application area.
- C. Product List: Use same designations indicated on Drawings and in the Interior Painting Schedule to cross-reference paint systems specified in this Section. Include color designations.

#### 1.5 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. Paint: 5 percent, but not less than 2 gal. (3.8 L) of each material and color applied.

#### 1.6 QUALITY ASSURANCE

- A. Mockups: Apply mockups 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.
    - 1. Vertical Surfaces: Provide samples of at least 20 sq. ft. (9 sq. m) for field paint.
  - 2. Final approval of color selections will be based on mockups.
    - 1. If preliminary color selections are not approved, apply one additional mockup of additional color selected by Architect at no added cost to Owner.
  - 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.

#### 1.7 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.

1.8 FIELD 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 of less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Approved Manufacturers:
  - 1. Sherwin Williams
  - 2. PPG
  - 3. Benjamin Moore

2.2 PAINT, GENERAL

- A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products List."
- B. Material Compatibility:
  - 1. Materials for use within each paint system shall be 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, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
- C. Colors: Match existing.
- D. VOCs: Provide No-VOC products.

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 the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

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1. Concrete: 12 percent.
  2. Fiber-Cement Board: 12 percent.
  3. Masonry (Clay and CMUs): 12 percent.
  4. Gypsum Board: 12 percent.
  5. Plaster: 12 percent.
- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth where intended to be.
- D. Plaster Substrates: Verify that plaster is fully cured.
- E. Spray-Textured Ceiling Substrates: Verify that surfaces are dry.
- F. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- G. Proceed with coating application only after unsatisfactory conditions have been corrected.
1. Application of coating indicates acceptance of surfaces and conditions.

### 3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and 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.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.
- E. 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.

### 3.3 INSTALLATION

- A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
  - 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.
  - 4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
  - 5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. 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.
- C. Paint the following work where exposed in occupied spaces:
  - 1. Uninsulated metal piping.
  - 2. Uninsulated plastic piping.
  - 3. Pipe hangers and supports.
  - 4. Metal conduit.
  - 5. Plastic conduit.
  - 6. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.

### 3.4 FIELD QUALITY CONTROL

- A. Dry-Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry-film thickness.
  - 1. Contractor shall touch up and restore painted surfaces damaged by testing.
  - 2. If test results show that dry-film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry-film thickness that complies with paint manufacturer's written recommendations.

### 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 INTERIOR PAINTING SCHEDULE

#### A. Concrete Substrates, Nontraffic Surfaces:

- 1. Latex System MPI INT 3.1E:
  - 1. Prime Coat: Latex, interior, matching topcoat.
  - 2. Topcoat: Latex, interior, flat (MPI Gloss Level 1), MPI #53.

#### B. CMU Substrates:

- 1. Institutional Low-Odor/VOC Latex System, MPI INT 4.2E:
  - 1. Block Filler: Block filler, latex, interior/exterior, MPI #4.
  - 2. Topcoat: Latex, interior, institutional low odor/VOC (MPI Gloss Level 3), MPI #145.

#### C. Gypsum Board and Plaster Substrates:

- 1. Institutional Low-Odor/VOC Latex System, MPI INT 9.2M:
  - 1. Prime Coat: Primer sealer, interior, institutional low odor/VOC, MPI #149.
  - 2. Topcoat: Latex, interior (MPI Gloss Level 3), MPI #52.

END OF SECTION 099124

SECTION 230100 - MECHANICAL GENERAL PROVISIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. This Section forms a part of all Division 23 Sections.

1.2 APPLICABLE SPECIFICATIONS, CODES AND STANDARDS

- A. Latest effective publications of following Specifications, regulations, standards, codes, etc., as applicable, form a part of these Specifications the same as if written fully herein and shall be followed as minimum requirements.

Codes and ordinances of local governing agencies:

AGA	American Gas Association
AHRI	Air Conditioning, Heating and Refrigeration Institute
AMCA	Air Moving and Conditioning Association
ANSI	American National Standard Institute
ASHRAE	American Society of Heating, Refrigerating and Air-conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
IEEE	Institute of Electrical and Electronics Engineers
NAFM	National Association of Fan Manufacturers
NEC 2014	National Electrical Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
OSHA	Occupational Safety and Health Administration
SMACNA	Sheet Metal and Air-conditioning Contractors National Association
UFAS	Uniform Federal Accessibility Standards
UL	Underwriters Laboratories, Inc.
VFSR	Virginia Fire Safety Regulations
VUSBC	Virginia Uniform Statewide Building Code, 2018 Edition

1.3 DRAWINGS

- A. General arrangements of indicated piping, ductwork and equipment are diagrammatic only, do not scale. Where rearrangement is necessary, submit drawings of proposed changes for approval. Due to scale of drawings, offsets, fittings and accessories may not be indicated. Work indicated, but having details omitted, shall be provided complete to perform function intended without extra cost. Investigate existing structural and finish conditions in building affecting

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plumbing, heating, ventilating and air-conditioning work, etc., and arrange work accordingly. Furnish fittings, traps, offsets, vents, valves and accessories required. Install equipment in accordance with manufacturer's recommendations and clearance requirements.

1.4 COORDINATION

- A. Coordinate piping, ducts and equipment with electrical, structural and architectural plans and work in order to avoid omissions and to eliminate any interference. Report in writing discrepancies, if found, to the Engineer as soon as possible after discovery.

1.5 WORKMANSHIP

- A. Workmanship shall be first class and of best quality in accordance with approved contemporary construction practices. Defective equipment and materials, or material damaged in the course of installation and tests shall be replaced or repaired in an approved manner.

1.6 CUTTING

- A. Cutting shall be carefully done. Repair damage to the building, piping, wiring, or equipment as a result of cutting for installation, using skilled mechanics of trade involved.

1.7 APPROVAL OF MATERIALS, FIXTURES AND EQUIPMENT

- A. See Specification Section 013300 "Submittals", for shop drawing submittal procedures. Within 30 days after award of the Contract and before any purchases are made, submit for approval a complete list of materials, fixtures and equipment proposed, together with names of manufacturers and catalog numbers for each Specification Section. Furnish other detailed information where directed. No consideration will be given to partial lists submitted from time to time. Approval of materials shall be based on manufacturer's published ratings. Materials, fixtures and equipment listed which are not in accordance with specified requirements shall be rejected. Contractor shall make resubmission of items not approved within 30 days from date of rejections. Submission shall be complete with description, ratings, dimensions and related items and any additional information required by the Owner.
- B. Materials and equipment shall be new, conforming to these Specifications.
- C. Two or more units of same class of equipment shall be product of single manufacturer; however, component parts of system need not be product of same manufacturer.
- D. Mechanical design has given full consideration to space requirements for equipment specified. Contractor is responsible for selecting equipment that will be accommodated by this space. Equipment not conforming to space allotted shall be rejected.
- E. Mechanical design has given full consideration for electrical requirements for equipment. Contractor is responsible for selecting equipment that will be accommodated by the electrical



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design indicated. Equipment not conforming to the electrical design provided under Division 26 is the Contractor's responsibility. All electrical changes required to accommodate the equipment provided shall be furnished and installed by the Contractor without change in Contract price or time of completion. This shall include but not be limited to wiring, conduit, circuit breakers, disconnect switches, starters and controllers.

- F. Submit one copy of equipment installation manuals to the Engineer for his use.

1.8 EQUIPMENT DESIGN

- A. Equipment and accessories not specifically described or identified by manufacturer's catalog numbers shall be designed in conformity with ASME, ANSI, IEEE, or other applicable technical standards, suitable for maximum working pressure and shall have neat and finished appearance.

1.9 SUPERVISION

- A. The Contractor for each Section under this Division shall maintain a competent foreman on the job at all times to supervise the work and coordinate with other trades for the installation of the system. Submit foreman's qualifications, including master's trade license, to the Engineer for approval.

1.10 NOTICES AND FEES

- A. Give all required notices, obtain all necessary permits (including a separate permit for the installation of refrigerant lines if required by the local "Authority Having Jurisdiction") and pay all required fees.

1.11 RECORD DRAWINGS

- A. Refer to Specification Section 017839 "Project Record Documents"

1.12 OPERATION AND MAINTENANCE MANUALS

- A. Refer to Specification Section 017823 "Operation and Maintenance Data"

1.13 OWNER'S TRAINING

- A. Upon completion of work and at a time designated by the Owner, the services of competent persons shall be provided as required to instruct Owner's representative in operation and maintenance of systems. Training sessions shall be a combination of on-site and in-classroom training and shall be a minimum of two 8-hour sessions. All training shall be video recorded by

the Contractor and provided in DVD format. Two copies of the DVD shall be submitted to the Owner.

1.14 WARRANTY-GUARANTEE

- A. Contractor shall furnish written warranty, countersigned and guaranteed by the General Contractor, stating that work executed under this Section of the Specifications shall be free from defects of materials and workmanship for a period of 12 months from date of Final Acceptance.
- B. Contractor shall service the systems for 12 months from date of Substantial Completion. Such service shall include all emergency services and adjustments, except cleaning/changing of filters. Adjustments and repairs to equipment shall be made by the original equipment manufacturer (OEM). Third party service agencies are not acceptable for making repairs or adjustments to equipment during the warranty period.
- C. The equipment manufacturer and Contractor shall provide a one-year material, labor and refrigerant warranty on all compressors. In addition, the manufacturer shall provide a material only warranty on all compressors for a period of 5 years total, beginning at the date of start-up of the compressor.
- D. Contractor shall be responsible for all maintenance, repair and servicing of mechanical equipment during the construction period as required by the equipment manufacturers and identified in the Operation and Maintenance Manuals. This shall include all routine maintenance, such as greasing of bearings, adjustment/replacement of belts, cleaning of coils, cleaning of strainers, calibration of controls and other routine maintenance items that may be unique to each piece of equipment. This shall also include repair and replacement of any malfunctioning or damaged parts. In addition, this shall include changing filters on a bi-weekly basis through award of Substantial Completion. Contractor shall respond within 24-hour notification by Owner or General Contract.

1.15 WELDER'S CERTIFICATIONS

- A. Submit welder's certifications to the Engineer/Architect for approval.

PART 2 - PRODUCTS

2.1 PIPE SLEEVES, PIPE HANGERS, PIPE SUPPORTS AND DUCT SUPPORTS

- A. Provide pipe sleeves, hangers, supports and duct supports. Contractor shall be responsible for proper and permanent location. Pipe and duct shall not be permitted to pass through footings, beams, or ribs, unless indicated and/or approved. All piping passing through masonry or concrete walls shall be sleeved and insulation shall run continuously through sleeve.

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- B. Install pipe sleeves and properly secure in place with grout where pipes pass through masonry or concrete and at all fire-rated assemblies. Pipe sleeves, except in footings, shall be sufficient diameter to provide approximately 1/4" clearance around insulation or pipe. Fill void between insulation or pipe and sleeve with mineral wool to prevent sound transmission. Pipe sleeves in walls and partitions shall be Schedule 40 steel pipe. Extend sleeves above floor at least 1", pack space around pipe with fireproof material and make watertight. Pipe penetration through below grade walls shall be sealed with modular seals selected for the type of pipe and wall penetration, "LINK SEAL" or approved equal. Where pipes pass through waterproofing membranes, provide flashing sleeves with integral flashing flanges or clamping device of 16-ounce soft-sheet copper; extend at least 8" from sleeve. Thoroughly mop flashing flanges and shields into membrane.
  
- C. Hang horizontal overhead runs of pipe with adjustable clevis-type hangers spaced not over 10 feet apart. Provide hangers other than aforementioned, if pipe size or other features make spacing at shorter intervals necessary. Pipe hangers shall be provided within 4 feet of all changes in direction of pipe. Pipe hangers shall not be installed on pipe fittings where fitting could bear the weight of connected pipe but instead shall be installed on pipe at intervals previously specified. Chain, strap, perforated bar, or wire hanger will not be permitted. Hangers shall have short turnbuckles or approved means of adjustment. Use trapeze hangers on pipes running parallel and close together. Hangers for copper tubing shall be copper plated where in contact with tubing. Hangers, including rods and clamps, shall be hot dipped galvanized exterior to the building and in all mechanical spaces, zinc plated in all interior spaces, except as otherwise specified.
  
- D. Hang all horizontal overhead runs of pre-insulated refrigerant pipe with a pipe shield as manufactured by EATON B-LINE, series SNAP'N SHIELD or approved equal. Hang all horizontal overhead runs of field insulated refrigerant piping with a clamp assembly attached to strut as manufactured by EATON B-LINE, series B-LINE ARMAFIX CLAMPS or approved equal. Refrigerant pipe insulation shall be continuous through the clamp assembly. All refrigerant pipe supports shall be spaced not over 6 feet apart.
  
- E. Refrigeration, condensate and gas piping on roof shall be supported by support blocks manufactured by ROOF TOP BLOX model RTB-01, or approved equal. The support blocks must be designed to eliminate roof penetrations, flashings or damage to roofing membrane. Support body shall be made of recycled UV-resistant Polypropylene Copolymer. Base platform material shall be 1" thick, 25psi, type 4 closed cell structural foam to distribute and evenly cushion loads. Support top surface shall have molded in pipe organizing saddles and strut mounting cradle. The top surface shall also have screw guide indents and engineered internal screw thread gripping feature. Block must accept up to 1/2" threaded rod using side entry nut slots to allow fast top side assembly and piping height adjustments or attachment of galvanized slotted steel strut channel. For roof mounted piping provide approved pipe supports every four feet for Polyvinyl Chloride (PVC) and every six feet for Copper. Provide polycarbonate securing brackets model SCB07. Brackets shall secure support directly to the roof membrane with M-1 structural adhesive.
  
- F. Supports for piping, ductwork and equipment shall be attached to a structural member, not bridging. Piping, ductwork and equipment shall not be attached to structural joist bridging or metal roof or floor decking. Provide additional steel supports spanning between joists or beams for hanger attachments. Additional steel supports shall be approved by the Structural Engineer.

- G. In areas supported by steel beams, secure hanger rods directly to beams.
- H. Provide galvanized steel shields or protection saddles to protect insulation at area of contact with hangers and supports. Where shields are used on pipes 1-1/2" and larger, provide insulation inserts at points of hangers and supports. Refer to Specification Section 230700 "Mechanical Insulation", for details.
- I. Support and fasten equipment in an approved manner.
- J. Ductwork shall be supported in accordance with SMACNA, HVAC Duct Construction Standards, unless otherwise noted or indicated. Ductwork shall be supported using threaded rod or solid metal strap as required by SMACNA. No other materials, such as perforated metal strap, or cloth strap, are acceptable. Wire may be used to hang round duct smaller than 10"; however, solid metal strap shall be used to wrap around duct. Wire shall not be used for rectangular duct or round duct larger than 10".

## 2.2 PIPE PENETRATIONS THROUGH WALLS AND CEILINGS

- A. Fit exposed pipes passing through finished walls or ceilings with escutcheon of chromium-plated cast-brass plates on chromium-plated pipe, nickel-plated steel plates on ferrous pipe, or copper tubing. Plates shall be large enough to completely close hole around pipes and conceal pipe sleeves and shall be round, with least dimension at least 1/2" larger than diameter of pipe and insulation. Secure plates in an approved manner.

## 2.3 UNIONS

- A. Unions shall be installed on each side of all control valves, regulators and similar items and one side of all pieces of equipment, such as pumps, tanks, etc., so that such equipment shall be readily disconnected and removed if necessary.

## 2.4 DIELECTRIC CONNECTIONS

- A. Dielectric connections shall be provided at all connections between ferrous and nonferrous piping or metals, except drain piping connections at drain pans for cooling coils and valves having cast-bronze adapters.

## 2.5 ELECTRICAL WORK FOR EQUIPMENT UNDER MECHANICAL SYSTEMS

- A. All non-integrated motor controllers and starters serving equipment installed under Division 23 Sections shall be furnished under those Sections and shall be turned over to Electrical Contractor, for installation by Electrical Contractor. Controllers shall be equipped with all auxiliary contacts, poles, or devices necessary to permit interlocking and control required.

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- B. Fractional horsepower motors 1/2 HP and below shall be single-phase, 60 cycles, 120V; motors larger than 1/2 HP shall be 3-phase, 60 cycles, of voltages indicated on the electrical drawings and conforming to the electrical service, except where indicated otherwise. Motors shall conform to latest NEMA requirements.
- C. All electrical power wiring required for equipment installed under Division 23 Sections shall be provided under Division 26 Sections with all necessary approved wiring diagrams and guidance provided under Division 23 Sections, with the exception of power wiring to Automatic Temperature Control panels which shall be provided by the Automatic Temperature Control Contractor.
- D. Raceways shall be 1/2" minimum. All wiring in rooms with exposed structure or in inaccessible ceiling and walls shall be installed in conduit. Label the front face of the cover on each junction box with indelible black marker indicating the number of each circuit contained in or running through the box. In areas where exposed construction is the final finished condition and conduit and junction boxes are called out to be painted, label the inside face of the covers.
- E. All control and power wiring required for temperature control system and all interlocking and accessory control wiring required for equipment installed under Division 23 Sections shall be installed by the Plumbing, Mechanical and Temperature Control Contractors. All power wiring for the temperature control system shall be fed from an emergency panel served by the emergency generator where emergency power is available on site. Accessory control wiring including, but not limited to interlock wiring for electric damper actuators (separate from DDC systems), equipment accessories for remote equipment sensors shall be provided and installed by the Plumbing, Mechanical and Automatic Temperature Control Contractors.
- F. All controls shall be NEMA rated and NEMA I enclosed where mounted inside building, except in kitchens which shall be NEMA 4X-SS. Starters and controls mounted outside or where specifically called for shall be NEMA 3R.
- G. Auxiliary 120-Volt contacts shall be provided to give control and interlocking as required or as indicated.
- H. Where control voltages are different from motor voltages, a control-voltage transformer shall be provided as a part of the starter.
- I. The Contractor shall be responsible for coordinating with the Division 26 Contractor for providing properly sized circuit breakers to serve equipment and motors furnished which differ from that specified or indicated. This shall be further understood to include branch circuit wiring, conduit, disconnect switches, etc., in accordance with the appropriate codes and specifications. The cost of providing this increased electrical service and related work shall be included under the applicable section under which the equipment and motors are being furnished, at no additional cost to Owner.
- J. The Automatic Temperature Controls Contractor shall be responsible for providing circuit breakers and power wiring and conduit from electrical panels installed under Division 26 to Automatic Temperature Controls panels. All electrical work shall be in accordance with appropriate codes and Division 26 specifications.

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- K. The Mechanical Contractor shall be responsible for the installation and mounting of all duct smoke detectors in new and existing ductwork. The duct smoke detector shall be furnished and provided with all fire alarm wiring under Division 28. Any and all Temperature Control wiring shall be provided under Division 23. Refer to the mechanical drawings for locations in new ductwork. Refer to the electrical drawings for locations of existing detectors to be replaced. Coordinate the installation of the detectors with the Electrical and Automatic Temperature Control Contractors.

2.6 MACHINERY ACCESSORIES

- A. Provide oil-level gages, grease cups and grease-gun fittings for machinery bearings as recommended by machinery manufacturer; where these lubricating means are not easily accessible, extend to locations as directed. Furnish all grease-gun fittings of uniform type.

2.7 AIR BALANCING DEVICES

- A. Furnish any additional material or equipment, such as sheaves, belts, motors and balancing devices, required to complete and/or adjust and balance the systems as recommended by the TAB Agency at no additional cost to the Owner. Failure to provide additional means of adjusting and balancing will not relieve the Contractor of responsibility for properly adjusting and balancing the various systems as intended.

2.8 DUCT SEALANT

- A. Where duct is indicated to be sealed, utilize a fire resistive, water based, indoor/outdoor, U.V. resistant, non-fibrated duct sealant, DUCTMATE EverSeal, FOSTER DUCT-FAS 32-19 or approved equal.
- B. Sealant shall have a volatile organic compound (VOC) rating of 24 g/L, less water.
- C. Sealant shall meet all SMACNA pressure classes up to 10" w.g. and SMACNA seal classes A, B and C.
- D. Apply sealant with brush working sealant into all joints. For spiral duct, apply sealant to male end of coupling prior to fitting straight run of duct to coupling. Follow manufacturer's instructions for all application requirements.
- E. The use of duct sealing tape of any kind is unacceptable.

PART 3 - EXECUTION

3.1 PIPE INSTALLATION

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- A. Pipe systems shall be complete. Pipe shall be of size indicated or, where not indicated, shall be of size required to produce capacities of the equipment specified. No pipe shall be buried in floors, unless specifically indicated or approved.
- B. Install runs of piping as indicated. Cut pipe accurately to measurements established at the building by the Contractor and work into place without springing or forcing. Do not cut or move any structural portions of the building without approval. Run piping above ground, parallel with lines of buildings, unless otherwise shown or specified.
- C. Unless otherwise indicated, connections to equipment shall be as shown by manufacturer's data. Make piping connections to equipment with unions or flanged connections arranged so that equipment can be dismantled without disturbing the piping installation. Unions shall be accessible after building is complete. Provide valves to isolate equipment for service or removal.
- D. Close pipe openings with caps or plugs during installation. Cover equipment tightly and protect against dirt, water and chemical or mechanical injury. Carefully free interior of pipe of superfluous material as work progresses. Upon completion of work, thoroughly clean materials and equipment and deliver in approved unblemished condition.
- E. Ream pipe after cutting and before threading and remove burrs. Make screwed joints with graphite and oil or approved graphite compound applied to threads only. Cut threads full and not more than three threads on pipe shall remain exposed. Caulking of threaded joints to stop or prevent leaks will not be permitted. Provide unions where required for disconnection.
- F. Make copper tubing sweat joints with noncorrosive flux and lead-free solder recommended for service encountered or as indicated.
- G. All copper pipe joints shall be made with fittings. Formed bell & spigot couplings and mechanical "T" formed joints are not acceptable.

### 3.2 EQUIPMENT INSTALLATION

- A. Erect equipment in neat and workmanlike manner. Align, level and adjust for satisfactory operation. Install so that connecting of piping and accessories can be made readily and so that parts are easily accessible for inspection, operation, maintenance and repair. Minor deviation from indicated arrangements may be made as approved by Owner.

### 3.3 EQUIPMENT SUPPORTS AND FOUNDATIONS

- A. Design and construct supporting structures of strength to safely withstand stresses to which they may be subjected and to distribute properly the load and impact over building areas. Conform to applicable technical societies' standards, also to codes and regulations of agencies having jurisdiction. Obtain approval before fabrication.
- B. Fasten wall-mounted or ceiling-hung equipment to building structures or inserts as approved.

3.4 NOISE AND VIBRATION

- A. Mechanical and electrical equipment shall operate without objectionable noise or vibration as determined by the Owner.
- B. If such objectionable noise or vibration should be produced and transmitted to occupied portions of building by apparatus, piping, ducts, or other parts of mechanical and electrical work, make necessary changes and additions as approved, without extra cost to the Owner.
- C. Isolators shall prevent, as far as practicable, the transmission of vibration, noise, or hum to any part of building.
- D. Isolators shall suit vibration frequency to be absorbed. Provide isolator units of area and distribution to obtain proper resiliency under load and impact.

3.5 PROTECTION OF EQUIPMENT AND MATERIALS

- A. Responsibility for care and protection of mechanical equipment rests with Contractor until Substantial Completion of the work.
- B. After delivery, before and after installation, protect equipment and materials against theft, injury, the environment, or damages from all causes.
- C. Protect equipment outlets and pipe openings with temporary plugs or caps.
- D. During construction, seal off all openings into interior of equipment and ductwork with sheet metal or taped polyethylene sheathing to prevent infiltration of dust.
- E. Temporary MERV 8 filters shall be provided a minimum of every 14 days for all fans that are operated during construction and new MERV 13 filters shall be installed after all construction dirt has been removed from the building just prior to testing and balancing. Following the testing and balancing, MERV 13 filters shall be provided a minimum of every 14 days for all fans that are operated during construction. Just prior to Final Completion, all filters shall be replaced with the final MERV 13 filters. Ducts shall be inspected for dust and dirt. Contractor shall provide a signed statement to indicate that new filters for each piece of equipment were installed just before Final Completion. Construction filters shall be removed and not be used as the final set of filters. The contractor shall keep a filter replacement log that includes equipment identifications and dates of filter installation. Log shall be provided to the Engineer and Owner for review on a monthly cycle. Should the Contractor fail to comply with the filter changes as specified, the Owner may, at his discretion, hire through a separate contract the specified filter changes and withhold the cost for this work from the construction contract amount as a back charge to the Contractor.
- F. Provide a spare filter (or sets of filters for equipment that require multiples) for each piece of equipment. Turn filters over to Owner with proper transmittal prior to Final Completion.



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- G. Equipment not designed for exterior installation (i.e., wall mounted exhaust fans, unit heaters, classroom vertical unit ventilators, ceiling and wall mounted split system, etc.) shall not be delivered to the job site until a location protected from the environment is provided. Location must be approved by the Architect and Engineer prior to delivery.
- H. Equipment suitable for exterior installation (i.e., condensing units, packaged rooftop air conditioning, condensing units, etc.) shall not be delivered to the job site until it is ready to be installed in its permanent location.

3.6 CONTRACTOR'S RESPONSIBILITY FOR MANUFACTURER'S AUTHORIZED FIELD START UP

- A. The equipment manufacturer shall furnish a factory-trained and certified service technician without additional charge to start the HVAC equipment. This individual's certifications shall be submitted as a shop drawing along with the equipment and shall be reviewed and approved by the Engineer. Unit manufacturers shall maintain service capabilities no more than 100 miles from the job site.
- B. The HVAC equipment to be started by the manufacturer's certified technician shall include:
  - 1. Packaged Rooftop Air Conditioning Units
  - 2. Split system air conditioning units
  - 3. Unit Ventilators
- C. The manufacturer shall furnish complete submittal wiring diagrams of the HVAC equipment as applicable for field maintenance and service.
- D. Start-up sheets on all equipment shall be submitted and reviewed by the engineer. An approved copy shall be included in the final TAB report. If required, this same representative shall be made available to review the startup sheets onsite with the Engineer and Owner.

3.7 CONTRACTOR'S RESPONSIBILITY FOR TESTING, ADJUSTING AND BALANCING (TAB)

- A. Provide the TAB Agency a full set of Contract Documents (drawings and technical specifications), all manufacturers' approved submittal data and copies of revised data as soon as possible.
- B. Ensure that a current TAB Engineer's certification certificate is kept on file.
- C. Ensure all systems have been installed and are in 100% working order before the TAB Engineer is called to the job site, including but not limited to ductwork, piping, terminals, electrical and ATC. The Contractor shall verify that each item of the Pre-TAB Checklist (see Appendix A) has been completed and shall deliver a signed copy of the Pre-TAB Checklist to the Owner's Representative and the TAB Agency attesting that the project is complete and ready for TAB work to begin.

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- D. Provide adequate access to all points of measurement and adjustment and ensure that all dampers operate freely.
- E. Provide a factory representative for all major pieces of equipment as requested by the TAB Agency to assist in operation and performance verification of equipment.
- F. Cooperate with the TAB Agency to help operate and adjust the control systems directly related to TAB work and provide any specialties required to make such adjustments.
- G. Carefully review the drawings and Specifications for the various systems noting all facilities incorporated in the design for purposes of adjusting and balancing. Should it be deemed necessary to provide additional dampers, baffles, valves, or other devices which would aid in the required adjusting and balancing, same shall be provided by the installing contractor.

3.8 CLEANING, PAINTING AND IDENTIFICATION

- A. Remove from site excess material, equipment protection, etc. Thoroughly clean piping, hangers, equipment, and trimmings and leave every part in perfect condition ready for use, painting, or insulation as required.
- B. Paint exterior surfaces of equipment supports and other ferrous metal work, except that which is galvanized, with one coat of RUSTOLEUM damp-proof red primer, or approved equal.
- C. Finish painting of exposed piping, ductwork, equipment and insulation in finished spaces shall be done under Section 099123 "Interior Painting".
- D. Refrigerant piping service shall be indicated with outdoor grade 3.2 mil thick high gloss adhesive backed vinyl labels which identify the service by name (not initials). Provide labels similar to Brimar, EZ Pipe Markers. Labels shall be used wherever piping is exposed, at all unit connections and at 25-foot intervals for concealed piping located above accessible ceilings. Label and arrow heights shall be 1".

3.9 EQUIPMENT MARKING

- A. Label all mechanical equipment, including starters, control panels, fans, split systems, heaters and air-handling units.
- B. Labels shall be machine engraved, laminated, 1/8" thick, Bakelite, nameplate type. Labels shall be black faces with white letters.
- C. Labels shall have 1/4" high letters.
- D. Labels shall be rigidly attached using rivets or screws. Adhesive backing is not acceptable.

3.10 EQUIPMENT INVENTORY

- A. Provide a complete equipment inventory for all Mechanical, Plumbing and Fire Protection equipment included in the project scope of work. Refer to Appendix B of this section for the required template. A separate form shall be provided for each new piece of equipment provided.
- B. Prior to substantial completion, submit the equipment inventory forms for review. Once approved, include the forms in the operation and maintenance manual.

APPENDIX A

PRE-TAB CHECKLIST

A. GENERAL

1. All components of the HVAC system have been installed, including controls and control wiring.
2. Power wiring has been installed and energized to all motorized equipment. Also, all line voltage control wiring required has been installed.
3. All equipment has been started and run tested through all specified sequences of operation by factory-authorized representatives and all safety controls have been verified to be operational.
4. All required testing of piping and duct systems has been completed in accordance with the drawings and specifications.

B. AIR DISTRIBUTION AND VENTILATION SYSTEMS

1. All air system filters have been replaced with new filters. The air moving equipment, ductwork and air terminals are installed and connected. All air systems are unobstructed and free of debris.
2. All manual volume control dampers required are installed and properly connected to adjustment handles. All damper handles are accessible and not covered by insulation or draw bands. All automatic dampers required have been installed with linkages connected and adjusted to provide the specified sequence of operation.
3. All ductwork and connections of duct to air terminals have been checked and no visible or audible leakage exists.
4. Fans are rotating in correct direction. Fans have been lubricated. Drive pulleys are aligned and belt tension is correct. Setscrews are tight securing keys into key-ways. Fan wheels turn freely and are balanced. Belt guards are in place.
5. Vibration isolators and flexible connectors have been installed where required. With fans in operation, there is no excessive vibration of fan assemblies or ductwork.

I, \_\_\_\_\_ an authorized representative of  
(Signature and Title)

\_\_\_\_\_  
(Company)

attest that all items contained in the above Pre-Tab Checklist have been completed

and verified as of this date:\_\_\_\_\_.

APPENDIX B

**Equipment Inventory Template**

Project Name: **(Add Project Name)**  
Project Address: **(Add Project Address)**

**Description of Item:** \_\_\_\_\_  
(i.e., Air Handling Unit, Ductless Split System, etc.)

**Classification:**

- HVAC
- Plumbing
- Fire Protection

**Building:** \_\_\_\_\_

**Equipment Location (Room Number):** \_\_\_\_\_

**Date Purchased:** \_\_\_\_\_

**Date Placed in Service:** \_\_\_\_\_

**Original Cost:** \_\_\_\_\_

**Life Expectancy (years):** \_\_\_\_\_

**Estimated Replacement Date:** \_\_\_\_\_

**Estimated Replacement Cost:** \_\_\_\_\_

**Manufacturer:** \_\_\_\_\_

**Model/Serial #:** \_\_\_\_\_

END OF SECTION 230100

SECTION 230500 - HEATING, VENTILATING AND AIR CONDITIONING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections and Section 230100 "Mechanical General Provisions" apply to this Section.
- B. Refer to Specification Sections 230900 "Automatic Temperature Controls" and the Control Diagrams on drawings for additional requirements and coordination between equipment and controls.

1.2 WARRANTY-GUARANTEES

- A. Contractor shall furnish written warranty, countersigned and guaranteed by the General Contractor, stating that work executed under this Section of the Specifications shall be free from defects of material and workmanship for a period of 12 months from date of Substantial Completion of the building. Refer to Section 230100 for additional warranty period responsibilities.

1.3 SUBMITTALS

- A. Submit manufacturer's performance data and unit details on all products specified below or indicated on drawings.

1.4 PROTECTION OF EQUIPMENT AND MATERIAL

- A. All equipment and material not specifically designed for exterior installation shall not be delivered to the job site until an indoor, dry location is available for storage. All equipment and material shall be covered and protected from dirt, debris, moisture, paint, coatings and damage of any kind. Store off the floor, in a location approved by the Owner, to prevent contact with water.
- B. All air-conveying equipment and material, including but not limited to unit ventilators, rooftop units, split systems, diffusers and ductwork shall be kept clean as described above and all airside surfaces shall be wiped clean (metal surfaces) prior to installation. Where equipment surfaces are subject to additional accumulation of dirt and debris, interior cleaning shall be done after the completion of ductwork installation at all unit openings.
  - 1. Exterior surfaces of all equipment shall be cleaned at completion of construction in a manner that condition and appearance of equipment is the same as it left the factory.

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2. No equipment shall be run without approval by the Engineer. Prior to granting approval, the Engineer will require the building to be broom swept clean without air bourn dust which can be pulled into the duct system. An individual area of the building may be partitioned off for temporary use of the HVAC system provided a partition is erected to separate it from the dirty areas and the air handler is adjusted to positively pressurize the conditioned area. The Contractor shall provide temporary filters for all intakes and return connections to air-conveying equipment at his own expense during the construction process in accordance with Specification Section 230100. Generally, a 2-inch MERV 8 temporary filter shall be placed over the return opening followed by two layers of blue construction filter media. The outer layer of blue media shall be changed weekly or sooner if the media is no longer blue. At all times, the filter media must be monitored for breakthrough. Maintain a filter log to record all inspections and changes. Filters shall be changed every 14 days regardless of condition. The Contractor assumes full responsibility for cleanliness of all equipment operated during the construction period and any ductwork used to convey air during construction prior to meeting Substantial Completion. If dust migrates into the duct system, it must be professionally cleaned. The Contractor shall clean all equipment to like-new condition as it appeared when it left the factory prior to substantial completion. All damages shall be repaired/replaced at the Contractor's expense.
3. Operation of the HVAC system during construction requires the safeties and duct smoke detectors to be operational to protect the building and personnel.

PART 2 - PRODUCTS

2.1 HEAT GENERATION (NOT USED)

2.2 REFRIGERATION (NOT USED)

2.3 AIR HANDLING EQUIPMENT

A. Exhaust Fans:

1. Fans shall be size, type, and have capacity as indicated on drawings. GREENHECK, LOREN COOK, or approved equal.
2. Fans shall be licensed to bear the AMCA Air and Sound Certified Ratings Seal. Fan air performance ratings shall be based on tests conducted in an AMCA registered laboratory for AMCA 210 air performance testing. The Test Standard used shall be ANSI/AMCA Standard 210-85, ANSI/ASHRAE Standard 51-1985, "Laboratory Methods of Testing Fans for Rating." All sizes must be tested, calculations to other sizes not acceptable. Fan sound performance shall be based on tests conducted in an AMCA registered laboratory for AMCA 300 Sound Performance Testing. The Test Standard used shall be AMCA 300 "Reverberant Room Method for Sound Testing of Fans." All sizes must be tested, calculations to other sizes are not acceptable. Air or Sound Test results are to be included in submittal.

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3. Each fan shall bear a permanently affixed manufacturer's nameplate containing the model number and individual serial number for future identification.
4. Provide solid-state speed controls for all direct drive fans.
5. All fans shall be statically and dynamically balanced.
6. Install as required for quiet operation.
7. Motor shall be a DC electronic commutation type motor (ECM) specifically designed for fan applications unless otherwise noted.
8. Downblast power roof ventilators:
  - a. Downblast power roof ventilators shall have aluminum housing, backward-inclined aluminum fan wheel, gravity-type back-draft dampers, bird screen, aluminum curb cap with pre-punched mounting holes, aluminum rub ring, motor isolated shock mounts, corrosion-resistant fasteners, lifting lugs and factory-wired NEMA 1 toggle disconnect switch. Provide direct or belt drive as indicated. Shaft shall be mounted in ball bearing pillow blocks. Bearings shall have grease fittings. Provide adjustable pulley and motor plate on belt drive units.
9. Ceiling Exhaust Fans:
  - a. Wheel: Forward curved centrifugal wheel constructed of calcium carbonate filled polypropylene. Statically and dynamically balanced in accordance with AMCA Standard 204-05
  - b. Motors: Motor enclosures shall be open drip proof (ODP), opening in the frame body and or end brackets. Motors shall be permanently lubricated sleeve bearing type to match with the fan load and furnished at the specific voltage and phase. Motor shall be mounted on vibration isolators and be accessible for maintenance. Motors shall be compatible for use with speed controls and provided with thermal overload protection
  - c. Housing: Constructed of heavy gauge galvanized steel. Interior shall be lined with 0.5 inches of acoustical insulation.
  - d. Aluminum Backdraft Damper: Prevents air from entering back into the building when fan is off and eliminates rattling or unwanted backdrafts.
  - e. Outlet. Outlet shall be square type field rotatable from horizontal to vertical discharge. Duct collar shall include an aluminum backdraft damper. Provide square to round transition where required by duct connection.
  - f. Grille: Aluminum white enamel finish fully adjustable for multiple installation conditions
  - g. Access Panel: Once installed shall have easy access to internal components
  - h. Disconnect Switch: NEMA 1 indoor application no water. (Single pole rocker switch assembly). Positive electrical shut-off. Wired from fan motor to junction box installed within motor compartment. Access for wiring shall be external
  - i. Provide solid-state speed controls for all direct drive fans.
  - j. Speed Controls: Controls the fan's output. Fan can be adjusted to 60 percent of full speed.
  - k. Curb Cap Model RCC-7, Curb Cap: weathertight aluminum construction, integral birdscreen, built in curb cap sized to fit existing or new roof curb. Contractor shall field verify existing curb dimension where indicated.



2.4 UNITARY EQUIPMENT

A. 100% Outside Air Ventilation Unit (DOAS-1 & 2)

1. Summary

- a. This section includes units with integral heating and cooling for outdoor installation. Integral heat source shall be Indirect Gas-Fired furnace. Integral cooling source shall be packaged DX. Airflow arrangement shall be Outdoor Air. Each unit shall be constructed in a horizontal configuration and shall incorporate additional product requirements as listed in Section 2 of this specification.

2. Warranty

- a. Refer to Specification Section 230100 for warranty requirements.

3. Manufacturers

- a. Available Manufacturers: Subject to compliance with specifications contained within this document, manufacturers offering products that may be incorporated into the work include but are not limited to:

- 1) Greenheck Fan Corporation
- 2) AAON
- 3) Daikin
- 4) Valent

4. Manufactured Units

- a. Unit shall be fully assembled at the factory and consist of an insulated metal cabinet, downturn outdoor air intake with 2" aluminum mesh filter assembly, evaporator coil, condensate drain pan, P trap, hot gas reheat coil, indirect gas furnace, packaged DX system, phase and brownout protection, motorized dampers, sensors, curb assembly, filter assembly for intake air, supply air blower assembly and an electrical control center. All specified components and internal accessories factory installed are tested and prepared for single-point high voltage connection.

5. Cabinet

- a. Materials: Formed, double wall insulated metal cabinet, fabricated to permit access to internal components for maintenance.

- 1) Outside Casing: 18 gauge, galvanized (G90) steel meeting ASTM A653 for components that do not receive a painted finish. Unit's exterior shall be supplied from the manufacturer using G60 galvalume steel with proprietary pre-painted material in the following finish color; Concrete Gray-RAL 70023. This has been subjected to a salt spray test per ASTM-B117 and evaluated using ASTM-D714 and ASTM-D610 showing no observable signs of rust or blistering until reaching 2,500 hours.

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- 2) Internal Assemblies: 22 gauge, galvanized (G90) steel] except for motor supports which shall be minimum 14 gauge galvanized (G90) steel.
- b. Cabinet Insulation: Comply with NFPA 90A and NFPA 90B and erosion requirements of UL 181.
  - 1) Materials: Rigid urethane foam
    - a) Thickness: 2 inch (50.8 mm)
    - b) Thermal Resistance: R13
    - c) Meets UL94HF-1 flame requirements
    - d) Location and application: Full coverage of entire exterior to include walls, roof of unit, unit base and doors.
  - c. Materials: Fiberglass insulation. If insulation other than fiberglass is used, it must also meet the Fire Hazard Classification shown below.
    - 1) Thickness: 2 inch (50.8 mm)
    - 2) Thermal Resistance: R8
    - 3) Fire Hazard Classification: Maximum flame spread of 25 and smoke developed of 50, when tested in accordance with ASTM C 411.
    - 4) Roof Insulation: 2 inch (50.8 mm) fiberglass located above the 1 inch (25.4 mm) foam panel.
  - d. Access panels / doors: Unit shall be equipped with insulated, hinged doors or removable access panels to provide easy access to all major components. Doors and access panels shall be fabricated of 18 gauge galvanized G90 steel or painted galvanized steel.
6. Supply Air blower assemblies: Blower assembly shall consist of an electric motor and direct-drive fan(s). Assembly shall be mounted on heavy gauge galvanized steel rails and further mounted on 1.125 inch thick neoprene vibration isolators. Blower motor(s) shall be capable of continuous speed modulation and controlled by a VFD.
7. Evaporator Coil: Evaporator coil shall be AHRI Certified and shall be (silver) soldered or brazed into the compressed refrigerant system. Coil shall be constructed of copper tubing, permanently bonded to aluminum fins and enclosed in a galvanized steel frame. If two compressors are used as components of the unit, then the evaporator coil shall be of "interlaced" configuration, permitting independent operation of either compressor without conflict with the other compressor.
8. Control panel / connections: Units shall have an electrical control center where all high and low voltage connections are made. Control center shall be constructed to permit single-point high voltage power supply connections. DOAS shall be equipped with a Unit Disconnect Switch.
9. Condensate drain pan: Drain Pan shall be an integral part of the unit whenever a cooling option is included. Pan shall be formed of welded austenitic stainless steel sheet material and provided with a welded stainless steel drain connection at the front for connection to a P trap. Drain pan shall be sloped in two directions to provide positive draining and drain connector shall be sealed at penetration through cabinet wall.
10. Reheat Coil with factory installed modulating hot gas reheat valve. This coil is coated with ElectroFin® coil coating.

11. Indirect gas furnace:
  - a. Shall be ETL Certified as a component of the unit.
  - b. Shall have an integral combustion gas blower.
  - c. Shall be ETL Certified for installation downstream of a cooling coil.
  - d. Shall have fault sensors to provide fault conditions to optional digital controller or building controls.
  - e. Shall have 4-pass tubular heat exchangers, constructed of type 409 stainless steel. Heat exchanger tubes shall be installed on the vest plate by means of swaged assembly, welded connections are not acceptable. Heat exchanger tubes shall be supported and also permit expansion and contraction of the tubes.
  - f. Heat exchanger shall have a 25 year extended warranty.
  - g. Furnace control shall be 12:1 Modulating or better for precises control of the discharge air temperature.
  - h. Shall be encased in a weather-tight metal housing with intake air vents. Large, metal door shall provide easy access to the enclosed vest plate, control circuitry, gas train, burner assembly, and exhaust blower.
  - i. Shall have solid state controls permitting stand-alone operation or control by building controllers.
  
12. Packaged DX System: Unit shall have an integral compressor(s) and evaporator coil located within the weather-tight unit housing. Condenser coils and appurtenant condenser fan assemblies shall be factory installed as integral subassemblies of the unit and mounted on the exterior of the unit. Unit condenser fans shall feature swept blade design resulting in reduced sound levels. Condenser fan motors shall be three phase, external rotor, type 56 frame, open air over and shaft up. Each condenser fan motor shall have a vented frame, rated for continuous duty and be equipped with an automatic reset thermal protector. Lead condenser fan will have an electronically commutated (EC) motor that will modulate to maintain a head pressure set point. Motors shall be UL Recognized and CSA Certified. The refrigerant compressor(s) shall be 100% variable speed Inverter hermetic scroll-type and shall be equipped with liquid line filter drier, thermostatic expansion valves (TXV)(s), manual reset high pressure and low pressure cutouts and all appurtenant sensors, service ports and safety devices. Compressed refrigerant system shall be fully charged with R-410A refrigerant. Each compressor shall be factory-equipped with an electric crankcase heater to boil off liquid refrigerant from the oil. The use of an electric crankcase heater is an essential unit-protective device.
  
13. Packaged DX Control and Diagnostics: The Packaged DX system shall be controlled by an onboard digital controller (DDC) that indicates both owner-supplied settings and fault conditions that may occur. The DDC shall be programmed to indicate the following faults:
  - a. Global alarm condition (active when there is at least one alarm)
  - b. Supply Air Proving alarm
  - c. Dirty Filter alarm
  - d. Compressor Trip alarm
  - e. Compressor Locked Out alarm
  - f. Supply Air Temperature Low Limit alarm

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- 1) Sensor #1 Out of Range (outside air temperature)
  - 2) Sensor #2 Out of Range (supply air temperature)
  - 3) Sensor #3 Out of Range (cold coil leaving air temperature)
14. Phase and Brownout Protection: RTU shall have a factory-installed phase monitor to detect electric supply phase loss and voltage brown-out conditions. Upon detection of a fault, the monitor shall disconnect supply voltage to all motors.
  15. Motorized Outdoor Air: AMCA Class 1A certified motorized damper of low leakage.
  16. Sensors are considered to be part of various optional operational modes or device controllers and are to be factory supplied and installed.
  17. Curb Assembly: A curb assembly made of 14 gauge galvanized steel shall be provided by the factory for assembly and installation as part of this division. The curb assembly shall provide perimeter support of the entire unit and shall have duct adapter(s) for supply air and return air. Curb assembly shall enclose the underside of the unit and shall be sized to fit into a recess in the bottom of the unit. Contractor shall be responsible for coordinating with roofing contractor to ensure curb unit is properly flashed to provide protection against weather/moisture penetration. Contractor shall provide and install appropriate insulation for the curb assembly. The curb shall be the height of 14”.
  18. Service Receptacle: 120 VAC GFCI service outlet shall be contractor-provided and installed by the contractor in a location designated by the plans.
  19. Hail Guards: Protects the condensing unit from damage due to extreme weather conditions such as hail and flying debris.
  20. Blower
    - a. Blower section construction Supply Air: direct drive motor(s) and blower(s) shall be assembled on a 14 gauge galvanized steel platform and shall be equipped with 1.125 inch thick neoprene vibration isolation devices.
    - b. Blower assemblies: Shall be statically and dynamically balanced and designed for continuous operation at maximum rated fan speed and horsepower.
    - c. Fan: Direct drive, airfoil plenum fan with steel wheels statically and dynamically balanced and AMCA certified for air and sound performance.
    - d. Blower section motor source quality control: Blower performance shall be factory tested for flow rate, pressure, power, air density, rotation speed and efficiency. Ratings are to be established in accordance with AMCA 210, “Laboratory Methods of Testing Fans for Rating.”
  21. Motors
    - a. General: Blower motors greater than 3/4 horsepower shall be “NEMA Premium™” unless otherwise indicated. Compliance with EPA minimum energy-efficiency standards for single speed ODP and TE enclosures is not acceptable. Motors shall be heavy-duty, permanently lubricated type to match the fan load and furnished at the specified voltage, phase and enclosure.
  22. Unit Controls
    - a. The unit shall be constructed so that it can function as a stand-alone heating and cooling system controlled by factory-supplied controllers, thermostats and sensors,

or it can be operated as a heating and cooling system controlled by a Building Management System (BMS). This unit shall be controlled by a factory-installed microprocessor programmable controller (DDC) that is connected to various optional sensors.

- b. Unit shall incorporate a DDC controller with integral LCD screen that provides text readouts of status. DDC controller shall have a built-in keypad to permit operator to access read-out screens without the use of ancillary equipment, devices or software. DDC controllers that require the use of equipment or software that is not factory-installed in the unit are not acceptable. Alarm readouts consisting of flashing light codes are not acceptable. Owner-specified conditions can be input by means of pushbuttons on the unit controller. Note: DDC controllers that require the use of separately-purchased handheld hardware or a PC and/or software to view or change settings are not allowed.
- c. RTU supply fan shall be configured for Constant Volume (ON / OFF)
- d. Outside Air damper control shall be field adjustable two-position.
- e. Economizer control shall be temperature / dew point.
- f. Dirty filter sensor shall be factory-installed.
- g. Operating protocol: The DDC shall be factory-programmed for BACnet MSTP.
- h. Variable Frequency Drive (VFD) unit shall have factory installed variable frequency drive for modulation of the supply air blower. The VFD shall be factory-programmed for unit-specific requirements and shall not require additional field programming to operate.
- i. Airflow monitoring required in the Supply airstream.

23. Filters

- a. Unit shall have permanent 2 inch (50.8 mm) aluminum mesh filters located in the outdoor air intake and shall be accessible from the exterior of the unit. MERV 13 disposable pleated filters shall be provided in the supply air stream.

B. Packaged Rooftop Single Zone VAV Air Conditioning Units (RTU-1, 3, 4, 6 & 7):

1. Summary

- a. This section includes units with integral heating and cooling for outdoor installation. Integral heat source shall be Indirect Gas-Fired furnace. Integral cooling source shall be packaged DX. Airflow arrangement shall be Outdoor Air with recirculation. Each unit shall be constructed in a horizontal configuration and shall incorporate additional product requirements as listed in Section 2 of this specification.

2. Warranty

- a. Refer to Specification Section 230100 for warranty requirements.

3. Manufacturers

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- a. Available Manufacturers: Subject to compliance with specifications contained within this document, manufacturers offering products that may be incorporated into the work include but are not limited to:

- 1) Greenheck Fan Corporation
- 2) AAON
- 3) Daikin
- 4) Valent

4. Manufactured Units

- a. Unit shall be fully assembled at the factory and consist of an insulated metal cabinet, downturn outdoor air intake with 2" aluminum mesh filter assembly, evaporator coil, condensate drain pan, P trap, hot gas reheat coil, indirect gas furnace, packaged DX system, phase and brownout protection, motorized dampers, sensors, curb assembly, filter assembly for intake air, supply air blower assembly and an electrical control center. All specified components and internal accessories factory installed are tested and prepared for single-point high voltage connection.

5. Cabinet

- a. Materials: Formed, double wall insulated metal cabinet, fabricated to permit access to internal components for maintenance.

- 1) Outside Casing: 18 gauge, galvanized (G90) steel meeting ASTM A653 for components that do not receive a painted finish. Unit's exterior shall be supplied from the manufacturer using G60 galvaneal steel with proprietary pre-painted material in the following finish color; Concrete Gray-RAL 70023. This has been subjected to a salt spray test per ASTM-B117 and evaluated using ASTM-D714 and ASTM-D610 showing no observable signs of rust or blistering until reaching 2,500 hours.
- 2) Internal Assemblies: 22 gauge, galvanized (G90) steel] except for motor supports which shall be minimum 14 gauge galvanized (G90) steel.

- b. Cabinet Insulation: Comply with NFPA 90A and NFPA 90B and erosion requirements of UL 181.

- 1) Materials: Rigid urethane foam
  - a) Thickness: 2 inch (50.8 mm)
  - b) Thermal Resistance: R13
  - c) Meets UL94HF-1 flame requirements
  - d) Location and application: Full coverage of entire exterior to include walls, roof of unit, unit base and doors.

- c. Materials: Fiberglass insulation. If insulation other than fiberglass is used, it must also meet the Fire Hazard Classification shown below.

- 1) Thickness: 2 inch (50.8 mm)

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- 2) Thermal Resistance: R8
  - 3) Fire Hazard Classification: Maximum flame spread of 25 and smoke developed of 50, when tested in accordance with ASTM C 411.
  - 4) Roof Insulation: 2 inch (50.8 mm) fiberglass located above the 1 inch (25.4 mm) foam panel.
- d. Access panels / doors: Unit shall be equipped with insulated, hinged doors or removable access panels to provide easy access to all major components. Doors and access panels shall be fabricated of 18 gauge galvanized G90 steel or painted galvanized steel.
6. Supply Air blower assemblies: Blower assembly shall consist of an electric motor and direct-drive fan(s). Assembly shall be mounted on heavy gauge galvanized steel rails and further mounted on 1.125 inch thick neoprene vibration isolators. Blower motor(s) shall be capable of continuous speed modulation and controlled by a VFD.
  7. Exhaust Air blower assemblies (RTU-1, 3, 6 & 7 only): Blower assembly shall consist of an electric motor and a direct-drive fan. Assembly shall be mounted on heavy gauge galvanized steel rails and further mounted on 1.125 inch thick neoprene vibration isolators. Blower motor shall be capable of continuous speed modulation and controlled by a VFD.
  8. Evaporator Coil: Evaporator coil shall be AHRI Certified and shall be (silver) soldered or brazed into the compressed refrigerant system. Coil shall be constructed of copper tubing, permanently bonded to aluminum fins and enclosed in a galvanized steel frame. If two compressors are used as components of the unit, then the evaporator coil shall be of “interlaced” configuration, permitting independent operation of either compressor without conflict with the other compressor.
  9. Control panel / connections: Units shall have an electrical control center where all high and low voltage connections are made. Control center shall be constructed to permit single-point high voltage power supply connections. DOAS shall be equipped with a Unit Disconnect Switch.
  10. Condensate drain pan: Drain Pan shall be an integral part of the unit whenever a cooling option is included. Pan shall be formed of welded austenitic stainless steel sheet material and provided with a welded stainless steel drain connection at the front for connection to a P trap. Drain pan shall be sloped in two directions to provide positive draining and drain connector shall be sealed at penetration through cabinet wall.
  11. Reheat Coil with factory installed modulating hot gas reheat valve. This coil is coated with ElectroFin® coil coating.
  12. Indirect gas furnace:
    - a. Shall be ETL Certified as a component of the unit.
    - b. Shall have an integral combustion gas blower.
    - c. Shall be ETL Certified for installation downstream of a cooling coil.
    - d. Shall have fault sensors to provide fault conditions to optional digital controller or building controls.
    - e. Shall have 4-pass tubular heat exchangers, constructed of type 409 stainless steel. Heat exchanger tubes shall be installed on the vest plate by means of swaged assembly, welded connections are not acceptable. Heat exchanger tubes shall be supported and also permit expansion and contraction of the tubes.
    - f. Heat exchanger shall have a 25 year extended warranty.

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- g. Furnace control shall be 12:1 Modulating or better for precise control of the discharge air temperature.
        - h. Shall be encased in a weather-tight metal housing with intake air vents. Large, metal door shall provide easy access to the enclosed vest plate, control circuitry, gas train, burner assembly, and exhaust blower.
        - i. Shall have solid state controls permitting stand-alone operation or control by building controllers.
- 13. Packaged DX System: Unit shall have an integral compressor(s) and evaporator coil located within the weather-tight unit housing. Condenser coils and appurtenant condenser fan assemblies shall be factory installed as integral subassemblies of the unit and mounted on the exterior of the unit. Unit condenser fans shall feature swept blade design resulting in reduced sound levels. Condenser fan motors shall be three phase, external rotor, type 56 frame, open air over and shaft up. Each condenser fan motor shall have a vented frame, rated for continuous duty and be equipped with an automatic reset thermal protector. Lead condenser fan will have an electronically commutated (EC) motor that will modulate to maintain a head pressure set point. Motors shall be UL Recognized and CSA Certified. The refrigerant compressor(s) shall be 100% variable speed Inverter hermetic scroll-type and shall be equipped with liquid line filter drier, thermostatic expansion valves (TXV)(s), manual reset high pressure and low pressure cutouts and all appurtenant sensors, service ports and safety devices. Compressed refrigerant system shall be fully charged with R-410A refrigerant. Each compressor shall be factory-equipped with an electric crankcase heater to boil off liquid refrigerant from the oil. The use of an electric crankcase heater is an essential unit-protective device.
- 14. Packaged DX Control and Diagnostics: The Packaged DX system shall be controlled by an onboard digital controller (DDC) that indicates both owner-supplied settings and fault conditions that may occur. The DDC shall be programmed to indicate the following faults:
  - a. Global alarm condition (active when there is at least one alarm)
  - b. Supply Air Proving alarm
  - c. Dirty Filter alarm
  - d. Compressor Trip alarm
  - e. Compressor Locked Out alarm
  - f. Supply Air Temperature Low Limit alarm
    - 1) Sensor #1 Out of Range (outside air temperature)
    - 2) Sensor #2 Out of Range (supply air temperature)
    - 3) Sensor #3 Out of Range (cold coil leaving air temperature)
- 15. Phase and Brownout Protection: RTU shall have a factory-installed phase monitor to detect electric supply phase loss and voltage brown-out conditions. Upon detection of a fault, the monitor shall disconnect supply voltage to all motors.
- 16. Motorized Outdoor & Return Air Damper: AMCA Class 1A certified motorized damper of low leakage.
- 17. Sensors are considered to be part of various optional operational modes or device controllers and are to be factory supplied and installed.
- 18. Curb Assembly: A curb assembly made of 14 gauge galvanized steel shall be provided by the factory for assembly and installation as part of this division. The curb assembly shall



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provide perimeter support of the entire unit and shall have duct adapter(s) for supply air and return air. Curb assembly shall enclose the underside of the unit and shall be sized to fit into a recess in the bottom of the unit. Contractor shall be responsible for coordinating with roofing contractor to ensure curb unit is properly flashed to provide protection against weather/moisture penetration. Contractor shall provide and install appropriate insulation for the curb assembly. The curb shall be the height of 14”.

19. Service Receptacle: 120 VAC GFCI service outlet shall be contractor-provided and installed by the contractor in a location designated by the plans.
20. Hail Guards: Protects the condensing unit from damage due to extreme weather conditions such as hail and flying debris.
21. Blower
  - a. Blower section construction Supply Air: direct drive motor(s) and blower(s) shall be assembled on a 14 gauge galvanized steel platform and shall be equipped with 1.125 inch thick neoprene vibration isolation devices.
  - b. Blower assemblies: Shall be statically and dynamically balanced and designed for continuous operation at maximum rated fan speed and horsepower.
  - c. Fan: Direct drive, airfoil plenum fan with steel wheels statically and dynamically balanced and AMCA certified for air and sound performance.
  - d. Blower section motor source quality control: Blower performance shall be factory tested for flow rate, pressure, power, air density, rotation speed and efficiency. Ratings are to be established in accordance with AMCA 210, “Laboratory Methods of Testing Fans for Rating.”
22. Motors
  - a. General: Blower motors greater than 3/4 horsepower shall be “NEMA Premium™” unless otherwise indicated. Compliance with EPCAct minimum energy-efficiency standards for single speed ODP and TE enclosures is not acceptable. Motors shall be heavy-duty, permanently lubricated type to match the fan load and furnished at the specified voltage, phase and enclosure.
23. Unit Controls
  - a. The unit shall be constructed so that it can function as a stand-alone heating and cooling system controlled by factory-supplied controllers, thermostats and sensors, or it can be operated as a heating and cooling system controlled by a Building Management System (BMS). This unit shall be controlled by a factory-installed microprocessor programmable controller (DDC) that is connected to various optional sensors.
  - b. Unit shall incorporate a DDC controller with integral LCD screen that provides text readouts of status. DDC controller shall have a built-in keypad to permit operator to access read-out screens without the use of ancillary equipment, devices or software. DDC controllers that require the use of equipment or software that is not factory-installed in the unit are not acceptable. Alarm readouts consisting of flashing light codes are not acceptable. Owner-specified conditions can be input by means of pushbuttons on the unit controller. Note: DDC controllers that require the use of separately-purchased handheld hardware or a PC and/or software to view or change settings are not allowed.

- c. RTU supply fan shall be configured for Single Zone VAV.
- d. Exhaust fan shall be configured for building pressure by factory.
- e. Outside Air/Return air damper control shall be field adjustable two-position.
- f. Economizer control shall be temperature / dew point.
- g. Dirty filter sensor shall be factory-installed.
- h. Operating protocol: The DDC shall be factory-programmed for BACnet MSTP.
- i. Variable Frequency Drive (VFD) unit shall have factory installed variable frequency drive for modulation of the supply and exhaust air blowers. The VFD shall be factory-programmed for unit-specific requirements and shall not require additional field programming to operate.
- j. Airflow monitoring required in the Supply airstream.

24. Filters

- a. Unit shall have permanent 2 inch (50.8 mm) aluminum mesh filters located in the outdoor air intake and shall be accessible from the exterior of the unit. MERV 13 disposable pleated filters shall be provided in the supply air stream.

C. Packaged Rooftop Variable Air Volume Air Conditioning Units (RTU-2 & 5):

1. Summary

- a. This section includes units with integral heating and cooling for outdoor installation. Integral heat source shall be Indirect Gas-Fired furnace. Integral cooling source shall be packaged DX. Airflow arrangement shall be Outdoor Air with recirculation. Each unit shall be constructed in a horizontal configuration and shall incorporate additional product requirements as listed in Section 2 of this specification.

2. Warranty

- a. Refer to Specification Section 230100 for warranty requirements.

1. Manufacturers

- a. Available Manufacturers: Subject to compliance with specifications contained within this document, manufacturers offering products that may be incorporated into the work include but are not limited to:

- 1) Greenheck Fan Corporation
- 2) AAON
- 3) Daikin
- 4) Valent

2. Manufactured Units

- a. Unit shall be fully assembled at the factory and consist of an insulated metal cabinet, downturn outdoor air intake with 2" aluminum mesh filter assembly, evaporator coil, condensate drain pan, P trap, hot gas reheat coil, indirect gas

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furnace, packaged DX system, phase and brownout protection, motorized dampers, sensors, curb assembly, filter assembly for intake air, supply air blower assembly and an electrical control center. All specified components and internal accessories factory installed are tested and prepared for single-point high voltage connection.

3. Cabinet
  - a. Materials: Formed, double wall insulated metal cabinet, fabricated to permit access to internal components for maintenance.
    - 1) Outside Casing: 18 gauge, galvanized (G90) steel meeting ASTM A653 for components that do not receive a painted finish. Unit's exterior shall be supplied from the manufacturer using G60 galvanneal steel with proprietary pre-painted material in the following finish color; Concrete Gray-RAL 70023. This has been subjected to a salt spray test per ASTM-B117 and evaluated using ASTM-D714 and ASTM-D610 showing no observable signs of rust or blistering until reaching 2,500 hours.
    - 2) Internal Assemblies: 22 gauge, galvanized (G90) steel] except for motor supports which shall be minimum 14 gauge galvanized (G90) steel.
  - b. Cabinet Insulation: Comply with NFPA 90A and NFPA 90B and erosion requirements of UL 181.
    - 1) Materials: Rigid urethane foam
      - a) Thickness: 2 inch (50.8 mm)
      - b) Thermal Resistance: R13
      - c) Meets UL94HF-1 flame requirements
      - d) Location and application: Full coverage of entire exterior to include walls, roof of unit, unit base and doors.
  - c. Materials: Fiberglass insulation. If insulation other than fiberglass is used, it must also meet the Fire Hazard Classification shown below.
    - 1) Thickness: 2 inch (50.8 mm)
    - 2) Thermal Resistance: R8
    - 3) Fire Hazard Classification: Maximum flame spread of 25 and smoke developed of 50, when tested in accordance with ASTM C 411.
    - 4) Roof Insulation: 2 inch (50.8 mm) fiberglass located above the 1 inch (25.4 mm) foam panel.
  - d. Access panels / doors: Unit shall be equipped with insulated, hinged doors or removable access panels to provide easy access to all major components. Doors and access panels shall be fabricated of 18 gauge galvanized G90 steel or painted galvannealed steel.
4. Supply Air blower assemblies: Blower assembly shall consist of an electric motor and direct-drive fan(s). Assembly shall be mounted on heavy gauge galvanized steel rails and

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- further mounted on 1.125 inch thick neoprene vibration isolators. Blower motor(s) shall be capable of continuous speed modulation and controlled by a VFD.
5. Exhaust Air blower assemblies (RTU-1, 3, 6 & 7 only): Blower assembly shall consist of an electric motor and a direct-drive fan. Assembly shall be mounted on heavy gauge galvanized steel rails and further mounted on 1.125 inch thick neoprene vibration isolators. Blower motor shall be capable of continuous speed modulation and controlled by a VFD.
  6. Evaporator Coil: Evaporator coil shall be AHRI Certified and shall be (silver) soldered or brazed into the compressed refrigerant system. Coil shall be constructed of copper tubing, permanently bonded to aluminum fins and enclosed in a galvanized steel frame. If two compressors are used as components of the unit, then the evaporator coil shall be of "interlaced" configuration, permitting independent operation of either compressor without conflict with the other compressor.
  7. Control panel / connections: Units shall have an electrical control center where all high and low voltage connections are made. Control center shall be constructed to permit single-point high voltage power supply connections. DOAS shall be equipped with a Unit Disconnect Switch.
  8. Condensate drain pan: Drain Pan shall be an integral part of the unit whenever a cooling option is included. Pan shall be formed of welded austenitic stainless steel sheet material and provided with a welded stainless steel drain connection at the front for connection to a P trap. Drain pan shall be sloped in two directions to provide positive draining and drain connector shall be sealed at penetration through cabinet wall.
  9. Reheat Coil with factory installed modulating hot gas reheat valve. This coil is coated with ElectroFin® coil coating.
  10. Indirect gas furnace:
    - a. Shall be ETL Certified as a component of the unit.
    - b. Shall have an integral combustion gas blower.
    - c. Shall be ETL Certified for installation downstream of a cooling coil.
    - d. Shall have fault sensors to provide fault conditions to optional digital controller or building controls.
    - e. Shall have 4-pass tubular heat exchangers, constructed of type 409 stainless steel. Heat exchanger tubes shall be installed on the vest plate by means of swaged assembly, welded connections are not acceptable. Heat exchanger tubes shall be supported and also permit expansion and contraction of the tubes.
    - f. Heat exchanger shall have a 25 year extended warranty.
    - g. Furnace control shall be 12:1 Modulating or better for precise control of the discharge air temperature.
    - h. Shall be encased in a weather-tight metal housing with intake air vents. Large, metal door shall provide easy access to the enclosed vest plate, control circuitry, gas train, burner assembly, and exhaust blower.
    - i. Shall have solid state controls permitting stand-alone operation or control by building controllers.
  11. Packaged DX System: Unit shall have an integral compressor(s) and evaporator coil located within the weather-tight unit housing. Condenser coils and appurtenant condenser fan assemblies shall be factory installed as integral subassemblies of the unit and mounted on the exterior of the unit. Unit condenser fans shall feature swept blade design resulting in reduced sound levels. Condenser fan motors shall be three phase, external

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- rotor, type 56 frame, open air over and shaft up. Each condenser fan motor shall have a vented frame, rated for continuous duty and be equipped with an automatic reset thermal protector. Lead condenser fan will have an electronically commutated (EC) motor that will modulate to maintain a head pressure set point. Motors shall be UL Recognized and CSA Certified. The refrigerant compressor(s) shall be 100% variable speed Inverter hermetic scroll-type and shall be equipped with liquid line filter drier, thermostatic expansion valves (TXV)(s), manual reset high pressure and low pressure cutouts and all appurtenant sensors, service ports and safety devices. Compressed refrigerant system shall be fully charged with R-410A refrigerant. Each compressor shall be factory-equipped with an electric crankcase heater to boil off liquid refrigerant from the oil. The use of an electric crankcase heater is an essential unit-protective device.
12. Packaged DX Control and Diagnostics: The Packaged DX system shall be controlled by an onboard digital controller (DDC) that indicates both owner-supplied settings and fault conditions that may occur. The DDC shall be programmed to indicate the following faults:
    - a. Global alarm condition (active when there is at least one alarm)
    - b. Supply Air Proving alarm
    - c. Dirty Filter alarm
    - d. Compressor Trip alarm
    - e. Compressor Locked Out alarm
    - f. Supply Air Temperature Low Limit alarm
      - 1) Sensor #1 Out of Range (outside air temperature)
      - 2) Sensor #2 Out of Range (supply air temperature)
      - 3) Sensor #3 Out of Range (cold coil leaving air temperature)
  13. Phase and Brownout Protection: RTU shall have a factory-installed phase monitor to detect electric supply phase loss and voltage brown-out conditions. Upon detection of a fault, the monitor shall disconnect supply voltage to all motors.
  14. Motorized Outdoor & Return Air Damper: AMCA Class 1A certified motorized damper of low leakage.
  15. Sensors are considered to be part of various optional operational modes or device controllers and are to be factory supplied and installed.
  16. Curb Assembly: A curb assembly made of 14 gauge galvanized steel shall be provided by the factory for assembly and installation as part of this division. The curb assembly shall provide perimeter support of the entire unit and shall have duct adapter(s) for supply air and return air. Curb assembly shall enclose the underside of the unit and shall be sized to fit into a recess in the bottom of the unit. Contractor shall be responsible for coordinating with roofing contractor to ensure curb unit is properly flashed to provide protection against weather/moisture penetration. Contractor shall provide and install appropriate insulation for the curb assembly. The curb shall be the height of 14”.
  17. Service Receptacle: 120 VAC GFCI service outlet shall be contractor-provided and installed by the contractor in a location designated by the plans.
  18. Hail Guards: Protects the condensing unit from damage due to extreme weather conditions such as hail and flying debris.
  19. Blower

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- a. Blower section construction Supply Air: direct drive motor(s) and blower(s) shall be assembled on a 14 gauge galvanized steel platform and shall be equipped with 1.125 inch thick neoprene vibration isolation devices.
- b. Blower assemblies: Shall be statically and dynamically balanced and designed for continuous operation at maximum rated fan speed and horsepower.
- c. Fan: Direct drive, airfoil plenum fan with steel wheels statically and dynamically balanced and AMCA certified for air and sound performance.
- d. Blower section motor source quality control: Blower performance shall be factory tested for flow rate, pressure, power, air density, rotation speed and efficiency. Ratings are to be established in accordance with AMCA 210, "Laboratory Methods of Testing Fans for Rating."

20. Motors

- a. General: Blower motors greater than  $\frac{3}{4}$  horsepower shall be "NEMA Premium™" unless otherwise indicated. Compliance with EPCAct minimum energy-efficiency standards for single speed ODP and TE enclosures is not acceptable. Motors shall be heavy-duty, permanently lubricated type to match the fan load and furnished at the specified voltage, phase and enclosure.

21. Unit Controls

- a. The unit shall be constructed so that it can function as a stand-alone heating and cooling system controlled by factory-supplied controllers, thermostats and sensors, or it can be operated as a heating and cooling system controlled by a Building Management System (BMS). This unit shall be controlled by a factory-installed microprocessor programmable controller (DDC) that is connected to various optional sensors.
- b. Unit shall incorporate a DDC controller with integral LCD screen that provides text readouts of status. DDC controller shall have a built-in keypad to permit operator to access read-out screens without the use of ancillary equipment, devices or software. DDC controllers that require the use of equipment or software that is not factory-installed in the unit are not acceptable. Alarm readouts consisting of flashing light codes are not acceptable. Owner-specified conditions can be input by means of pushbuttons on the unit controller. Note: DDC controllers that require the use of separately-purchased handheld hardware or a PC and/or software to view or change settings are not allowed.
- c. RTU supply fan shall be configured for duct pressure by factory.
- d. Exhaust fan shall be configured for building pressure by factory.
- e. Outside Air/Return air damper control shall be field adjustable two-position.
- f. Economizer control shall be temperature / dew point.
- g. Dirty filter sensor shall be factory-installed.
- h. Operating protocol: The DDC shall be factory-programmed for BACnet MSTP.
- i. Variable Frequency Drive (VFD) unit shall have factory installed variable frequency drive for modulation of the supply and exhaust air blowers. The VFD shall be factory-programmed for unit-specific requirements and shall not require additional field programming to operate.
- j. Airflow monitoring required in the Supply airstream.

22. Filters

- a. Unit shall have permanent 2 inch (50.8 mm) aluminum mesh filters located in the outdoor air intake and shall be accessible from the exterior of the unit. MERV 13 disposable pleated filters shall be provided in the supply air stream.

D. Vertical Classroom Unit Ventilator Heat Pump (UV-A & B):

- 1. The design for vertical unit ventilators are based on BARD - Model "ITEC". Alternatively, provide units manufactured by CHANGEAIR, MARVAIR or approved equipment by Newport News Public School.
- 2. Construction:
  - a. Constructed of 20-gauge prepainted steel consisting of galvanized steel in accordance with ASTM A653, modified acrylic primer .25 MIL., top coat paint shall be .75 MIL. Exterior panels shall be double wall construction. No screws exposed on the exterior panels. Front panel is hinged and lockable for filter service and access to primary functional electrical controls. Front and side panels are easily removable for separation of top and bottom sections. Back of unit to be painted in neutral color to reduce visibility from outdoors. Color options shall be selected by the owner.
  - b. No fiberglass shall not be utilized in any part of the unit.
  - c. Exterior panels shall be easily removable, and cabinet shall consist of two modules with refrigeration system contained in top section. The two sections can easily be separated by removing 4 bolts. Fork slots allow for the top module to be lifted and separated. Each module shall pass thru a standard door frame, and/or into standard sized elevator doors without tilting or laying equipment down.
  - d. Unit shall be suitable for right- or left-hand corner installation without modification. No clearance is required. All service access shall be thru the front of the unit. Side supply grilles on accessory ductless plenum box shall include adjustable opposed damper to balance airflow for each side discharge, and in corner installations.
  - e. Refer to paragraph 2.9.B for condensate overflow switch.
- 3. Refrigeration System:
  - a. Compressor: Shall be 2-stage hermetically sealed scroll compressor with internal unloading providing 2 stages of heating and cooling operation.
  - b. The refrigeration circuit shall be equipped with factory installed high- and low-pressure control with resettable lockout circuit. An internal overload shall protect the compressor against excessive motor temperatures and currents. Refrigerant shall be R-410A.
  - c. Refrigeration circuit will include thermostatic expansion valve (TXV), liquid line filter dryer, refrigerant service ports and discharge muffler. Service gauge access ports shall be available without removing any panels.
  - d. The compressor shall be mounted on double floating isolation mounting system and fitted with a factory installed sound attenuation jacket.
- 4. Condensate Drain System

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- a. Condensate shall be removed from the unit by connections located in the back of the unit. Both indoor and outdoor coil drain pans shall be constructed of non-corrosive materials and shall not allow standing water in the drain pan. A factory installed condensate overflow protection system shall monitor both drain pans and shut down system to prevent condensate overflow.
5. Fans and Motors:
- a. The indoor blower motor shall be electronically commutated variable speed (ECM), factory programmed to produce rated air flow from 0 to .5-inch WC of external static pressure. The motor is to be self-adjusting to provide proper rated air flow at high static pressures without user adjustment or wiring changes by the user. The motor shall be pre-programmed for 20-second ramp up and 60-second down rate for quiet, smooth starting and stopping. PSC motor shall not be acceptable. Motor shall automatically adjust to proper blower speeds matching compressor operation: ultra-quiet ventilation only, stage 1 cooling, stage 2 cooling, stage 1 heating, and stage 2 heating, continuous circulation ventilation mode.
  - b. The condenser fan motor shall be electronically commutated motor-ECM. Motor shall provide variable speed operation, ball bearing, 6kV surge protection and matched to a sweep designed low noise composite condenser fan. Factory integrated modulating low ambient control shall be provided as standard.
6. Filter:
- a. Filters shall be 2" thick radial pleated disposable cotton and synthetic blend filters. Minimum Efficiency Reporting Value of MERV 8 per ASHRAE standard 52.2.
  - b. Filters shall be accessible thru front of unit. Filter size shall be readily available commercial sizes.
7. Electrical Components And Controls
- a. Electrical components shall be easily accessible for routine inspection and maintenance through front service panels. Disconnect shall be standard on all 460 volt models. Disconnect access is through lockable access panel. Lock and key are to be provided with each unit. Unit shall have single point entry for line voltage. Electrical component access point shall be located at standard eye level to allow easy serviceability.
  - b. The internal low voltage control circuit shall consist of a current limiting 24 VAC type 75 VA transformer with circuit breaker.
  - c. Defrost control shall be by temperature and time. After 30, 60, or 90 minutes (selectable) the heat pump control shall place the system in defrost mode. The defrost circuit shall consist of a solid state electronic heat pump control. A 90-minute timer (factory setting) shall initiate a defrost cycle if the outdoor coil temperature indicates the possibility of an iced condition. The thermistor sensor, speed-up terminal for service, and a ten-minute defrost override shall be all be standard on the electronic heat pump control.
  - d. To prevent rapid compressor short cycling, a five-minute time delay circuit shall be incorporated into the heat pump control board. A low pressure bypass shall be



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incorporated into the heat pump control board to prevent nuisance tripping during low temperature start-up.

- e. All units with 3-phase power shall include factory mounted phase rotation monitor. This device shall protect scroll compressor from reverse rotation and also protect unit from phase failure. If 3-phase power is incorrectly connected at the field power connections, the phase monitor shall lock out the unit and a red light will illuminate indicating incorrect phase. If unit is wired correctly a green light will illuminate. If a power leg is lost, the phase monitor will lockout the unit due to phase imbalance. Once the condition is corrected, turning the power off at the circuit breaker or disconnect will reset the phase monitor.

8. Dehumidification and Hot Gas Reheat:

- a. The dehumidification option shall incorporate an independent reheat coil in the supply air stream in addition to the standard evaporator coil, 2-way valve, solid state dehumidification circuit board, and independent dehumidification terminal on 24-volt control terminal strip. The coil shall be mounted after the evaporator coil, and sized to nominally match the sensible cooling capacity. The solid-state dehumidification circuit shall monitor the 24-volt terminal for a call for dehumidification. If the humidity rises above a set point the dehumidification terminal is energized the dehumidification control board shall:
  - 1) Monitor unit operation. If dry bulb temperature is satisfied and no call for cooling or heating is active, the unit will energize in cooling mode and also energize the 2-way valve so that reheat coil becomes active.
  - 2) If the unit is operating in cooling or heating at the time of the call for dehumidification, the unit shall remain in cooling or heating until comfort temperature set point is satisfied. If the high humidity call is still active, the unit will then operate in dehumidification mode.
  - 3) If a call for cooling or heating is received during dehumidification operation, the solid-state board will deenergize the 2-way valve. The unit shall operate in active cooling or heating mode until dry bulb set point is satisfied.
  - 4) If the humidity set point control is satisfied and no call for cooling or heating is active the unit will cycle off.

9. Ventilation – Energy Recovery Ventilator

- a. Energy Recovery module shall consist of 2 rotary wheels in an insulated cassette frame complete with silica gel media, seals, drive motor, belt, intake and exhaust blowers. Dampers will be used to prevent infiltration during off periods.
- b. The inherent design of the ERV shall be such as to promote self-cleaning in standard conditions.
- c. Intake and exhaust blower motors shall be fractional horsepower ECM motors providing either 3 selectable cfm levels (450, 375, 300) or modulating cfm based on 0-10 v modulating signal from a control source. Intake and exhaust airflow shall be independently adjustable providing for positive pressurization of the space.
- d. The ERV thermal performance shall be certified by the manufacturer in accordance with ASHRAE Standard 84, Method of Testing Air-to Air Heat Exchangers and ARI Standard 1060, Rating for Air-to-Air Energy Recovery Ventilation

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Equipment Cassettes, and shall be listed in the ARI Certified Products. Unit complies with ANSI/ASHRAE Standard 62.1 Ventilation for Acceptable Air Quality.

- e. The energy transfer media shall include enthalpy transfer utilizing silica gel desiccant or other media with high latent transfer capability. All components of the ERV assembly shall be warranted (parts only) 5 years from date of installation.

10. Accessories:

- a. Disconnect Switch: Located on the control panel, disconnect switch shall be sized for the full load amperage of the unit. This shall allow the unit to be disconnected from the power supply prior to any maintenance. In the off position, the switch shall have the ability to be locked out.
- b. Duct Flange: Factory fitted discharge duct flange allowing for easy field connection of a discharge duct to top of the unit.
- c. Wall Sleeve: Unit manufacturer shall furnish a properly sized wall plenum for intake and exhaust condenser air, including intake and exhaust air path for ventilation air. Sleeve shall be telescoping for adjustable width, and adjustable 3" height from 31" to 34" AAF, or higher with factory supplied subbase. Wall sleeve shall be constructed of galvanized steel, coated with an epoxy primer and baked on polyester enamel paint. Wall sleeve casing shall be capable of withstanding 500-hour salt spray exposure per ASTM B117.
- d. Outdoor Louver: Exterior Louver shall be a product of the SPVU manufacturer that has been designed, tested and rated to meet the manufacturers rated performance standards as a system. Louver shall be available in 1" or 2" depths. Louvers shall be constructed of mill finish aluminum and powder coated to color. Factory standards colors include dark bronze, medium bronze, or aluminum. Color chart shall be provided for additional color options if required.
- e. Cabinet Extension: Three-sided assembly manufactured of prepainted steel matching unit color, to fill space from top of unit to ceiling. For use on ducted or plenum box installations. Contractor to field verify sizes required.
- f. Side Trim Kit: Side trim pieces, 6" in depth manufactured of prepainted steel matching unit color shall be used to trim out space between rear sides of unit and exterior wall. Contractor to field verify sizes required.

11. Warranty:

- a. Refer to specification section 230100 for warranty information.

E. Split System Heat Pumps (IU/OU-B):

- 1. Units shall be size, type, and have capacity as indicated. Provide units manufactured by DAIKIN, SAMSUNG, LG or approved equal. Indoor unit DAIKIN model FCQ shall be a ceiling cassette fan coil unit, operable with R-410A refrigerant, equipped with an electronic expansion valve, for installation into the ceiling cavity equipped with an air panel grill.
- 2. Unit shall be a four-way air distribution type, white, impact resistant with a washable decoration panel. The supply air is distributed via motorized louvers which shall be horizontally and vertically adjusted from 0° to 90°. Computerized PID control shall be

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used to control superheat to deliver a comfortable room temperature condition. The unit shall be equipped with a programmed drying mechanism that dehumidifies while limiting changes in room temperature when used with wired wall controller remote control. The indoor units sound pressure shall range from 29 dB(A) to 34 dB(A) at low speed measured at 5 feet below the unit.

3. The system must be installed by a factory trained contractor.
4. Each unit's performance is based on nominal operating conditions:
5. Indoor Unit:
  - a. The Daikin indoor unit FCQ shall be completely factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, condensate drain pan, condensate drain pump, condensate safety shutoff and alarm, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch.
  - b. Indoor unit and refrigerant pipes shall be charged with dehydrated air prior to shipment from the factory.
  - c. Both refrigerant lines shall be insulated from the outdoor unit.
  - d. Return air shall be through the concentric panel, which includes a resin net mold resistant filter.
  - e. The indoor units shall be equipped with a condensate pan and condensate pump. The condensate pump shall provide up to 21" of lift and shall have a built-in safety shutoff and alarm.
  - f. The indoor units shall be equipped with a return air thermistor.
  - g. All electrical components shall be accessible through the decoration panel.
  - h. The indoor unit shall be separately powered with 208~230V/1-phase/60Hz.
  - i. The voltage range shall be 253 volts maximum and 187 volts minimum.
6. Unit Cabinet:
  - a. The cabinet shall be space saving and shall be designed for installation in a suspended ceiling grid.
  - b. Three auto-swing positions shall be available to choose, which include standard, draft prevention and ceiling stain prevention.
  - c. The airflow of the unit shall have the ability to shut down one or two sides allowing for simpler corner installation.
  - d. Fresh air intake shall be possible by way of direct duct installation to the side of the indoor unit cabinet.
  - e. A branch duct knockout shall be provided for branch ducting supply air.
  - f. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.
7. Fan:
  - a. The fan shall be direct-drive turbo fan type with statically and dynamically balanced impeller with high and low fan speeds.
  - b. The fan motor shall operate on 208/230 volts, 1 phase, 60 hertz with a motor output range from 0.06 to 0.12 HP.
  - c. The airflow rate shall be available in high and low settings.

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- d. The fan motor shall be thermally protected.
8. Filter:
- a. The return air shall be filtered by means of a washable long-life filter with mildew proof resin.
9. Coil:
- a. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.
  - b. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.
  - c. The coil shall be a 2-row cross fin copper evaporator coil with 17 FPI design completely factory tested.
  - d. The refrigerant connections shall be flare connections and the condensate shall be 1 -1/32 inch outside diameter PVC.
  - e. A condensate pan shall be located under the coil.
  - f. A condensate pump with a 21-inch lift shall be located below the coil in the condensate pan with a built-in safety alarm.
10. Electrical:
- a. A separate power supply shall be required of 208/230 volts, 1 phase, 60 hertz. The acceptable voltage range shall be 187 to 253 volts.
11. Control:
- a. The unit shall have controls provided by manufacturer to perform input functions necessary to operate the system.
  - b. The unit shall be compatible with interfacing with a BMS system via BACnet gateways.

12. Outdoor Unit:

The outdoor unit shall be specifically matched to the corresponding indoor unit size. The outdoor unit shall be complete factory assembled and pre-wired with all necessary electronic and refrigerant controls. The outdoor shall be controlled by a microprocessor and dedicated EEV's shall be provided for capacity control during part load of the indoor unit.

- a. Unit Cabinet:
  - 1) The outdoor unit shall be completely weatherproof and corrosion resistant. The unit shall be constructed from rust-proofed mild steel panels coated with a baked enamel finish.
  - 2) The outdoor unit will come furnished with four mounting feet, mounted across the base pan, to allow bolting to a roof curb rail.
- b. Fan:

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- 1) The fan shall be a direct drive, propeller type fan.
- 2) The motor shall be inverter driven with permanently lubricated type bearings.
- 3) A fan guard shall be provided on the outdoor unit to prevent contact with fan operation.
- 4) Airflow shall be horizontal discharge.

c. Coil:

- 1) The outdoor coil shall be nonferrous construction with corrugated fin tube.
- 2) The fins shall be covered with an anti-corrosion acrylic resin and hydrophilic film type E1, rated for up to 1000 hours salt spray.
- 3) Refrigerant flow from the condenser shall be controlled via a metering device.

d. Compressor:

- 1) The outdoor compressor shall be a patented, variable speed swing inverter-driven compressor.
- 2) The outdoor unit shall have an accumulator and four-way reversing valve.
- 3) PVE Refrigerant Oil shall be used to provide improved lubrication & better chemical stability, and no hydrolysis.
- 4) The compressor shall have an internal thermal overload.
- 5) The outdoor unit can operate with a maximum vertical height difference of 65-5/8 feet and overall maximum length of 98-1/2 feet without any oil traps or additional components.

e. Electrical:

- 1) The electrical power requirement is 208-230 volt, 1-phase, and 60 Hz power.
- 2) The voltage range limitations shall be a minimum of 187 volts and a maximum of 253 volts.

F. Split System Heat Pumps (IU/OU-A, C & D):

1. Unit shall be size, type, and have capacity indicated DAIKIN, TRANE, YORK, or approved equal. Units shall meet or exceed efficiencies scheduled on the drawings.
2. Unit shall be horizontal mounted for ducted application. Unit shall be complete with casing, blower, filter, heat exchanger, reversing valve, controls, and condensate trap and drain assembly.
3. Evaporator coil shall be constructed of copper tubes and aluminum fins and shall be internally cleaned and provided with refrigerant holding charge. Coil casing shall be pre-painted steel. Piping connections shall be sweat fittings.
4. Fan motor shall be open drip proof with internal overloads.
5. Provide 24-volt control transformer with control circuit fuse to protect transformer from overload.

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6. Provide duct flanges for supply duct connections. Return connections shall be either right or left side as indicated on drawings.
7. Provide blower door safety switch to interrupt electrical power at the unit when the panel covering the blower compartment is removed.
8. Provide filter rack with 2" MERV 8 disposable filters.
9. Blower cabinet shall be insulated.
10. Provide auxiliary and main drain pans. Install float switch in main drain pan. Switch shall disable unit upon activation.
11. Unit shall be provided with terminal strip to be controlled by the DDC system, refer to the drawing for sequence of operation and terminal points required.
12. Condensing Unit
  - a. Unit shall be size, type, and have capacity indicated. DAIKIN, TRANE, YORK, or approved equal.
  - b. Outdoor unit shall be complete with scroll compressor, external service valves, charging port, condenser coil, and condenser fan.
  - c. Condenser coil shall be constructed of copper tube and aluminum fins. Fins shall be protected with a decorative grille.
  - d. Compressor shall be internally protected against high pressure and temperature. This shall be accomplished by the simultaneous operation of the high-pressure relief valve and a temperature sensor which protect the compressor if undesirable operating conditions occur. Compressor shall be isolated to prevent vibration.
  - e. Provide liquid line filter dryer factory installed. Secured re-usable service valves shall be provided on both the liquid and suction sweat connections for ease of evacuation and charging.
  - f. Condenser fan motor bearings shall be long life permanently lubricated requiring no annual servicing.
  - g. Cabinet shall be made of pre-treated and powder-coated heavy-gauge steel.
  - h. Refer to warranty requirements in Section 230100.

G. Ductless Split System Heat Pump Unit (IU-E, OU-E):

1. The heat pump system shall be a MITSUBISHI Electric split system with variable speed inverter compressor technology. The system shall consist of a wall-mounted indoor section with wired, wall-mounted controller and a horizontal discharge, single phase outdoor unit.
2. Quality Assurance:
  - a. The units shall be tested by a Nationally Recognized Testing Laboratory (NRTL) and shall bear the ETL label.
  - b. All wiring shall be in accordance with the National Electrical Code (NEC).
  - c. The units shall be rated in accordance with Air-conditioning, Heating, and Refrigeration Institute's (AHRI) Standard 240 and bear the ARI Certification label.
  - d. The units shall be manufactured in a facility registered to ISO 9001 and ISO 14001, which is a set of standards applying to environmental protection set by the International Standard Organization (ISO).
  - e. A dry air holding charge shall be provided in the indoor section.
  - f. The outdoor unit shall be pre-charged with R-410a refrigerant for 70 feet (20 meters) of refrigerant tubing.

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- g. System efficiency shall meet or exceed 13.6 SEER.
3. Delivery, Storage and Handling:
- a. Unit shall be stored and handles according to the manufacturer's recommendations.
  - b. The wireless controller shall be shipped inside the carton with the indoor unit and able to withstand 105°F storage temperatures and 95% relative humidity without adverse effect.
4. Warranty:
- a. The units shall have a manufacturer's parts and defects warranty for a period one (1) year from date of installation. The compressor shall have a warranty of 6 years from date of installation. If, during this period, any part should fail to function properly due to defects in workmanship or material, it shall be replaced or repaired at the discretion of the manufacturer. This warranty does not include labor.
  - b. Manufacturer shall have over 25 years of continuous experience in the U.S. Market.
5. Indoor Unit Cabinet (IU-E):
- a. The indoor unit cabinet shall be a space-saving ceiling-recessed cassette type. The cabinet shall be formed from galvanized sheet metal coated with high-density foam insulation.
  - b. The indoor unit shall be factory assembled, wired and tested. Contained within the unit shall be all factory wiring and internal piping, drain left mechanism, control circuit board, fan, and fan motor. Single branch ducting shall be allowed from cabinet. The cabinet panel shall have provisions for a field installed filtered outside air intake.
  - c. A separate grill assembly shall be attached to the front of the cabinet to provide supply air vanes in four directions and a center mounted return air section. The four-way grill shall be fixed to bottom of cabinet allowing two, three or four-way blow. The grill vane angles shall be individually adjustable from the wired remote controller to customize the airflow pattern for the conditioned space. Grill assembly color shall be Munsell 6.4Y8.9/0.4.
  - d. The unit, in conjunction with the wired, wall-mounted controller shall have a self-diagnostic function, 3-minute time delay mechanism, and an auto restart function. Indoor unit and integral refrigerant pipes shall be purged with dry nitrogen and capped before shipment from the factory.
  - e. The indoor fan shall be an assembly with a turbo fan propeller, direct driven by a single motor and shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings. The indoor fan shall consist of five (5) speed settings, Low, Mid1, Mid2, High and Auto. The fan shall have a selectable Auto fan setting that will adjust the fan speed based on the difference between controller set-point and space temperatures.
6. Indoor Unit (IU-E):
- a. Unit Cabinet:

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- 1) The indoor unit cabinet shall be wall mounted by means of a factory supplied mounting plate. The cabinet shall be formed from high strength molded plastic with front panel access for filter. Cabinet color shall be white – Munsell 0.70 8.59/097.
  - 2) The indoor unit shall be factory assembled, wired and tested. Contained within the unit shall be all factory wiring and internal piping, control circuit board and fan motor.
  - 3) The unit in conjunction with the wired, wall-mounted controller shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, and a test run switch. Indoor unit and refrigerant pipes shall be purged with dry nitrogen before shipment from the factory.
- b. Fan: The evaporator fan shall be high performance, double inlet, forward curve, direct drive sirocco fan with a single motor. The fans shall be statically and dynamically balanced and run on a motor with permanently lubricated bearings. The indoor fan shall consist of four (4) speeds: Low, M1, M2, and Hi.
  - c. Vane: There shall be a motorized horizontal vane to automatically direct air flow in a horizontal and downward direction for uniform air distribution. The horizontal vane shall significantly decrease downward air resistance for lower noise levels, and shall close the outlet port when operation is stopped. There shall also be a set of vertical vanes to provide horizontal swing airflow movement selected by remote control.
  - d. Filter: Return air shall be filtered by means of an easily removable washable filter.
  - e. Coil: The evaporator coil shall be of nonferrous construction with pre-coated aluminum strake fins on copper tubing. The multi-angled heat exchanger shall have a modified fin shape that reduces air resistance for a smoother, quieter airflow. All tube joints shall be brazed with PhosCopper or silver alloy. The coils shall be pressure tested at the factory. A condensate pan and drain shall be provided under the coil.
  - f. Electrical: The power source for the indoor unit shall be from the outdoor unit.
  - g. Condensate Lift Pump: Provide a condensate pump capable of providing enough lift to route condensate up to roof.
7. Electrical:
- a. The electrical power of the unit shall be 208/230 volts, 1-phase, 60 hertz.
  - b. The system shall be capable of satisfactory operation within voltage limits of 198 volts to 253 volts.
  - c. The indoor unit shall be provided with A-Control – a system allowing the indoor unit to be powered and controlled directly from the outdoor unit using a 14-gauge (AWG) 3-wire connection plus ground providing both primary power and integrated, by-directional, digital control signal without additional connections.
  - d. The indoor units shall not have any supplemental or “back-up” electrical heating elements.
8. Control:



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- a. The control system shall consist of two (2) microprocessors, one in each indoor and outdoor unit, interconnected by A-Control. This three (3) conductor 14 ga. AWG wire with ground method shall provide power feed and bi-directional digital control transmission between the outdoor and indoor units.
- b. The system shall be capable of automatic restart when power is restored after power interruption. The system shall have self-diagnostics ability, including total hours of compressor run time. Diagnostics codes for indoor and outdoor units shall be displayed on the wired controller display panel.
- c. The microprocessor located in the indoor unit shall have the capability of monitoring return air temperature and indoor coil temperature, receiving and processing commands from the wired controller, providing emergency operation and for controlling the operation of the outdoor unit.
- d. The indoor unit shall be connected to a wall mounted wired controller to perform input functions necessary to operate the system. The wired controller shall have a large multi-language DOT liquid crystal display (LCD) presenting contents in eight (8) different languages, including English, French, Chinese, German, Japanese, Spanish, Russian, and Italian.
- e. There shall be a built-in weekly timer with up to eight pattern settings per day. The controller shall consist of an On/Off button, Increase/Decrease Set Temperature buttons, a Heat/Auto/Cool/Dry/Fan mode selector, a Timer Menu button, a Timer On/Off button, Set Time buttons, a Fan Speed selector, a Vane Position selector, a Louver Swing button, a Test Run button, and a Check Mode button. The controller shall have a built-in temperature sensor. Temperature shall be displayed in either Fahrenheit (°F) or Celsius (°C). Temperature changes shall be by increments of 1°F (1°C) with a range of 67°F to 87°F (19°C to 30°C).
- f. The wired controller shall display operating conditions such as set temperature, room temperature, pipe temperatures (i.e., liquid, discharge, indoor and outdoor), compressor operating conditions (including running current, frequency, input voltage, On/Off status and operating time), LEV opening pulses, sub cooling and discharge super heat.
- g. Normal operation of the wired controller shall provide individual system control in which one wired controller and one indoor unit are installed in the same room. Temperature sensing shall be done by a Thermistor mounted in the return air stream of the indoor unit. An alternate temperature sensor shall be located within the wall controller. Selection of the sensor is by switch in the indoor unit. The controller shall have the capability of controlling up to a maximum of sixteen systems at a maximum developed control cable distance of 1,650 feet (500 meters).
- h. The control voltage from the wired controller to the indoor unit shall be a digital +/-24 volts, DC signal. The control signal between the indoor and outdoor unit shall be pulse signal 24 volts DC. Up to two wired controllers shall be able to be used to control one unit.
- i. Control system shall control the continued operation of the air sweep louvers, as well as provide On/Off and mode switching. The controller shall have the capability to provide sequential starting with up to fifty seconds delay.
- j. A two wire (one pair) twisted, stranded, 18 gauge (AWG), jacketed, control cable shall be used to connect the controller to the indoor unit.
- k. Mechanical contractor shall install the Control Damper and provide interlock with indoor unit.

9. Outdoor Unit (OU-E):
- a. The outdoor unit shall be compatible with PLA type indoor units. The connected indoor unit must be of the same capacity as the outdoor unit.
  - b. The outdoor unit shall be equipped with a control board that interfaces with the indoor unit to perform all necessary operation functions.
  - c. The outdoor unit shall be capable of operating at 0°F (-18°C) ambient temperature without additional low ambient controls (optional wind baffle may be required).
  - d. The outdoor unit shall be able to operate with a maximum height difference of 100 feet between indoor and outdoor units.
  - e. The system shall have a maximum refrigerant tubing length of 100 feet for the 18,000 and 65 feet for the 24,000, BTU/h units between indoor and outdoor units without the need for line size changes, traps or additional oil. Models PUZ-A18NHA and PUZ-A24NHA shall be pre-charged for a maximum of 70 feet of refrigerant tubing – PUZ-A42NHA for 100 feet.
  - f. The outdoor unit shall be completely factory assembled, piped, and wired. Each unit must be test run at the factory.
  - g. Cabinet: The casing shall be constructed from galvanized steel plate, coated with an electrostatically applied, thermally fused acrylic or polyester powder coating for corrosion protection and have a Munsell 3Y 7.8/1.1 finish. The fan grill shall be of ABS plastic.
  - h. Fan: Models PUZ-A18NHA AND PUZ-A24NHA shall be furnished with fan AC fan motor. The fan motor shall be of aerodynamic design for quiet operation, and the fan motor bearings shall be permanently lubricated. The outdoor unit shall have horizontal discharge airflow. The fan shall be mounted in front of the coil, pulling air across it from the rear and dispelling it through the front. The fan shall be provided with a raised guard to prevent contact with moving parts.
  - i. The L shaped condenser coil shall be of copper tubing with flat aluminum fins to reduce debris build up. The coil shall be protected with an integral metal guard. Refrigerant flow from the condenser shall be controlled by means of linear expansion valve (LEV) metering orifice. The LEV shall be controlled by a microprocessor controlled step motor.
  - j. The compressor for models PUZ-A18NHA, PUZ-A24NHA, PUZ-A30NHA and PUZ-A36NHA shall be a DC rotary compressor with Variable Compressor Speed Inverter Technology. The compressor f or model PUY-A42NHA shall be a Frame Compliant Scroll compressor with variable speed inverter drive technology. The compressor shall be driven by inverter circuit to control compressor speed. The compressor speed shall dynamically vary to match the room load for significantly increasing the efficiency of the system which results in vast energy savings. To prevent liquid from accumulating the in the compressor during the off cycle, a minimal amount of current shall be intermittently applied to the compressor motor to maintain sufficient heat. The outdoor unit shall have an accumulator and high-pressure safety switch. The compressor shall be mounted to avoid the transmission of vibration.

## 2.5 TERMINAL EQUIPMENT

- A. Electric Cabinet Unit Heater: (CUH-A &BC)

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1. Units shall be size, type, and have capacity as indicated. Provide units manufactured by MARKEL, or approved equal.
2. Cabinet: The cabinet shall be constructed of heavy-duty 16-gauge zinc-coated steel. The cabinet shall be finished with a durable powder coated beige paint. The front cover shall be removable for easy installation and service of all internal components. The grille configuration shall be convertible to any airflow configuration by removal of four fasteners. The cabinet shall be designed for floor, wall, or ceiling mounting.
3. Elements: Elements shall be all steel tubes with highest quality nickel-chromium resistance wire embedded in compacted efficient dielectric to ensure proper heat transfer. Steel helical fins shall be machine crimped and brazed to tube for effective transfer of heat.
4. Motor and Blower Assembly: Motor and blower shall be direct drive and resiliently mounted on a rigid heavy-gauge steel frame for quiet operation and long life. All motors shall have built-in overload protection and shall be lifetime lubricated. The motor shall be vented and mounted in the airstream to provide maximum cooling of the motor.
5. Limit Controls: The heater shall utilize two safety limits built into the controls to automatically shut off the heater if safe operating temperatures are exceeded. The primary limit shall be a capillary type, which senses the heat along the full length of the elements. The secondary limit shall be a manual reset thermal device. All heaters shall have a built-in fan purge to dissipate residual heat from elements on heater shutdown.
6. Controls: Heater shall have high/low heat and fan rocker switch. These controls shall be factory wired and tamper resistant and adjustable through front of louver assembly.

B. Electric Unit Heaters (UH-A):

1. Unit shall be size, type, and have capacity as indicated. Provide units manufactured by MARKEL, or approved equal.
2. Unit shall be complete, including casing, electric heating coil, fans, fan motor, built-in disconnect switch, integral thermostat filters, and baked-enamel cabinet in color selected by Architect.
3. Construction: Heavy 18-Gauge welded steel cabinet with powder coated finish and control compartment housing a master terminal board with a hinged and latched access door, simplifying wiring, installation & maintenance.
4. Heating Element: Copper clad steel sheath element with continuously brazed steel fins formed to allow side draw through air flow.
5. Motor and Blower Assembly: Totally enclosed, 1-speed, 1-phase, permanently lubricated, thermally protected motors with unit bearings. Motor shall be mounted with rubber insulators to minimize vibration & noise. Fan over-ride purges unit of residual heat at shutdown.
6. Louver Assembly: Louvers are individually adjustable for directional control of air flow up to 15° from straight horizontal.
7. Installation: Unit Heater shall be mounted for horizontal discharge.

2.6 HVAC PIPING AND SPECIALTIES

A. PIPING

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1. Refrigerant and HVAC drain piping shall be provided as specified below. Where options of different materials are given for the same service, contractor shall select materials and use them uniformly throughout the system. Contractor shall submit experience with all of the materials and joining methods specified.
2. Condensate drain piping:
  - a. Above ground (within building and plenum rated ceiling)
    - 1) Type L copper
  - b. Above ground (exterior to building)
    - 1) Schedule 40 PVC
3. Refrigerant piping:
  - a. Above ground
    - 1) Copper Type ACR
4. Gas Piping:
  - a. Galvanized steel - screw fabricated (2 inch and under)
  - b. Galvanized steel – welded (2-1/2 inch and over)
5. Type L copper pipe shall conform to ASTM B42, and be assembled with wrought-copper soldering fittings using 95-5 solder as specified herein.
6. Schedule 40 PVC pipe shall be assembled in strict accordance with manufacturer's instructions. Solvent cement shall conform to ASTM D2564.
7. Schedule 40 black steel pipe shall be fabricated by welding using Schedule 40 steel welding fittings conforming to ASTM A53.
8. ACR tubing shall be nitrogen-filled assembled with wrought-copper soldering fittings using silver solder.
9. Piping shall be run concealed, except where no ceiling is provided. Coordinate installation of piping with other disciplines. Locate all piping tight against structure where possible. No piping shall be installed below mechanical equipment, or within mechanical or electrical equipment clearance requirements.

## 2.7 AIR DISTRIBUTION

### A. Ductwork

1. Provide all ducts, plenums, connections, dampers, and related items required to form a complete system as indicated on drawings and specified herein.
2. All ductwork shall be sheet metal.
3. Sheet-metal ducts shall be fabricated from G60 galvanized-steel sheets, 304 stainless steel, or 3003 aluminum, and shall be of gauges called for and as detailed in 2005 SMACNA Manual, HVAC Duct Construction Standards (Metal and Flexible). All ductwork from variable air volume rooftop units to the inlet of VAV terminal boxes shall

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be 3" w.g. pressure class construction. All constant volume ductwork shall be 1" w.g. pressure class construction and shall be single-wall rectangular or round.

4. Duct sealing requirements shall be Class A for all ductwork except for the following which may be Class B:
  - a. Exhaust in conditioned spaces
  - b. Supply duct <2" w.g. operating pressure in conditioned spaces
  - c. Return duct in conditioned spaces
5. All companies being considered as potential suppliers of duct and fitting components shall submit drawings and dimension data for approval. These submittals shall serve as a basis for acceptance or rejection of product.
  - a. All fittings furnished for use on a project must be identical to the approved submittal data.
  - b. Any fittings rejected by the project engineer shall be replaced with fittings equal to the original approved submittals. All expenses incurred in the replacement of fittings that do not conform to these requirements shall be the responsibility of the installing contractor.
6. Duct shall be provided in continuous, un-joined lengths wherever possible. Except when interrupted by fittings, round spiral duct sections shall not be less than 12 feet long. Flat oval duct not interrupted by fittings shall not be less than 12 feet long. Round spiral pipe and fittings greater than 24" diameter, and oval spiral pipe and fittings greater than 25" wide, will have flanged connections. Flanges for dual wall duct must also hold the inner liner of dual wall duct concentric without the use of additional couplings or spacers.
7. Round ductwork for exposed application shall be in accordance with SMACNA 2005 standards. Duct shall be double-wall, spiral, lockseam construction. Where rectangular take-offs for registers are shown, a tack-welded factory- installed take-off shall be provided. Exposed duct shall have "paint grip" finish suitable for field painting. Exposed ductwork shall be "Architectural" grade and shall receive special care in construction and shipping.
8. Double-wall round ductwork shall be used where indicated, and shall be of spiral lockseam construction with an airtight outer pressure shell, a 2" thick insulation layer, and a solid inner liner that completely covers the insulation throughout. Fittings to have solid inner liner.
9. Unless otherwise specified, all double-wall duct and fittings inner shell for dual wall duct shall be a minimum G-60 galvanized sheet metal. All spiral pipe used for inner shells will have 3 intermediate ribs and be fabricated in accordance with ASTM A525 and A527 specifications in a minimum of 26 gauges for the inner and outer shells.
10. Round fittings may be spot welded and bonded
11. Insulation shall have the following UL rating:

Flame Spread	10-20
Fuel Contributed	10-15
Smoke Developed	0-20

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12. Round and flat oval spiral duct and fittings shall be UNITED MCGILL CORPORATION, or equal by HAMLIN SHEET METAL, SEMCO MANUFACTURING, LINDAB, INC or EASTERN SHEET METAL.
13. Ductwork shall not be delivered to the job site until just prior to erection. Ductwork with dents or other damages shall not be accepted. Double-wall acoustically-lined ductwork shall be removed from the job site and shall not be used if liner is allowed to become wet to any degree.
14. Rectangular low velocity ductwork shall be constructed from galvanized steel sheets of lock form quality per ASTM A653 with a G60 zinc coating (0.60 oz/ft<sup>2</sup>), unless otherwise shown on the contract documents. Sheets shall be free of pits, blisters, slivers, and un-galvanized spots.
15. Insulated-flexible acoustical air ducts shall be FLEXMASTER USA TYPE 1M, THERMAFLEX Type M-KE, or approved equal, suitable for up to 10" w.g. positive pressure and rated velocity of 5500 FPM. Flexible ductwork shall meet NFPA 90A standards, conform to UL standard 181, and be ETL listed Class 1 air duct. Flexible duct shall have a flame spread of less than 25 and smoke developed of less than 50. Flexible ductwork shall be fabricated with a polyethylene or chlorinated polyethylene inner film, wrapped in 2" thick with a thermal conductance of R-6 fiberglass insulation, with an outer reinforced metallized vapor barrier. The inner film shall be supported by a corrosion resistant galvanized steel helix formed and mechanically locked to the polyethylene fabric. The inside bend radius shall be ½ x inside diameter in all sizes. Flexible branch ductwork to diffusers shall be limited to maximum length of 5 feet long and maximum velocity of 600 feet per minute. Flexible duct connections at variable air volume terminals shall be a maximum of 3 feet long. Contractor to provide proper flex duct size to ensure velocity limit is not exceeded. Support flexible ducts a minimum of every 4 feet. Supports shall not compress or constrict the flexible duct. Refer to the diffuser installation details on the drawings.
16. Provide flexible connections of fiberglass between ducts and air-handling unit connections, fan coil units, and exhaust fans. Connector shall be constructed using double lock gripping fingers at metal to fabric contact. Connector shall be rated airtight and watertight up to 10" w.g. positive to 10" w.g. negative pressure. Provide flexible connections, not less than 4 inches wide, constructed of approved fireproof, waterproof, non-asbestos, glass fabric, at the inlet and outlet connection of each fan unit, securely fastened to the unit and to the ductwork by a 24-gauge galvanized steel band provided with tightening screws. There shall be no metal-to-metal contact at flexible connections. There shall be no stretching of the flexible material at flexible connections. The connection shall be UL listed, to meet NFPA 90A and 90B requirements and the following applications:  
Indoor: Neoprene coated glass fabric, minimum 30 oz./sq.yd., DUCTMATE "PROFLES<sup>TM</sup>" or approved equal.  
Outdoor: U.V. resistant Hypalon coated glass fabric, minimum 24 oz./sq.yd. DUCTMATE "PROflex<sup>TM</sup>" or approved equal.
17. Space roof mounted duct supports and suspended duct hangers every 4 feet, maximum. Insulated duct shall have saddle hangers. Suspended duct hangers attached to the side of the ductwork are acceptable. Refer to duct support details on the drawings.
18. Fabricate ductwork with airtight joints, presenting smooth surface on inside, neatly finished on outside; construct with curves and bends to aid in easy flow of air. Unless otherwise indicated, make inside radius of curves and bends at least width of ducts. Where square elbows have to be used, provide double wall turning vanes in all elbows.

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- Deflecting vanes shall be double wall blades, fit into side rails, and screw or rivet to duct elbow in field. Blades and side strips shall be small or large double vanes as detailed in SMACNA Duct Manual. DUCTMATE "PROrail™" or approved equal.
19. Construct, brace, and support ducts and air chambers in a manner that they shall neither sag nor vibrate to any perceptible extent when fans are operating at maximum speed or capacity.
  20. Provide sandwich type or square framed access doors for service temperature and pressure required, where indicated and where not indicated, in locations and of sizes which shall afford easy access to multi-blade dampers, smoke detectors, fire dampers, and other equipment and devices requiring inspection and servicing. Access doors shall be installed to avoid lights, piping, conduit, ceiling grid, etc., to provide unobstructed access. Access doors shall be installed on the underside of the ductwork. Access doors shall be a minimum of 24" x 18" where possible. Access doors in all factory fabricated ductwork shall be factory installed and sizes and locations shall be identified on the ductwork shop drawing submittal. In non-accessible ceilings, provide access doors in ceiling. DUCTMATE or approved equal.
  21. Connect ductwork to intake and discharge louvers, dampers, and other work installed in various trades requiring sheet-metal connections.
  22. Make sheet-metal connections to masonry work airtight and watertight in approved manner.
  23. Provide opposed-blade dampers for control of air volume and for balancing system, where indicated or required. Dampers shall be of sheet metal at least one gauge heavier than duct and reinforced; shall be installed in an accessible location. Provide indicating quadrant and locking device for adjusting and locking dampers in position. Provide extended shafts on all volume dampers greater than the thickness of the insulation to provide free movement of damper positioner. Stiffen duct at damper location, install damper in manner to prevent rattling.
  24. Provide remote cable operated volume damper for control of air volume and for balancing system as manufactured by UNITED ENERTECH CORPORATION, model BO-RI or approved equal. The damper shall be constructed of galvanized steel. The inner wire of the casing shall be stainless steel with tensile strength of 260,000 lbs. For application where the diffuser or grille is installed in hard ceiling below 16'-0" AFF, the adjustable controller shall be installed in diffuser or grille face, model BO-150. Otherwise provide 50' cable and locate adjustable controller concealed in wall with 3-3/4" cover plate, model BO-702.
  25. Provide square to round transition fittings with balancing damper at all round-duct take-offs to supply diffusers and registers.
  26. Duct sizes are inside free area. Increase duct sizes as required.
  27. Ductwork and accessories shall not be delivered to the job site until just prior to erection and must be stored in an approved manner.
  28. All ductwork shall be internally cleaned by vacuuming prior to installation.
  29. All ductwork open ends shall be sealed with polyethylene and duct tape during construction after hanging.

B. Phenolic Duct System (Exterior Ductwork)

1. Exterior ductwork shall be a phenolic duct system as manufactured by THERMADUCT or approved equal.
2. Ductwork shall comply with SMACNA Phenolic Duct Construction Standard guidelines.

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3. The Ductwork shall be a fortified cladded duct system in accordance with the UL and ASTM standards for outdoor applications with adverse weather conditions and factory-made air ducts.
4. The system shall be designed with a smooth aluminum surface to have similar frictional characteristics to that of galvanized sheet metal and include a structural flange and reinforcement system.
5. The system shall be designed to a maximum air velocity of 6000 fpm, maximum pressure of 10" w.c. positive and negative at SMACNA Air-Leakage Class 1, and operating temperatures between -15°F and 185°F.

C. Grilles, Registers and Diffusers:

1. Refer to drawings for types, material, models, finishes as manufactured by PRICE, TITUS, METALAIRE, or approved equal. Air devices shall have performance characteristics (throw, noise, and pressure drop) equal to air devices scheduled on the drawings. This information shall be provided with the submittal.
2. Grille and register frames and louvers shall be one-piece construction.
3. Paint interior surfaces of ducts behind grilles and registers with flat black enamel.

D. Shut Off Variable Air Volume Terminal Units:

1. General: Provide variable air volume terminals complete with casing, primary air valve and discharge plenum, where indicated. Units shall be manufactured by PRICE, TRANE, or approved equal. Acoustical data shall be certified in accordance with ARI 880. Acoustical data shall consider effect of discharge plenum and outlet combination.
2. Casing: Provide 22-gauge, acoustically lined, galvanized-steel casing. The interior surface of the unit casing shall be acoustically and thermally lined with 1-inch, 1.0 lb./ft<sup>3</sup> density glass fiber with matt facing. The insulation R-Value is 3.85. The insulation shall be UL listed and meets NFPA-90A and UL 181 standards as well as bacteriological standard ASTM C 665. There shall be no exposed edges of insulation (complete metal encapsulation).
3. Primary Air Valve: The primary air inlet connection shall be an 18-gage galvanized steel cylinder sized to fit standard round duct. A multiple-point, averaging flow sensing ring shall be provided with balancing taps for measuring +/-5% of unit cataloged airflow. An airflow-versus-pressure differential calibration chart shall be provided. The damper blade shall be constructed of a closed-cell foam seal that is mechanically locked between two 22-gage galvanized steel disks. The damper blade assembly shall be connected to a cast zinc shaft supported by self-lubricating bearings. The shaft shall be cast with a damper position indicator. The valve assembly shall include a mechanical stop to prevent over-stroking. At 4.0 in. w.g., air valve leakage shall not exceed 1% of cataloged airflow.
4. Electric Heating Coil: Provide factory-mounted electric heater, UL recognized resistance open-type heater with airflow switch. Heater shall also contain a disc-type automatic pilot duty thermal primary cutout, and manual reset load carrying thermal secondary device. Heater element material shall be nickel-chromium. The heater terminal box shall be provided with 7/8" knockouts for field power supply. Terminal connections shall be plated steel with ceramic insulators.
  - a. Provide an air pressure device designed to disable the heater when the system fan is off.



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- b. Provide mercury electric heater 24V contactor for use with direct digital controls.
  - c. Line Fuse: A safety fuse located in the electric heater's line of power to prevent power surge damage to the electric heater. A line fuse shall be provided for the fan motor to prevent power surge damage to the motor.
  - d. Disconnect Switch: A factory provided disconnect switch with an interlocking door on the heater control panel.
- 5. Provide factory mount controller and damper operator.
  - 6. Units shall have removable access panel or access door for service access.
  - 7. Units shall be installed with strict attention paid to manufacturer's recommended length of straight inlet duct.
  - 8. Automatic Controls: Provide factory-installed automatic (direct digital) controls provided by the control vendor. The control vendor shall furnish and variable volume terminal unit manufacturer shall install Direct Digital Controller. Controller shall provide the sequence of operation specified. Controller shall provide the required signals to achieve pressure independent operation throughout the specified volume range of the unit. Variable volume terminal unit manufacturer shall examine terminal unit locations indicated on drawings and shall locate controllers on most accessible side of unit. All costs associated with factory mounting of vendor's controls shall be included in this Section.
- E. Kitchen Ventilation System:
- 1. All components of the Kitchen Ventilation System shall be provided by a single vendor, including the hood, fire suppression system, exhaust fan, make up air system, and associated temperature control system.
  - 2. Kitchen Range Hood:
    - a. Furnish and install kitchen exhaust hood of size, type and capacity as indicated. Unit shall be as manufactured by CAPTIVEAIRE, or equal. The model ND-2 is an exhaust and makeup air canopy hood rated for all types of cooking equipment. The hood shall have the size, shape and performance specified on drawings.
    - b. Construction shall be type 430 stainless steel with a #3 or #4 polish where exposed. Individual component construction shall be determined by the manufacturer and ETL. Construction shall be dependent on the structural application to minimize distortion and other defects. All seams, joints and penetrations of the hood enclosure to the lower outermost perimeter that directs and captures grease-laden vapor and exhaust gases shall have a liquid-tight continuous external weld in accordance with NFPA 96. Hood shall be wall type with a minimum of four connections for hanger rods. Corner hanging angles have a 5/8" x 1-1/2" slot pre-punched at the factory, allowing hanging rods to be used for quick and safe installation.
    - c. Ventilator shall be furnished with U.L. classified high efficiency stainless steel baffle filters, supplied in size and quantity as required by ventilator. The filters shall extend the full length of the hood and the filler panels shall not be more than 6" in width.
    - d. The hood manufacturer shall supply complete computer generated submittal drawings including hood sections view(s) and hood plan view(s). These drawings

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must be available to the engineer, architect and owner for their use in construction, operation and maintenance.

- e. Exhaust duct collar to be 4" high with 1" flange. Duct sizes, CFM and static pressure requirements shall be as shown on drawings. Static pressure requirements shall be precise and accurate; air velocity and volume information shall be accurate within 1-ft increments along the length of the ventilator.
- f. U.L. incandescent light fixtures and globes shall be installed and pre-wired to a junction box. The light fixtures shall be installed with a maximum of 4'0" spacing on center and allow up to a 100 watt standard light bulb.
- g. The hood shall have:
  - 1) A double wall insulated front to eliminate condensation and increase rigidity. The insulation shall have a flexural modulus of 475 EI, meet UL 181 requirements and be in accordance with NFPA 90A and 90B.
  - 2) An integral front baffle to direct grease laden vapors toward the exhaust filter bank.
  - 3) A built-in wiring chase provided for outlets and electrical controls on the hood face and shall not penetrate the capture area or require an external chaseway.
  - 4) Removable grease cup for easy cleaning.
  - 5) The hood shall be ETL Listed as "Exhaust Hood Without Exhaust Damper", ETL Sanitation Listed and built in accordance with NFPA 96. The hood shall be listed for 450°F cooking surfaces at 150 CFM/ft, 600°F cooking surfaces at 200 CFM/ft, and 700°F cooking surfaces at 250 CFM/ft. The hood shall be ETL Listed as "Exhaust Hood Without Exhaust Damper".
- h. Kitchen Hood Fire Suppression System:
  - 1) Furnish and install a hood fire suppression system of size, type and capacity as indicated. Unit shall be as manufactured by TYCO FIRE SUPPRESSION & BUILDING PRODUCTS, or approved equal.
  - 2) The basic system shall consist of an ANSUL® AUTOMAN® regulated release assembly which includes a regulated release mechanism and a wet chemical storage tank housed within a single enclosure. Nozzles, blow-off caps, detectors, cartridges, agent, fusible links, and pulley elbows shall be supplied in separate packages in the quantities needed for fire suppression system arrangements. Additional equipment shall include remote manual pull station, mechanical and electrical gas valves, pressure switches, and electrical switches for automatic equipment and gas line shut-off.
  - 3) Wet Chemical Agent: The extinguishing agent shall be a specially formulated, aqueous solution of organic salts with a pH range between 7.8 – 8.2, designed for flame knockdown and foam securement of grease related fires.
  - 4) Agent Tank: The agent tank shall be installed in a stainless steel enclosure or wall bracket. The tank shall be constructed of stainless steel. The tanks shall have a working pressure of 110 psi, a test pressure of 330 psi, and a minimum burst pressure of 600 psi. The tank shall include an adaptor/tube assembly containing a burst disc union.

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- 5) Regulated Release Mechanism: The regulated release mechanism shall be a spring-loaded, mechanical/pneumatic type capable of providing the expellant gas supply to one or two agent tanks depending on the capacity of the gas cartridge used. It shall contain a factory installed regulator deadset at 110 psi with an external relief of approximately 180 psi. It shall have the following actuation capabilities: automatic actuation by a fusible link detection system and remote manual actuation by a mechanical pull station. The regulated release mechanism shall contain a release assembly, regulator, expellant gas hose, and agent storage tank housed in a stainless steel enclosure with cover. The enclosure shall contain knock-outs for 1/2 in. conduit. The cover shall contain an opening for a visual status indicator. It shall be compatible with mechanical gas shut-off devices; or, when equipped with a field or factory-installed switch, it shall be compatible with electric gas line or appliance shutoff devices.
  - 6) Discharge Nozzles: Each discharge nozzle shall be tested and listed with the R-102 system for a specific application. Nozzles tips shall be stamped with the flow number designation (1/2, 1, 2, and 3). Each nozzle shall have a metal or rubber blow-off cap to keep the nozzle tip orifice free of cooking grease build-up.
  - 7) Distribution Piping: Distribution piping shall be Schedule 40 black iron, chrome-plated, or stainless steel pipe conforming to ASTM A120, A53, or A106.
  - 8) Detectors: The detectors shall be the fusible link style designed to separate at a specific temperature.
  - 9) Cartridges: The cartridge shall be a sealed steel pressure vessel containing either carbon dioxide or nitrogen gas. The cartridge seal shall be designed to be punctured by the releasing device supplying the required pressure to expel wet chemical agent from the storage tank.
  - 10) Agent Distribution Hose: Kitchen appliances manufactured with or resting on casters (wheels/rollers), which have the Fire Suppression System hard piped, shall include a UL Listed agent distribution hose as a component of the suppression system. This shall allow the appliance to be moved for cleaning purposes without disconnecting the appliance fire suppression protection. Hose assembly shall include a restraining cable kit to limit the appliance movement within the range (length) of the flexible hose.
  - 11) Flexible Conduit: The manufacturer supplying the Fire Suppression System shall offer flexible conduit as an option to rigid EMT conduit for the installation of pull stations and/or mechanical gas valves. The flexible conduit shall be UL Listed and include all approved components for proper installation.
  - 12) Pull Station Assembly: The Fire Suppression System shall include a remote pull station for manual system actuation. The pull station shall be designed to include a built-in guard to protect the pull handle. The pull station shall also be designed with a pull handle to allow for three finger operation and shall be red in color for quick visibility.
- i. Kitchen Exhaust Fan:
- 1) Construction:

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- a) **Housing:** The fan windband shall be constructed of heavy gauge aluminum. Horizontal and vertical internal supports shall be used to securely fasten the windband to the discharge apron to provide rigidity for hinging and added strength to reduce shipping damage. The discharge apron shall have a rolled bead for added strength.
- b) **Base:** The base shall be constructed of galvanized steel for improved rigidity. Base corners shall be welded to provide strength and support for hinging and cleaning and to prevent leakage into the building.
- c) **Wheel:** The fan wheel shall be centrifugal backward inclined and non-overloading. Wheels shall be balanced in two planes and done in accordance with AMCA standard 204-96, Balance Quality and Vibration Levels for Fans. The wheel blades shall be aerodynamically designed to minimize turbulence, increase efficiency and reduce noise. The wheel blades shall be welded to the wheel inlet cone. In the event that balancing weights are required they shall be riveted to the blades or wheel. The wheel inlet shall overlap the fan base inlet for maximum performance and efficiency. The wheel shall be firmly attached to the motor shaft with two set screws.
- d) **Motor & Motor Compartment:** Motors shall be heavy duty ball bearing type, mounted out of the airstream and furnished at the specified voltage, phase and enclosure. Motor mounting plate shall be constructed of heavy gauge galvanized steel and isolated from the fan structure with vibration isolators. The motor compartment shall be cooled by outside air drawn through an extruded aluminum conduit tube. To seal the conduit tube passage and prevent noise silicone rubber grommets shall isolate the conduit tube from the fan housing. The motor compartment shall be of a two-piece construction with the top cap having quick release clips to provide quick and easy access to the motor compartment.
- e) **Shaft & Bearings:** Shafts shall be precision ground and polished. Heavy duty, pre-lubricated bearings shall be selected for a minimum (L50) life in excess of 200,000 hours of operation at maximum cataloged operating speed. They shall be designed for and individually tested specifically for use in air handling applications.
- f) **Belts & Drives:** Belts shall be oil and heat resistant, non-static type. Drives shall be cast type, precision machined and keyed and secured attached to the fan and motor shafts. Drives shall be sized for a minimum of 150% of the installed motor horsepower. Fan operating speed shall be factory set using adjustable pitch motor pulleys.
- g) **Grease Spout:** A grease spout made of aluminum tubing shall be welded to the fan housing. The weld shall be factory tested to ensure it will not leak.
- h) **Nylon Washers:** To provide a tight seal all fasteners in the fan housing shall be backed with nylon washers.
- i) **Safety Disconnect Switch:** A safety disconnect switch shall be standard on all NCA-HPFA units with open drip proof motors. Switches shall be installed in a NEMA3R enclosure and mounted to exterior of windband for easy access.

j. Kitchen Make-up Air Unit:

- 1) Furnish and install make-up air unit of size, type and capacity indicated. Unit shall be as manufactured by CAPTIVEAIRE or approved equal.
- 2) Construction: Unit housing shall be constructed of 20 Gauge G-90 galvanized steel. The wall panels and roof panels shall be fabricated by forming double-standing, self-locking seams that require no additional support. The floor and wall panels shall be caulked air tight with a silicone caulk. All casing panels shall be attached with sheet-metal, screws or rivets which can be removed to field service large components. The unit base shall be suitable for curb or flat mount. Housing construction should be suitable for outdoor or indoor installation. An observation port shall be located on the exterior of the unit for observation of the main flame and pilot flame. All controls, gas valves, modulating controls and electrical components shall be mounted within the, burner vestibule. The burner vestibule shall be an integral part of the unit and not extend outside the exterior casing of the unit and not exposed to the main air stream. The vestibule full-size door shall provide easy access to controls and gas-train components. Blower door shall provide easy access to blower, motor and drives. Access doors shall be provided on both front and back side of unit providing full access to every part of the unit.
- 3) Base: The base shall be constructed of galvanized steel for improved rigidity. Base shall be structurally reinforced to accommodate the blower assembly and burner.
- 4) Blower: Blower shall be forward-curved, centrifugal double width, double inlet, constructed G-90 galvanized steel. Unit shall have a heavy-duty, solid-steel shaft. Wheels shall be balanced in two planes and done in accordance with AMCA standard 204-96, *Balance Quality and Vibration Levels for Fans*. The wheel blades shall be aerodynamically designed to minimize turbulence, increase efficiency and reduce noise. The wheel blades shall be securely attached to the wheel inlet ring. The wheel shall be firmly attached to the fan shaft with set screws and keys. The blower assembly shall be isolated from the fan structure with vibration isolators.
- 5) Motor and Motor Compartment: Motors shall be heavy duty ball bearing type and furnished at the specified voltage, phase and enclosure. Motor mounting plate shall be constructed of heavy gauge galvanized steel and shall be designed to provide easy adjustment of belt tension.
- 6) Shaft & Bearings: Shafts shall be precision ground and polished. Heavy duty, pre-lubricated bearings shall be selected for a minimum (L50) life in excess of 200,000 hours of operation at maximum cataloged operating speed. They shall be designed for, and individually tested specifically for use in air handling applications.
- 7) Belts & Drives: Belts shall be oil and heat resistant, non-static, grip-notch type. Drives shall be cast type, precision machined and keyed and secured attached to the fan and motor shafts. Fan operating speed shall be factory set using adjustable pitch motor pulleys. Blower Drives shall be fully adjustable. All drives shall be a minimum of 2 groove.
- 8) Filters: The filter rack shall have 2" filters.

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- 9) Burner:
- a) The burner shall have non-clogging, 4302B stainless-steel combustion baffles attached to a ductile aluminum gas-supply section with no moving parts to wear out or fail. The burner shall be capable of 92% combustion efficiency with a maximum turndown ratio of 15 to 1.
  - b) The gas burner shall be, furnished with a pilot package arranged so that the pilot flame lights the burner with instantaneous ignition. Pilot assembly includes a flame rod, spark rod and pilot—automatically ignited by a 6,000 volt ignition transformer. A flame-rod rectification system shall be used to prove pilot and main flame.
  - c) Rear access doors or a removable lid will provide complete access to burner and pilot assembly.
  - d) Burner profile plates shall be self-adjusting to operate across the complete CFM range of each model heater.
- 10) Gas Equipment:
- a) Standard: All gas equipment shall conform to local-Code requirements.
  - b) Components:
    - (i) Pilot-gas shut-off valve
    - (ii) Pilot-gas regulator
    - (iii) Pilot-gas valve
    - (iv) Main-gas shut-off valve
    - (v) Main-gas regulator
    - (vi) Two solenoid valves
    - (vii) Modulating-gas valve
    - (viii) Burner
- 11) All gas manifold components shall be piped and wired at the factory.
- 12) Safety Controls Standard:
- a) Motor starter with adjustable overloads
  - b) Air-flow safety switch
  - c) Electronic flame-safety relay
  - d) High-temperature limit switch
  - e) Main-gas regulator
  - f) Two solenoid valves
  - g) Modulating-gas valve
  - h) Burner
  - i) Adjustable burner ON/OFF inlet air ductstat to shut off burner when inlet air is sufficiently warm to maintain space temperature.
  - j) Non-fused disconnect
  - k) Casing insulation shall be 1" x 1.5# density with a foil face.
  - l) Outside Air Hood: The Perforated Supply Plenum (PSP) shall provide make-up air through perforated stainless steel panels. All seams shall

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be welded and have stainless steel on exposed surfaces. Unexposed surfaces shall be constructed of aluminized steel. Perforated diffuser plates shall be included in the design and to provide even air distribution and the plenum shall be insulated to prevent condensation.

- m) Roof Curb: Roof curb shall be constructed of galvanized steel. Curb shall be fully gasketed between the curb top and unit bottom with the curb providing full perimeter support, cross structure support and air seal for the unit.
- 13) Controls: The following control option shall be provided by the manufacturer's unit mounted controls. Refer to Specification Section 230900 for control points that shall be available to the DDC controls.
- a) The Electrical Package, typically FP, is designed to thermostatically activate the exhaust fans for an exhaust hood whenever elevated temperatures are sensed in the exhaust system. This shall meet the requirements of IMC 507.2.1.1 by providing a thermostat(s) mounted in the duct or hood riser to sense increased exhaust temperatures. Controls shall be listed by ETL (UL 508A). The control enclosure shall be NEMA 1 rated and listed for installation inside of the exhaust hood utility cabinet. The control enclosure may be constructed of stainless steel or painted steel.
  - b) Temperature probes(s) located in the duct riser shall be constructed of Stainless Steel. The thermostat is factory set at an activation temperature of 85 degrees. Once the exhaust temperature reaches the set-point, then contacts will be closed and the exhaust fans will be activated. The controls also provide hysteresis to prevent cycling of the fans after the cooking appliances have been turned off and the heat in the exhaust system is reduced. The hysteresis is factory set 2 degrees and will keep the exhaust running until the temperature falls 2 degrees below the activation set point. The activation and hysteresis settings may be field adjusted on the temperature controller inside the control enclosure to meet actual operating conditions. The panel is factory pre-wired to shut down supply fans in a fire condition. There is also a factory pre-wire option to turn the exhaust fans on in a fire condition (if required).

## 2.8 VIBRATION ISOLATION

### A. Vibration Isolators:

1. Mechanical equipment indicated below shall be isolated from the structure by resilient vibration and noise isolators. Equipment to be isolated includes unit heaters, horizontal split system heat pump indoor unit ..... Minimum deflection shall be 1".
  - a. Hangers shall be pre-compressed and locked at the rated deflection by means of a resilient upstop to keep the equipment at a fixed elevation during installation. The hangers shall be designed with a release mechanism to free the spring after the

installation is complete and the hanger is subjected to its full load. Deflection shall be clearly indicated by means of a scale. Submittals shall include a drawing of the hanger showing the 30° capability. Hangers shall be type PC30N as manufactured by Mason Industries, Inc. or equal.

Springs shall be seated in a steel washer reinforced neoprene cup that has a neoprene bushing projecting through the bottom hole to prevent rod to hanger contact. Spring diameters and the lower hole sizes shall be large enough to allow the hanger rod to swing through a 30° arc from side to side before contacting the cup bushing.

## 2.9 MEASUREMENT AND CONTROL

### A. Low Voltage Condensate Overflow Shut-off Switch

1. Low voltage condensate overflow shut-off switches shall be installed on all condensate drain pans as manufactured by RECTORSEAL approved equal.
2. The condensate shut-off switch shall detect rising water in condensate drain pans and interrupts the thermostat circuit to shut off the unit before flooding occurs. The device shall be installed on the primary drain pan rim with a two-piece clamp system that does not require drilling.
3. Mechanical equipment without adequate pan clearance to install a primary drain pan switch shall provide a switch installed on the primary drain pan outlet. The condensate shut-off switch shall detect downstream clogs in condensate drains and interrupts the thermostat circuit to shut off the unit before flooding occurs
4. The switch shall incorporate a high capacity 5-amp, 24-volt AC magnetic float switch in a fully housed protective cover. The housing shall include a pull up test knob for functional testing of system.
5. The switch shall include an alarm wire to connect to the BAS. The switch shall send an alarm signal to the BAS frontend workstation. The mechanical contractor shall be responsible for coordinating the switch connections with the controls contractor.
6. The switch shall be UL Listed to comply with UL 508.

### B. Air Purification System

1. This section describes the design, performance and installation of an air purification system intended for use as part of another manufacturer's air handling unit or mounted on the duct as shown on the plans, details and equipment schedules.
2. The air purification system(s) shall be of the size, type, arrangement and capacity indicated and required by the unit furnished and manufactured by GLOBAL PLASMA SOLUTIONS model GPS-FC AND GPS-Ibar, AMERICAN ION, ACTIVE AIR SOLUTIONS, or approved equal.
3. Each piece of air handling equipment, so designated on the plans, details, equipment schedules and/or specifications shall contain a Plasma Generator with Bi-polar Ionization output as described here within.
4. The Bi-polar Ionization system shall be capable of:



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- a. Effectively killing microorganisms downstream of the bi-polar ionization equipment (mold, bacteria, virus, etc.).
  - b. Controlling gas phase contaminants generated from human occupants, building structure and furnishings.
  - c. Capable of reducing static space charges.
  - d. All manufacturers shall provide documentation by an independent NELEC accredited laboratory that proves the product has minimum kill rates for the following pathogens given the allotted time and in a space condition:
    - 1) MRSA - >96% in 30 minutes or less
    - 2) E.coli - > 99% in 15 minutes or less
    - 3) TB - > 69% in 60 minutes or less
    - 4) C. diff - >86% in 30 minutes or less
  - e. The ionization device shall be designed such that it may fit into any scheduled mounting configuration. The ionization device shall be powered from the control board without having to require revised fusing.
  - f. The bi-polar ionization system shall operate in a manner such that equal amounts of positive and negative ions are produced. Uni-polar ion devices shall not be acceptable.
  - g. Humidity: Plasma Generators shall not require preheat protection when the relative humidity of the entering air exceeds 85%. Relative humidity from 0 - 100%, condensing, shall not cause damage, deterioration or dangerous conditions within the air purification system. Air purification system shall be capable of wash down duty.
5. Ionization Requirements:
- a. The Bi-polar ionization system shall consist of Bi-Polar Plasma Generator and integral power supply. The Bi-polar system shall be installed where indicated on the plans or specified to be installed. The device shall be capable of being powered by 18VAC, 24VAC, 110VAC or 200VAC to 240VAC without the use of an external transformer. Ionization systems requiring isolation transformers shall not be acceptable.
  - b. Ionization Output: The ionization output shall be controlled such that an equal number of positive and negative ions are produced. Imbalanced levels shall not be acceptable. An LED indicator shall be provided to prove ion output is activated.
  - c. Ionization output from each electrode shall be a minimum of 200 million ions/cc when tested at 2" from the ionization generator.
6. Ozone Generation:
- a. The operation of the electrodes or Bi-polar ionization units shall conform to UL 867-2007 and UL 2988 with respect to ozone generation. There shall be no detectable ozone generation during any operating condition, with or without airflow.
7. Electrical Requirements:
- a. Wiring, conduit and junction boxes shall be installed within housing plenums in accordance with NEC NFPA 70. Plasma Generator shall accept an electrical service of 24VAC, 115 VAC or 200-240VAC, 1 phase, 50/60 Hz. The contractor shall

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coordinate electrical requirements with air purification manufacturer during submittals.

8. Control Requirements:

- a. All Plasma Generators shall have internal short circuit protection, overload protection, and automatic fault reset.
- b. The installing contractor shall mount and wire the Plasma device within the air handling unit specified or as shown on the plans. The contractor shall follow all manufacturer IOM instructions during installation.
- c. A control relay shall be provided to sense the ion output and indicate to the BAS via dry-contacts that the ion output is functioning normally. NO and NC contacts shall be available to the BAS system for ease of integration.
  - 1) Each piece of air handling equipment, so designated on the plans, details, equipment schedules and/or specifications shall contain a Plasma Detector with integral BAS contacts.
  - 2) The Plasma Detector sensor shall be designed to these minimum standards:
    - a) Ability to detect both positive and negative ion levels from 1,000 ions/cc to 20 million ions/cc minimum. Detection limit shall be field adjustable based on sensor mounting location and manufacturer being sensed.
    - b) Plasma detector shall have integral dry alarm contacts for connection to the BAS to prove the ion system is operating properly and the ion system output is above the minimum preset threshold from the sensor manufacturer. The alarm shall activate when either positive or negative ion output drops below the preset setpoint. Cold plasma systems only providing indication the input power is applied or output power is present shall not be acceptable. The independent cold plasma detector shall be capable of working with any air purification manufacturer's system.
    - c) Cold plasma detector shall have an input voltage of 12VDC, 24VDC or 24VAC user selectable.
    - d) Cold plasma detector shall be capable of duct mounting or integral air stream mounting.
    - e) Housing shall be constructed of fire-retardant ABS plastic.
    - f) Temperature and humidity shall have no effect on the cold plasma detector output accuracy.
    - g) The alarm output shall be provided with NO, NC and C terminals for ease of integration to the BAS. The contacts shall be rated for up to 5 amps at 230VAC or up to 24VDC at 2 amps.
    - h) A BACnet or LonWorks control interface shall be provided by the cold plasma detector manufacturer.

9. GPS-IBAR Equipment Requirements:

- a. Electrode Specifications (Bi-polar Ionization):

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- 1) Each Plasma Generator with Bi-polar Ionization output shall include the required number of electrodes and power generators sized to the air handling equipment capacity. A minimum of sixteen 316 medical grade stainless steel ion needles per foot of coil face width shall be provided. Bi-polar ionization tubes manufactured of glass and steel mesh shall not be acceptable due to replacement requirements, maintenance, and performance output reduction over time, ozone production and corrosion.
  - 2) Electrodes shall be energized when the main unit disconnect is turned on and the fan is operating.
- b. Air Handler Mounted Units:
- 1) Where so indicated on the plans and/or schedules Plasma Generator(s) shall be supplied and installed. The mechanical contractor shall mount the Plasma Generator and wire it to the remote mount power supply using the high voltage cables provided by the air purification manufacturer. An 115VAC or 230VAC circuit shall be provided to the ion generator power supply panel. Each ion generator shall be designed with an aluminum casing, integral grounding connection and high voltage quick connector.
10. GPS-FC Equipment Requirements:
- a. Electrode Specifications (Bi-polar Ionization):
- 1) Each Plasma Generator with Bi-polar Ionization output shall include the required number of electrodes and power generators sized to the air handling equipment capacity. A minimum of one electrode pair per 1,200 CFM (2,039 m<sup>3</sup>/h) of air flow shall be provided. Bi-polar ionization tubes manufactured of glass and steel mesh shall not be acceptable due to replacement requirements, maintenance, performance output reduction over time, ozone production and corrosion.
  - 2) Electrodes shall be energized when the main unit disconnect is turned on and the fan is operating. Ionization systems requiring the use of a mechanical air pressure switch to cycle the electrodes only when the fan is operating shall not be acceptable due to high failure rates and pressure sensitivity.
11. GPS-DM48-AC Equipment Requirements:
- a. Electrode Specifications (Bi-polar Ionization):
- 1) Each Plasma Generator with Bi-polar Ionization output shall include the required number of electrodes and power generators sized to the air handling equipment capacity. A minimum of one electrode pair per 4,800 CFM of air flow shall be provided. Bi-polar ionization tubes manufactured of glass and steel mesh shall not be acceptable due to replacement requirements, maintenance, performance output reduction over time, ozone production and corrosion. Plasma generators using recessed metal needles shall not be permitted due to output reduction and corrosion over time.

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- 2) Electrodes shall be energized when the main unit disconnect is turned on and the fan is operating. Electrodes shall be made from carbon fiber to prevent oxidation over time. Internal circuitry shall be provided to sense air flow across the electrode output. Ionization systems requiring the use of a mechanical air pressure switch to cycle the electrodes only when the fan is operating shall not be acceptable due to high failure rates and pressure sensitivity.
- 3) Electrode pair shall provide a minimum of 200 million ions per cubic centimeter as measured at 2 inches, both positive and negative ions, in equal quantities. Devices providing less than 200 million ions/cc per electrode pair shall not be acceptable.
- 4) Each Plasma Generator shall be provided with a self-cleaning system that is field programmable to change the number of days between the cleaning cycle. Systems without a no-maintenance, self-cleaning system shall not be acceptable.
- 5) Each electrode pair shall be designed with a banana style plug such that it can be field replaced if necessary.
- 6) Each Plasma Generator shall be provided with a weather proof housing that shall allow the unit to be mounted inside or outside and provide a clear cover to view the plasma generator without having to open the housing. The housing shall be provided with a 3/4 turn locking mechanism to allow the plasma generator to be removed for inspection without tools. The manufacturer shall provide a gasket that mounts between the housing and the duct as well as between the plasma generator and the weather-proof housing.

### PART 3 - EXECUTION

#### 3.1 TESTS

- A. Refer to Section 230593 "Testing, Adjusting and Balancing" for related requirements.
- B. At his discretion, the Owner shall be represented at all tests. Contractor shall provide 48 hours' notice to the Owner prior to the tests unless otherwise specified.
- C. Refrigerant piping shall be tested with dry nitrogen and trace of refrigerant at test pressures recommended by equipment manufacturer. After system has been proven tight under test pressure, it shall be evacuated to a pressure 2.5 mm Hg absolute. The refrigerant compressor shall not be used for evacuating the system. Vacuum shall be checked by use of a mercury manometer.
- D. Test all gas piping at 50 psig with oil-free compressed air for 2 hours with no loss in pressure.

END OF SECTION 230500

SECTION 230593 - TESTING, ADJUSTING AND BALANCING (TAB)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections and Section 230100 "Mechanical General Provisions" apply to this Section.

1.2 SCOPE OF WORK

- A. The General Contractor shall obtain the services of an independent testing and balancing agency whose business is limited to testing, adjusting and balancing and shall be certified by AABC (or NEBB). Agency shall have been in the TAB business for a minimum of 5 years. The TAB (Testing, Adjusting and Balancing) Agency shall be a direct subcontractor of the General Contractor and not affiliated in any way with the Mechanical Contractor.
- B. Testing and balancing shall be performed in accordance with National Standards for Testing and Balancing Heating, Ventilating and Air-conditioning Systems, 2002, as published by Associated Air Balance Council (AABC).
- C. All work shall be performed under the direct supervision of a certified TAB Engineer. All other personnel shall be regular full-time employees of the TAB Agency.
- D. Test and Balance Agency shall submit within 30 days after receipt of construction contract two copies of qualifications, including current TAB Engineer's certificate and National Project Certification Performance Guaranty.
- E. TAB work shall not commence until all components of the HVAC system have been installed completely, including all power wiring and controls and all equipment has been started and run tested in each mode of operation. Should any items be found incomplete at the time that TAB work is performed, the TAB Agency shall immediately notify the General Contractor and Owner's Representative of any deficiencies found. The General Contractor shall be responsible for correcting reported deficiencies and verifying that the system is 100% complete, operable and ready for TAB work to proceed.

PART 2 - PRODUCTS

2.1 MATERIAL AND EQUIPMENT

- A. Provide all necessary instrumentation required to measure and adjust the HVAC air systems.

- B. Equipment and instruments shall be of types approved by the Owner's Representative and/or manufacturers of devices installed.
- C. Instruments used for testing and balancing of air systems shall have calibration verified within a period of 12 months prior to balancing.

### PART 3 - EXECUTION

#### 3.1 GENERAL, MECHANICAL AND ELECTRICAL CONTRACTOR'S RESPONSIBILITY

- A. The General Contractor shall be responsible for directing the Mechanical and Electrical Contractors to fulfill the Contractors' Responsibility for Testing, Adjusting and Balancing as required in Section 230100. TAB work shall not commence until the conditions of paragraph 1.2.E of this Section and all requirements of Section 230100 for TAB have been completed.

#### 3.2 TAB AGENCY'S RESPONSIBILITY

- A. Carefully review the drawings and Specifications for the various systems noting all facilities incorporated in the design for purposes of adjusting and balancing. Should it be deemed necessary to provide additional dampers, baffles, valves, or other devices which would aid in the required adjusting and balancing, same shall be provided by the installing contractor.
- B. The TAB Agency shall report any and all deficiencies that prohibit adjusting and balancing in accordance with the Contract Documents to the Contractor and the Owner's Representative.
- C. Adjust all duct and equipment, including valves, controls, dampers, etc., to properly perform to  $\pm 10\%$  of their respective design quantities of flow.
- D. Determination of the air volumes shall be made by pitot tube and differential draft gauge for all supply, return, outdoor air and exhaust air ducts. Openings for pitot traverses shall be provided as required and shall be fitted with neat removable plugs or covers. Air quantities at grilles, registers, diffusers, etc., shall be measured as recommended by the various manufacturers of the outlets.
  - 1. VAV boxes shall be balanced in a manner that assures the design primary airflow is delivered to the VAV box at maximum and minimum air flow. The manufacturer provided flow measurement device may or may not be accurate due to upstream duct conditions. (see 3.2.H.7 for reporting requirements)
- E. The Test and Balance Agency shall perform the following:
  - 1. Adjust fan RPM, tighten and align fan belts, measure operating amps.
  - 2. Adjust volume dampers to obtain designed air volume.
  - 3. Adjust grilles, diffusers and registers to obtain designed airflow and air pattern.
  - 4. Adjust each air handler to obtain designed airflow.
  - 5. Adjust dampers to provide design outside air quantities.

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6. Adjust airflow exhausted from and supplied to hoods.
  7. In cooperation with the ATC Contractor's representative, setting adjustments of automatically controlled dampers to operate as specified. The TAB Agency shall inform ATC Contractor of all abnormalities in sequencing and/or calibration of components discovered during balancing.
  8. Final settings of dampers and valves shall be permanently marked. Where provided, memory stops and locking devices shall be adjusted and locked to the final setting.
- F. Before the work is offered for Final Acceptance, all equipment shall be run through a test to demonstrate that it has been adjusted to meet the requirements of the drawings and Specifications. Copies of the test and adjustment data shall be submitted in a report to the Owner's Representative prior to final inspection.
- G. The TAB Report shall include a General Comments section providing an overview of systems operation, observations of system installation abnormalities and deficiencies, problems encountered, etc. If required, provide explanation of methods of measurement and disparity between measured and design quantities.
- H. Test and Balance Agency Report shall include the following data for each system. All sheets shall be neatly typed. Balancing Agency shall submit with his report a set of neatly marked plans identifying location of each piece of equipment, air terminal, flow measuring device and points of traverse. Report all measured quantities and design quantities where applicable.
1. CFM of each supply, return, exhaust grille and diffuser.
  2. RPM and CFM of each fan.
  3. Supply, return and outdoor air CFM of each AHU and fan terminal unit where required.
  4. Air pressure drop across A/C unit cooling coils.
  5. Air pressure drop across each filter bank.
  6. Discharge and suction static pressure of each fan.
  7. Maximum and minimum differential pressure and corresponding CFM of each terminal box.
  8. Voltage rating and operating volts of each fan motor. For fan motors requiring three-phase power, record voltage of each individual phased leg and check for voltage imbalance.
  9. CFM of each exhaust hood.
  10. Temperatures for each air handling unit at maximum capacity including the following measurements:
    - a. Entering and Leaving air temperature at each coil.
  11. Air Handling unit is defined as any equipment that consists of a fan and coil, including split systems, rooftop units, and vertical classroom unit ventilators.
  12. Nameplate data of each piece of HVAC equipment installed.
- I. During the Final Inspection, the Agency shall have present all necessary instrumentation and an individual to make readings of select information which was submitted in the balance report. The select readings shall be made where directed by and in the presence of the Owner's Representative and shall not deviate more than 5% from the values submitted in the report.

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- J. The Owner's Representative may select no more than 20% of all reported data for rechecking. If more than 20% of data verified is not within  $\pm 5\%$  of submitted data, the Owner's Representative may void entire report and ask for complete rebalancing. The field check shall be made within 45 days of approved TAB submittal.

END OF SECTION 230593



SECTION 230700 - MECHANICAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections and Section 230100 "Mechanical General Provisions" apply to this Section.

1.2 SUBMITTALS

- A. Submit manufacturers' data on all insulation products, schedule which indicates where each product is to be used and thickness of each product.

1.3 WARRANTY-GUARANTEE

- A. Contractor shall furnish written warranty, countersigned and guaranteed by the General Contractor, stating that work executed under this Section of the Specifications shall be free from defects of materials and workmanship for a period of 12 months from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 INSULATION – GENERAL

- A. All insulation shall have a composite (insulation, jacket or facing and adhesive used to adhere the facing or jacket to the insulation) fire and smoke rating as requested by ASTM E84, NFPA 255 and UL 723, not exceeding:

Flame spread	25
Smoke developed	50

- B. Accessories, such as adhesive, mastics, cements, tapes and fire-resistant cloth for fittings, shall have same fire and smoke ratings as components listed above.
- C. Installation of insulation shall be accomplished in strict accordance with manufacturer's recommendations and shall be CERTAINTED, OWENS-CORNING, JOHNS MANVILLE or KNAUF INSULATION for glass fiber insulation; ARMACELL for flexible unicellular insulation.

2.2 PIPE INSULATION

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- A. Glass fiber insulation having a thermal conductivity not greater than 0.24 Btu x in./hr. x sq. ft. x °F in a mean temperature of 75°F. Insulation shall have factory-applied all-purpose jacket.
- B. Flexible unicellular insulation having a thermal conductivity not greater than 0.27 Btu x in./hr. x sq. ft. x °F in a mean temperature of 75°F.

2.3 DUCT INSULATION

- A. Blanket Type within the conditioned space: Glass fiber, ¾-lbs/cu. ft., foil faced, vapor-sealed flexible duct insulation. Thermal conductivity shall not exceed 0.29 Btu x in./hr. x sq. ft. x °F.
- B. Board Type within the conditioned space: Glass fiber, 3.0-lbs./cu. ft., foil faced, vapor-sealed board insulation. Thermal conductivity shall not exceed 0.23 Btu x in./hr. x sq. ft. x °F.

2.4 DUCT LINER (inside the conditioned space)

- A. 2" thickness glass fiber insulation as manufactured by JOHNS MANVILLE, LINACOUSTIC RC™. Insulation shall conform to the physical properties and requirements of ASTM C1071. Insulation shall be installed in strict accordance with the manufacturer's instructions.
  - 1. Glass fiber, 3.0-lbs./cu.ft., insulation having a thermal conductivity not greater than 0.24 Btu x in./hr. x sq. ft. x °F at a mean temperature of 75°F. Insulation shall be factory applied. Insulation shall have a composite fire and smoke rating as required by ASTM E84, UL 723 and NFPA 255, not exceeding 25 flame-spread and 50 smoke developed.
  - 2. Insulation shall be coated with an EPA-registered immobilized anti-microbial agent which shall effectively resist the growth of bacteria and fungi as proven by tests in accordance with ASTM G21 and G22. Insulation shall be rated for a maximum air velocity of 5,000 fpm when tested per UL 181, Section 17, with no fiber shedding. Edge coating shall be accomplished using Permacote SuperSeal and shall meet all the performance requirements of the insulation.

2.5 DUCT LINER (Outside Building)

- A. 3" thickness glass fiber insulation as manufactured by JOHNS MANVILLE, LINACOUSTIC RC™. Insulation shall conform to the physical properties and requirements of ASTM C1071. Insulation shall be installed in strict accordance with the manufacturer's instructions.
  - 1. Glass fiber, 3.0-lbs./cu.ft., insulation having a thermal conductivity not greater than 0.12 Btu x in./hr. x sq. ft. x °F at a mean temperature of 75°F. Insulation shall be factory applied. Insulation shall have a composite fire and smoke rating as required by ASTM E84, UL 723 and NFPA 255, not exceeding 25 flame spread and 50 smoke developed.
  - 2. Insulation shall be coated with an EPA-registered immobilized anti-microbial agent which shall effectively resist the growth of bacteria and fungi as proven by tests in accordance with ASTM G21 and G22. Insulation shall be rated for a maximum air velocity of 5,000 fpm when tested per UL 181, Section 17, with no fiber shedding. Edge

coating shall be accomplished using Permacote SuperSeal and shall meet all the performance requirements of the insulation.

## 2.6 INSULATED DUCT COATING

- A. Provide insulated duct coating on all exterior galvanized sheet metal ductwork, POLAR SEAL, ASTEC, or approved equal.
  - 1. Water based acrylic plastic primer “prime security” shall provide 100% adhesion to substrate, stop oil migration and set base for waterproof membrane “top security”.
  - 2. Water-based acrylic plastic waterproof membrane “top security” with bright white reflective heat shield consisting of a high concentrate of titanium dioxide to reflect ultraviolet rays.
  - 3. Membrane “top security” shall be non-chalking, mildew and fungus resistant and crack resistant.
  - 4. Membrane “top security” shall be capable of withstanding sub-zero and extreme heat conditions without degradation. Membrane shall not shrink or become brittle because of age. Membrane shall be resistant to environmental pollution and other chemicals, such as ammonia, chlorine, insecticides, herbicides and other common airborne chemicals.

## 2.7 SELF-ADHESIVE, FIELD-APPLIED, OUTDOOR JACKETS

- A. Subject to compliance with requirements, provide self-adhesive outdoor jacket by POLYGUARD PRODUCTS INC., 3M, MFM BUILDING PRODUCTS CORP., or approved equal.
- B. Outdoor jacker shall consist of a laminated vapor barrier and waterproofing membrane with perm rating 0.00 perm, when tested according to ASTM 96/E 96M, for installation over either fiberglass or foam board insulation located above ground outdoors. System shall consist of a foil polymer laminated film with a coating of rubberized bituminous compound or acrylic adhesive that allows membrane to self-adhere to the substrate.
- C. Composite membrane shall consist of a multi-ply embossed UV resistant aluminum foil/polymer laminate to which is applied a layer of rubberized asphalt and shall have the following characteristics:
  - 1. Membrane Thickness: 59 mils
  - 2. Solar Reflectance, CRRC Initial Rating: 0.86
  - 3. Solar Reflectance, CRRC 3-year Rating: 0.77
  - 4. Thermal Emittance, CRRC Initial Rating: 0.82
  - 5. Thermal Emittance, CRRC 3-Year Rating: 0.86

## 2.8 ALUMINUM PIPE JACKETS

- A. Aluminum jacket shall be .016" thick (28 ga.) smooth aluminum sized to provide a minimum 2" self-gauging overlap longitudinal and circumferentially, minimum 3/4" by .015" thick (30 ga.) draw bands. Jacket shall be supplied with a factory-applied polykraft moisture barrier. CHILDERS PRODUCTS COMPANY, STRAP-ON JACKETING.

- B. Provide fitting covers of same material as jacket and of same manufacturer.

## 2.9 PVC PIPE JACKET FITTING COVERS

- A. One-piece molded-type PVC plastic fitting covers and jacketing material, color matching JOHNS MANVILLE Zeston 2000, or approved equal.
- B. Connections shall be made using pressure-sensitive color matching vinyl tape.

## 2.10 FIRE WRAP

- A. Acceptable Manufacturer: THERMAL CERAMICS: 2102 Old Savannah Rd., Augusta, GA 30906; or approved equal.
- B. Thermal Material: 2000°F rated core blanket, manufactured from patented bio-soluble Superwool chemistry (Calcium Magnesium Silicate).

- 1. Product: FireMaster FastWrap XL as manufactured by THERMAL CERAMICS.

- a. For commercial, kitchen hood exhaust ductwork: Insulation enclosure system tested and classified by UL (HNKT G18) to provide zero clearance to combustible construction and 2-hour fire rating per ASTM E 2336.

- 2. Fully encapsulated thermal material in fiberglass reinforced aluminum/polypropylene scrim.

- a. Encapsulation material marked with UL Classification Mark.
- b. Encapsulation material marked with ICC-ES report number ESR 2213.
- c. Collars supplied in 6-inch (150 mm) wide by 25 feet (7620 mm) long rolls.

- 3. Product Characteristics:

- a. Thickness: 1-1/2" ((38 mm).
- b. Nominal Density: of 6 pcf
- c. R-Value: 7.35 per layer of FireMaster Fast Wrap XL when tested in accordance with ASTM C518.
- d. Flame Spread: <25 when tested in accordance with ASTM E 84.
- e. Smoke Development: <50 when tested in accordance with ASTM E 84.

- C. Accessory Materials:

- 1. Glass Filament Tape: Minimum 3/4 inch (19 mm) wide – used to temporarily secure blanket until permanent attachment using steel banding and/or steel insulation pins.
- 2. Aluminum foil Tape: Minimum 3 inches (76mm) used to seal cut edges.
- 3. Carbon Steel or Stainless Strapping Material Minimum: 1/2 inch (13 mm) wide and 0.015 inch (.38 mm) thick.

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4. Steel Insulation Pins: Minimum 12-gauge, length sufficient to penetrate through duct wrap insulation.
5. Insulation Clips: Galvanized steel, minimum 1-1/2 inches (38 mm) round or square.
6. Through Penetration Firestop Sealants:
  - a. Packing Material: Remove encapsulation material from FastWrap XL, use core blanket (white) as penetration packing material.
  - b. Firestop sealants per applicable building code report and/or laboratory design listings.
7. Grease Duct Access Doors:
  - a. Field fabricated access doors per Thermal Ceramics installation instructions.
  - b. Ductmate F2-HT Doors (NFPA 96 Compliant, tested with FireMaster FastWrap XL per ASTM E 2336)
  - c. Ductmate Ultimate Door (NFPA 96 Compliant, UL Listed per UL 1978, tested with FireMaster FastWrap XL per ASTM E 2336)
  - d. FireMaster Ductmate F2-HT-XL3 Access doors are supplied as a complete installation with DuctMate F2-HT Door and 3 layers of FastWrap XL insulation installed as tested in accordance with ASTM E 2336. Supplied in standard door sizes of 6 by10 inches (152 mm x 254 mm), 8 by12 inches (203 mm x 305 mm), 12 by16 inches (305 mm x 406 mm) and 14 by18 inches (356 mm x 457 mm).

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Insulation shall be installed by a licensed applicator and in strict accordance with the manufacturer's instructions. Deliver all materials to the job site and store in a safe, dry place. Use all means necessary at the job site to protect materials from dust, dirt, moisture and physical abuse before and during installation. Insulation that becomes damaged prior to installation shall not be installed and shall be removed from the job site. Insulation that becomes wet or damaged after installation shall be removed and disposed of and replaced with new insulation.
- B. Surfaces to be insulated shall be cleaned free of dirt, scale, moisture, oil and grease prior to installation of the insulation.

#### 3.2 PIPING (GLASS FIBER INSULATION, UNLESS OTHERWISE NOTED)

- A. Schedule:

Refrigerant Suction Piping:

1" thickness flexible unicellular for pipe sizes up to 1-1/2" and 1-1/2" thickness for pipe sizes over 1-1/2".

Condensate Drain Above Floor: 1/2" Thickness

- B. Fittings on insulated piping smaller than 4" shall be insulated with fiberglass blanket to thickness equal to adjoining pipe insulation unless otherwise noted. On all fittings and valves, insulation shall be finished with a preformed PVC jacket.
- C. Fittings and valves on refrigerant suction piping shall be insulated with cut sections of flexible unicellular insulation of thickness equal to adjoining pipe insulation.
- D. All flexible unicellular and glass fiber piping insulation exposed to the weather shall be provided with aluminum jacketing.
- E. No piping shall be insulated until it has been tested and thoroughly cleaned.

### 3.3 DUCTWORK

#### A. Definitions:

1. Concealed: Ductwork which shall be hidden from view by ceilings, walls, chases, or soffits, either by the work of this Contract, or by future tenant build-out work.
2. Exposed: Ductwork which is permanently in view, typically found in gymnasium, mechanical rooms, storage rooms, electrical rooms, or other unfinished space.

#### B. Schedule:

Concealed Supply, Return, Relief and Outside Air Ductwork Externally Insulated: (inside the conditioned space)	2" thickness blanket
Exposed Supply, Return, Relief and Outside Air Ductwork Externally Insulated: (inside the conditioned space)	2" thickness liner
Supply and Return Ductwork Internally Lined: (outside building)	3" thickness liner
Plenums:	2" thickness
Transfer Ducts:	Not Required
Exhaust Ducts:	Not Required
Factory Insulated Double Wall Ductwork:	Not Required

- C. Insulate necks and tops of all supply air diffusers, registers and grilles.
- D. Blanket-type insulation shall be stapled and taped in accordance with manufacturer's instructions.
- E. Insulation on ductwork over 16" in height or width must be attached with stick pins. When using self-adhesive pins, prepare surface to be applied to ensure adhesion.
- F. Tape all edges of insulation to ensure that no insulation is exposed.

#### 3.4 INSULATED DUCT COATING

- A. Clean galvanized outer surface of sheet metal ductwork as recommended by the manufacturer of the duct coating.
- B. Apply POLAR SEAL "prime security" over all exposed ductwork at a rate of 100 square feet per gallon. Use polyester scrim over any joints or open areas. Completely saturate scrim in the first coat of "prime security".
- C. After first coat is dry (dries from milky white when wet to clear opaque when dry), apply second coat of "prime security" at a rate of 100 square feet per gallon and let dry.
- D. Apply POLAR SEAL "top security" at a rate of 100 square feet per gallon and allow to dry.
- E. After first coat is dry, apply a second coat of POLAR SEAL "top security" at a rate of 100 square feet per gallon.

#### 3.5 SELF-ADHESIVE, FIELD-APPLIED, OUTDOOR JACKETS

- A. Ducts shall be sealed in accordance with SMACNA HVAC Duct Construction Standards Metal and Flexible - Second Edition (1995) Seal Class B (or latest version of SMACNA) prior to installation of insulation and the outdoor, field-applied jacket.
- B. Outdoor, field-applied insulation and jacket on ductwork insulation shall be pitched to shed water and prevent water ponding on top of the duct.
- C. Fiberglass insulations shall have a factory applied FSK facing. Contractor shall be responsible for testing adhesion to any substrate.
- D. Substrate surfaces shall be clean, dry, and free of oil films.
- E. Select outdoor, field-applied jacket materials in accordance with manufacturer's instructions for coverage on the underside of the ductwork, to avoid pins.
- F. Contractor shall adhere to the following duct installation criteria for proper maintenance of vapor barrier and physical integrity:

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1. Board insulation shall be mechanically installed on properly sealed ductwork according to the specifications using insulation fasteners (mini-cup weld pins or perforated, based pins and washers).
  2. Washers shall be covered with a 4-inch square piece of smooth foil tape prior to jacketing the ductwork to prevent the puncture of the outer membrane by the fasteners.
  3. Insulation on the top of the ductwork shall be installed to allow for the water to shed from the top of the duct and to prevent water from ponding on the top of the duct.
- G. Contractor shall follow one of the options below for the installation of the outdoor, field-applied jacket depending on the jacket product and the duct sizes:
1. Two Piece Installation.
  2. Four Piece Installation.
- H. Contractor shall protect outdoor, field-applied jackets from damaging chemicals. Solvation will occur to the rubberized bitumen when exposed to petroleum or coal tar based compounds. Contact the manufacturer immediately for more information if there is doubt, before any chemical interaction.
- I. Contractor shall allow each piece of the outdoor, field-applied jacket to stretch by using a 6-inch lap over the circumferential lap, and a 4-inch wide butt lap or overlap over the joint, and then roll with a roller. Position longitudinal laps at a water shed position.
- J. Contractor shall not pre-apply the outdoor, field-applied jacket to fabricated insulation unless metal banding is used. Outdoor, field-applied jackets are not mechanical fastening systems and will not hold the insulation on the duct.
- 3.6 FIREWRAP
- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- C. Preparation:
1. Remove dirt and dust from surfaces of openings and items penetrating rated floors and rated walls.
- D. Installation:
1. Install Firewrap in direct contact with the ductwork in accordance with manufacturer's instructions, applicable laboratory listings and building code reports and referenced standards. For additional complex duct design installation recommendations, see the Thermal Ceramics' complete installation guide.
    - a. For commercial, kitchen hood exhaust ductwork: Installation shall be performed by an experienced contractor per manufacturer instructions, applicable UL Listings and ICC-ES building code report (ESR 2213 or ESR 2832). Provide UL



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Listed liquid tight Thermal Ceramics FastDoor XL access doors where required by code. Sheet metal and insulation contractors shall coordinate installation of Fast Door XL.

2. Install 2 layers of Firewrap for a 2-hour commercial kitchen grease duct application per ASTM E 2336.
  - a. General Installation Instructions for Double Layer Installations: The inside layer of Firewrap blankets are cut to a length that will fit around the duct and meet with a tight butt joint. Adjacent blankets on the inside layer are tightly butted against each other. The outside layer is cut to a length that will fit around the duct and overlap itself no less than 3 inches (152 mm). Adjacent blankets on the outside layer overlap each other a minimum of 3", or they can be fitted together with a tight butt joint and covered with a 6-inch (305 mm) wide collar centered over the butt joint. Cut edges of the blanket shall be taped with aluminum foil tape to prevent exposed edges of the insulation from wicking of condensation moisture in air ventilation ducts or grease from a leaking grease duct joint. During installation, the blankets are temporarily held in place with filament tape until the wrap is mechanically attached with steel bands or steel insulation pins.
3. Mechanical Fastening of Enclosure Material to Ductwork:
  - a. Banding - Carbon steel or stainless steel banding is used to hold the outer layer of the blanket enclosure in place. Banding is minimum 1/2 inch (12.7 mm) wide and is placed around the entire perimeter of the duct on maximum 10-1/2 inches (267 mm) centers and 1-1/2 inches (38 mm) from each blanket or collar edge.
  - b. Pinning - To prevent blanket sag on duct spans 24-inch wide (610 mm) or larger, minimum 12-gauge steel insulation pins are welded to the duct along bottom horizontal and outside vertical runs in columns spaced 12 inches (305 mm) apart, 6 to 12-inch (152 to 305 mm) from each edge and on 10-1/2 inches (267 mm) centers. Pins are also required 1 inch (25 mm) from the end of a duct and 1 inch (25 mm) from any edge near a 90° bend spaced 6-inch (152 mm) apart. Pins are locked in place with 1-1/2 inch (38 mm) diameter or 1-1/2 inch (38 mm) square galvanized steel speed clips or cup head pins. Pins are turned down or the excess cut off to eliminate sharp edges.
4. Grease Duct Access Door Installation:
  - a. Install field fabricated doors per manufacturers' instructions and applicable building code reports and laboratory design listings.
  - b. Prefabricated Ductmate F2-HT or Ductmate Ultimate doors may be installed per manufacturers' installation instructions and field insulated per Thermal Ceramics installation instructions, applicable building code reports and laboratory design listings.
  - c. Install access openings at each change in direction and at intervals as required by code. Insulation cover system shall be tested and listed by UL (HNKT G18) to provide zero clearance to combustible construction and 2-hour fire rating per ASTM E 2336. Duct access cover panel shall be tested and listed by UL (YYXS.MH47995) with integral neoprene gasket to provide liquid tight seal and

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shall have a high temperature gasket and signage “Access Door – Do Not Obstruct” compliant to code and NFPA 96. Installation shall be performed by an experienced contractor per manufacturer instructions and applicable UL Listings. Sheet metal and insulation contractors shall coordinate installation of the FastDoor XL and the duct enclosure system.

5. Through-Penetration Firestop System:

- a. When the duct penetrates a concrete or dry wall fire rated floor, ceiling, or wall an approved firestop system shall be employed. Firewrap shall be installed directly to the duct through the penetration, or terminated on both sides of the penetration depending on the annular space allowance between the duct and the duct opening. When the Firewrap enclosure system is terminated on both sides of the through penetration, the duct wrap material is mechanically attached to the duct at the termination points using either steel banding or steel pins.
- b. To fire stop the through penetration void area, fill the annular space between the wrapped duct or bare duct and the periphery of the opening with scrap Firewrap firmly packed into the opening. Compress scrap blanket to percentage stated in the firestop listing for a minimum depth as specified in the firestop listing. Recess packing material below surface on both sides of walls or top side only for floors to the depth stated in the firestop listing. Seal over the packing material using an approved firestop sealant to a depth as stated in the firestop listing, flush with top side of a floor assembly and both sides of a wall assembly.

E. Repair Procedures:

1. Repair damaged Firewrap in accordance with manufacturer's instructions.
2. Remove damaged section by cutting the bands and removing the anchor clips holding it in place. Apply a new section of the same dimension ensuring the same overlap and installation method that existed previously. Cut edges and tears in the foil must be taped with aluminum tape to prevent the insulation from wicking moisture or grease.

F. Protection:

1. Protect installed products until completion of project.
2. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 230700

SECTION 230800 - COMMISSIONING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections, and Section 230100, "Mechanical General Provisions" apply to this Section.

1.2 WORK INCLUDED

- A. A separate Commissioning Agent (Engineer) will be engaged by the Owner to administer the commissioning.
- B. The Contractor shall provide all commissioning services as outlined in this Section; perform all testing, measurements, and inspection outlined in the 'Commissioning Plan'; and coordinate with the Commissioning Agent. A template Commissioning Plan is attached. The final plan will be written after the construction contract is underway.
- C. The Systems to be commissioned include:
  - 1. All HVAC and related systems

1.3 COMMISSIONING OBJECTIVES

- A. To ensure that all building systems, subsystems, equipment, controls, and interfaces with other building systems are installed, tested, and are operating in compliance with Contract Documents and within the scope of design requirements.
- B. To ensure that all system operation and maintenance personnel are properly instructed to effectively and efficiently operate and maintain the systems, subsystems, equipment, and controls, and that they will receive all required manuals and documentation.
- C. The Commissioning Agent shall provide the following to the Contractor for implementation and execution.
  - 1. Commissioning Plan: The Commissioning Agent shall prepare the Commissioning Plan in accordance with contents as specified herein.
  - 2. Checklists and Test Forms: The Commissioning Agent shall prepare the Pre-Functional Checklists and Functional Performance Test Forms, specifically for this project, and edited to suit the equipment and systems installed.
  - 3. Submittals:

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- a. The Contractor shall submit the following documents to the Commissioning Agent for review and inclusion in the Commissioning Plan.
  - i. Piping pressure and vacuum test reports
  - ii. Equipment startup reports
  - iii. DALT report
  - iv. TABs report
  - v. Prefunctional Checklists completed by the installing Foreman.
  - vi. O&M Manuals with warranties
  - vii. Training class agenda and schedule
  
- b. Commissioning Report: The Commissioning Agent shall assemble the final Commissioning Report comprised of completed prefunctional and functional checklists, equipment startup test reports, etc. organized by subsystem and submitted as one package. The results of failed tests shall be included along with a description of the corrective action taken.

1.4 REFERENCED STANDARDS

- A. ASHRAE Guideline 1-1996, "The HVAC Commissioning Process."
- B. NEBB, "Procedural Standards for Building Systems Commissioning."
- C. SMACNA, "HVAC Systems Commissioning Manual."

1.5 COMMISSIONING TEAM

- A. The Contractor shall designate team members from each of the following to participate in the Commissioning Process (both pre-and post-occupancy):
  - 1. General Contractor
  - 2. Mechanical Subcontractor (and HVAC startup technicians)
  - 3. Electrical Subcontractor
  - 4. Testing, Adjusting and Balancing (TAB) Subcontractor
  - 5. Automatic Temperature Controls Subcontractor
  
- B. The Owner shall designate a representative to participate in the Commissioning Process.
  
- C. Each of the team member's names shall be submitted in writing to the Commissioning Agent for inclusion in the Commissioning Plan.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 IMPLEMENTATION OF COMMISSIONING PLAN

- A. Plan Submittal: After the start of construction, the Commissioning Agent shall provide the Commissioning Plan to the Contractor for implementation and execution. The Plan shall provide the scope of commissioning tasks to the appropriate parties. Typical elements of the Plan shall include the following:
1. Commissioning Agent's preparation of the Commissioning Test Schedule and distribution to the Contractor and Owner.
  2. Commissioning Agent visits to the job site to observe installation activities.
  3. Contractor's pre-startup verification and completion of the Pre-functional Checklists.
  4. Contractor's submittal of equipment and systems startup verification to the Commissioning Agent.
  5. Contractor's submittal of testing, adjusting, and balancing (TAB) reports to the Commissioning Agent.
  6. Contractor's functional performance testing with the Commissioning Agent.
  7. Contractor's completion of operating and maintenance manuals and submittal to the Commissioning Agent.
  8. Contractor's operation and maintenance personnel instruction.
  9. Commissioning Agent's preparation of the Final Commissioning Report and submission to Owner.
  10. Owner acceptance
- B. Equipment and Systems Startup:
1. Pre-startup Verification: Prior to startup of equipment and systems, the Contractor shall indicate on the pre-start checklists and Commissioning Agent shall observe and verify that all items have been substantially installed in accordance with the project Contract Documents, including all change orders. Verification of the basic installation testing of systems shall be performed by the Contractor and shall include:
    - a. Cleaning of equipment and systems of construction dirt and debris, including replacement of filters, and all items per the approved checklists.
  2. Startup Verification: The Contractor shall indicate on the startup checklists, and Commissioning Agent shall verify that all HVAC equipment, systems, and subsystems have been activated and operate substantially in accordance with Contract Documents, with all equipment, system, and electrical operating and safety devices checked and functional. The Contractor's work also includes but is not limited to:
    - a. Calibration and testing of all automatic temperature control devices and building automation systems.
    - b. Testing and verification of all interlocks and interfacing between HVAC equipment, systems, subsystems, and other building systems.
    - c. Completion of testing, adjusting, and balancing (TAB) work, including the rechecking of 10% of the measurements.

3. Startup Documentation: Completed startup checklists shall be filled out by the Contractor after startup verification of each HVAC system, subsystem or each item of HVAC equipment. Startup checklists used by the Contractor Technicians shall be neat and typed using standard formats appropriate for the equipment. On request, the Contractor shall provide trend data demonstrating equipment has been started and is operating within design parameters.
4. Notification: The Commissioning Agent shall notify the Owner and Contractor when the startup verification has been completed and the HVAC functional performance testing can be started.

### 3.2 FUNCTIONAL PERFORMANCE TESTING

- A. Purpose: Every item of equipment, all systems and subsystems, controls, and all related equipment shall be tested and evaluated for conformance to performance data in the Contract Documents. Included is conformance to:
  1. Equipment input and output capacities.
  2. Systems and subsystems flow and distribution performance.
  3. Control system performance, accuracy, and adherence to sequences of operation.
  4. Minimum or part load operations and performance.
  5. Interface with other equipment and/or systems.
- B. Equipment Testing: Equipment functional performance testing shall not begin until the following notification of completion has been given to the Owner by the Commissioning Agent.
  1. Copies of the manufacturer's equipment start up reports are submitted to the Engineer for review and approval.
  2. Copies of the commissioning pre-start up and start up reports are submitted to the Engineer and Owner for review and approval.
  3. Direct digital control graphic screen shots of all equipment are submitted showing unit is operating within design parameters.
  4. Demonstrate through trend data successful operation of the HVAC systems for a period of not less than 2 weeks.
  5. Functional performance test checklists developed by the Commissioning Agent shall be used by the Contractor to document the equipment functional performance tests. Each item of equipment will be functional performance tested by the Contractor and the results documented by the Contractor at full load (and under part load conditions where required by the Contract Documents). Operation under "abnormal and/or emergency conditions" shall be simulated by the Contractor for equipment and systems, and all safety equipment and control operations verified. Test methods shall be documented and approved by the Commissioning Agent prior to implementation and shall be covered during the Owner's training as well. No equipment test functions or procedures shall be eliminated from the functional performance test unless approved by the Commissioning Agent and the Owner.

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- C. Systems Testing: Functional performance testing shall not begin until all equipment and systems have had startup verification by the Contractor and notification of completion has been given to the Owner by the Commissioning Agent.
1. Functional performance test checklists to document system or subsystem functional performance tests.
  2. The functional performance testing of systems by the Contractor shall begin after equipment and subsystems have been tested and documented. The system interlock and interface testing sequence shall depend on the system design, complexity, and other factors.
  3. HVAC systems and subsystems shall be tested under full load conditions and under part load conditions by the Contractor.
  4. Actual physical responses shall be observed. Reliance on control signals or other indicators is not acceptable.
  5. Control component input and output signals shall be confirmed by the Contractor for correctness under all operating conditions.
  6. At the end of the functional performance test procedures, every mode of each operation of a system, each piece of equipment, every item in the control sequence description, and every zone or subsystem shall be proven to operate by the Contractor as defined in the project Contract Documents.
- D. Test Documentation: Functional performance test checklists developed by the Commissioning Agent shall be used by the Contractor to document the results of the functional performance testing process.
1. Testing verification shall be provided by signatures of responsible parties (the Contractor, Sub-Contractors, Commissioning Agent, and Owner's Representative) on the functional performance test checklists and equipment checklists.
  2. Functional performance testing shall be performed by the Contractor, by members of the Commissioning Team as outlined, and approved by the Commissioning Plan.
  3. All members shall remain on the Commissioning Team throughout the entire functional performance testing procedures. Substitutions shall be permitted only by written approval of the Commissioning Agent and Owner.
- E. Test Failures: No system or subsystem shall be accepted until all items of equipment in the system have approved and verified functional performance test checklists.
1. When a functional performance test is not approved, the Contractor shall be directed to provide a written report to the Commissioning Agent listing the deficiencies causing the test failure, and the possible remedies to correct the deficiencies.
  2. After all deficiencies have been corrected; the entire functional performance test for the equipment, system, or subsystem shall be repeated.
  3. The Commissioning Agent will continue to monitor the actions to correct the equipment or system deficiencies until an acceptable functional performance test has been accomplished.
- F. Deferred Tests: If any checklist or functional performance test cannot be completed for seasonal reasons, lack of occupancy, or for other reasons, a written report shall be sent by the Contractor to the Commissioning Agent indicating when the test will be scheduled.

1. If any checklist or functional performance test cannot be accomplished due to deficiencies outside the scope of the work, the deficiencies shall be resolved and corrected by the appropriate parties before completion of the commissioning process.
- G. Control System Verification: The Control Contractor shall provide a field technician on site with a portable control access computer and related test equipment. The date and time of this control system verification testing shall be scheduled in advance with the Commissioning Agent. The field technician shall demonstrate to the Commissioning Agent the accuracy of each physical input point, and the response of each physical output point during each mode of operation identified in the Sequence of Controls.
- H. A checklist shall be provided by the Contractor for each of the physical hardware points prior to this system verification demonstration, with all identification information and the physical location of each physical input/output device. For input sensors, this checklist shall be completed during the field test to indicate what the actual measured reading was during the verification, verses what the control system indicated it was. For output devices, this checklist shall indicate what the response actually was verses what it should have been for each mode of operation. Any defective control component shall be replaced, and any programming errors identified shall be corrected and re-demonstrated to the Commissioning Agent.
- I. Every item of the systems listed in 1.2.B shall be functionally tested in the presence of the Commissioning Agent and Owners Representative by installing contractor and supplying vendor technical representative.

### 3.3 OPERATOR INSTRUCTION

- A. During System Installation: Schedules and materials for the participation of the operation and maintenance personnel during the installation of the systems and equipment shall be implemented as per the Commissioning Plan or as indicated in the Contract Documents by the Contractor.
1. Operation and maintenance personnel instruction shall include:
    - a. An instruction agenda with objectives
    - b. Classroom sessions using Contract Documents (specifications, system drawings), shop drawings, sequence of operations, equipment installation and operation manuals, and audio-visual aids, etc.
    - c. "Factory specialist" presentations by representatives approved by the Commissioning Agent
    - d. Job site visits
    - e. Sign-in sheets to verify attendance
    - f. Video-taping of all sessions
- B. During Commissioning: The Contractor shall prepare schedules and coordinate the training sessions with the parties involved.



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1. Equipment and systems maintenance manuals and schedules should be provided along with other information not provided during the installation phase instruction sessions.
- C. Turn-over Instruction: When the systems are ready to be turned over to the Owner, the Contractor shall schedule a final session for operation and maintenance personnel instruction. The following shall be included:
1. Attendance by the Commissioning Agent, installing contractors, major equipment suppliers, and all other interested parties
  2. Review of all system and equipment operations
  3. Additional hands-on instruction where requested by the Owner or Commissioning Agent
  4. A question/answer discussion period

### 3.4 COMMISSIONING REPORT

- A. The commissioning documentation shall be prepared by the Commissioning Agent and shall be organized into a format similar to the Commissioning Plan. All pages shall be numbered, a table of contents provided, and shall include the following information:
1. Commissioning Plan: Provide a copy of the Commissioning Plan.
  2. TAB Reports: Contractor shall provide approved testing, adjusting, and balancing (TAB) reports for all HVAC systems being commissioned to the Commissioning Agent for inclusion in the Report.
  3. Drawings: As-built shop drawings of equipment and systems, sequence of operations, and as-built Contract Documents as modified by change orders shall be provided by the Contractor to the Commissioning Agent for inclusion in the Report.
  4. Startup Checklists: Provide all startup checklists and equipment startup reports, organized by systems and subsystems.
  5. Functional Performance Tests: Functional performance test checklists for all equipment, systems, subsystems, interlocks, and system interfaces organized by systems and subsystems shall be provided by the Contractor to the Commissioning Agent for inclusion in the Report.
  6. Operation and Maintenance Manuals: Copies of approved operation and maintenance manuals specified in the systems Contract Documents and/or in the Commissioning Plan shall be provided by the Contractor to the Commissioning Agent for inclusion in the Report.
  7. Video Recording: Copies as indicated in the Contract Documents shall be provided by the Contractor to the Commissioning Agent for inclusion in the Report.

### 3.5 ACCEPTANCE

- A. Documents to Owner: The Commissioning Agent shall be responsible for maintaining the commissioning documentation until Final Acceptance of the project. All checklists required by this Section shall become part of the commissioning documentation. The commissioning documentation shall be kept current and shall be available for inspection at all times. At the time of final acceptance of the project, the Commissioning Agent shall furnish copies of the commissioning documentation to the Owner and Contractor.

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- B. Warranties: All equipment and system guarantees and warranties specified in the Contract Documents shall be furnished to the Owner by the Contractor at the time of final acceptance of the project.

END OF SECTION 230800



# COMMISSIONING PLAN NEWSOME PARK ELEMENATRY SCHOOL



Project # 21-059



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## COMMISSIONING OVERVIEW

The purpose of this Commissioning Plan is to provide a clear and concise roadmap for the implementation of the commissioning process. The systems to be commissioned are identified in the Project Specifications.

This Commissioning Plan is a living document. The basic process and procedures for commissioning this project are detailed below. As the project develops appendices will be added to organize test reports, startup technician reports, issues logs, and completed checklists. Test documentation will be added throughout the construction project. At the end of the project the resulting compilation of information will become the Final Commissioning Report.

Integrating commissioning into a fast-moving construction project can be a challenge. The points below describe how our firm performs Commissioning.

- Commissioning begins during the design stage when our Commissioning Agent (CxA) reviews the project documents and makes comments to the designers. A Commissioning Plan is prepared for inclusion in the Bid Documents.
- After the construction contract is awarded and prior to the start of system rough-in, a Kick Off Meeting is held with the construction team. This will include the Project Managers and Foremen for the General, Mechanical, Electrical, TABs, and Controls Contractors; Equipment Representatives; and the Owner.
- The General Contractor (GC) is asked to maintain the Prefunctional Checklist. This document is a part of the Commissioning Plan and has a checklist for every unit on the drawing HVAC equipment schedule. The installing trade Foreman is asked to review the Prefunctional Checklist and confirm completion by initialing each item. When the Prefunctional Checklist is complete, the GC requests a CxA site visit.
- The GC is requested to not start HVAC equipment until receiving concurrence from the Engineer, CxA and Owner. Prior to granting concurrence, the CxA will confirm the Prefunctional Checklist is complete and discuss the building conditions with the GC. The goal being to prevent permanent damage to the equipment.
- Equipment startup is required to be performed by Factory Authorized technicians and documented on standardized report forms.
- After startup, the Test and Balance Contractor (TABs) may begin his work.
- The Design Engineer and CxA will review all startup and testing, adjusting, and

balancing (TABs) reports.

- When the TABs report has been submitted and approved by the Design Engineer and the control system is complete; Functional Commissioning may begin.
- Functional Testing will include all specified modes of control and sequence of operation under full and part load. The performance of alarms will be checked.
- Typically, Functional Commissioning occurs between Substantial and Final Completion of the Project. As such, design weather conditions may not be available when the project has achieved Substantial Completion. To address this issue, we follow the following guidelines.
  - Refrigerant based systems which reject heat to the atmosphere can be properly verified only when near design conditions are present. For these systems, second season testing is sometimes required.
  - Gas and electric heating sources and geothermal water source heat pumps can typically be verified by measuring the temperature differential across the appliance. For cases when this is not possible, second season commissioning will be performed.
  - Equipment shall not be forced to operate in the cooling or heating mode other than through the raising or lowering of coil discharge or indoor space temperature setpoints.
  - If there is insufficient time to perform the functional testing during the construction period, seasonal commissioning may have to be performed the following year.
  - When the building must be occupied prior to Functional Commissioning, the testing occurs after normal hours for the occupants.
- The Engineer shall review all as-built record drawings, control drawings, and sequences of operation. Any changes to the electrical design to accommodate a substitute piece of equipment shall be reflected in the Record Drawings.
- The CxA or another member of Thompson Consulting Engineers will review the O&M manuals and Training Agenda.
- A Final Commissioning Report will be prepared and issued by the CxA along with a recommendation on Final Acceptance after all the Issues Log items have been resolved.

## **DESIGN PHASE**

During the design phase, the CxA performs the following activities:

- Review and Modify Project Specifications
- Develop Initial Commissioning Plan
- Attend Pre-Bid Meeting (if requested)

### Review and Modify Project Specifications

There are specific commissioning requirements located throughout the project specifications. During design, the CxA will review the specifications and suggest changes to the Design Engineer.

The specifications include the format in which contractor submittals will be presented, pressure testing of piping and duct systems, startup requirements, training requirements, system manual requirements, and so on.

The CxA will include the quality related items from the specifications in the commissioning checklists.

### Develop Initial Commissioning Plan

The initial commissioning plan is similar to many other projects. It is intended to clarify individual roles and responsibilities relative to the commissioning process, identify the systems to be commissioned, and include a few typical commissioning checklists.

The commissioning plan will be distributed as a part of the project specifications.

### Attend Pre-Bid Meeting

A representative of Thompson Consulting Engineering will attend the Pre-Bid Meeting, if requested.

## **CONSTRUCTION PHASE**

During construction phase, the CxA tasks include:

- Attend the Pre-Construction Meeting (if requested).
- Conduct the Commissioning Kickoff Meeting.
- Back check Prefunctional Checklists maintained by the Installing Contractors.
- Monitor system startup
- Maintain and distribute the Issues Log.
- Conduct Functional Testing.
- Review the Owner Training Agenda.
- Review the Operation and Maintenance (O&M) manual.

### Pre-Construction Meeting

Once the contractor is selected, the commissioning authority will attend and participate in the pre-construction meeting if requested. The role of CxA during the meeting will be to review and discuss the commissioning and the communication protocols the project team has developed.

### Commissioning Kickoff Meeting

Prior to the start of Pre-Functional testing, the CxA will lead a kickoff meeting. This will include the Project Managers and Foremen for the General, Mechanical, Electrical, TABs, and Controls Contractors; Equipment Representatives; and the Owner.

The meeting will review the goals of commissioning, establish a schedule, and assign responsibilities to specific individuals. Once an individual is assigned to be a part of the commissioning team, they cannot be removed without prior concurrence of the commissioning authority to preserve continuity.

### Prefunctional Checklists

The Prefunctional Checklists are developed by the commissioning authority. They are to be completed by the General Contractor and Subcontractors. The intent of the checklists is to provide an organized method to verify the equipment is properly installed and requirements of the Project Documents are met.

### System Startup

When the Prefunctional Checklists are complete, and the building cleanliness is adequate, equipment startup can proceed. The specifications contain specific requirements for startup. A field report for each unit is required to be submitted for review and inclusion in the final commissioning report.



### Issues Log

The CxA will maintain an Issues Log to track items of concern. Each item will stay open until it is resolved; either by correcting the construction, demonstrating compliance as-is; or Owner acceptance.

### Functional Testing

Functional testing occurs after all construction and startup is complete, the TABs report is approved by the Engineer, and DDC graphics are finished. A small team consisting of the CxA, Controls Technician, Mechanical Contractor, Equipment Startup Technicians, TABs Agent, and Owners Representative will exercise all the systems in the project scope.

### Review Training

The CxA will review the contractor's submitted training agenda to ensure the specification requirements are covered and the contractor understands the expectations of training.

### O&M Systems Manual

The Construction Administrator or the CxA will review the final manual for completeness and clarity.

### Warranty Review

The Construction Administrator or CxA will review the warranty certificates provided by the Contractor.

**CONTACT INFORMATION**

**Owners Representative**

TO BE DETERMINED

**Architect**

TO BE DETERMINED

**Mechanical Engineer**

Kevin Allen  
Thompson Consulting Engineers  
22 Enterprise Parkway  
Hampton, VA 23666  
(757) 599-4415

**General Contractor**

TO BE DETERMINED

**Mechanical Contractor**

TO BE DETERMINED

**Controls Contractor**

TO BE DETERMINED

**TABs Contractor**

TO BE DETERMINED

SECTION 230885 - DUCT CLEANING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including Construction Contract General Conditions, Contract Forms, other Division-I Specification Sections and Section 230100 "Mechanical General Provisions" apply to this Section.

1.2 APPLICABLE STANDARDS AND PUBLICATIONS

- A. The following current standards and publications of the issues currently in effect form a part of this Specification to the extent indicated by any reference thereto:
  - 1. National Air Duct Cleaners Association (NADCA): "Assessment, Cleaning & Restoration of HVAC Systems (ACR 2006)," 2006.
  - 2. National Air Duct Cleaners Association (NADCA): "Understanding Microbial Contamination in HVAC Systems," 1996.
  - 3. National Air Duct Cleaners Association (NADCA): "Introduction to HVAC System Cleaning Services," 2004.
  - 4. National Air Duct Cleaners Association (NADCA): Standard 05 "Requirements for the Installation of Service Openings in HVAC Systems," 2004.
  - 5. Underwriters' Laboratories (UL): UL Standard 181.
  - 6. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE): Standard 62-89, "Ventilation for Acceptable Indoor Air Quality".
  - 7. Environmental Protection Agency (EPA): "Building Air Quality," December 1991.
  - 8. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA): "HVAC Duct Construction Standards - Metal and Flexible," 1985.
  - 9. North American Insulation Manufacturers Association (NAIMA): "Cleaning Fibrous Glass Insulated Air Duct Systems," 1993.

1.3 SPECIAL PROVISIONS

- A. Qualification of the HVAC System Cleaning Contractor:
  - 1. Membership: The HVAC system cleaning contractor shall be a certified member of the National Air Duct Cleaners Association (NADCA), or shall maintain membership in a nationally recognized non-profit industry organization dedicated to the cleaning of HVAC systems.
  - 2. Certification: The HVAC system cleaning contractor shall have a minimum of one (1) Air System Cleaning Specialist (ASCS) certified by NADCA on a full time basis, or shall have staff certified by a nationally recognized certification program and organization dedicated to the cleaning of HVAC systems.
  - 3. Supervisor Qualifications: A person certified as an ASCS by NADCA, or maintaining an equivalent certification by a nationally recognized program and organization, shall be responsible for the total work herein specified.

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4. Experience: The HVAC system cleaning contractor shall submit records of experience in the field of HVAC system cleaning as requested by the Engineer. Bids shall only be considered from firms which are regularly engaged in HVAC system maintenance with an emphasis on HVAC system cleaning and decontamination.
5. Equipment, Materials and Labor: The HVAC system cleaning contractor shall possess and furnish all necessary equipment, materials and labor to adequately perform the specified services.
  - a. The Contractor shall assure that its employees have received safety equipment training, medical surveillance programs, individual health protection measures, and manufacturer's product and Material Safety Data Sheets (MSDS) as required for the work by the U.S. Occupational Safety and Health Administration, and as described by this Specification.
  - b. The Contractor shall maintain a copy of all current MSDS documentation and safety certifications at the site at all times, as well as comply with all other site documentation requirements of applicable OSHA programs and this Specification.
  - c. Contractor shall submit to the Engineer all MSDS for all chemical products proposed to be used in the cleaning process.
6. Licensing: The HVAC system cleaning contractor shall provide proof of maintaining the proper license(s), if any, as required to do work in this state. Contractor shall comply with all Federal, state and local rules, regulations, and licensing requirements.

1.4 STANDARDS

- A. NADCA Standards: The HVAC system cleaning contractor shall perform the services specified here in accordance with the current published standards of the National Air Duct Cleaners Association (NADCA).
- B. All terms in this Specification shall have their meaning defined as stated in the NADCA Standards.
- C. NADCA Standards must be followed with no modifications or deviations being allowed.

1.5 DOCUMENTS

- A. Mechanical Drawings: The Contractor shall provide the HVAC system cleaning contractor with one copy of the following documents:
  1. Project drawings and specifications.
  2. Approved construction revisions pertaining to the HVAC system.

PART 2 - PRODUCTS (NOT USED)

### PART 3 - EXECUTION

#### 3.1 SCOPE OF WORK

- A. The scope of this work applies to existing ductwork to remain and be re-used as part of the new systems.
- B. This section defines the minimum requirements necessary to render HVAC components clean, and to verify the cleanliness through inspection and/or testing in accordance with items specified herein and applicable NADCA Standards.
- C. The Contractor shall be responsible for the removal of visible surface contaminants and deposits from within the HVAC system in strict accordance with these Specifications.
- D. The HVAC system includes any interior surface of the facility's air distribution system for conditioned spaces and/or occupied zones. This includes the entire supply air ducts and supply diffusers and the return air ducts to the rooftop unit and return air grilles.

#### 3.2 HVAC SYSTEM COMPONENT INSPECTIONS AND SITE PREPARATIONS

- A. HVAC System Component Inspections: Prior to the commencement of any cleaning work, the HVAC system cleaning contractor shall perform a visual inspection of the HVAC system to determine appropriate methods, tools, and equipment required to satisfactorily complete this project. The cleanliness inspection should include ductwork and associated diffusers and grilles.
- B. The cleanliness inspection shall be conducted without negatively impacting the indoor environment through excessive disruption of settled dust, microbial amplification or other debris. In cases where contamination is suspected, and/or in sensitive environments where even small amounts of contaminant may be of concern, environmental engineering control measures should be implemented
- C. Damaged system components found during the inspection shall be documented and brought to the attention of the Engineer.
- D. Site Evaluation and Preparations: Contractor shall conduct a site evaluation, and establish a specific, coordinated plan which details how each area of the building will be protected during the various phases of the project.
- E. Inspector Qualifications: Qualified personnel should perform the HVAC cleanliness inspection. At minimum, such personnel should have an understanding of HVAC system design, and experience in utilizing accepted indoor environmental sampling practices, current industry HVAC cleaning procedures, and applicable industry standards.

### 3.3 GENERAL HVAC SYSTEM CLEANING REQUIREMENTS

- A. Containment: Debris removed during cleaning shall be collected and precautions must be taken to ensure that Debris is not otherwise dispersed outside the HVAC system during the cleaning process.
- B. Particulate Collection: Where the Particulate Collection Equipment is exhausting inside the building, HEPA filtration with 99.97% collection efficiency for 0.3-micron size (or greater) particles shall be used. When the Particulate Collection Equipment is exhausting outside the building, Mechanical Cleaning operations shall be undertaken only with Particulate Collection Equipment in place, including adequate filtration to contain Debris removed from the HVAC system. When the Particulate Collection Equipment is exhausting outside the building, precautions shall be taken to locate the equipment down wind and away from all air intakes and other points of entry into the building.
- C. Controlling Odors: Measures shall be employed to control odors and/or mist vapors during the cleaning process.
- D. Component Cleaning: Cleaning methods shall be employed such that all HVAC system components must be Visibly Clean as defined in applicable standards (see NADCA Standards). Upon completion, all components must be returned to those settings recorded just prior to cleaning operations.
- E. Service Openings: The Contractor shall utilize service openings, as required for proper cleaning, at various points of the HVAC system for physical and mechanical entry, and inspection.
- F. Contractor shall utilize the existing service openings already installed in the HVAC system where possible.
- G. Other openings shall be created where needed and they must be created so they can be sealed in accordance with industry codes and standards.
- H. Closures must not significantly hinder, restrict, or alter the airflow within the system.
- I. Closures must be properly insulated to prevent heat loss/gain or condensation on surfaces within the system.
- J. Openings must not compromise the structural integrity of the system.
- K. Construction techniques used in the creation of openings should conform to requirements of applicable building and fire codes, and applicable NFPA, SMACNA and NADCA Standards.
- L. All service openings capable of being re-opened for future inspection or remediation shall be clearly marked and shall have their location reported to the Architect in project report documents.
- M. Air Distribution Devices (Registers, Grilles & Diffusers): The Contractor shall clean all air distribution devices.
- N. Duct Systems: Contractor shall:

1. Create service openings in the system as necessary in order to accommodate cleaning of otherwise inaccessible areas.
2. Mechanically clean all duct systems to remove all visible contaminants, such that the systems are capable of passing Cleaning Verification Tests.

### 3.4 HEALTH AND SAFETY

- A. Safety Standards: Cleaning contractors shall comply with applicable federal, state, and local requirements for protecting the safety of the contractor's employees, building occupants, and the environment. In particular, all applicable standards of the Occupational Safety and Health Administration (OSHA) shall be followed when working in accordance with this Specification.
- B. Occupant Safety: No processes or materials shall be employed in such a manner that they will introduce additional hazards into occupied spaces.
- C. Disposal of Debris: All Debris removed from the HVAC System shall be disposed of in accordance with applicable federal, state and local requirements.

### 3.5 MECHANICAL CLEANING METHODOLOGY

- A. Removal Cleaning Methods: The HVAC system shall be cleaned using Source Removal mechanical cleaning methods designed to extract contaminants from within the HVAC system and safely remove contaminants from the facility. It is the Contractor's responsibility to select Source Removal methods that will render the HVAC system Visibly Clean and capable of passing cleaning verification methods and other specified tests, in accordance with all general requirements. No cleaning method, or combination of methods, shall be used which could potentially damage components of the HVAC system or negatively alter the integrity of the system.
- B. All methods used shall incorporate the use of vacuum collection devices that are operated continuously during cleaning. A vacuum device shall be connected to the downstream end of the section being cleaned through a predetermined opening. The vacuum collection device must be of sufficient power to render all areas being cleaned under negative pressure, such that containment of debris and the protection of the indoor environment are assured.
- C. All vacuum devices exhausting air inside the building shall be equipped with HEPA filters (minimum efficiency), including hand-held vacuums and wet-vacuums.
- D. All vacuum devices exhausting air outside the facility shall be equipped with Particulate Collection, including adequate filtration to contain Debris removed from the HVAC system. Such devices shall exhaust in a manner that will not allow contaminants to re-enter the facility. Release of debris outdoors must not violate any outdoor environmental standards, codes, or regulations.
- E. All methods require mechanical agitation devices to dislodge debris adhered to interior HVAC system surfaces, such that debris may be safely conveyed to vacuum collection devices. Acceptable methods will include those, which will not potentially damage the integrity of the ductwork, nor damage porous surface materials, such as liners inside the ductwork or system components.

- F. Methods of Cleaning Fibrous Glass Insulated Components:
  - 1. Fibrous glass thermal or acoustical insulation elements present in any ductwork shall be thoroughly cleaned with HEPA vacuuming equipment, while the HVAC system is under constant negative pressure, and not permitted to get wet in accordance with applicable NADCA and NAIMA standards and recommendations.
- G. Cleaning methods used shall not cause damage to fibrous glass components and will render the system capable of passing Cleaning Verification Tests.
- H. Damaged Fibrous Glass Material:
  - 1. Evidence of Damage: If there is any evidence of damage, deterioration, delaminating, friable material, mold or fungus growth, or moisture such that fibrous glass materials cannot be restored by cleaning or resurfacing with an acceptable insulation repair coating, they shall be identified for replacement.
  - 2. Replacement: When requested or specified, Contractor must be capable of remediating exposed damaged insulation in ductwork requiring replacement.
  - 3. Replacement Material: In the event fiberglass materials must be replaced, all materials shall conform to applicable industry codes and standards, including those of UL and SMACNA.
  - 4. Replacement of damaged insulation is not covered by this Specification.

### 3.6 CLEANLINESS VERIFICATION

- A. General: Verification of HVAC System cleanliness will be determined after mechanical cleaning and before the application of any treatment or introduction of any treatment-related substance to the HVAC system, including biocidal agents and coatings.
- B. Visual Inspection: The HVAC system shall be inspected visually to ensure that no visible contaminants are present.
- C. If no contaminants are evident through visual inspection, the HVAC system shall be considered clean; however, the Engineer reserves the right to further verify system cleanliness through Surface Comparison Testing or the NADCA vacuum test specified in the NADCA standards.
- D. If visible contaminants are evident through visual inspection, those portions of the system where contaminants are visible shall be re-cleaned and subjected to re-inspection for cleanliness.
- E. NADCA vacuum test analysis should be performed by a qualified third party experienced in testing of this nature.

### 3.7 PRE-EXISTING SYSTEM DAMAGE

- A. Contractor is not responsible for problems resulting from prior inappropriate or careless cleaning techniques of others. Any such issues found shall be brought to the attention of the Engineer.



3.8 POST-PROJECT REPORT

- A. At the conclusion of the project, the Contractor shall provide a report to the Engineer indicating the following:
1. Success of the cleaning project, as verified through visual inspection and/or gravimetric analysis.
  2. Areas of the system found to be damaged and/or in need of repair.

END OF SECTION 230885

SECTION 230900 - AUTOMATIC TEMPERATURE CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections Section 230100, “Mechanical General Provisions,” and Section 230500 “Heating, Ventilating, Air Conditioning” apply to this section.
- B. Refer to drawings for unit control sequences, control diagrams, and points lists.

1.2 SYSTEM DESCRIPTION

- A. Overview: NNPS has standardized on the Tridium Niagara N4 (or later Tridium version) platform for its user interface and building controllers for all building control systems. The controls contractor shall provide new BACnet compatible controllers for all new and existing HVAC equipment at Newsome Park Elementary School. It is the intent of NNPS to utilize the BACnet interface on packaged equipment. The packaged equipment shall be provided with an expansion module to capture any points required for independent control of the equipment. The user interface shall have setpoint control and mode of operation command available through the BACnet interface. The unit mounted controller shall not rely on a building controller for operational commands. If required, the control contractor may utilize a building controller for status points not available through the BACnet interface or expansion modules. For all new and existing HVAC equipment not controlled through the unit BACnet interface, the controls contractor shall provide new BACnet compatible controllers. Where possible, the controls contractor may re-use existing compatible controllers to interface with the Tridium Niagara N4 platform. All new and existing equipment controllers shall be integrated into the Tridium Niagara N4 system architecture. The open protocol Direct Digital Controls (DDC) controllers provided by the control contractor and/or the HVAC equipment manufacturers shall be connected to the Niagara N4 platform. The controls contractor is responsible for integrating new and existing controls with the Niagara N4 supervising server located at NNPS plant.
- B. Protocols: NNPS standard is to utilize BACnet protocol within the building control system. BACnet factory supplied onboard controllers shall be in their “native” open protocol, avoiding the need for gateways or translators. There may be some instances where a gateway or translator is the only method to integrate a controller, but those shall be submitted to and approved by the consultant engineer on a case-by-case basis.
- C. DDC Controllers: The building control system will consist of DDC controllers that can stand-alone operate each piece of HVAC equipment (existing and new) or an HVAC system (existing and new) without the use of more than one (1) controller per equipment or system. The DDC controllers will be a combination of factory supplied controllers and control contractor provided and field installed controllers. The coordination of factory controllers vs. field controllers, sensors and integration will be the responsibility of the controls contractor to coordinate with the HVAC equipment providers. Reuse existing controllers where possible.

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- D. **Factory Installed Controllers:** When a factory installed controller is provided with the HVAC equipment, the manufacturer is required to expose all functional and operational points within that controller to the open protocol communication port on the controller. This may require the manufacturers to create “shadow points” that mirror internal points within the onboard controller. The intent is not to display every point on the user interface graphics, but to ensure that all points are accessible to the building control system. The controls contractor shall coordinate with the equipment supplier to ensure the hand-shake between the building control system and the factory supplied controller is 100% accurate and reliable information. The controls contractor shall be responsible for all field installation of sensors and control wiring for factory supplied controls.
- E. **Building Controllers:** The controls contractor shall furnish and install Building Controllers to incorporate all the existing and new DDC controllers and factory controllers into one seamless harmonic building control system. The Building Controllers shall be based on the Niagara 4 Framework and “open licensed” so that any Niagara approved and qualified contractor can fully access and support the building control system. The controls contractor shall provide the number of DDC controllers needed to fully implement the sequence of operation, regardless of license pricing limitation thresholds.
- F. **Network Communication:** NNPS will provide a network communication port in a local data closet. The controls contractor shall furnish & install a CAT5 communication cable from each Building Controller to the designated port on the IT switch. Additionally, the controls contractor shall provide NNPS with the Building Controller’s MAC address and location identifier. The JACE passwords shall be provided by NNPS to the Contractor. There shall be no other passwords or access to the JACE other than as provided by NNPS.
- G. **Server:** NNPS has an established and designated server that is running the Niagara N4 Framework. The server applications to be applied by the controls contractor for this project are as follows:
1. **User Login Credentials:** are synchronized via the NNPS Active Directory where access privileges are assigned by a designated staff person. The controls contractor shall review & incorporate these user privileges in the building control system as to prevent lower-level users from obtaining specific features that are above their level of authority. Note: these access groups & privileges are well defined on the server.
  2. **Point Mapping:** Every point in the building control system shall be mapped to the server by the controls contractor.
  3. **Graphics:** The control contractor will be responsible for developing and populating color graphics on the server for Newsome Park Elementary School that are in accordance with NNPS standards.
  4. **Schedules:** The control contractor will be responsible for linking existing schedules from the server to the appropriate areas of the school.
  5. **Trending:** The control contractor will be responsible for mapping and archiving all trended points to the server with uploading to the server every 2 hours. NNPS will provide to the controls contractor the trend intervals for all point types.
  6. **Alarming:** The control contractor will be responsible for developing “smart alarms” which are critical alarms that get transmitted via email and/or text message to designated NNPS staff. Note: the smart alarm schedule and distribution list is currently setup on the server.

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- H. User Interface: The controls contractor is not required to provide any user interface products such as computer workstations, laptop computers, notebook computers or panel mounted displays. NNPS will utilize its existing user interface products to access the building control system through the NNPS network.
- I. Software Editing Tools:
  - 1. The control contractor shall provide one (1) licensed copies of the Niagara Engineering Tool software required to program and modify the internal programming for the DDC controllers that are provided by the control contractor. Included shall be a detailed user manual on how to use the software tool.
  - 2. In addition, each JACE shall have embedded work bench software to permit programing changes without the use of the above Niagara Engineering Tool.
- J. The installation of the control system shall be performed under the direct supervision of the controls contractor including; shop drawings, flow diagrams, bill of materials, component designation or identification number and sequence of operation.
- K. All materials and equipment used shall be standard components, regularly manufactured for this and/or other systems and not custom designed especially for this project.
- L. The controls contractor shall be responsible for all Building Automation Systems (BAS), temperature control, 120 volt and low-voltage control wiring for the mechanical system, including interlock wiring for non DDC controlled equipment, for a complete and operable system. Control wiring shall be done in accordance with the specifications, NNPS standard practices, and all local and national codes.
- M. The controls contractor shall purchase three 5-year maintenance support agreements for a total of 15 years of coverage, to begin after the initial 18-month support agreement expires. The agreement ownership shall be transferred to Newport News Public Schools.

### 1.3 QUALITY ASSURANCE

- A. The DDC system shall be designed and installed, commissioned and serviced by manufacturer / factory trained personnel. The controls contractor shall have an in-place support facility within 100 miles of the project site with technical staff, spare parts inventory and necessary test and diagnostic equipment.
- B. The controls contractor shall provide a dedicated and experienced Tridium Niagara N4 certified project manager for this work, responsible for direct supervision of the installation, start up and commissioning of the building control system.
- C. Materials and equipment shall be the catalogued products of manufacturers regularly engaged in production and installation of automatic temperature control systems and shall be manufacturer's latest standard design that complies with the specification requirements.
- D. All Building Controllers and DDC controllers shall be UL Listed under Standard UL 916.
- E. All programmers working in the N4 platform shall be Niagara 4 certified.

- F. The Controls Contractor shall lead a coordination meeting between Major Equipment Suppliers, Mechanical Contractor, Electrical Contractor, General Contractor, Engineer and Owner to plan the integration of manufacturer provided equipment level controllers into the control system. Every control point and startup responsibilities shall be reviewed for a smooth integration process. Meeting minutes shall be prepared and forwarded to participants by the Controls Contractor.
- G. All electronic equipment shall conform to the requirements of FCC Regulation, Part 15, Governing Radio Frequency Electromagnetic Interference and be so labeled.
- H. The lead programmer shall operate the controls the entire duration of the Commissioning process.

#### 1.4 WORK BY OTHERS

- A. All control and power wiring required for temperature control system and all interlocking and accessory control wiring required for equipment installed under Division 23 Sections shall be installed by the Temperature Control Contractor. The Automatic Temperature Controls Contractor shall be responsible for providing circuit breakers and power wiring and conduit from electrical panels installed under Division 26 to Automatic Temperature Controls panels.
- B. Wiring of all power feeds through all disconnect starters to electrical motor.
- C. Wiring of any remote start/stop switches and manual or automatic motor speed control devices not furnished by BAS manufacturer.
- D. Wiring of any electrical sub-metering devices furnished by BAS manufacturer.

#### 1.5 SUBMITTALS

- A. Submit six complete sets of documentation in the following phased delivery schedule:
  - 1. Equipment data cut sheets
  - 2. System schematics, including:
    - a. Sequence of operations
    - b. Point names
    - c. Point addresses
    - d. Interface wiring diagrams
    - e. Panel layouts
    - f. System riser diagrams
    - g. Auto-CAD compatible record drawings
- B. Upon project completion, submit operation and maintenance manuals, consisting of the following:
  - 1. Index sheet, listing contents in alphabetical order.

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2. Manufacturer's equipment parts list of all functional components of the system.
  3. Auto-CAD disk of system schematics, including wiring diagrams.
  4. Description of sequence of operations.
  5. As-Built interconnection wiring diagrams.
  6. Operator's Manual.
  7. Trunk cable schematic showing remote electronic panel locations and all trunk data.
  8. List of connected data points, including panels to which they are connected and input device (ionization detector, sensors, etc.)
  9. Conduit routing diagrams.
  10. Backup Niagara logic files for all JACE and Drivers for this project.
- C. Niagara 4 Technical Certification Program (TCP) certificate for all integrating and on-site programmers.
- D. The input setup data for equipment manufacturer provided programmable controllers shall be included in the O&M manual or controls as-built documents. This may take the form of screen shots for each input screen for each controller.

#### 1.6 WARRANTY

- A. Provide all services, materials and equipment necessary for the successful operation of the DDC system for a period of one year after project acceptance.
- B. The adjustment, required testing, and repair of the system includes all new computer equipment, transmission equipment and sensors and control devices.
- C. The on-line support services shall allow the local Controls Contractor to remote-in over the customer's LAN/WAN via secure connection to monitor and control the facility's DDC system. This remote connection to the facility shall be within 2 hours of the time that the problem is reported. This coverage shall be extended to include normal business hours, after business hours, weekends and holidays.
- D. If the problem cannot be resolved on-line by the local office, the national office of the building automation system manufacturer shall have the same capabilities for remote connection to the facility. If the problem cannot be resolved with on-line support services, the Controls Contractor shall dispatch the appropriate personnel to the job site to resolve the problem within 3 hours of the time that the problem is reported.

## PART 2 - PRODUCTS

### 2.1 PRE-APPROVED CONTROL CONTRACTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following pre-qualified manufacturers; NO SUBSTITUTIONS.
1. HONEYWELL: Controls provide by licensed Authorized Control Integrator (ACI) contractor only.

- B. Pre-Approved Controls Contractors shall also have completed two projects of similar scope to the HVAC Replacement at Newsome Park Elementary School. Upon request, contractor shall submit a summary of similar completed projects along with the contact information for an Owner's Representative who can serve as a reference.
- C. No additional control contractors will be considered.

## 2.2 DDC EQUIPMENT

- A. Operator Work Station: This project will utilize existing workstations owned and maintained by NNPS.
- B. Server: This project will utilize an existing server and software applications owned and maintained by NNPS.
- C. Building Controllers: Provide an adequate number of Building Controllers to achieve monitoring and control of all data points specified and necessary to satisfy the sequence of operation for all mechanical systems shown on the plans. Building Controllers shall be provided as required to accomplish the sequence of operation regardless of software licensing pricing limitations. Each Building Controller shall be connected to the NNPS network via Ethernet connection to an IT switch port located in a nearby data closet.
  - 1. Building Controllers shall be suitable for the anticipated ambient conditions and mounted in dustproof enclosures and shall be rated for operation at 32°F to 122°F and 5 to 95% RH, non-condensing.
  - 2. Serviceability: Provide diagnostic LEDs for power, communication, and processor. All wiring connections shall be made to field-removable, modular terminal strips or to a termination card connected by a ribbon cable.
  - 3. Memory: The Building Controls shall maintain all BIOS and programming information in the event of a power loss by utilizing EEPROM auto-save features.
  - 4. Diagnostics: The Building Controller shall continually check the status of its processor and memory circuits. If an abnormal operation is detected, the controller shall assume a predetermined failure mode and generate an alarm notification.
  - 5. Immunity to power and noise: Controller shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80% nominal voltage. Operation shall be protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 Watts at 3 ft.
  - 6. Automatic staggered restart of HVAC equipment after restoration of power with short cycle protection.
  - 7. The Building Controllers shall provide the interface between the Server and the DDC Controllers and provide global supervisory control functions over the entire building control system. It shall be capable of executing application control programs to provide:
    - a. Calendar functions
    - b. Scheduling
    - c. Trending

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- d. Alarm monitoring and routing
  - e. Time synchronization by means of an Atomic Clock Internet site including automatic synchronization
  - f. Integration of open protocols for BACnet, LON and Modbus
  - g. Central Management functions for all DDC Controllers and integrated controllers.
8. Building Controllers must provide the following hardware features as a minimum:
- a. One Ethernet Port – 10/100 Mbps
  - b. One RS-232 ports
  - c. Four RS-RS485 ports electrically isolated
  - d. One LonWorks Interface Port – 78KB FTT-10A with Weidmuller connector
  - e. Power supply 24 VAC or 24 VDC
  - f. Battery Backup
  - g. Real-time clock
9. Event Alarm Notification and Actions:
- a. The Building Controller shall provide alarm recognition, storage; routing, management, and analysis to supplement distributed capabilities of equipment or application specific controllers.
  - b. The Building Controller shall be able to route any alarm condition to any defined user location via NNPS network.
  - c. Provide for the creation of a minimum of five (5) alarm classes for the purpose of routing types, Critical, Failure, Trouble, Override, and User-Defined.
  - d. Provide timed (schedule) routing of alarms by class, object, group, or node.
  - e. Provide alarm generation from binary object “runtime” and /or event counts for equipment maintenance. The user shall be able to reset runtime or event count values with appropriate password control.
  - f. Control equipment and network failures shall be treated as alarms and annunciated.
  - g. Alarms shall be annunciated in any of the following manners as defined by the user:
    - 1) Screen message text
    - 2) Email of the complete alarm message to multiple recipients. Provide the ability to route and email alarms based on:
      - 3) Day of week
      - 4) Time of day
      - 5) Recipient
      - 6) Graphic with flashing alarm object(s)
  - h. The following shall be recorded by the Building Controller for each alarm:
    - 1) Time and date
    - 2) Location (building, floor, zone, office number, etc.)
    - 3) Equipment (air handler #, access way, etc.)
    - 4) Acknowledge time, date, and user who issued acknowledgement.



- 5) Number of occurrences since last acknowledgement.
  - i. Alarm actions may be initiated by user defined programmable objects created for that purpose.
  - j. Defined users shall be given proper access to acknowledge any alarm, or specific types or classes of alarms defined by the user.
  - k. A log of all alarms shall be maintained by the UNC and/or a server (if configured in the system) and shall be available for review by the user.
  - l. Provide a “query” feature to allow review of specific alarms by user defined parameters.
  - m. A separate log for system alerts (controller failures, network failures, etc.) shall be provided and available for review by the user.
  - n. An Error Log to record invalid property changes or commands shall be provided and available for review by the user.
10. Data Collection and Storage
- a. The Building Controller shall have the ability to collect data for any property of any object and store this data for future use.
  - b. The data collection shall be performed by log objects, resident in the Building Controller that shall have, at a minimum, the following configurable properties:
    - 1) Designating the log as interval or deviation.
    - 2) For interval logs, the object shall be configured for time of day, day of week and the sample collection interval.
    - 3) For deviation logs, the object shall be configured for the deviation of a variable to a fixed value. This value, when reached, will initiate logging of the object.
    - 4) For all logs, provide the ability to set the maximum number of data stores for the log and to set whether the log will stop collecting when full, or rollover the data on a first-in, first-out basis.
    - 5) Each log shall have the ability to have its data cleared on a time-based event or by a user-defined event or action.
  - c. All log data shall be stored in a relational database in the UNC and the data shall be accessed from a server (if the system is so configured) or a standard Web Browser.
  - d. All log data, when accessed from a server, shall be capable of being manipulated using standard SQL statements.
  - e. All log data shall be available to the user in the following data formats:
    - 1) HTML
    - 2) XML
    - 3) Plain Text
    - 4) Comma or tab separated values

- f. The Building Controller shall have the ability to archive its log data locally (to itself) and remotely to the server.
  - 1) Archive on time of day
  - 2) Archive on user-defined number of data stores in the log (buffer size)
  - 3) Archive when log has reached its user-defined capacity of data stores
  - 4) Provide ability to clear logs once archived

11. Audit Log:

- a. Provide and maintain an Audit Log that tracks all activities performed in the Building Controller. Provide the ability to specify a buffer size for the log and the ability to archive log based on time or when the log has reached its user-defined buffer size. Provide the ability to archive the log locally (to the Building Controller), to another Building Controller on the network, or to a server. For each log entry, provide the following data:
  - 1) Time and date
  - 2) User ID
  - 3) Change or activity: i.e., Change setpoint, add or delete objects, commands, etc.

D. DDC Controllers: Modular, comprising processor board with programmable, nonvolatile, RAM/EEPROM memory for custom control applications and standard control applications. DDC Controllers shall be provided for; Packaged Rooftop Units, DOAS Units, Vert-WSHPs, Horz-WSHPs, the central plant pumping system, and other applications as shown on drawings or identified in the points list.

- 1. DDC Controllers shall monitor and/or control each input/output point; process information; and provide at least 50 expressions for customized HVAC control including mathematical equations, Boolean logic, PID control loops with anti-windup, sequencers, timers, interlocks, thermostats, enthalpy calculation, counters, interlocks, ramps, drivers, schedules, calendars, OSS, compare, limit, curve fit, and alarms.
- 2. Capable of stand-alone mode control functions operate regardless of network status.
- 3. Have a local operator interface port for program download from portable workstation.
- 4. Shall communicate with the Building Controller using BACnet protocol.

### 2.3 CONTROL PANELS

A. Local Control Panels: Unitized NEMA 1 cabinet with suitable brackets for wall or floor mounting, located adjacent to each system under automatic control. Provide common keying for all panels.

- 1. Fabricate panel's 0.06-inch thick, furniture-quality steel, or extruded-aluminum alloy, totally enclosed, with hinged doors and keyed lock and with manufacturer's standard shop-painted finish.
- 2. Interconnections between internal and face-mounted devices pre-wired with color-coded stranded conductors neatly installed in plastic troughs and/or tie-wrapped. Terminals for

field connections shall be UL Listed for 600-volt service, individually identified per control/interlock drawings, with adequate clearance for field wiring. Control terminations for field connection shall be individually identified per control drawings.

3. Power Supplies: Provide power supplies that have the line-voltage (120V) totally enclosed as to ensure Arch-Flash Compliance. Only low-voltage shall be exposed within any control panel.
4. Provide ON/OFF power switch with over-current protection for control power sources to each local panel.

## 2.4 SENSORS

### A. Electronic Temperature Sensors: Vibration and corrosion resistant for wall, immersion, or duct mounting as required.

1. Resistance Temperature Detectors: Platinum, thermistor, or Balco.
  - a. Accuracy: Plus or minus 0.2 percent at calibration point; thermistors shall have a maximum 5-year drift of no more than .225°F maximum error of no more than .36°F
  - b. Wire: Twisted, shielded-pair cable
  - c. Insertion Elements in Ducts: Single point, 6 inches long; use where not affected by temperature stratification or where ducts are smaller than 4 sq. ft.
  - d. Averaging Elements in Ducts: 60 inches, long, flexible for use where prone to temperature stratification or where ducts are larger than 4 sq. ft.; 264 inches long, flexible for use where prone to temperature stratification or where ducts are larger than 16 sq. ft; length as required.
  - e. Insertion Elements for Liquids: Brass socket with minimum insertion length of 2-1/2 inches. All thermometers shall have a digital read-out.
  - f. Outside-Air Sensors: Watertight inlet fitting, shielded from direct sunlight.
2. Humidity Sensors: Bulk polymer sensor element.
  - a. Accuracy: 2 percent at 10-90% RH with linear output.
  - b. Room Sensors: Range of 0 to 100 percent relative humidity
  - c. Duct and Outside-Air Sensors: With element guard and mounting plate, range of 0 to 100 percent relative humidity.
3. Static-Pressure Transmitter: Non-directional sensor with suitable range for expected input, and temperature compensated.
  - a. Accuracy: +/- 1 percent of full scale with repeatability of 0.5 percent.
  - b. Output: 4 to 20 mA, 0-5 vDC, 0-10 vDC.
  - c. Building Static-Pressure Range: -.1 to .1, -0.25 to 0.25, -.5 to .5, -1.0 to 1.0 IN WC., jumper selectable.
4. Pressure Transmitters: Direct acting for gas, liquid, or steam service; range suitable for system; proportional output 4 to 20 mA.

### B. Equipment operation sensors as follows:

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1. Status Inputs for Fans: Differential-pressure switch with adjustable range of 0 to 5 IN WC.
  2. Status Inputs for Electric Motors: Current-sensing relay with current transformers, adjustable and set to 175 percent of rated motor current.
- C. Electric Low-Limit Duct Thermostat: Snap-acting, single-pole, single-throw, manual- or automatic-reset switch that trips if temperature sensed across any 12 inches of bulb length is equal to or below set point.
1. Bulb Length: Minimum 20 feet
  2. Quantity: One thermostat for every 20 sq. ft. of coil surface.
  3. Quantity: One thermostat for every 20 sq. ft. of coil surface.

## 2.5 CONTROL CABLE

- A. Network communication cable shall be plenum rated CAT5.
- B. BACnet communication cable shall be plenum rated and certified BACnet compatible.
- C. Field device cable shall be plenum rated 18 gauge stranded, twisted-shielded.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. The project plans shall be thoroughly examined for control device and equipment locations. Any discrepancies, conflicts, or omissions shall be reported to the Architect/Engineer for resolution before rough-in work is started.
- B. The controls contractor shall inspect the site to verify that equipment may be installed as shown. Any discrepancies, conflicts, or omissions shall be reported to the Engineer for resolution before rough-in work is started.
- C. The controls contractor shall examine the drawings and specifications for other parts of the work. If head room or space conditions appear inadequate, or if any discrepancies occur between the plans and the Contractor's work and the plans and the work of others, the control contractor shall report these discrepancies to the Engineer and shall obtain written instructions for any changes necessary to accommodate the Contractor's work with the work of others.

### 3.2 PROTECTION

- A. The controls contractor shall protect all work and material from damage by its employees and/or subcontractors and shall be liable for all damage thus caused.
- B. The controls contractor shall be responsible for its work and equipment until finally inspected, tested, and accepted.

### 3.3 COORDINATION

#### A. Site:

1. The project coordination between trades is the responsibility of the prime contractor who is the one tier higher contractual partner, such as Mechanical Contractor, General Contractor, Construction Manager, Owner or Owner's representative as applicable.
2. The controls contractor shall follow prime contractor's job schedule and coordinate all project related activities through the prime contractor except otherwise agreed or in minor job site issues. Reasonable judgment shall be applied.
3. Where the work will be installed in close proximity to, or will interfere with, work of other trades, the controls contractor shall assist in working out space conditions to make a satisfactory adjustment.
4. If the controls contractor deviates from the job schedule and installs work without coordinating with other trades, so as to cause interference with work of other trades, the controls contractor shall make the necessary changes to correct the condition without extra charge.
5. Coordinate and schedule work with all other work in the same area, or with work that is dependent upon other work, to facilitate mutual progress.

#### B. Submittals:

1. Refer to the "Submittals" paragraph in PART 1 of this Specification for requirements.

#### C. Test and Balance:

1. The controls contractor shall furnish a single set of all tools necessary to interface to the control system for test and balance purposes.
2. The controls contractor shall provide training in the use of these tools. This training will be planned for a minimum of 2 hours.

#### D. Coordination with controls specified in other Sections or Divisions of this Specification include controls and control devices that are to be part of or interfaced to the control system specified in this Section. These controls shall be integrated into the system and coordinated by the controls contractor as follows:

1. Each supplier of controls product is responsible for the configuration, programming, startup, and testing of that product to meet the sequences of operation described in this Section.
2. The controls contractor shall coordinate and resolve any incompatibility issues that arise between the control products provided under this Section and those provided under other Sections or Divisions of this Specification.
3. The controls contractor is responsible for providing all controls described in the Contract Documents regardless of where within the Contract Documents these controls are described.

#### E. The controls contractor is responsible for the interface of control products provided by multiple suppliers regardless of where this interface is described within the Contract Documents.

3.4 GENERAL WORKMANSHIP

- A. Install equipment, piping, and wiring/raceway parallel to building lines (i.e., horizontal, vertical, and parallel to walls) wherever possible.
- B. Provide sufficient slack and flexible connections to allow for vibration of equipment.
- C. Install all equipment in readily accessible locations as defined by Chapter 1, Article 100, Part A of the National Electrical Code (NEC).
- D. Verify integrity of all wiring to ensure continuity and freedom from shorts and grounds.
- E. All equipment, installation, and wiring shall comply with acceptable industry specifications and standards for performance, reliability, and compatibility and be executed in strict adherence to local codes and standard practices.

3.5 FIELD QUALITY CONTROL

- A. Controls contractor shall have a 6 Sigma certified (or equivalent certification) quality manager on staff to inspect the project execution and to enforce quality standards.
- B. All work, materials, and equipment shall comply with the rules and regulations of applicable local, state, and federal codes and ordinances as identified in PART 1 of this Specification.
- C. Controls contractor shall continually monitor the field installation for code compliance and quality of workmanship.
- D. Controls contractor shall have work inspected by local and/or state authorities having jurisdiction over the work.

3.6 WIRING:

- A. All control and interlock wiring shall comply with national and local electrical codes and Division 26 of this Specification. Where the requirements of this Section differ from those in Division 26, the requirements of this Section shall take precedence.
- B. All NEC Class 1 (line voltage) wiring shall be UL-Listed in approved 3/4" conduit according to NEC and Division 26 requirements.
- C. All low-voltage wiring shall meet NEC Class 2 requirements. (Low-voltage power circuits shall be sub fused when required to meet Class 2 current limit.)
- D. Where NEC Class 2 (current-limited) wires are in concealed and accessible locations, including ceiling return air plenums, approved cables not in conduit may be used provided that cables are UL-Listed for the intended application. For example, cables used in ceiling plenums shall be UL-Listed specifically for that purpose.

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- E. All wiring in mechanical, electrical, or service rooms, or where subject to mechanical damage, shall be installed in conduit.
- F. Do not install Class 2 wiring in conduit containing Class 1 wiring. Boxes and panels containing high voltage wiring and equipment may not be used for low-voltage wiring except for the purpose of interfacing the two (e.g., relays and transformers).
- G. Do not install control wiring in conduit containing line voltage.
- H. Where plenum-rated cable is run exposed, wiring is to be run parallel along a surface or perpendicular to it and neatly tied at 3 m (10 ft) intervals.
- I. Where plenum-rated cable is used without conduit, it shall be supported from or anchored to structural members. Cables shall not be supported by or anchored to ductwork, electrical conduits, piping, or ceiling suspension systems.
- J. All wire-to-device connections shall be made at a terminal block or wire nut. All wire-to-wire connections shall be at a terminal strip or wire nut.
- K. All wiring within enclosures shall be neatly bundled and anchored to permit access and prevent restriction to devices and terminals.
- L. Maximum allowable voltage for control wiring shall be 120 V. If only higher voltages are available, the Contractor shall provide step-down transformers or interposing relays.
- M. All plenum-rated wiring shall be installed as continuous lengths, with no splices permitted between termination points.
- N. All wiring in conduit shall be installed as continuous lengths, with no splices permitted between termination points or junction boxes.
- O. Maintain fire rating at all penetrations. Install plenum wiring in sleeves where it passes through walls and floors.
- P. Size and type of conduit and size and type of wire shall be the responsibility of the Contractor, in keeping with the manufacturer's recommendations and NEC requirements, except as noted elsewhere.
- Q. Include one pull string in each conduit 3/4 in. or larger.
- R. Control and status relays are to be located in designated enclosures only. These enclosures can include packaged equipment control panel enclosures unless they also contain Class 1 starters.
- S. Conceal all conduit, except within mechanical, electrical, or service rooms. Install conduit to maintain a minimum clearance of 15 cm (6 in.) from high-temperature equipment (e.g., steam pipes or flues).
- T. Secure conduit with conduit clamps fastened to the structure and spaced according to code requirements. Conduit and pull boxes may not be hung on flexible duct strap or tie rods.

Conduits may not be run on or attached to ductwork.

- U. Adhere to this Specification's Division 26 requirements where conduit crosses building expansion joints.
- V. The controls contractor shall terminate all control and/or interlock wiring and shall maintain updated (as-built) wiring diagrams with terminations identified at the job site.
- W. Flexible metal conduits and liquid-tight, flexible metal conduits shall not exceed 1 m (3 ft) in length and shall be supported at each end. Flexible metal conduit less than 1/2-inch electrical trade size shall not be used. In areas exposed to moisture, including chiller and boiler rooms, liquid-tight, flexible metal conduits shall be used.
- X. Conduit must be adequately supported, properly reamed at both ends, and left clean and free of obstructions. Conduit sections shall be joined with couplings (according to code). Terminations must be made with fittings at boxes, and ends not terminating in boxes shall have bushings installed.

### 3.7 COMMUNICATION WIRING

- A. The controls contractor shall adhere to the items listed in the "Wiring" paragraph in PART 3 of the Specification.
- B. All cabling shall be installed in a neat and workmanlike manner. Follow manufacturer's installation recommendations for all communication cabling.
- C. Do not install communication wiring in raceway and enclosures containing Class 1 or other Class 2 wiring.
- D. Maximum pulling, tension, and bend radius for cable installation, as specified by the cable manufacturer, shall not be exceeded during installation.
- E. Controls contractor shall verify the integrity of the entire network following the cable installation. Use appropriate test measures for each particular cable.
- F. When a cable enters or exits a building, a lightning arrestor must be installed between the lines and ground. The lightning arrestor shall be installed according to the manufacturer's instructions.
- G. All runs of communication wiring shall be un-spliced length when that length is commercially available.
- H. All communication wiring shall be labeled to indicate origination and destination data.
- I. Grounding of coaxial cable shall be in accordance with NEC regulations article on "Communications Circuits, Cable, and Protector Grounding."

### 3.8 INSTALLATION OF SENSORS



A. General:

1. Install sensors in accordance with the manufacturer's recommendations.
2. Mount sensors rigidly and adequately for the environment within which the sensor operates.
3. Room temperature sensors shall be installed in existing junction boxes.
4. All wires attached to sensors shall be air sealed in their raceways or in the wall to stop air transmitted from other areas affecting sensor readings.
5. Low-limit sensors used in mixing plenums shall be installed in a serpentine manner horizontally across the full face of the coil.

3.9 IDENTIFICATION OF HARDWARE AND WIRING

- A. All wiring and cabling, including that within factory-fabricated panels shall be labeled at each end within 5 cm (2 in.) of termination with the DDC address or termination number.
- B. Permanently label or code each point of field terminal strips to show the instrument or item served.
- C. Identify control panels with minimum 1 cm (1/2 in.) letters on laminated plastic Newsome Park ES Newport News Public Schools nameplates.
- D. Identify all other control components with permanent labels. All plug-in components shall be labeled such that removal of the component does not remove the label.
- E. Identify room sensors with nameplates.
- F. Manufacturers' nameplates and UL or CSA labels are to be visible and legible after equipment is installed.
- G. Identifiers shall match record documents.

3.10 PROGRAMMING

- A. Provide sufficient internal memory for the specified sequences of operation and trend logging.
- B. Point Naming: System point names shall be modular in design, allowing easy operator interface without the use of a written point index. Point Naming standard shall be agreed upon between Owner and Controls Contractor. Refer to "Submittals" in PART 1.
- C. Operator Interface:
  1. Standard graphics—Provide graphics for all mechanical systems and floor plans of the building. Point information on the graphic displays shall dynamically update. Show on each graphic all input and output points for the system. Also show relevant calculated points, such as setpoints.
  2. Show Dashboard for all equipment on a "graphic" summary table. Provide dynamic information for each point shown.

3.11 CONTROL SYSTEM CHECKOUT AND TESTING

- A. Perform a three-phase commissioning procedure consisting of field I/O calibration and commissioning, system commissioning and integrated system program commissioning. Document all commissioning information on commissioning data sheets that shall be submitted prior to acceptance testing. Commissioning work that requires shutdown of system or deviation from normal function shall be performed when the operation of the system is not required. The commissioning must be coordinated with the Owner and Construction Manager to ensure systems are available when needed. Notify the operating personnel, in writing, of the testing schedule so that authorized personnel from the Owner and Construction Manager are present throughout the commissioning procedure.
- B. Phase I – Field I/O Calibration and Commissioning:
1. Verify that each control panel has been installed according to plans, specifications, and approved shop drawings. Calibrate, test, and have signed off each control sensor and device. Commissioning to include, but not be limited to:
    - a. Sensor accuracy at 10, 50 and 90% of range.
    - b. Sensor range.
    - c. Verify analog limit and binary alarm reporting.
    - d. Point value reporting.
    - e. Binary alarm and switch settings.
    - f. Actuator and positioner spring ranges if pneumatic actuation is utilized.
    - g. Fail safe operation on loss of control signal, pneumatic air, electric power, network communications, etc.
- C. Phase II – System Commissioning:
1. Each DDC program shall be put on line and commissioned. The controls contractor shall, in the presence of the Owner and Construction Manager, demonstrate each programmed sequence of operation and compare the results, in writing. In addition, each control loop shall be tested to verify proper response and stable control, within specified accuracy. System program test results shall be recorded on commissioning data sheets and submitted for record. Any discrepancies between the specification and the actual performance will be immediately rectified and re-tested.
- D. Phase III – Integrated System Program Commissioning:
1. Tests shall include, but not be limited to:
    - a. Data communication, both normal and failure modes.
    - b. Fully loaded system response time.
    - c. Impact of component failures on system performance and system operation.
    - d. Time/Date changes.
    - e. End of month/end of year operation.
    - f. Season changeover.
    - g. Global application programs and point sharing.

- h. System backup and reloading.
  - i. System status displays.
  - j. Diagnostic functions.
  - k. Power failure routines.
  - l. Battery backup.
  - m. Testing of all electrical and HVAC systems with other division of work.
- 2. Submit for approval, a detailed acceptance test procedure designed to demonstrate compliance with contractual requirements. This Acceptance test procedure will take place after the commissioning procedure but before final acceptance, to verify that sensors and control devices maintain specified accuracy and the system performance does not degrade over time.
  - 3. Using the commissioning test data sheets, the controls contractor shall demonstrate each point. The controls contractor shall also demonstrate 100% of the system functions. The controls contractor shall demonstrate all points and system functions until all devices and functions meet specification.
  - 4. The controls contractor shall supply all instruments for testing. Instruments shall be turned over to the Owner after acceptance testing.
  - 5. All test instruments shall be submitted for approval prior to their use in commissioning.
    - a. Test Instrument Accuracy:
      - 1) Temperature: 1/4°F or 1/2% full scale, whichever is less.
      - 2) Pressure: High Pressure (PSI): 1/2 PSI or 1/2% full scale, whichever is less.
      - 3) Low Pressure: 1/2% of full scale (in w.c.).
      - 4) Electrical: 1/4% full scale.
  - 6. After the above tests are complete and the system is demonstrated to be functioning as specified, a 30-day performance test period shall begin. If the system performs as specified throughout the test period, requiring only routine maintenance, the system shall be accepted. If the system fails during the test, and cannot be fully corrected within 8 hours, the Owner may request that performance tests be repeated.

### 3.12 CONTROL SYSTEM DEMONSTRATION AND ACCEPTANCE

#### A. Demonstration:

- 1. Prior to acceptance, the control system shall undergo a series of performance tests to verify operation and compliance with this Specification. These tests shall occur after the controls contractor has completed the installation, started up the system, and performed his/her own tests.
- 2. The tests described in this Section are to be performed in addition to the tests that the Contractor performs as a necessary part of the installation, start-up, and debugging process and as specified in the "Control System Checkout and Testing" paragraph in PART 3 of this Specification. The Engineer will be present to observe and review these tests. The Engineer shall be notified at least 10 days in advance of the start of the testing procedures.

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3. The demonstration process shall follow that approved in PART 1, "Submittals." The approved checklists and forms shall be completed for all systems as part of the demonstration.
4. The controls contractor shall provide at least two persons equipped with two-way communication and shall demonstrate actual field operation of each control and sensing point for all modes of operation, including day, night, occupied, unoccupied, fire/ smoke alarm, seasonal changeover, and power failure modes. The purpose is to demonstrate the calibration, response, and action of every point and system. Any test equipment required to prove the proper operation shall be provided by and operated by the control's contractor.
5. As each control input and output is checked, a log shall be completed showing the date, technician's initials, and any corrective action taken or needed.
6. Demonstrate compliance with PART 1, "System Performance."
7. Demonstrate compliance with sequences of operation through all modes of operation.
8. Additionally, the following items shall be demonstrated:
  - a. DDC control loop response: The controls contractor shall supply trend data output in a graphical form showing the step response of each DDC control loop. The test shall show the loop's response to a change in set point, which represents a change of actuator position of at least 25% of its full range. The sampling rate of the trend shall be from 10 seconds to 3 minutes, depending on the speed of the loop. The trend data shall show for each sample the setpoint, actuator position, and controlled variable values. Any loop that yields unreasonably under-damped or over-damped control shall require further tuning by the Contractor.
  - b. Optimum start/stop: The controls contractor shall supply a trend data output showing the capability of the algorithm. The change-of value or change-of-state trends shall include the output status of all optimally started and stopped equipment, as well as temperature sensor inputs of affected areas.
  - c. Operational logs for each system that indicate all setpoints, operating points, valve positions, mode, and equipment status shall be submitted to the Engineer. These logs shall cover three 48-hour periods and have a sample frequency of not more than 10 minutes. The logs shall be provided in both printed and electronic formats.
9. Any tests that fail to demonstrate the operation of the system shall be repeated at a later date. The controls contractor shall be responsible for any necessary repairs or revisions to the hardware or software to successfully complete all tests.

B. Acceptance:

1. All tests described in this Specification shall have been performed to the satisfaction of both the Engineer and Owner prior to the acceptance of the control system as meeting the requirements of completion. Any tests that cannot be performed due to circumstances beyond the control of the controls contractor may be exempt from the completion requirements if stated as such, in writing, by the Engineer. Such tests shall then be performed as part of the warranty.
2. The system shall not be accepted until all forms and checklists completed as part of the demonstration are submitted and approved as required in PART 1, "Submittals."

3.13 TRAINING

- A. The controls contractor shall provide competent instructors to give full instruction to designated personnel in the adjustment, operation and maintenance of the system installed. Factory employed/ certified instructors shall be thoroughly familiar with all aspects of the subject matter they are to teach. All training shall be held during normal work hours of 7:00 a.m. to 3:00 p.m. weekdays.
- B. Provide a minimum combined 16 hours of on-site training / orientation session and classroom or on-line training session for personnel designated by the Owner. Coordinate training sessions with the owner.

3.14 MISCELLANEOUS

- A. Air Purification System Plasma Detector: The DDC System shall connect to the dry-contacts of the manufacturers provided control relay on the duct mounted plasma detection device. The DDC system shall transmit an alarm to the DDC operator's workstation anytime the associated system fan is enabled and the plasma detector fails to detect ions in the airstream.

END OF SECTION 230900

SECTION 260100 - ELECTRICAL GENERAL PROVISIONS

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 SCOPE OF WORK

- A. This Section of the Specifications describes the material and installation procedures to be followed for furnishing and installing the electrical equipment and material as outlined and described on the contract drawings and as stated in this Division of the Specifications.
- B. Where the word "Contractor" appears in this Division of the Specifications, it applies to the Contractor performing the electrical portion of the work, unless specifically indicated otherwise.
- C. The Contractor shall install the systems as specified herein and indicated on the contract drawings and shall furnish all labor, material, tools, scaffolds, erection equipment, services and other items of expense as necessary as a part of this Contract. This Contract further includes placing the systems into operation and properly testing, adjusting, balancing and training the owner's personnel on the use of all items of equipment as specified and as approved by the Architect.

1.3 SUPERVISION

- A. The Electrical Contractor shall have a competent and English speaking designated Supervisor who is a Certified Master Electrician on the job site at all times that any electrical work is being performed. This shall include any and all electrical work being accomplished by contractors who are subcontractors to the prime Electrical Contractor.

1.4 DRAWINGS

- A. General arrangements of the necessary conduits, feeders, light fixtures, devices, panels, and equipment are indicated on the drawings in diagrammatic form only. Due to the scale of the drawings, offsets, fittings, and accessories may not be shown. Work indicated but having details omitted shall be provided complete to an operating condition with all fittings, wiring, and ancillary equipment and material as required. Where rearrangement is necessary, submit drawings of proposed changes for approval and coordinate and arrange work with consideration to the mechanical drawings, the existing building conditions and to the work of the various other building trades. Equipment provided under this Division of the Specifications shall be installed in accordance with the recommendations of the equipment or material manufacturer.

1.5 COORDINATION

- A. Coordinate the electrical work with the mechanical drawings and work in order to avoid omissions and to eliminate any interference. Report any discrepancies found, as soon as possible, after discovery, to the Architect.
- B. The contractor shall be responsible for coordinating with the Division 23 Contractor for providing properly sized circuit breakers to serve mechanical equipment and motors furnished which differ from that specified or indicated. This shall be further understood to include branch circuit wiring, conduit, disconnect switches, etc., in accordance with the appropriate codes and specifications. The cost of providing this increased electrical service and related work shall be included under the applicable section under which the equipment and motors are being furnished, at no additional cost to Owner.

1.6 CODES AND STANDARDS

- A. Various recognized codes and standards form a part of these Specifications the same as if written fully herein and shall be followed as minimum requirements. The codes and standards will be referred to by their abbreviated names and are listed below. Reference to these standards shall be understood to mean the latest edition and accumulative supplements which have been adopted by the "Authority Having Jurisdiction," unless noted otherwise.

ASAD	ADA Standards for Accessible Design
ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
CBMA	Certified Ballast Manufacturers Association
IBC	International Building Code
ICC	International Code Council
ICEA	Insulated Cable Engineers Association
IECC	International Energy Conservation Code
IEEE	Institute of Electrical and Electronics Engineers
IESNA	Illuminating Engineering Society of North America
LEED	Leadership in Energy and Environmental Design
NEC 2014	National Electrical Code
NEMA	National Electrical Manufacturers Association
NESC	National Electrical Safety Code
NFPA	National Fire Prevention Association
NFPA 70E	Standard for Electrical Safety in the workplace
OSHA	The Occupational Safety and Health Act
UL	Underwriters Laboratories, Inc.
VUSBC	Virginia Uniform Statewide Building Code, 2018 Edition

- B. All equipment, material, apparatus, and work shall conform to the requirements of the NEC. If the Contractor observes that the drawings and specifications are at variance therewith, the contractor shall notify the Architect in writing. If the Contractor performs such work contrary

to the above referenced rules and regulations and without written acknowledgment or notice thereto, they shall correct this work and bear all cost arising therefrom.

1.7 NOTICES AND FEES

- A. Give all required notices, obtain all necessary permits, and pay all required fees, including any fees associated with temporary electrical power services during construction. Utility company fees, which are for the permanent installation of electrical power services, shall be paid for by the Owner.

PART 2 - PRODUCTS

2.1 EQUIPMENT AND MATERIALS

- A. Refer to Specification 013300 "Submittals", for shop drawing submittal procedures. Submit shop drawings for materials required for this project as indicated herein. Obtain approval from the Architect before manufacture is started on any of same. The shop drawings shall show complete details of the various items, wiring diagrams, etc., and shall be submitted in a sufficient number of copies to allow the Engineer to retain one copy. Approved copies of all shop drawings shall be kept on the job site accessible to the Architect at all times. All new power distribution equipment (switchboards, panelboards, disconnect switches, transformers, contactors, and other power related components) shall all be by the same manufacturer.

2.2 ACCEPTABLE MANUFACTURERS

- A. The following list states specific names of acceptable manufacturers of particular equipment and indicates the types of material on which submittals shall be made:

Submittal  
Information  
Required:

Power Distribution Equipment (Switchboards,  
Panelboards, and Motor Control Centers..... Shop Drawings  
General Electric / ABB Company  
Square D Company  
Eaton/Cutler-Hammer  
Siemens

Disconnect Switches ..... Product Data  
General Electric / ABB Company  
Square D Company  
Eaton/Cutler-Hammer  
Siemens



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Wiring Devices and Cover Plates ..... Product Data  
Hubbell  
Leviton  
Arrow-Hart  
Pass and Seymour

Surface Metal Raceway ..... Product Data  
Wiremold  
Hubbell Incorporated  
Mono Systems

- B. The following list states other materials for which product data submittals shall be made:
- Circuit Breakers (each type)
  - Conductors (each type)
  - Conduit (each type)
  - Fire Alarm System Components
  - Fuses (each type)
  - MC Cable (each type)
  - Surface Metal Raceway (including all accessory components)
- C. Catalog numbers and manufacturers are listed as a guide for minimum requirements to be met. Material and equipment of manufacturers other than those listed will be given consideration by the Architect providing the material meets the minimum requirements set forth in these Specifications and providing the material or equipment will provide satisfactory performance for the intended installation, does not exceed the dimensions and weight of the specified item and meets the aesthetic performance desired of the specified item. Submittals of other than specified equipment shall have indicated on the specification sheets in the shop drawing submittals each item called for in these Specifications by paragraph and subparagraph numbers and/or letters.
- D. Refer to Specification Section 012500 for substitution requirements.
- E. Any deviation from the manufacturers listed in the preceding list and /or of those stated in the Contract Documents shall be submitted to the Architect for approval in accordance with Specification Section 260500, "Materials and Methods." Facsimile transmission of data for review will not be accepted.
- F. The Engineer will review for approval, only one substitute for each type of material specified in the Division 26 Contract Documents. If the substitute material is not approved, the Contractor shall provide the material by one of the specified manufacturers. Approval of substitute material is at the sole discretion of the Architect and Owner, and the Contractor shall bear all costs arising therefrom, including any design fees if additional design effort is deemed prudent or necessary by the Architect.
- G. Only the types of materials specified herein are approved for use on this project. No other material types will be considered.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. "Provide," as used on the drawings and in these Specifications, shall mean furnish, install, connect, adjust, test, and place into operation, except where otherwise specifically stated in the contract documents.
- B. Provide coordinated electrical systems, equipment, and material complete with auxiliaries and accessories as required for a complete and operable finished project.
- C. Run all conduits concealed except where specifically indicated otherwise. Exposed conduit installation other than where indicated shall be approved by the Architect and Owner prior to installation.

### 3.2 CLEANING AND PAINTING

- A. Remove all dirt, trash, and oil from all raceways, boxes, fittings, cabinets, and panelboards.
- B. Protect, to the satisfaction of the Architect, all equipment provided against damage during construction. If damage does occur to any materials, refinish, repair, or replace the equipment or material as directed by the Architect.

### 3.3 REPAIR OF EXISTING WORK

- A. Repair of existing work, demolition, and modification of existing electrical distribution systems shall be performed as follows:
  - 1. Workmanship: Lay out work in advance.
    - a. Exercise care when cutting, channeling, chasing, or drilling of walls, partitions, ceilings, or other surfaces as necessary for proper installation, support, or anchorage of conduit, raceways, or other electrical work. Repair damage to buildings and materials or equipment damaged using skilled craftsmen of the appropriate trades.
  - 2. Existing Concealed Wiring to be Removed:
    - a. Existing concealed wiring to be removed shall be disconnected from its source. Remove conductors and cut conduits flush with concrete floors, and top openings with non-shrink grout. Where conduit that passes through walls is removed, seal opening in wall with a material that is equal to the fire rating of the material the wall is constructed from.
  - 3. Continuation of Service:

- a. Maintain continuity of existing circuits to remain. Existing circuits shall remain energized unless otherwise indicated. Circuits which are to remain but were disturbed during demolition shall have circuit wiring and power restored back to original condition as approved by the Architect. Only materials specified for this project may be used to affect repairs.

### 3.4 RECORD DRAWINGS

- A. Refer to Specification Section 017839 “Project Record Documents”.

### 3.5 OPERATION AND MAINTENANCE MANUALS

- A. Refer to Specification Section 017823 “Operation and Maintenance Data”.

The following list states materials for which Operation and Maintenance Data submittals shall be made:

- Fire Alarm System Components
- Power Distribution Equipment (Panelboards and Disconnect Switches)

### 3.6 EQUIPMENT INVENTORY

- A. Provide a complete equipment inventory for all Electrical Equipment listed below. Refer to Appendix A in this section for the required template. A separate form shall be provided for each new piece of equipment provided.
- B. Prior to substantial completion, submit the equipment inventory forms for review. Once approved, include the forms in the operation and maintenance manual.

The following list states materials for which equipment inventory shall be made:

- Fire Alarm System Components
- Power Distribution Equipment (Panelboards and Disconnect Switches)

**APPENDIX A**

**New Equipment Inventory**

Project Name: **(Add Project Name)**  
Project Address: **(Add Project Address)**

**Description of Item:** \_\_\_\_\_  
(ex. Switchboard, Panelboards, Generator, Lighting, etc.)

**Classification:**

- Lighting
- Power Distribution
- Auxiliary Systems

**Building:** \_\_\_\_\_

**Equipment Location (Room Number):** \_\_\_\_\_

**Date Purchased:** \_\_\_\_\_

**Date Placed in Service:** \_\_\_\_\_

**Original Cost:** \_\_\_\_\_

**Life Expectancy (years):** \_\_\_\_\_

**Estimated Replacement Date:** \_\_\_\_\_

**Estimated Replacement Cost:** \_\_\_\_\_

**Manufacturer:** \_\_\_\_\_

**Model/Serial #:** \_\_\_\_\_

END OF SECTION 260100

SECTION 260500 - MATERIALS AND METHODS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and General provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections, and Section 260100, "Electrical General Provisions," apply to this Section.

1.2 SCOPE OF WORK

- A. Provide all labor, material, tools, scaffolds, erection equipment, services and supplies to fabricate, install, connect, adjust, test, and place in operation the electrical and other systems as called for in these Specifications and as indicated on the Contract Drawings.
- B. Properly store and protect all material and equipment until installed.
- C. All material and equipment shall be new and of the quality noted or specified. Material, equipment, and work of inferior quality will be rejected and shall be removed from the job site immediately upon rejection and replaced. Unacceptable work shall be removed and replaced. All replacement material and work shall be done at the Contractor expense. The Architect will decide upon the quality of material and equipment furnished and of the work performed.

1.3 WARRANTIES

- A. The Contractor shall provide the Owner with a one-year, unlimited material and labor warranty on all work accomplished and materials provided under Division 26, including all components thereof except as otherwise noted herein or in other specifications. The warranty start date is the date of project "Substantial Completion" as determined by the Architect. All warranties shall be submitted as part of the shop drawing submittals.

PART 2 - PRODUCTS

2.1 MATERIAL

- A. Electrical material furnished under these Specifications shall be new and listed by UL and shall bear the UL label where labeling service is available for the type of material provided for this project.

2.2 RACEWAYS

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- A. Raceways shall be of the size indicated or as required by the NEC; whichever is the larger; except where larger conduits are specified on the Contract Drawings. Raceways shall be 1/2" minimum
- B. Raceways shall be provided for all electrical systems indicated on the drawings unless specifically indicated otherwise. Raceways shall be hot-dip galvanized rigid steel conduit (GRS), electrical metallic tubing (EMT), flexible steel conduit, or intermediate metallic conduit (IMC). Flexible steel conduit run outdoors shall be liquid tight. Schedule 40 PVC conduit may be used only below grade, under concrete slabs-on-grade and other locations where specifically indicated.

### 2.3 CONDUCTORS

- A. Conductors shall be of the American Wire Gauge size indicated on the contract drawings or specified herein.
- B. All conductors shall be copper.

### 2.4 OUTLETS

- A. Outlet and junction boxes shall be of one-piece galvanized construction of a type and size applicable for use in the location indicated on the contract drawings and as required by the NEC.
- B. Locations of outlets for devices, power, and equipment are indicated on the contract drawings. Owing to the small scale of the drawings, it is not possible to indicate the exact location. Examine the mechanical drawings, and finish conditions and arrange work as required to meet such conditions to the approval of the Architect.

### 2.5 FUSES

- A. All fuses shall be provided by the Electrical Contractor.
- B. Fuses shall be as follows:
  - 1. General: All fuses must carry the UL inspected label. All fuses shall be plainly marked with ampere rating, voltage rating, interrupting capacity when greater than 10,000 Amperes and current limiting where it applies.
  - 2. Interrupting Capacity: Each fuse shall be capable of safely interrupting the maximum short-circuit current available at the point in the circuit where installed.
  - 3. Coordination: Service fuses and the fuses installed in feeder circuits shall be coordinated to provide a selective system of over-current protection.
- C. Main, feeder, and branch circuit fuses shall be as follows:

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1. Circuits 0 to 600 amperes shall be protected by BUSSMANN Low-Peak, Limitron, or Fusetron (RK5, 200,000 I/C) Fuses rated as indicated on the drawings.

## 2.6 LABELING

- A. Label all disconnect switches and panelboards provided under Division 26 of these Specifications.
- B. Labels shall be machine engraved, laminated, Bakelite, nameplate type. Labels shall have black faces with white letters.
- C. Size of labels shall be based on the required lettering and lettering size. The following are the minimum requirements for each type of label:
  1. Panelboards: First line of label shall state name of panel as shown on the drawings. Second line shall state from where the panel is fed. Lettering shall be 3/8" high.

Example:      Panel L-100  
                    Fed from MDS  
                    Circuit # \_\_\_\_\_  
                    Voltage \_\_\_\_\_

2. Disconnect Switches/Lighting Contactors/Time Clocks: Disconnect switches, lighting contactors and time clocks shall be labeled in 1/4" high letters. First line shall state what the switch/contactor is feeding. Second line shall state from which circuit and panel the switch/contactor/time clock is fed.
- D. Attach labels with a minimum of two rivets or sheet metal screws. Adhesive-backed labeling will not be accepted.

## 2.7 PULL BOXES

- A. Install pull boxes at all necessary points, whether indicated on the drawings or not, to prevent injury to conductor insulation or other damage that might result from pulling resistance or for other reasons necessary for proper installation. Minimum dimensions shall not be less than the NEC requirements and shall be increased if necessary for practical reasons or where required to fit the job condition.
- B. Above grade pull boxes shall be constructed of galvanized sheet steel, code gauge, except that not less than 12-gauge shall be used for any box. Where boxes are used in connection with exposed conduit, plain covers attached to the box with a suitable number of countersunk flathead machine screws may be used.
- C. All junction and pull box covers shall be labeled indicating the circuits contained therein in a manner that will prevent unintentional interference with circuits during testing and servicing. For example: "HE1-13." See Specification Section 260534 for additional labeling requirements.

## 2.8 DISCONNECT SWITCHES

- A. Disconnect switches shall conform to governing industry NEMA standards. They shall be listed by UL. Disconnect switches shall be NEMA standard HD, quick-make, quick-break type, and capable of being locked in the off position.
- B. Where disconnect switches are indicated or required by the NEC to be weatherproof, furnish NEMA 3R enclosures.
- C. Arc Flash Warning Labels: Provide all disconnect switches provided by this project with Arc Flash warning labels on the exterior of the switch.

## 2.9 BRANCH CIRCUITS

- A. The branch circuit wiring has been designed to utilize the advantages of multi-wire distribution and shall be installed substantially as indicated on the drawings. Major changes in the grouping or general routing of the branch circuits require prior approval in writing from the Architect/Engineer.
- B. The number of conductors in each run of conduit is indicated on the drawings, but where there is a conflict between the number of wires indicated and the actual number required as determined by the functional requirements of the connected load, or where the number of wires was inadvertently omitted from the drawings, the correct number and size of wires as determined by the functional requirements of the connected load shall govern and be provided at no additional cost.
- C. Where individual 120V or 277V homerun circuits are shown on the drawings, they may be combined as follows:
  - 1. No more than three phase conductors plus three neutrals and one ground per conduit.
  - 2. No two of the same phase conductor per conduit.
  - 3. Provide 120V circuits with individual neutrals per circuit. Neutrals may not be shared.
  - 4. Neutral sharing by 277V circuits is acceptable.

## 2.10 MOTOR DISCONNECTING MEANS

- A. Provide a disconnecting means for each motor where indicated on the drawings. A circuit breaker in a panelboard or horsepower rated switch will be acceptable as a disconnecting means, if readily accessible and if located within sight of the motor and in compliance with all codes. A quick-make and quick-break general use tumbler or snap switch will be acceptable for capacities of 20 amperes or less and 300 volts and less, provided the ampere rating of the switch is at least double the rating of the equipment controlled. Switches of 30- to 400-ampere capacity shall be of the enclosed, quick-make and quick-break type, heavy duty, horsepower rated. Switches shall disconnect all ungrounded conductors and shall disconnect grounded conductors if required by the NEC or if called out on the drawings to do so. Switches shall be fusible type where indicated on the drawings.



2.11 CABLE TIES

- A. Provide cable ties in the length required. Standard, indoor cable ties shall be 7.9 inches in length minimum, 0.19 inches in width and 0.47 inches thick. The tensile strength shall be 50 pounds minimum and the maximum bundle diameter shall be 2 inches. Standard cable ties shall be black in color. Plenum rated cable ties shall be 6 inches in length minimum, .075 inches in width and 0.1 inches thick. The tensile strength shall be 50 pounds minimum and the maximum bundle diameter shall be 1.5 inches. Plenum rated cable ties shall be maroon in color.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install material in a first-class and workmanlike manner to the satisfaction of the Architect.

END OF SECTION 260500

## SECTION 260518 - METAL CLAD CABLES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specifications Sections, and Section 260100, "Electrical General Provisions," apply to this Section.

#### 1.2 DESCRIPTION

- A. Aluminum Metal clad cables may be utilized for branch circuit wiring in walls and above lay-in-tile ceilings only and installed in accordance with NEC 330.

#### 1.3 REFERENCES

- A. Aluminum Metal clad cable shall be constructed in strict accordance with Underwriters Laboratories, Inc. Standard for Aluminum Metal Clad Cables, UL 1569. The cable shall bear the UL label and the manufacturer's "E" number.
- B. Further, the product shall have passed UL Test Procedure 1479, Through Penetration Fire Rating, and meet NEC 330.

### PART 2 - PRODUCTS

#### 2.1 CONDUCTORS

- A. Provide electrical wires, cables, and connectors of manufacturer's standard materials, as indicated by published product information; designed and constructed as recommended by manufacturer for a complete installation and for application indicated. Except as otherwise indicated, provide copper conductors with conductivity of not less than 98% at 20°C (75°F).
- B. Wiring sizes #12 and #10 AWG shall be solid. Larger sizes may be stranded.

### PART 3 - EXECUTION

#### 3.1 SPLICES

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- A. Splicing connectors must have a metal spring that is free to expand. The spring must be suitably coated to resist corrosion. Each connector size must be listed by UL for the intended purpose. The connectors must be suitably color coded to assure that the proper size is used on the wire combinations to be spliced. Each connector must be capable of withstanding 105°C ambient temperatures. The connectors must be compatible with all common rubber and thermoplastic wire insulations. They must also be capable of making copper-to-copper, copper-to-aluminum, and aluminum-to-aluminum splices. At the Contractor’s option, self-strapping electrical tap connectors may be used in wire size and voltage range of the connector. When tape is required for splices, SCOTCHBRAND No. 33, or approved equal, shall be used. Use plastic tape on PVC and its copolymers and rubber-based pressure-sensitive adhesive. The tape must be applicable at temperatures ranging from 0°F through 100°F without loss of physical or electrical properties. The tape must not crack, slip, or flag when exposed to various environments indoor or outdoor. The tape must also be compatible with all synthetic cable insulations as well as cable splicing compounds.
- B. MC Cable used to serve light switches shall be provided with a neutral conductor.
- C. Make splices in conductors #8 AWG and larger with solderless connectors, with molded composition covers.
- D. Connect conductors #12 and #10 AWG with pre-insulated spring connectors rated at not less than 105°C. Connectors shall be UL approved for fixture and pressure work. Connectors shall be 3M CO. SCOTCHLOK, Type Y, R, and B, or approved equal.
- E. Join or terminate conductors #8 AWG and larger with pressure-type copper connectors and properly tape.
- F. All branch circuit and control wiring shall be color coded. The color shall be integral with sheath for sizes #12, #10, and #8 AWG. Larger size wire and cable shall be color coded with a minimum 1/2" wide, colored, plastic tape strip. Place strips a minimum of 6" on center anywhere the conductors are accessible and visible. Wire and cable shall be color coded to match the existing color coding if an existing color code is present. If there is no existing color code, provide the following:

<u>120/208-Volt System</u>	<u>277/480-Volt System</u>
Phase A - black	Phase A - brown
Phase B - red	Phase B - orange
Phase C - blue	Phase C - yellow
Neutral - white	Neutral - grey
Ground - green	Ground - green

- G. Advise the Architect if the color coding provided by the utility company differs from that indicated above.

3.2 SUPPORT OF CABLE

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- A. Cable shall be supported at intervals as required by the NEC. Contractor shall supply the necessary additional bracing of an approved material to support the cable. Where long runs of cable need to be supported, the Contractor shall install a trapeze to support the cable.
- B. MC cable shall be located same as required for the installation of raceways (Specification Section 260533), unless otherwise noted elsewhere in the Contract Documents.

END OF SECTION 260518

SECTION 260519 - CONDUCTORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections, and Section 260100, "Electrical General Provisions," apply to this Section.

1.2 SCOPE OF WORK

- A. Feeder and branch circuit wiring shall conform to the requirements of the NEC, and shall meet all relevant ASTM specifications.

PART 2 - PRODUCTS

2.1 CONDUCTORS

- A. Provide electrical wires, cables, and connectors of manufacturer's standard materials, as indicated by published product information; designed and constructed as recommended by manufacturer for a complete installation and for the application indicated. Provide copper conductors with a conductivity of not less than 98% at a temperature of 20°C (68°F).
- B. Provide factory-fabricated wires of sizes, ampacity ratings, and materials for applications and services indicated. Where not indicated, provide proper wire selection as determined by installer to comply with project's installation requirements, the NEC, and NEMA standards. Select from the following UL types those wires with construction features which fulfill project requirements:
  - 1. Type THWN or THHN: Max operating temperature not to exceed 90°C (194°F) (THHN) in dry locations, or 75°C (167°F) (THWN) in wet or dry locations. Insulation, flame-retardant, moisture- and heat-resistant, thermoplastic; outer covering, nylon jacket; conductor, annealed copper.
  - 2. Type XHHW: For dry and wet locations; max operating temperature 90°C (194°F) for dry locations, and 75°C (167°F) for wet locations. Insulation, flame-retardant, cross-linked synthetic polymer; conductor, annealed copper.
- C. Unless specified otherwise, power conductors shall be 600 volt, Type THWN/THHN, or XHHW.
- D. Conductors shall be continuous from outlet to outlet with splices made only in pull boxes, junction boxes, and outlet boxes.

- E. Do not use wire smaller than #12 AWG for power wiring.
- F. Wiring sizes #12 and #10 AWG shall be solid. Larger sizes may be stranded.
- G. Neutral conductors shall not be under sized.

### PART 3 - EXECUTION

#### 3.1 SPLICES

- A. Splicing connectors must have a metal spring that is free to expand. The spring must be suitably coated to resist corrosion. Each connector size must be listed by UL for the intended purpose. The connectors must be suitably color coded to assure that the proper size is used on the wire combinations to be spliced. Each connector must be capable of withstanding 105°C ambient temperatures. The connectors must be compatible with all common rubber and thermoplastic wire insulations. They must also be capable of making copper-to-copper, copper-to-aluminum, and aluminum-to-aluminum splices. At the Contractor's option, self-strapping electrical tap connectors may be used in wire size and voltage range of the connector. When tape is required for splices, SCOTCHBRAND No. 33, or approved equal, shall be used. Use the plastic tape on PVC and its copolymers and rubber-based pressure-sensitive adhesive. The tape must be applicable at temperatures ranging from 0°F through 100°F without loss of physical or electrical properties. The tape must not crack, slip, or flag when exposed to various environments indoor or outdoor. The tape must also be compatible with all synthetic cable insulations as well as cable splicing compounds.
- B. Make splices in conductors #8 AWG and larger with solderless connectors, with molded composition covers.
- C. Connect conductor sizes #12 and #10 AWG with pre-insulated spring connectors rated at not less than 105°C. Connectors shall be UL approved for fixture and pressure work. Connectors shall be 3M CO. SCOTCHLOK, Type Y, R, and B, or approved equal.
- D. Join or terminate conductors #8 AWG and larger with pressure-type copper connectors and properly tape.
- E. All branch circuit, feeder, and control wiring shall be color coded. The color shall be integral with sheath for sizes #12, #10, and #8 AWG. Larger size wire and cable shall be color coded with a minimum 1/2" wide, colored, plastic tape strip. Place strips a minimum of 6" on center anywhere the conductors are accessible and visible. Wire and cable shall be color coded to match the existing color coding if an existing color code is present. If there is no existing color code, provide the following:

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<u>120/208-Volt System</u>	<u>277/480-Volt System</u>
Phase A - black	Phase A - brown
Phase B - red	Phase B - orange
Phase C - blue	Phase C - yellow
Neutral - white	Neutral - gray
Ground - green	Ground - green

- F. After all wiring is pulled and ready for operation but prior to placing systems in service, conduct insulation resistance tests in all feeder circuits. Measure the insulation resistance between conductors and between each conductor and ground. Make measurements with an instrument capable of making measurements at an applied potential of 500 Volts.
- G. Take readings after the voltage has been applied for a minimum of one minute. The minimum insulation resistance for circuits of #12 AWG conductors shall be 1,000,000 ohms. For circuits of #10 AWG or larger conductor, a resistance based on the allowable ampacity of the conductor shall be as follows:

25 through 50 Amperes	250,000 ohms
51 through 100 Amperes	100,000 ohms
101 through 200 Amperes	50,000 ohms

- H. Advise the Engineer if the color-coding provided by the utility company differs from that indicated above.

### 3.2 TEMPORARY WIRING

- A. Temporary wiring is not specified nor governed by this Division of the Specifications.

END OF SECTION 260519

## SECTION 260525 - SURFACE METAL RACEWAYS

### PART 1 - GENERAL

#### 1.1 REQUIREMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections, and Section 260100, "Electrical General Provisions," apply to this Section.

#### 1.2 SCOPE

- A. The work covered under this Section shall include furnishing and installing surface mounted metal raceways complete for all electrical systems as shown on the Drawings and herein specified. Surface raceway systems shall consist of raceway bases, covers, appropriate fittings, dividers, and device mounting plates necessary for a complete installation.
- B. All material and equipment shall be new and of the quality noted or specified. Material, equipment, and work of inferior quality will be rejected and shall be removed from the job site immediately upon rejection and replaced. Unacceptable work shall be removed and replaced. All replacement material and work shall be done at the Contractor expense. The Architect will decide upon the quality of material and equipment furnished and of the work performed.

#### 1.3 QUALITY ASSURANCE

- A. All equipment, materials, and their installation shall conform to the requirements of the National Electrical Code (NEC), local code requirements, and these Specifications.
- B. All equipment and materials shall be listed by Underwriters Laboratories, Inc. (UL) for their intended use and shall bear the UL label.
- C. Equipment shall be constructed in accordance with National Electrical Manufacturer's Association (NEMA) standards.
- D. Submittals are required in accordance with Section 260100 of these Specifications.

#### 1.4 USES PERMITTED

- A. Surface mounted metal raceway shall be used where indicated on the drawings where new wiring is required on existing walls and on new walls as also indicated on the Drawings.

#### 1.5 DELIVERY, STORAGE AND HANDLING



- A. Deliver raceway systems in factory labeled packages.
- B. Store and handle in strict compliance with manufacturer's written instructions and recommendations.
- C. Protect from damage due to weather, excessive temperature, and construction operations.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Surface metal raceways shall be as manufactured by The Wiremold Company, as described herein as the basis of design, or equal products as manufactured by Hubbell Incorporated and Mono Systems.
- B. All components and fittings shall be of the same manufacturer, or UL listed as an assembly.

### 2.2 MATERIALS AND COMPONENTS

- A. All surface metal raceways shall be galvanized steel, unless otherwise indicated. Finish shall be white in color having a scratch-resistant surface (a polyester topcoat over a colored base) and shall be suitable for field repainting to match surroundings.
- B. A full complement of fittings must be available including but not limited to mounting clips and straps, couplings, flat, internal and external elbows, cover clips, tees, entrance fittings, wire clips, support clips, c-hangers, end caps, conduit connectors, bushings, and take-off fittings to adapt to flush wall boxes. The covers shall be painted with an enamel finish; colored to match the raceway. They shall overlap the raceway to hide uneven cuts. All fittings shall be supplied with a base where applicable to eliminate mitering. Transition fittings shall be available to adapt to other sizes and types of raceways of the same manufacturer. Provide all fittings, etc. for a complete installation.
- C. Device Boxes shall be suitable for the type of raceways provided and for mounting standard devices and faceplates. Device boxes shall be provided in single- and multiple-gang configurations, up to six-gang. Single-gang boxes shall allow for snap-on and fastener applications. They shall range in depth from 0.94" to 2.75". Extension boxes shall be provided to adapt to existing standard flush switch and receptacle boxes.
- D. The raceway manufacturer shall provide a complete line of connectivity outlets and modular inserts for UTP/STP, Fiber Optic, Coaxial and other cabling types with face plates and bezels to facilitate mounting. A complete line of preprinted station and port identification labels, snap-in icon buttons as well as write-on station identification labels shall be available. Provide as needed for a complete installation.
- E. Raceways used for communications cabling shall have a complete line of full capacity corner elbows and tee fittings, and used where required or shown on the Drawings, to maintain a

controlled 2" cable bend radius which meets the specifications for Fiber Optic and UTP/STP cabling and exceeds the TIA 569 requirements for communications pathways.

### 2.3 SURFACE METAL RACEWAYS

- A. Wiremold Series 500 or 700 raceway shall be one-piece design with a base and cover factory assembled. The total width shall be 3/4" x 17/32" high with a capacity of 0.19 square inches for 500 or 3/4" x 21/32" with a capacity of 0.26 square inches for 700. The raceway base and cover shall be a minimum thickness of 0.040". The raceway shall be available in five (5) foot and ten (10) foot lengths.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine conditions under which surface raceways, boxes, distribution systems, accessories, and fittings are to be installed and substrate that will support raceways. Notify the Architect/Engineer of conditions detrimental to proper completion of the work. Do not proceed with work until unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Surface raceways shall be installed in strict compliance with the manufacturer's installation instructions and recommendations and approved shop drawings. Coordinate installation with adjacent work to ensure proper clearances and to prevent electrical hazards.
- B. Surface raceways shall be installed parallel with or at right angles to building structure and at the mounting heights noted on Drawings.
- C. Surface raceway systems shall be mechanically continuous and connected to all electrical outlets, boxes, device mounting brackets, and cabinets, in accordance with manufacturer's installation sheets.
- D. Metal raceways shall be electrically continuous and bonded in accordance with the National Electrical Code for proper grounding.
- E. Surface raceway shall be supported at intervals not exceeding five (5) feet or in accordance with manufacturer's installation sheets using appropriate anchors and screws. The use of drive pins and/or other methods using compressed air or gases are not acceptable.
- F. Provide accessories as required for a complete installation, including insulated bushings and inserts where required by the manufacturer.
- G. Close all unused raceway openings using manufacturer's recommended accessories.

- H. All surface raceway connections to outlet and/or junction boxes shall be made using adjustable offset connectors or combination connectors as detailed on the Drawings. The connectors shall be furnished by the manufacturer of the surface raceway.
- I. Field cutting of surface raceways base and covers shall be accomplished by the use of the manufacturer's raceway cutters specifically designed for this purpose.

### 3.3 CLEANING AND PROTECTION

- A. Clean exposed surfaces using non-abrasive materials and methods recommended by manufacturer.
- B. Protect raceways and boxes until final acceptance by the Owner.
- C. Repaint marred and scratched surfaces with touch-up paint to match original finish.

END OF SECTION 260525

SECTION 260526 - GROUNDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections, and Section 260100, "Electrical General Provisions," apply to this Section.

1.2 SCOPE OF WORK

- A. Provide grounding for conduits, motor frames, metal casings, receptacles, and solid neutral, and as required by NEC Article 250.

PART 2 - PRODUCTS

2.1 GROUND WIRE

- A. Provide a green insulated ground wire, sized per the NEC, in all conduits, junction boxes, and pull boxes.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Connect grounding conductors to the panelboard equipment ground bus and not to the panelboard neutral bus. Also connect grounding bushings to the ground bus. Connect the neutral bus only to the system neutral wire. Provide a bonding wire between the equipment ground bus and the neutral bus in the main distribution equipment only. The grounding system (conduit, cabinets, enclosures, and grounding conductors) and the grounded system (neutral conductors and service equipment ground) shall be separate and independent systems, except at the main distribution equipment.
- B. Test resistance to ground and submit readings to the Architect for review. Include the date and time of the test and the name of the individual performing the test.

END OF SECTION 260526

SECTION 260529 - SUPPORTING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections, and Section 260100, "Electrical General Provisions," apply to this Section.

1.2 SCOPE OF WORK

- A. Extent of supports, anchors, sleeves, and seals is indicated in other Division 26 Sections.
- B. Types of supports, anchors, sleeves, and seals specified in this Section include the following:

- C-clamps
- I-beam clamps
- One-hole conduit straps
- Two-hole conduit straps
- Round steel rods
- Expansion anchors
- Toggle bolts
- Wall and floor seals

- C. Supports, anchors, sleeves, and seals furnished as part of factory-fabricated equipment are specified as part of equipment assembly in other Division 26 Sections.

1.3 QUALITY ASSURANCE

- A. Furnish supporting devices manufactured by firms regularly engaged in manufacture of supporting devices of types, sizes, and ratings required.
- B. Comply with the requirements of the NEC, as applicable to construction and installation of electrical supporting devices.
- C. Comply with applicable requirements of ANSI/NEMA FB1, "Fittings and Supports for Conduit and Cable Assemblies."
- D. Comply with NECA "Standard of Installation" pertaining to anchors, fasteners, hangers, supports, and equipment mounting.
- E. Provide electrical components which are UL-Listed and labeled.

PART 2 - PRODUCTS

2.1 MANUFACTURED SUPPORTING DEVICES

- A. Provide supporting devices complying with manufacturer's standard materials, design, and construction in accordance with published product information and as required for a complete installation, and as herein specified. Where more than one type of device meets indicated requirements, selection is installer's option.
- B. Provide supporting devices of types, sizes, and materials required, and having the following construction features:
1. Reducing Couplings: Steel rod reducing coupling, 1/2" by 5/8"; galvanized steel; approx. 16 pounds per 100 units.
  2. C-Clamps: Galvanized steel; 1/2" rod size; approx. 70 pounds per 100 units.
  3. I-Beam Clamps: Galvanized steel, 1-1/4" by 3/16" stock; 3/8" cross bolt; flange width 2"; approx. 52 pounds per 100 units.
  4. One-hole Conduit Straps: For supporting metal conduit through 3/4" galvanized steel; approx. 7 pounds per 100 units.
  5. Two-hole Conduit Straps: For supporting metal conduit above 3/4" galvanized steel; 3/4" strap width; and 2-1/8" between center of screw holes.
  6. Hexagon Nuts: For 1/2" rod size; galvanized steel; approx. 4 pounds per 100 units.
  7. Round Steel Rod: Galvanized steel; 1/2" dia.; approx. 67 pounds per 100 feet.
  8. Offset Conduit Clamps: For supporting 2" rigid metal conduit; galvanized steel; approx. 200 pounds per 100 units.
- C. Provide anchors of types, sizes, and materials required and having the following construction features:
1. Expansion Anchors: 1/2"; approx. 38 pounds per 100 units.
  2. Toggle Bolts: Springhead; 3/16" by 4"; approx. 5 pounds per 100 units.
- D. Provide sleeves and seals of types, sizes, and materials required, and having the following construction features:
1. Provide factory-assembled, watertight wall and floor seals suitable for sealing around conduit, pipe or tubing passing through concrete floors and concrete block walls. Construct with steel sleeves, malleable-iron body, neoprene sealing grommets and rings, metal pressure rings, pressure clamps and cap screws.
- E. Provide U-channel strut system for supporting electrical equipment, 16-gauge hot-dip galvanized steel of sizes required; construct with 9/16" dia. holes, 8" o.c. on top surface, and with the following fittings which mate and match with U-channel:
- Fixture hangers
  - Channel hangers
  - End caps
  - Beam clamps

Wiring stud  
Rigid conduit clamps  
Conduit hangers  
U-bolts

### PART 3 - EXECUTION

#### 3.1 INSTALLATION OF SUPPORTING DEVICES

- A. Install hangers, anchors, sleeves, and seals as indicated in accordance with manufacturer's published instructions and with recognized industry practices to ensure supporting devices comply with the requirements of the NEC, NECA, and ANSI/NEMA for installation of supporting devices.
- B. Coordinate with other electrical work, including outlet box, raceway and wiring work, as necessary to interface installation of supporting devices with other work.
- C. Install hangers, supports, clamps, and attachments to support conduit and outlet boxes properly from building structure. Arrange for grouping of parallel runs of horizontal conduits to be supported together on trapeze-type hangers where possible. Install supports with maximum spacings indicated.
- D. Tighten sleeve seal nuts until sealing grommets have expanded to form watertight seal.

END OF SECTION 260529

SECTION 260533 - RACEWAYS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections, and Section 260100, "Electrical General Provisions," apply to this Section.

1.2 SCOPE OF WORK

- A. Run all conduit concealed, except conduit may be run exposed in mechanical rooms, locations where specifically indicated, and spaces with exposed construction as approved by the Architect.
- B. Provide a conduit system complete with fittings and hangers as specified herein and as required by the NEC. Run all electrical wiring systems above 24 Volts in conduit unless specifically indicated otherwise.
- C. Install conduit as a complete system without wiring and continuous from outlet to outlet and from fitting to fitting, mechanically and electrically connected to all boxes, fittings, and wireways, and grounded in accordance with the NEC.
- D. Cap ends of all conduit promptly upon installation with plastic pipe caps. Caps shall remain until wiring is ready to be installed. Taping the ends of conduits is not acceptable.
- E. Size conduit to equal or exceed the minimum requirements of the NEC (except where sizes are specifically indicated on the drawings and in these specifications).
- F. Verify exact swing of doors, prior to installing conduit for switches. Coordinate switches with the Architect's plans, change orders, addenda, and job site differences and make the necessary adjustments to avoid conflicts at no additional cost.
- G. Coordinate the routing of conduit with other trades to avoid conflicts with structural members, piping, ductwork, and other job site conditions.
- H. When PVC conduit is used below grade, it shall be glued together in such a manner so as to make it watertight.

PART 2 - PRODUCTS

2.1 CONDUIT



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- A. Minimum size conduit shall be 1/2". Use larger sizes as required by the NEC to accommodate the number and sizes of wires contained therein.
- B. Conduit concealed in walls or above ceilings shall be rigid (GRS), electrical metallic tubing (EMT), or intermediate metallic conduit (IMC). Flexible conduit may be used above accessible ceilings only. Conduit installed below grade and under concrete floors and slabs shall be Schedule 40 PVC, unless otherwise indicated. Conduit run vertically through concrete shall be GRS or IMC starting at 6" below the bottom of the slab. Where conduits turn up inside a wall cavity, IMC and GRS may be converted to EMT at 6" above the top of the concrete slab.
- C. GRS, EMT and IMC shall be UL approved, hot-dip, high-strength, galvanized steel.
- D. Rigid PVC conduit shall be Schedule 40 (or Schedule 80 if required by the NEC), extruded from high-grade PVC compound and shall be light gray in color. Rigid PVC conduit shall be UL approved for direct burial and concrete encasement.
- E. Flexible conduit shall be galvanized, continuous spiral, single strip type. In areas subject to moisture and where specifically indicated, flexible conduit shall have a plastic covering in accordance with NEC Article 350. Fittings shall be standard UL approved with ground connector. Watertight connectors shall be used with plastic-covered conduit. All flexible conduit installed outdoors shall be plastic covered. The maximum length for flexible conduit is 72" unless as otherwise indicated.
- F. Conduit may not be run in the flutes of metal roof decking and may not be attached to any part of metal roof decking.
- G. Bury conduit run below grade a minimum of 24" below finished grade or so the top of the conduit is 6" below the bottom of the concrete slab if run underneath concrete unless indicated or required to be deeper. Increase the burial depth as required so that no part of the conduit radius is within the concrete slab where conduits turn vertical. Coordinate conduit routings and depths with all other trades and any and all existing underground utilities.

## 2.2 FITTINGS

- A. All conduit entering or leaving panelboards, cabinets, outlet boxes, pull boxes, or junction boxes shall have lock nuts and bushings, except provide insulated throat connectors on EMT conduit 3/4" and 1". Rigid steel conduit shall have a lock nut both inside and outside of the enclosure entered. Install bushings on the ends of IMC conduit and EMT conduit larger than 1". Insulating bushings shall be OZ Type A for GRS and IMC, and Type B for EMT. Conduit entering enclosures through concentric knockouts shall have grounding-type bushings with copper bond wire to enclosure.
- B. Provide expansion fittings where conduits cross building expansion joints. Expansion fittings shall be OZ Type AX with OZ Type BJ bonding jumper. See Architectural drawings for location of expansion joints.
- C. Fittings for rigid conduit shall be threaded type, except where IMC changes to EMT above floor slab, fittings shall be threadless type.

- D. Fittings for EMT shall be UL-approved, steel set screw couplings.

### 2.3 JUNCTION BOXES

- A. Use junction boxes on exposed conduit work for changes in direction of conduit runs and breaking around beams and columns.
- B. Furnish covers and gaskets with the junction boxes where installed in damp or wet locations.
- C. Label all junction and pull box covers indicating the circuits contained therein in a manner that will prevent unintentional interference with circuits during testing and servicing. For example: "HE1-13." See Specification Section 260534 for labeling requirements.

### 2.4 PIPE SLEEVES

- A. Provide pipe sleeves where conduits larger than 2" pass through walls. Contractor shall be responsible for proper and permanent location. Conduit shall not be permitted to pass through footings, beams, or ribs, unless indicated and/or approved. Coordinate pipe sleeve locations with all other trades affected.
- B. Install pipe sleeves and properly secure in place with grout where conduit passes through masonry or concrete and at all fire-rated assemblies. Pipe sleeves shall be of a sufficient diameter to provide approximately 1/4" clearance all around the conduit. Fill void between conduit and sleeve with mineral wool to prevent sound transmission. Pipe sleeves in foundation walls shall be cast iron, 2" larger in diameter than the conduit installed. Pipe sleeves in walls, floors, and partitions shall be Schedule 40 black steel pipe. Extend sleeves above floor at least 1", pack space around conduit with fireproof material, and make watertight. Pipe sleeves passing through firewalls, smoke partitions, fire partitions, or floors shall be sealed with a UL-rated system appropriate for the specified rating.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install conduit concealed in walls, below floor slabs, and above ceilings, except conduit may be run exposed in mechanical and electrical equipment rooms. Maintain a minimum clear distance of 6" from parallel runs of flues, steam, or hot water pipes. Do not run conduit horizontally in concrete slabs.
- B. Use flexible conduit (minimum 18" in length, maximum 72" in length) for connections to all motors, dry-type transformers, water heaters, and any equipment subject to vibration.
- C. Group conduit so it is uniformly spaced, where straight and at turns. Make bends and offsets (where unavoidable) with a hickey or bending machine.

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- D. Ream GRS and IMC conduit after threading to remove all burrs.
- E. Securely fasten conduit to outlets, junction boxes, and pull boxes to affect firm electrical contact. Join conduit with approved couplings. Running threads are not allowed.
- F. Exercise care to avoid condensation pockets in the installations. Keep conduit, fittings, and boxes free from foreign matter of any kind, before, during, and after installation.
- G. Do not use EMT below grade, outdoors and in wet locations.
- H. Support exposed runs of conduit in accordance with N.E.C. 342, 344, 348, 350 and 358 and parallel or perpendicular to walls, structural members, or intersections of vertical planes and ceilings with right angle turns consisting of fittings or symmetrical bends. Support conduit within one foot of all changes in direction and on each side of the change.
- I. Supports shall be wall brackets, trapeze, strap hanger, or pipe straps, secured to hollow masonry with toggle bolts; to brick and concrete with expansion bolts; to metal surfaces with machine screws; and to wood with wood screws.
- J. Use explosive drive equipment to make connections where the use of this equipment is beneficial, and is subject to strict compliance with safety regulations and approved by the Owner.
- K. Wooden plugs inserted in masonry and the use of nails as fastening media are prohibited.
- L. Do not support conduit from lay in tile ceilings grids, ceiling grid hangers, or lay on ceiling tiles.
- M. Prime conduit with a surface conditioner “GalvaGrip” or approved equal and paint to match the surface on which attached. Conduit installed in mechanical and electrical rooms need not be painted.
- N. Install and support conduit from the underside of the upper chord in bar joist construction.
- O. Do not support conduit from or attach outlet or junction boxes to metal roof decks.
- P. Do not run conduit in the cavity of exterior walls between brick and CMU.
- Q. Seal openings in floors where conduits penetrate vertically through with a clear silicon sealant to prevent liquids and insects from passing through.
- R. Where conduits penetrate vertically through fire-rated floors, or walls seal the conduits with a UL-Listed, water-resistant firestop material with a rating equal to or greater than the rating of the penetrated floors.
- S. Metal conduit installed in earth shall be painted with two coats of bitumastic paint.

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- T. All conduit runs entering the building from outdoors shall be sealed against moisture migration and condensation by filling with insulating type foam.

END OF SECTION 260533

SECTION 260534 - ELECTRICAL BOXES AND FITTINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections, and Section 260100, "Electrical General Provisions," apply to this Section.

1.2 SCOPE OF WORK

- A. Furnish and install all junction boxes of a type and size applicable for use in the location indicated on the drawings and where required by the NEC.

PART 2 - PRODUCTS

2.1 OUTLET BOXES

- A. Outlet boxes shall be sheet steel, zinc coated, or cadmium plated.
- B. Provide existing and new outlet boxes installed but not used, including data outlets, with blank coverplates matching those provided on adjacent outlets.
- C. Size boxes as follows:
  - 1. Receptacle Outlet Boxes: Provide single gang outlet boxes 1-1/2" deep unless required to be larger. Provide extra deep boxes where required.
  - 2. Where larger size boxes are required or called for, they shall be similar in all other respects to the types specified above.
- D. Provide boxes located above suspended ceilings with galvanized steel covers, with openings or knockouts as required for type of service.

2.2 PULL BOXES AND JUNCTION BOXES

- A. Install pull boxes and junction boxes where required for changes in direction, at junction points, and where needed to facilitate wire pulling.
- B. Size boxes in accordance with the requirements of the NEC.
- C. Boxes shall be constructed of 12-gauge minimum hot-rolled sheet steel and shall be hot-dip galvanized inside and outside to match the conduit. Boxes shall have removable covers.

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- D. Label the front face of the cover on each box with indelible black marker indicating the number of each circuit contained in or running through the box. In areas where exposed construction is the final finished condition and conduit and junction boxes are called out to be painted, label the inside face of the covers.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Check all door swings and coordinate with all furniture, built-in equipment, and cabinetry prior to roughing-in conduit and boxes for switches, receptacles, and auxiliary system devices. Make necessary adjustments in the location of same to avoid conflicts as approved by the Architect and at no additional cost to the Owner.
- B. Prior to roughing-in conduit, coordinate with other trades and the Owner regarding all equipment requiring electrical connections. Required adjustments to the conduit and wire sizes shall be made at no additional cost.
- C. Conduit installation shall be rigid and secure, and, where necessary, angle iron (1" by 1" by 1/4" or larger) shall be provided to facilitate adequate mounting.
- D. Install electrical boxes and fittings in accordance with manufacturer's published instructions, applicable requirements of the NEC and NECA "Standard of Installation," and in accordance with recognized industry practices to fulfill project requirements.
- E. Coordinate installation of electrical boxes and fittings with wire/cable, wiring devices, and raceway installation work.
- F. Provide "weatherproof-while-in-use" rated outlet covers for interior and exterior locations exposed to weather or moisture.
- G. Provide knockout closures to cap unused knockout holes where blanks have been removed in panel cans, terminal cabinet backboxes, junction boxes, outlet boxes and pull boxes.
- H. Install electrical boxes in those locations which ensure ready accessibility to enclosed electrical wiring.
- I. Fasten electrical boxes firmly and rigidly to substrates or structural surfaces to which attached or solidly embed electrical boxes in concrete or masonry.
- J. Subsequent to installation of boxes, protect boxes from construction debris and damage.
- K. Upon completion of installation work, properly ground all electrical boxes.
- L. Do not mount boxes to metal roof decking.

END OF SECTION 260534

## SECTION 262200 - DRY-TYPE TRANSFORMERS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections, and Section 260100, "Electrical General Provisions," apply to this Section.

#### 1.2 SCOPE OF WORK

- A. Extent of transformer work is indicated by drawings and schedules.
- B. Types of transformers specified in this Section include K4- K13-rated dry-type transformers.
- C. Electrical wiring connections for transformers are specified in applicable Division 26 Sections.

#### 1.3 QUALITY ASSURANCE

- A. Comply with the requirements of the NEC, as applicable to installation and construction of electrical power distribution transformers.
- B. Comply with applicable portions of NEMA TR1 and DOE 2016 minimum Standards for power distribution transformers.
- C. Comply with applicable requirements of ANSI C57-Series pertaining to power distribution transformers.
- D. Comply with requirements of NEMA ST20, "Dry-type Transformers for General Applications,"
- E. Comply with applicable requirements of ANSI/UL 506, "Safety Standard for Specialty Transformers." Provide power distribution transformers and components which are UL-Listed and labeled.
- F. Comply with applicable requirements of NESC (ANSI C2) pertaining to indoor and outdoor installation of transformers.

### PART 2 - PRODUCTS

#### 2.1 POWER DISTRIBUTION TRANSFORMERS

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- A. Except as otherwise indicated, provide manufacturer's standard materials and components as indicated by published product information, designed and constructed as recommended by manufacturer, and as required for complete installation. All transformers shall be products of a single manufacturer.
- B. Dry-type Distribution Transformers: Provide factory-assembled, DOE 2016 compliant and K4-rated, air-cooled, dry-type distribution transformers where shown; of sizes, characteristics, and rated capacities indicated; 3-phase; 60 Hz, 30kV BIL, 4.0% nominal impedance, copper windings, with 480-Volts delta connection primary and 208/120-Volts secondary wye connected. Provide primary winding with six 2-1/2% taps; two above and four below primary rated voltage. Transformers 15kVA and above shall be rated for 150°C temperature rise above 40°C ambient except K4 rated transformers shall be rated for 115°C temperature rise above 40°C ambient. All insulating materials shall be in accordance with NEMA ST20 Standard for a 220°C UL component recognized insulation system. Limit transformer surface temperature rise to maximum of 65°C. Provide terminal enclosure, with cover, to accommodate primary and secondary coil wiring connections and electrical supply raceway terminal connector. Equip terminal leads with connectors installed. Provide wiring connectors suitable for copper wiring. Sound levels shall not exceed the following: 51 to 150kVA = 50 dB. The core of the transformer shall be visibly grounded to the enclosure by means of a flexible grounding conductor sized in accordance with applicable NEMA, IEEE, and ANSI standards. Provide transformers with fully enclosed sheet-steel enclosures. Apply manufacturer's standard light gray indoor enamel over cleaned and phosphatized steel enclosure. Provide transformers suitable for floor or wall mounting as indicated. The transformers shall be listed by UL for the specified temperature rise.

### PART 3 - EXECUTION

#### 3.1 INSPECTION

- A. Examine areas and conditions under which power distribution transformers and ancillary equipment are to be installed and notify the General Contractor, in writing, of conditions detrimental to proper completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

#### 3.2 INSTALLATION OF TRANSFORMERS

- A. Install transformers as indicated, complying with manufacturer's published instructions (including rear ventilation clearances), applicable requirements of the NEC, NESC, NEMA, ANSI, DOE and IEEE standards, and in accordance with recognized industry practices to ensure that products fulfill requirements.
- B. Coordinate transformer installation work with electrical raceway and wire/cable work, as necessary for proper interface.
- C. Connect transformer units to electrical wiring system; comply with requirements of other Division 26 Sections.



- D. Tighten electrical connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL 486A and UL 486B.
- E. Provide 4" thick concrete housekeeping pad under all transformers. Exceed dimensions of transformer by 6" on all sides. Chamfer all exposed edges 1/2".
- F. Keep transformers clean and free from foreign matter of any kind, before, during, and after installation.
- G. Provide sufficient space around transformer for cooling as recommended by the manufacturer. Provide a minimum space of 8" between the transformer and any wall.

### 3.3 GROUNDING

- A. Provide equipment grounding connections for power distribution transformers as indicated. Tighten connections to comply with tightening torques specified in UL 486A to assure permanent and effective grounding.

### 3.4 TESTING

- A. Prior to energization of transformers, check all accessible connections for compliance with manufacturer's torque tightening specifications.
- B. Prior to energization, check circuitry for electrical continuity and for short-circuits.
- C. Upon completion of installation of transformers, energize primary circuitry at rated voltage and frequency from normal power source and test transformers, including but not limited to audible sound levels, to demonstrate capability and compliance with requirements. Where possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units or components and proceed with retesting.
- D. Infrared Scanning: After Substantial Completion, but not more than 60 days from Final Acceptance, perform an infrared scan of each transformer.
  - 1. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
  - 2. Record of Infrared Scanning: Prepare a certified report that identifies transformer checked and describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

END OF SECTION 262200

## SECTION 262413 - MAIN DISTRIBUTION SWITCHBOARD

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections, and Section 260100, "Electrical General Provisions," apply to this Section.

#### 1.2 SCOPE OF WORK

- A. Extent of switchboard work is indicated by drawings and schedules.
- B. Type of switchboard specified in this Section is as follows:
  - 1. Dead-front distribution; circuit breaker type, in NEMA 1 enclosure.

#### 1.3 QUALITY ASSURANCE

- A. Comply with the requirements of the NEC, as applicable to wiring methods, construction, and installation of switchboards.
- B. Comply with applicable requirements of UL 486A, "Wire Connectors and Soldering Lugs for Use with Copper Conductors," and UL 891, "Dead-front Electrical Switchboards," pertaining to installation of switchboards. Provide switchboards and components which are UL-Listed and labeled.
- C. Comply with applicable requirements of ANSI standards pertaining to switchboard assemblies.
- D. Comply with applicable portions of NEMA PB2, "Dead-front Distribution Switchboards" and NEMA PB2.1, "Instructions for Safe Handling, Installation, Operation, and Maintenance of Switchboards."

#### 1.4 SUBMITTALS

- A. Submit manufacturer's data on switchboards, including but not limited to voltages, number of phases, frequencies, and short-circuit and continuous current ratings. Provide application data for main and branch circuit breakers, sections, main buses, and basic insulation levels.
- B. Submit 1/4" scale layout drawings of switchboards showing accurately scaled basic equipment sections, including auxiliary compartments, section components, and combination sections. Indicate on the layout drawings that the number and size of each conduit scheduled for bottom entry into the compartment has been verified as achievable and that the switchboard will fit in the space indicated with all code-required working clearances complied with.

- C. Submit wiring diagrams for switchboards showing connections to electrical power feeders and distribution branches. Clearly differentiate between portions of wiring that are manufacturer installed and portions to be field installed.
- D. Submit switchboard shop drawings to Dominion Virginia Power and gain approval on same prior to submitting to the Architect. Provide evidence that Dominion Virginia Power has approved the equipment for installation.

## PART 2 - PRODUCTS

### 2.1 EQUIPMENT SECTIONS AND COMPONENTS

- A. Except as otherwise indicated, provide switchboards and ancillary components of types, sizes, characteristics, and ratings indicated, which comply with manufacturer's standard design, materials, components, and construction, in accordance with published product information, and as required for complete installation.
- B. Provide factory-assembled, dead-front, metal-enclosed, self-supporting secondary power switchboards of types, sizes, and electrical ratings and characteristics indicated; consisting of panel (vertical) units and containing circuit-breakers of quantities and ratings indicated. Provide aluminum main bus and connections to switching devices and circuit breaker branches of sufficient capacity to limit rated continuous current operating temperature rise of no greater than 65°C above average ambient temperature of 30°C with main bus and tap connections silver surfaced and bolted tightly according to manufacturer's torquing requirements for maximum conductivity. Brace bus for short-circuit stresses up to the interrupting capacity indicated. Prime and coat switchboard with manufacturer's standard finish and color. Equip units with built-in lifting eyes and yokes; and provide individual panel (vertical) units, suitable for bolting together at project site. Construct switchboard units for an indoor outdoor, NEMA Type 1 environment.
- C. Construct dead-front switchboards, suitable for floor mounting, with front cabling/ wiring accessibility, and conduit accessibility as indicated. Provide welded steel channel framework, hinged wireway front covers to permit ready access to branch circuit-breaker load side terminals. Coat enclosures with manufacturer's standard corrosive-resistant finish.
- D. Provide switchboard bussing with sufficient cross-sectional area to fulfill UL 891 pertaining to temperature rise. Construct through bus of aluminum with ampacity and short-circuit current rating as indicated on the drawings.
- E. Provide an ammeter and voltmeter and instrument transfer switches for each. Mount meters recessed in front doors and install meter wiring and lacing with sufficient flexibility at hinged edge of meter front mounting plates to prevent damage.
- F. Provide required, solid-state ground-fault protection unit, equipped with static relays, sensors, pilot lights and push buttons for fault indication and reset. Include fuse blocks, fuses, and control power transformers.

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- G. Provide phase failure protection on load side of the main breaker or switch. The use of under-voltage trip relays to accomplish this is not acceptable.
- H. The main breaker shall be a 100% duty rated, fixed mount, full function electronic circuit breaker with adjustable long-term, short-term, and instantaneous trips, and ground fault protection when of a size as to be required by the NEC.
- I. Provide main breaker/switch capacitor trip capability on switchboard.
- J. Provide HACR rated branch circuit breakers for all heating and air conditioning equipment.
- K. Provide switchboard with Energy Reduction Maintenance Switch with local status indicator in compliance with NEC article 240.87.

### PART 3 - EXECUTION

#### 3.1 INSPECTION

- A. Examine areas and conditions under which switchboard and components are to be installed, and notify the General Contractor, in writing, of conditions detrimental to proper completion of work. Do not proceed with work until unsatisfactory conditions have been corrected.
- B. Verify Phase Rotation of existing system with the power company and existing equipment to be reconnected prior to removal.

#### 3.2 INSTALLATION

- A. Install switchboards as indicated, in accordance with manufacturer's published instructions, and with recognized industry practices; complying with applicable requirements of the NEC, NEMA PB2.1, and NECA "Standard of Installation."
- B. Coordinate with other work, including electrical cabling/wiring work, as necessary to interface installation of switchboards with other work.
- C. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL 486A.
- D. Provide 4" thick concrete housekeeping pad under all switchboards. Exceed dimensions of transformer by 6" on all sides. Chamfer all exposed edges 1/2".

#### 3.3 ADJUSTING AND CLEANING

- A. Adjust operating mechanisms for free mechanical movement.

- B. Repair scratched or marred surfaces to match original finishes.
- C. Keep switchboard clean and free from foreign matter of any kind, before, during, and after installation.

### 3.4 GROUNDING

- A. Provide equipment grounding connections for switchboards as required by the NEC and the “Local Authority Having Jurisdiction.” Tighten connections to comply with tightening torques specified in UL 486A to assure permanent and effective grounding.

### 3.5 FIELD QUALITY CONTROL

- A. Prior to energization of circuitry, verify all accessible connections meet manufacturer’s tightening torque specifications.
- B. Prior to energization of switchboards, check with ground resistance tester phase-to-phase and phase-to-ground insulation resistance levels to ensure requirements are fulfilled.
- C. Prior to energization, check switchboards for electrical continuity of circuits and for short circuits.
- D. Subsequent to wire and cable hook-ups, energize switchboards and demonstrate functioning in accordance with requirements. Where necessary, correct malfunctioning units and then retest to demonstrate compliance.
- E. Infrared Scanning: After Substantial Completion, but not more than 60 days from Final Acceptance, perform an infrared scan of the switchboard.
  - 1. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
  - 2. Record of Infrared Scanning: Prepare a certified report that identifies and describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

### 3.6 GROUND FAULT EQUIPMENT TESTING

- A. Ground fault equipment provided with main distribution switchboards shall be tested when first installed on the site in accordance with the requirements of NEC Article 230.95.
- B. A written record of the test shall be made available to the authority having jurisdiction.

END OF SECTION 262413

## SECTION 262416 - PANELBOARDS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections, and Section 260100, "Electrical General Provisions," apply to this Section.

#### 1.2 SCOPE OF WORK

- A. Extent of panelboard, load center, and enclosure work, including cabinets and cutout boxes, is indicated by drawings and schedules.
- B. Refer to other Division 26 Sections for cable/wire, connectors, and electrical raceway work required in conjunction with panelboards and enclosures; not work of this Section.

#### 1.3 QUALITY ASSURANCE

- A. Comply with the requirements of the NEC, as applicable to installation of panelboards, cabinets, and cutout boxes. Comply with the NEC requirements pertaining to installation of wiring and equipment in hazardous locations.
- B. Comply with applicable requirements of UL 67, "Electric Panelboards," and UL 50, UL 869, UL 486A, UL 486B, and UL 1053 pertaining to panelboards, accessories, and enclosures. Provide units which are UL-Listed and labeled.
- C. Comply with NEMA 250, "Enclosures for Electrical Equipment (1,000 Volts Maximum)," and NEMA PB1, "Instructions for Safe Installation, Operation, and Maintenance of Panelboards Rated 600 Volts or Less."

### PART 2 - PRODUCTS

#### 2.1 ACCEPTABLE MANUFACTURERS

- A. Except as otherwise indicated, provide panelboards, enclosures, and ancillary components of types, sizes, and ratings indicated, which comply with manufacturer's standard materials; design and construction in accordance with published product information; equip with proper number of unit panelboard devices as required for complete installation. Where types, sizes, or ratings are not indicated, comply with the NEC, UL, and established industry standards for those applications indicated. Series rating is not acceptable for circuit breakers serving life safety equipment.

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- B. Provide dead-front, safety-type, power distribution panelboards as indicated, with panelboard switching and protective devices in quantities, ratings, types, and arrangement shown; with mechanical type conductor connectors for Main, Neutral, and Ground lugs approve for copper or aluminum conductors. Specific circuit breaker placement is required in panelboards to match the circuit breaker placement indicated in the panelboard schedule on the drawings. Equip with copper busbars with not less than 98% conductivity and with neutral bus. Provide suitable lugs on neutral bus for outgoing circuits requiring neutral connections. Provide bolt-on molded-case main and branch circuit breaker types for each circuit, with toggle handles that indicate when tripped. Where multiple-pole circuit breakers are indicated, provide with common trip so an overload on one pole will trip all poles simultaneously. Provide panelboards with bare uninsulated grounding bars suitable for bolting to enclosures. Select enclosures fabricated by same manufacturer as panelboards, which mate properly with panelboards. Branch mounted main circuit breakers are not acceptable. Provide bottom mounted main circuit breakers for panelboards fed from below. Provide top mounted main circuit breakers for panelboards fed from above. All spaces shall have bus fully extended and drilled for the future installation of breakers.
- C. Provide galvanized sheet-steel cabinet-type enclosures, in sizes and NEMA types as indicated, code gauge, minimum 16-gauge thickness. Construct with multiple knockouts and wiring gutters. Provide fronts with adjustable trim clamps, and doors with flush locks and keys. All panelboard enclosures shall be keyed alike. Equip with interior circuit directory frame and card with clear plastic covering. Provide baked gray enamel finish over a rust-inhibitor coating. Design enclosures for flush mounting unless otherwise indicated. Provide enclosures which mate properly with panelboards to be enclosed.
- D. Provide panelboard accessories and devices, including but not necessarily limited to circuit breakers and ground-fault protection units, as recommended by panelboard manufacturer for ratings and applications indicated. Circuit breakers serving permanently connected appliances rated over 300 volt-amperes shall be capable of being locked in the "OFF" position. Provide HACR rated circuit breakers for all heating and air conditioning equipment
- E. Provide panelboards with weatherproof NEMA 3R enclosures with air flow, whether indicated or not, when installed outdoors.

### PART 3 - EXECUTION

#### 3.1 INSPECTION

- A. Examine areas and conditions under which panelboards and enclosures are to be installed, and notify the General Contractor, in writing, of conditions detrimental to proper completion of work. Do not proceed with work until unsatisfactory conditions have been corrected.
- B. Install panelboards and enclosures as indicated, in accordance with manufacturer's published instructions, applicable requirements of the NEC and NECA "Standard of Installation," and in compliance with recognized industry practices to ensure that products fulfill requirements.

- C. Coordinate installation of panelboards and enclosures with raceway installation work.
- D. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL 486A and UL 486B.
- E. Anchor enclosures firmly to walls and structural surfaces, ensuring that they are permanently and mechanically secure.
- F. Provide properly wired electrical connections within enclosures.
- G. Provide a typed circuit index card for each panelboard upon completion of installation work. Indicate load served and room number(s). Use final room numbers obtained from the Architect or Owner, not construction room numbers as shown on the drawings.

### 3.2 GROUNDING

- A. Provide equipment grounding connections for all panelboards. Tighten connections to comply with tightening torques specified in UL 486A and UL 486B to assure permanent and effective grounding.

### 3.3 FIELD QUALITY CONTROL

- A. Keep panelboards clean and free from foreign matter of any kind, before, during, and after installation.
- B. Prior to energization of circuitry, check all accessible connections to manufacturer's tightening torque specifications.
- C. Prior to energization of panelboards, check with ground resistance tester phase-to-phase and phase-to-ground insulation resistance levels to ensure requirements are fulfilled.
- D. Prior to energization, check panelboards for electrical continuity of circuits and for short-circuits.
- E. Subsequent to wire and cable hook-ups, energize panelboards and demonstrate functioning in accordance with requirements. Where necessary, correct malfunctioning units, and then retest to demonstrate compliance.
- F. Infrared Scanning: After Substantial Completion, but not more than 60 days from Final Acceptance, perform an infrared scan of each panelboard. Remove panel fronts so joints and connections are accessible to portable scanner.
  - 1. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.



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2. Record of Infrared Scanning: Prepare a certified report that identifies panelboards checked and describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

END OF SECTION 262416

SECTION 262420 - MOTORS AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections, and Section 260100, "Electrical General Provisions," apply to this Section.

1.2 SCOPE OF WORK

- A. Furnish and install disconnect switches as indicated on the drawings and specified herein.
- B. Provide all power wiring, disconnect switches and electrical connections to all equipment provided and requiring electrical connections. Starters and/or magnetic contactors; including Variable Frequency Drives ("VFD") for HVAC equipment that is not integral with the HVAC equipment; shall be furnished by Division 23 Contractor, installed where and as indicated on the electrical drawings by the Electrical Contractor and provided with power wiring by the Electrical Contractor unless otherwise indicated. Power wiring between magnetic contactors and the final connection point on the HVAC equipment shall be provided under Division 26. Division 23 Contractor shall provide the proper number and size of auxiliary contacts in the magnetic contactors required for the proper operation and control of the HVAC equipment.
- C. All control wiring and conduits between control instruments and the magnetic contactor or VFD serving a piece of mechanical equipment shall be provided by Division 23 Contractor and installed in accordance with the requirements of Division 26, unless otherwise indicated on the electrical drawings or in the electrical specifications.
- D. Review the mechanical drawings and specification sections for exhaust fans requiring control by wall switch, solid state speed controller, or line voltage thermostat and provide same where indicated on the electrical drawings.

PART 2 - PRODUCTS

2.1 DISCONNECT SWITCHES

- A. Disconnect switches shall be rated for the voltage of the equipment being served with number of poles and current rating as indicated. Disconnect switches shall be non-fusible or fusible type as indicated on the drawings.
- B. Switches shall be NEMA standard HD type.
- C. Switches shall be horsepower rated when used for motor disconnect means.

- D. Provide fused disconnect switches complete with appropriately sized fuses for the circuits controlled.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION OF DISCONNECT SWITCHES

- A. Examine area and conditions under which electrical connections for equipment are to be installed. Notify the General Contractor; in writing; of conditions detrimental to proper completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.
- B. Coordinate locations of disconnect switches with the locations of mechanical equipment, piping, electrical equipment and any and all other building elements such that all NEC requirements, including working clearances, are met. Adjust locations from those shown on the drawings as required to comply with NEC working clearance requirements at no additional cost to the project.
- C. Secure disconnects switches to building elements or equipment housings where indicated on the drawings. Where building walls or equipment housings do not provide suitable mounting surfaces, provide a galvanized unistrut frame or rack satisfactory in size to securely support the disconnect switch, magnetic contactor and /or VFD. Where racks are required to be roof mounted, secure the rack to the roof in a method that does not compromise the roof membrane in any way. Submit the roof attachment method to the Owner/Engineer for approval prior to construction or installation.

#### 3.2 ELECTRICAL CONNECTIONS TO EQUIPMENT

- A. Provide electrical connections to equipment indicated in accordance with equipment manufacturer's published instructions and recognized industry practices. Comply with applicable requirements of UL, the NEC and the NECA "Standard of Installation," to ensure that products fulfill requirements.
- B. Coordinate with other work, including wires/cables, raceway and equipment installation as necessary to properly interface installation of electrical connections to equipment with other work.
- C. Connect electrical power supply conductors to equipment in accordance with equipment manufacturer's published instructions and wiring diagrams. Mate and match conductors of electrical connections for proper interface between electrical power supplies and installed equipment.
- D. Cover splices with electrical insulating material equivalent to or greater than the electrical insulation rating of the conductors being spliced.

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- E. Prepare cables and wires by cutting and stripping covering, armor, jacket, and insulation properly to ensure uniform and neat appearance where cables and wires are terminated. Exercise care to avoid cutting through tapes which will remain on conductors. Avoid “ringing” conductors while skinning wire.
- F. Trim cables and wires as short as practicable and arrange routing to facilitate inspection, testing and maintenance.
- G. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer’s published torque tightening values for equipment connectors. Accomplish tightening by utilizing proper torqueing tools, including torque screwdriver, beam-type torque wrench, and ratchet wrench with adjustable torque settings. Where manufacturer’s torqueing requirements are not available, tighten connectors and terminals to comply with torqueing values contained in UL 486A.
- H. Provide flexible steel conduit for motor connections and other electrical equipment connections where subject to movement and vibration.
- I. Provide liquid-tight flexible steel conduit for connection of motors and other electrical equipment where subject to movement and vibration and where connections are located where subject to any of the following conditions:
  - 1. All exterior locations
  - 2. Moist or humid atmosphere where condensation can be expected to accumulate (Example: sump pump and elevator pits)
  - 3. Corrosive atmosphere (Example: battery charging rooms)
  - 4. Water spray
  - 5. Dripping oil, grease, or water
  - 6. Kitchens and Sculleries

3.3 FIELD QUALITY CONTROL

- A. Upon completion of installation of electrical connections and after circuitry has been energized with rated power source, test connections to demonstrate capability and compliance with requirements. Ensure that direction of rotation of each motor fulfills requirement. Correct malfunctioning units at site, then retest to demonstrate compliance.

END OF SECTION 262420

SECTION 262710 - SERVICE AND DISTRIBUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specifications Sections, and Section 260100, "Electrical General Provisions," apply to this Section.

1.2 ELECTRICAL SERVICE

- A. The electrical service for the building shall be 480/277 Volts, 3-phase, 4-wire, grounded neutral.
- B. Install current transformer equipment and a meter base furnished by Dominion Energy or the local electrical utility company where indicated on the drawings except the final location of the meter base shall be as directed by Dominion Energy or the local electrical utility company. Provide a 1-1/4" empty conduit (with pull wire) between the current transformer equipment and the meter base. Make all provisions necessary for metering equipment and install as directed by Dominion Energy or the local electrical utility company.
- C. Consult with Dominion Energy or the local electrical utility company for color coding of cables when service lateral is provided by this Contract and color code cables as directed by Dominion Energy or the local electrical utility company. Advise the Engineer if the color coding provided by Dominion Energy or the local electrical utility company differs from that indicated in Specification Sections 260518 and 260519.

1.3 SERVICE CONDUIT AND CONDUCTORS

- A. The service lateral will originate from a pad-mounted transformer furnished by Dominion Energy or the local electric utility company. Provide conduit of the size and quantity indicated on the drawings. Consult with Dominion Energy or the local electrical utility company before commencement of electrical service work.

PART 2 - PRODUCTS

2.1 ELECTRICAL SERVICE EQUIPMENT

- A. Electrical service equipment shall comply with the requirements of the NEC.

PART 3 - EXECUTION

3.1 SERVICE AND DISTRIBUTION

- A. Arrangement shall be as indicated on the drawings and as required by Dominion Energy or the local electrical utility company, including exact point of service and metering requirements.

END OF SECTION 262710

SECTION 262713 - SERVICE ENTRANCE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections, and Section 260100, "Electrical General Provisions," apply to this Section.

1.2 SCOPE OF WORK

- A. Extent of service entrance work is indicated by drawings and schedules.
- B. Switchboards used for service entrance equipment are specified in other Division 26 Sections, and are work of this Section.
- C. Refer to other Division 26 sections for wires/cables, raceways, and electrical boxes and fittings work required in connection with service entrance equipment; not work of this Section.

1.3 QUALITY ASSURANCE

- A. Comply with the requirements of the NEC, as applicable to construction and installation of service entrance equipment and accessories.
- B. Comply with construction and installation requirements of the following NEMA standards for service entrance equipment and accessories where applicable:

Std Pub No. AB1	Molded Case Circuit Breakers
Std Pub No. PB1.2	Application Guide for Ground-fault Protective Devices for Equipment
Std Pub No. PB2	Dead-front Distribution Switchboards

- C. Comply with construction and installation requirements of the following UL standards for service entrance equipment and accessories:
  - UL 50 Electrical Cabinets and Boxes
  - UL 489 Molded Case Circuit Breakers and Circuit Breaker Enclosures
  - UL 854 Service Entrance Cables
  - UL 869 Electrical Service Equipment
- D. Provide service entrance rated equipment and accessories which are UL-Listed and labeled and marked, "SUITABLE FOR USE AS SERVICE ENTRANCE EQUIPMENT."
- E. Comply with applicable requirements of IEEE 241 pertaining to service entrances.

- F. Comply with ANSI C2, “National Electrical Safety Code,” installation requirements for above ground service entrance conductors.

## PART 2 - PRODUCTS

### 2.1 SERVICE ENTRANCE EQUIPMENT

- A. Provide service entrance equipment and accessories of types, sizes, ratings, and electrical characteristics indicated, which comply with manufacturer’s standard materials, design, and construction in accordance with published product information, and as required for complete installation and as herein specified.
- B. All electrical service entrance equipment, dry-type transformers, panelboards, disconnect switches, lighting contactors, and magnetic contactors provided under Division 26 of these Specifications shall be by the same equipment manufacturer.

### 2.2 RACEWAYS

- A. Provide raceways complying with Specification Section 260533, “Raceways.”

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install service entrance equipment as indicated in accordance with equipment manufacturer’s published instructions, and with recognized industry practices, to ensure that service entrance equipment fulfills requirements. Comply with applicable installation requirements of the NEC and NEMA standards.
- B. Coordinate with other electrical work, including utility company wiring, as necessary to interface installation of service entrance equipment work with other work.
- C. Set field-adjustable GFP devices and circuit breakers for pickup and time-current sensitivity ranges subsequent to installation of devices and circuit breakers in accordance with the recommendations of the Short Circuit Coordination Study/Arc Flash Hazard Analysis.

### 3.2 GROUNDING

- A. Provide equipment bonding and grounding connectors, sufficiently tight to assure a permanent and effective grounding, for service entrance equipment and wiring/ cabling as required by the NEC.



3.3 ADJUST AND CLEAN

- A. Adjust operating mechanisms for free mechanical movement.
- B. Repair scratched or marred enclosure surfaces to match original finishes to the satisfaction of the Engineer.

3.4 FIELD QUALITY CONTROL

- A. Upon completion of installation of service entrance equipment and electrical circuitry, energize circuitry and demonstrate capability and compliance with requirements. Where possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units and retest.

END OF SECTION 262713

SECTION 262726 - WIRING DEVICES AND DEVICE PLATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections, and Section 260100, "Electrical General Provisions," apply to this Section.

1.2 SCOPE OF WORK

- A. The extent of wiring device work is indicated by drawings and schedules. Wiring devices are defined as single discrete units of the electrical distribution systems which are intended to carry but not utilize electric energy.
- B. Types of electrical wiring devices in this Section include the following:
  - Receptacles
  - Ground-fault circuit interrupters
  - Cover plates
- C. Comply with the requirements of the NEC, as applicable to installation and wiring of electrical wiring devices.
- D. Comply with applicable requirements of UL 20, 486A, 498, 943, and 1472 pertaining to installation of wiring devices. Provide wiring devices which are UL-Listed and labeled.
- E. Comply with applicable portions of NEMA WD1, "General-purpose Wiring Devices, and WD5, "Wiring Devices, Specific Purposes."

PART 2 - PRODUCTS

2.1 FABRICATED WIRING DEVICES

- A. Provide factory-fabricated wiring devices in types and electrical ratings for applications indicated and which comply with NEMA WD1. Provide white colored-devices.

2.2 RECEPTACLES

- A. Duplex: Provide Industrial/Institutional, Specification-Grade, duplex receptacles, 2-pole, 3-wire, grounding, with green hexagonal equipment ground screw, single-piece brass mounting yoke with integral ground terminals, 20 amperes, 125 Volts, with metal plaster ears; designed

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for side and back wiring, with NEMA configuration 5-20R, unless otherwise indicated. LEVITON 5362 or approved equal.

- B. Ground-fault Weather Resistant Circuit Interrupters; Provide Industrial/Institutional, Specification-Grade, “feed-thru”-type ground-fault circuit interrupters, with heavy-duty duplex receptacles, capable of being installed in a 2-3/4" deep outlet box without adapter, grounding type UL-rated Class A, Group 1, rated 20 amperes, 125 Volts, 60 Hz; with solid-state ground-fault sensing and signaling; with 5 mA ground-fault trip level; equipped with NEMA configuration 5-20R. LEVITON model WR899-W, or approved equal.

### 2.3 WIRING DEVICE ACCESSORIES

- A. Cover plates: Provide mid-size white nylon cover plates for single and combination wiring devices of types and with ganging and cutouts as required. Provide metal screws for securing plates to devices; screw heads colored to match color of plates. Provide stainless-steel cover plates in mechanical and electrical equipment rooms.
- B. Provide “extra duty weatherproof-while-in-use” rated cover plates for receptacles installed outdoors where exposed to weather.

## PART 3 - EXECUTION

### 3.1 INSTALLATION OF WIRING DEVICES

- A. Install wiring devices where indicated in Contract Documents in accordance with manufacturer’s published instructions, applicable requirements of the NEC and NECA “Standard of Installation,” and in accordance with recognized industry practices to fulfill project requirements.
- B. Coordinate with other work, including painting, electrical boxes and wiring work, as necessary to interface installation of wiring devices with other work.
- C. Install wiring devices only in electrical boxes which are clean, free from building materials, dirt, and debris.
- D. Install wiring devices after wiring work is completed.
- E. Install cover plates after painting work is completed. Label the inside face of each cover plate with indelible black marker indicating the number of each circuit contained in or running through the outlet box.
- F. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer’s published torque tightening values for wiring devices. Where manufacturer’s torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL 486A and UL 486B. Use properly scaled torque indicating hand tool.

- G. Terminate all switch and receptacle wiring on side screw terminals. Back terminations are not permitted.
- H. Install all switches and receptacles with sufficient wiring length such that the device may be extracted from the outlet box a minimum of 6" while still connected.

### 3.2 PROTECTION OF COVER PLATES AND RECEPTACLES

- A. Upon installation of cover plates and receptacles, take caution regarding use of convenience outlets. At time of Substantial Completion, replace all cover plates and receptacles which have been damaged; during the execution of this project; including those painted over, burned, or scored by faulty plugs.

### 3.3 GROUNDING

- A. Provide equipment grounding connections for wiring devices, unless otherwise indicated. Tighten connections to comply with tightening torques specified in UL 486A to assure permanent and effective grounding.

### 3.4 TESTING

- A. Prior to energizing circuitry, test wiring for electrical continuity and for short-circuits. Ensure proper polarity of connections is maintained. Subsequent to energization, test wiring devices to demonstrate compliance with requirements.

END OF SECTION 262726

## SECTION 264313 - SURGE PROTECTIVE DEVICES

### PART 1 - GENERAL

#### 1.1 SCOPE

- A. The Contractor shall furnish and install the Surge Protective Device (SPD) equipment having the electrical characteristics, ratings, and modifications as specified herein and as shown on the contract drawings.

#### 1.2 RELATED SECTIONS

- A. Section 262413 – Switchboards – Low Voltage (Group Mounted Feeders)
- B. Section 262416 – Panelboards

#### 1.3 REFERENCES

- A. SPD units and all components shall be designed, manufactured, and tested in accordance with the latest applicable UL standard (ANSI/UL 1449 3<sup>rd</sup> Edition).

#### 1.4 SUBMITTALS – FOR REVIEW/APPROVAL

- A. The following information shall be submitted to the Engineer:
  - 1. Provide verification that the SPD complies with the required ANSI/UL 1449 3rd Edition listing by Underwriters Laboratories (UL) or other Nationally Recognized Testing Laboratory (NRTL). Compliance may be in the form of a file number that can be verified on UL's website or on any other NRTL's website, as long as the website contains the following information at a minimum: model number, SPD Type, system voltage, phases, modes of protection, Voltage Protection Rating (VPR), and Nominal Discharge Current ( $I_n$ ).
  - 2. Electrical/mechanical drawings showing unit dimensions, weights, installation instruction details, and wiring configuration.
- B. Where applicable the following additional information shall be submitted to the engineer:
  - 1. Descriptive bulletins
  - 2. Product sheets

#### 1.5 QUALIFICATIONS

- A. The manufacturer of the assembly shall be the manufacturer of the major components within the assembly.

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- B. For the equipment specified herein, the manufacturer shall be ISO 9001 or 9002 certified.
- C. The manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of five (5) years. When requested by the Engineer, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.
- D. The SPD shall be compliant with the Restriction of Hazardous Substances (RoHS) Directive 2002/95/EC.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Equipment shall be handled and stored in accordance with manufacturer’s instructions. One (1) copy of manufacturer’s instructions shall be included with the equipment at time of shipment.

1.7 OPERATION AND MAINTENANCE MANUALS

- A. Operation and maintenance manuals shall be provided with each SPD shipped.

PART 2 - PRODUCTS

2.1 VOLTAGE SURGE SUPPRESSION – GENERAL

- A. Electrical Requirements:
  1. Unit Operating Voltage – Refer to drawings for operating voltage and unit configuration.
  2. Maximum Continuous Operating Voltage (MCOV) – The MCOV shall not be less than 115% of the nominal system operating voltage.
  3. The suppression system shall incorporate thermally protected metal-oxide varistors (MOVs) as the core surge suppression component for the service entrance and all other distribution levels. The system shall not utilize silicon avalanche diodes, selenium cells, air gaps, or other components that may crowbar the system voltage leading to system upset or create any environmental hazards.
  4. Protection Modes – The SPD must protect all modes of the electrical system being utilized. The required protection modes are indicated by bullets in the following table:

Configuration	Protection Modes			
	L-N	L-G	L-L	N-G
Wye	●	●	●	●
Delta	N/A	●	●	N/A
Single Split Phase	●	●	●	●
High Leg Delta	●	●	●	●

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5. Nominal Discharge Current ( $I_n$ ) – All SPDs applied to the distribution system shall have a 20kA  $I_n$  rating regardless of their SPD Type (includes Types 1 and 2) or operating voltage. SPDs having an  $I_n$  less than 20kA shall be rejected.
6. ANSI/UL 1449 3rd Edition Voltage Protection Rating (VPR) – The maximum ANSI/UL 1449 3rd Edition VPR for the device shall not exceed the following:

Modes	208Y/120	480Y/277
L-G; N-G	800	1200
L-L	1200	2000
L-N	900	1500

B. SPD Design:

1. Maintenance Free Design – The SPD shall be maintenance free and shall not require any user intervention throughout its life. SPDs containing items such as replaceable modules, replaceable fuses, or replaceable batteries shall not be accepted. SPDs requiring any maintenance of any sort such as periodic tightening of connections shall not be accepted. SPDs requiring user intervention to test the unit via a diagnostic test kit or similar device shall not be accepted.
2. Balanced Suppression Platform – The surge current shall be equally distributed to all MOV components to ensure equal stressing and maximum performance. The surge suppression platform must provide equal impedance paths to each matched MOV. Designs incorporating replaceable SPD modules shall not be accepted.
3. Electrical Noise Filter – Each unit shall include a high-performance EMI/RFI noise rejection filter. Noise attenuation for electric line noise shall be up to 50 dB from 10 kHz to 100 MHz using the MIL-STD-220A insertion loss test method. Products unable able to meet this specification shall not be accepted.
4. Internal Connections – No plug-in component modules or printed circuit boards shall be used as surge current conductors. All internal components shall be soldered, hardwired with connections utilizing low impedance conductors.
5. Monitoring Diagnostics – Each SPD shall provide the following integral monitoring options:
  - a. Protection Status Indicators - Each unit shall have a green / red solid-state indicator light that reports the status of the protection on each phase.
    - 1) For wye configured units, the indicator lights must report the status of all protection elements and circuitry in the L-N and L-G modes. Wye configured units shall also contain an additional green / red solid-state indicator light that reports the status of the protection elements and circuitry in the N-G mode. SPDs that indicate only the status of the L-N and L-G modes shall not be accepted.
    - 2) For delta configured units, the indicator lights must report the status of all protection elements and circuitry in the L-G and L-L modes.
    - 3) The absence of a green light and the presence of a red light shall indicate that damage has occurred on the respective phase or mode. All protection status indicators must indicate the actual status of the protection on each phase or mode. If power is removed from any one phase, the indicator lights must continue to indicate the status of the protection on all other

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phases and protection modes. Diagnostics packages that simply indicate whether power is present on a particular phase shall not be accepted.

- b. Remote Status Monitor – The SPD must include Form C dry contacts (one NO and one NC) for remote annunciation of its status. Both the NO and NC contacts shall change state under any fault condition.
- c. Audible Alarm and Silence Button – The SPD shall contain an audible alarm that will be activated under any fault condition. There shall also be an audible alarm silence button used to silence the audible alarm after it has been activated.
- d. Surge Counter – The SPD shall be equipped with an LCD display that indicates to the user how many surges have occurred at the location. The surge counter shall trigger each time a surge event with a peak current magnitude of a minimum of  $50 \pm 20A$  occurs. A reset pushbutton shall also be standard, allowing the surge counter to be zeroed. The reset button shall contain a mechanism to prevent accidental resetting of the counter via a single, short-duration button press. In order to prevent accidental resetting, the surge counter reset button shall be depressed for a minimum of 2 seconds in order to clear the surge count total.
  - 1) The ongoing surge count shall be stored in non-volatile memory. If power to the SPD is completely interrupted, the ongoing count indicated on the surge counter's display prior to the interruption shall be stored in non-volatile memory and displayed after power is restored. The surge counter's memory shall not require a backup battery in order to achieve this functionality.

6. Overcurrent Protection:

The unit shall contain thermally protected MOVs. These thermally protected MOVs shall have a thermal protection element packaged together with the MOV in order to achieve overcurrent protection of the MOV. The thermal protection element shall disconnect the MOV(s) from the system in a fail-safe manner should a condition occur that would cause them to enter a thermal runaway condition.

7. Fully Integrated Component Design – All of the SPD's components and diagnostics shall be contained within one discrete assembly. SPDs or individual SPD modules that must be ganged together in order to achieve higher surge current ratings or other functionality shall not be accepted.

8. Safety Requirements:

The SPD shall minimize potential arc flash hazards by containing no user serviceable / replaceable parts and shall be maintenance free. SPDs containing items such as replaceable modules, replaceable fuses, or replaceable batteries shall not be accepted. SPDs requiring any maintenance of any sort such as periodic tightening of connections shall not be accepted. SPDs requiring user intervention to test the unit via a diagnostic test kit or similar device shall not be accepted.



- a. SPDs designed to interface with the electrical assembly via conductors shall require no user contact with the inside of the unit. Such units shall have any required conductors be factory installed.
- b. SPDs shall be factory sealed in order to prevent access to the inside of the unit. SPDs shall have factory installed phase, neutral, ground and remote status contact conductors factory installed and shall have a pigtail of conductors protruding outside of the enclosure for field installation.

2.2 SYSTEM APPLICATION

- A. The SPD applications covered under this section include distribution and branch panel locations and switchboard assemblies. All SPDs shall be tested and demonstrate suitability for application within ANSI/IEEE C62.41 Category C, B, and A environments.
- B. Surge Current Capacity – The minimum surge current capacity the device is capable of withstanding shall be as shown in the following table:

Minimum Surge Current Capacity based on ANSI / IEEE C62.41 Location Category			
Category	Application	Per Phase	Per Mode
C	Service Entrance Locations (Switchboards, Main Service Entrance)	250 kA	125 kA
B	High Exposure Roof Top Locations (Distribution Panelboards)	160 kA	80 kA
A	Branch Locations (Panelboards)	120 kA	60 kA

- C. SPD Type – SPDs installed on the load side of the service entrance disconnect shall be Type 1 or Type 2 SPDs.

2.3 LIGHTING AND DISTRIBUTION PANELBOARD REQUIREMENTS

- A. The SPD application covered under this section includes lighting and distribution panelboards. The SPD units shall be tested and demonstrate suitability for application within ANSI/IEEE C62.41 Category B environments.
  - 1. The SPD shall not limit the use of through-feed lugs, sub-feed lugs, and sub-feed breaker options.
  - 2. SPDs shall be installed immediately following the load side of the main breaker. SPDs installed in main lug only panelboards shall be installed immediately following the incoming main lugs.
  - 3. The panelboard shall be capable of re-energizing upon removal of the SPD.
  - 4. The SPD connected to a 30A circuit breaker for disconnecting purposes may be installed using short lengths of conductors as long as the conductors originate integrally to the SPD. The SPD shall be located directly adjacent to the 30A circuit breaker.
- B. Side mount Mounting Applications Installation (SPD mounted external to electrical assembly):

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1. Lead length between the breaker and suppressor shall be kept as short as possible to ensure optimum performance. Any excess conductor length shall be trimmed in order to minimize let-through voltage. The installer shall comply with the manufacturer's recommended installation and wiring practices.

#### 2.4 ENCLOSURES

- A. All enclosed equipment shall have NEMA 1 general purpose enclosures, unless otherwise noted. Provide enclosures suitable for locations as indicated on the drawings and as described below:
  1. NEMA 1 – Constructed of steel intended for indoor use to provide a degree of protection to personal access to hazardous parts and provide a degree of protection against the ingress of solid foreign objects.
  2. NEMA 4 – Constructed of steel intended for either indoor or outdoor use to provide a degree of protection against access to hazardous parts; to provide a degree of protection of the equipment inside the enclosure against ingress of solid foreign objects (dirt and windblown dust); to provide a degree of protection with respect to the harmful effects on the equipment due to the ingress of water (rain, sleet, snow, splashing water, and hose directed water); and that will be undamaged by the external formation of ice on the enclosure.
  3. NEMA 4X – Constructed of stainless steel providing the same level of protection as the NEMA 4 enclosure with the addition of corrosion protection.

### PART 3 - EXECUTION

#### 3.1 FACTORY TESTING

- A. Standard factory tests shall be performed on the equipment under this section. All tests shall be in accordance with the latest version of NEMA and UL standards.

#### 3.2 INSTALLATION

- A. The Contractor shall install all equipment per the manufacturer's recommendations and the contract drawings.

#### 3.3 WARRANTY

- A. The manufacturer shall provide a full ten (10) year warranty from the date of shipment against any SPD part failure when installed in compliance with manufacturer's written instructions and any applicable national or local code.

END OF SECTION 264313