

**THE SCHOOL DISTRICT OF PHILADELPHIA**  
**Office of Capital Programs**  
**440 North Broad Street, 3<sup>rd</sup> Floor – Suite 371**  
**Philadelphia, PA 19130**

TELEPHONE: (215) 400-4730

**ADDENDUM No. 01**

**Subject:** Wright Elementary School – Major HVAC Renovation  
SDP Contract No.

GC: B-089(c) OF 2018/2019

MC: B-079(c) OF 2018/2019

PC: B-090(c) OF 2018/2019

EC: B-080(c) OF 2018/2019

**Location:** 2201-51 N. 28TH ST, PHILADELPHIA, PA 19132

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**This ADDENDUM dated 1/14/2022 shall modify and become part of the Contract Documents for the work of this project. Any items not mentioned herein, or affected by, shall be performed strictly in accordance with the original documents.**

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**Questions**

Question #1:

Who does the penetrations for Mechanical, Plumbing, Electrical Contractors?

**Drilling of Painted CMU walls or Painted Concrete Ceilings, Walls or Slabs for attachment or penetration of mechanical, electrical or plumbing piping, conduit or ductwork must be done by the Asbestos Abatement Contractor (AAC) retained by the Mechanical Contractor.**

**See section 19 of the Abatement Specification for drilling holes in painted CMU or Concrete Walls, Slabs or Ceilings. Total of 1750 holes or attachment points is estimated.**

**Other prime contractors shall coordinate the layout of holes or attachment points for their work with the AAC.**

**Each respective trade is responsible for their sleeves prior to installation and sealing of penetrations after installation (including fire stopping as required) as documented in the contract documents.**

Question #2:

Is the interior work in the school done on first or second shift?

**Response: Except for work in the boiler room, all interior work must be done on the second shift while the school is in session.**

Question #3:

Can work outside and in the boiler room be done during regular working hours?

**Response: All interior work, except in the boiler room, during the school year is to be performed on second shift. During the summer hours and winter break hours first shift work may be approved. Contractor to submit a phasing work plan for approval of all work to be considered during regular working hours. This is subject to approval.**

Question #4:

The Mechanical contractor has the environmental scope of work but does the MC have lead stabilization too?

**Response: NO. Lead Based Paint stabilization of the responsibility of each prime contractor as required by its work, in accordance with Section 01 1100 ENVIRONMENTAL COORDINATION, Part 4 and Section 21 of the Abatement Specification**

Question #5:

Besides general cleanup by all primes who is responsible for final cleaning?

**Response: Mechanical Contractor is to provide final cleaning.**

Question #6:

Please advise that Trane Tracer SC controls network is acceptable to SDOP? Tracer SC has been successfully installed on at least 12 schools over the past 3 years

**Response:**

**Refer to project specification for acceptable manufacturers and product. Substitutions will not be evaluated during the bid phase per Instructions to Bidders.**

Question #7:

Please confirm the required SCCR rating for the chiller Circuit Breaker?

**Response:**

**Per M601 general note 1. ALL 3 PHASE MOTORS TO HAVE A MINIMUM SHORT CIRCUIT CURRENT RATING OF 22 KAIC**

Question #8:

Please confirm the required sound levels required for the chiller?

**Response:**

**Chiller to obtain a weighted sound pressure at full load of 65dBA.**

Question #9:

Please confirm that plenum rated wire is NOT acceptable installation method and that all wiring must be in EMT, Wired Mold, or Rigid conduit based on area of installation?

**Response:**

**Confirmed plenum rated wiring is not acceptable. EMT and Rigid conduit is required per the contract documents.**

Question #10:

Please confirm that the Unit Ventilators are required to have air flow measuring stations?

**Response:**

**No it is not required.**

Question #11:

Is there a specification for the HLR (Enverid heat load reduction units) unit?

**Response:**

**See attached specification 237320**

Question #12:

Is there a door and louver schedule?

**Response:**

**Yes see attached drawing.**

Question #13:

Please provide a spec for the Chiller Fencing

**Response:**

**See contract specification 323119.**

Question #14:

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1. .Power keynote 11 on drawing ED401 states to paint the entire length of the existing rigid conduit for the 13.2 KV feeder. However, the length of this conduit is unknown, as the location of the existing PECO transformer is not shown in plan. Please indicate the location of existing PECO transformer in plan so that we can estimate the length of conduit to paint.

**Response:**

**Include 250' of length. Electrical incoming service is located in southeast corner of building.**

Question #15:

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1. Keynote 3 on drawing E103 is not typical for multiple prime projects. Please confirm the delineation of scope should be revised as noted below:
  1. ·EC furnishes duct detector and sampling tube.
  2. ·MC installs duct detector & sampling tube within duct.
  3. ·EC provides test switch for duct detector.
  4. ·EC provides control relay module with form-c contact, if form-c contact isn't already built into duct detector.
  5. ·EC provides SLC wiring to duct detector.
  6. ·MC provides control wiring from dry contact of fire alarm relay to mechanical equipment.

**Response:**

**Confirmed. See clarification below within Drawings**

Question #16:

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1. Coordination Notes / Discussion at Phasing Meeting on drawing G102 states that the EC spec covers wiring methods for control wiring. However, general note 2 on drawing E101 states that the MC will provide wiring and conduit for circuits less than 120V. Please confirm that the MC shall provide wiring and conduit for circuits less than 120V and therefore will also cover wiring methods for control wiring.

**Response:**

**Confirmed. EC to provide wiring and conduit for 120V and above. MC to provide wiring and conduit for all wiring below 120V**

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**Question #17:**

Detail 1/A401 says refer to structural drawings for concrete pad details.  
Please provide additional structural drawings

**Response:**

This detailing is provided on sheet S-001 for both removal of existing pads and installation of new pads.

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**Drawings:**

- E103 – Keynote 3
  - **Change**

NEW DUCT DETECTOR - REFER TO MECHANICAL DRAWINGS FOR EXACT LOCATION OF ALL DETECTORS.  
MECHANICAL CONTRACTOR WILL PROVIDE (FURNISH AND INSTALL) DUCT SMOKE DETECTORS AND SAMPLING TUBES AS WELL AS INTERLOCK WITH AIR HANDLING UNIT CONTROLS PER MECHANICAL DRAWINGS.  
ELECTRICAL CONTRACTOR WILL PROVIDE AS NEEDED CONTROL RELAY MODULE WITH FORM-C CONTACT AND SLC WIRING BETWEEN DETECTORS AND EXISTING FIRE ALARM CONTROL PANEL.  
ALL WIRING SHALL RUN IN RGS CONDUIT.  
ALL NEW FIRE ALARM DEVICES SHALL BE COMPATIBLE WITH EXISTING FIRE ALARM SYSTEM.  
COORDINATE ALL WORK WITH THE FIRE ALARM VENDOR FOR THE SCHOOL TO ASSURE THAT BATTERY AND POWER SUPPLY ARE ADEQUATE FOR NEW DEVICES. PROVIDE BOOSTER POWER SUPPLY AND ADDITIONAL BATTERY, AS A SEPARATE LINE ITEMS IN THE BID PROPOSAL.  
E.C. SHALL BE RESPONSIBLE FOR FIRE ALARM BATTERY CALCULATION AND SUBMISSION TO CITY OF PHILADELPHIA L&I, IF REQUIRED.  
EXISTING FIRE ALARM SYSTEM SHALL BE RE-CERTIFIED AFTER INSTALLATION OF THE DUCT DETECTORS IS COMPLETED.
  - **To**

NEW DUCT DETECTOR - REFER TO MECHANICAL DRAWINGS FOR EXACT LOCATION OF ALL DETECTORS.  
ELECTRICAL CONTRACTOR TO FURNISH DUCT DETECTOR AND SAMPLING TUBE.  
MECHANICAL CONTRACTOR TO INSTALL DUCT SMOKE DETECTORS AND SAMPLING TUBES AS WELL AS INTERLOCK WITH AIR HANDLING UNIT CONTROLS PER MECHANICAL DRAWINGS.  
ELECTRICAL CONTRACTOR WILL PROVIDE AS NEEDED CONTROL RELAY MODULE WITH FORM-C CONTACT AND SLC WIRING BETWEEN DETECTORS AND EXISTING FIRE ALARM CONTROL PANEL.  
MC TO PROVIDE CONTROL WIRING FROM DRY CONTACT OF FIRE ALARM RELAY TO MECHANICAL EQUIPMENT.  
ALL WIRING SHALL RUN IN RGS CONDUIT.  
ALL NEW FIRE ALARM DEVICES SHALL BE COMPATIBLE WITH EXISTING FIRE ALARM SYSTEM.  
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#### Specifications

- **ADD 237320** – Sorbent-Based indoor Air Filtration Systems

**End of Addendum**

**SECTION 23 73 20**  
**SORBENT-BASED INDOOR AIR FILTRATION SYSTEMS**

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes factory-packaged and assembled HVAC Load Reduction (HLR®) Modules, herein Equipment Modules, to provide gas-phase air filtration for the cleaning of indoor air molecular contaminants, including carbon dioxide, formaldehyde, and other volatile organic compounds (VOCs) in addition to outdoor-generated contaminants such as Ozone and fine particulate matter (PM).

1.2 WORK INCLUDED

- A. The mechanical contractor to furnish original equipment as designed, specified, and scheduled. The mechanical contractor to install original equipment as mandated by the submitted and approved Construction Drawings.
- B. The mechanical contractor shall be responsible for coordinating all requirements of the original equipment as published by the manufacturer.
- C. If the mechanical contractor elects to substitute alternate equipment or an increase or decrease in specified original equipment, the altered system shall be resubmitted for review and approval prior to equipment manufacturing release.

1.3 DEFINITIONS

- A. HLR: HVAC Load Reduction
- B. HVAC: Heating, Ventilation, Air-Conditioning
- C. VOC: Volatile Organic Compound
- D. PID: Control action, proportional plus integral plus derivative
- E. IAQ: Indoor Air Quality
- F. IAQP: Indoor Air Quality Procedure
- G. VRP: Ventilation Rate Procedure
- H. CFM: Cubic Feet per Minute [ft<sup>3</sup>/min]
- I. BMS: Building Management System
- J. LEED: Leadership in Energy and Environmental Design
- K. USGBC: United States Green Building Council

1.4 REFERENCE

- A. Applicable provisions of Division 1 govern work under this section

#### 1.5 REFERENCE STANDARDS

- A. ASHRAE 52.2 – Method of Testing General Ventilation Air Cleaning Devices for Removal Efficiency by Particle Size
- B. ASHRAE 145.2 - Laboratory Test Method for Assessing the Performance of Gas-Phase Air-Cleaning Systems: Air-Cleaning Devices
- C. ASHRAE 62.1 – Ventilation for Acceptable Indoor Air Quality
- D. NFPA 70 – National Electric Code (conductors, equipment and raceways)
- E. NFPA 90A – Installation of Air Conditioning and Ventilation Systems
- F. UL-1995 – Standard for Safety for Heating and Cooling Equipment
- G. EN60950-1, CSA Std C22.2 No.113-10 UL507 9th Ed

#### 1.6 SUBMITTALS

##### A. Information Submittals

1. Furnish all product equipment information including drawings indicating unit dimensions, product data, cut sheets, required clearances, field connection locations, unit weights and lifting lugs, wiring diagrams, and proper installation configuration(s). Drawings shall be submitted at scale of  $\frac{1}{4}'' = 1'-0''$ .
2. Report electrical requirements for power supply wiring including wiring diagrams for interlock and controls wiring, clearly indicating factory-installed and field-installed wiring requirements. Report motor electrical characteristics.
3. Equipment support submittal, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved, for the applicable roof and/or outdoor rated equipment:
  - a. Size and location of unit-mounted rails and anchor points and methods for anchoring units to roof curb, including base connection details.
  - b. Required roof penetrations for ducts, pipes, and electrical raceways, including size and location of each penetration, if required.
4. Vibration Isolation, Wind and Seismic Restraint Certificates (if applicable by local code requirements) for dedicated outdoor rated equipment, accessories, and components from the manufacturer. Must be stamped and signed by a professional engineer with a license in the project state.

##### B. ASHRAE 62.1 Indoor Air Quality Procedure Compliance Report

1. Provide the documentation required by ASHRAE Standard 62.1 – 2016 page 49 and relevant addenda. A summary of compliance requirements for the list of design compounds (DCs) and design targets and mixture of compounds (Table 1 & 2) currently available is summarized in the Compliance Section.

C. LEED Compliance Report

1. If applicable, provide some or all documentation and product data indicating units and system compliance with USGBC's LEED v4 Pilot Credit EQpc124: Performance-Based Indoor Air Quality Design and Assessment.

D. Closeout Documents

1. Operations, and Maintenance (O+M) Manual as published by original equipment manufacturer and revised for applicable installed product:
2. Manufacturer technician or factory-trained personnel to provide Equipment Start-Up Report.
3. Any revisions made by the Contractor to the conditions or from that shown on the drawings shall be included in 'As-built' document package.

1.7 SHOP DRAWINGS

- A. Include dimensioned computer-generated unit plans, elevation views, section drawings, attachment details, wall and floor penetrations, structural frame design, in locations applicable for equipment module installation.
- B. Shop drawing submittals shall be coordinated with mechanical contractor to ensure feasibility of design and corrected for any altered field conditions not foreseeable by the registered design engineer.
- C. Shop drawings to be used for the purposes of accurate material planning, sizing and ordering, and account for all necessary and predicted field change orders.
- D. Include details of equipment and system assemblies and features. Indicate dimensions, required clearances, and acceptable service space. Include the following:
  1. Each installed unit's type, details, and equipment ratings.
  2. Nameplate legends and equipment tags.
  3. Tabulations of all installed supporting equipment, devices, controllers, and sensors.
- E. Wiring diagram, system block diagram, controls diagram, schematic wiring for all equipment modules and supporting equipment shall be furnished by contractor.

1.8 QUALITY ASSURANCE

- A. The design indicated on the schedules and shown on the drawings is based upon the in-scope products, herein the original equipment, of the named manufacturer. Alternate equipment or solutions are acceptable only if specified/scheduled performance requirements are met and approved by Engineer of Record. Refer to Division 1, General Conditions, Equals and Substitutions.
- B. The units shall be factory assembled and tested per this specification. Each equipment module unit shall be fully end-of-line tested for proper functioning including fan operation, heater operation, actuator operation, and correct sensor calibration.



1.9 RATINGS AND CERTIFICATIONS

1. Unit safety: UL 1995 or CSA C22.2 No.236
2. Filter media: ANSI/UL 900 listed Class I or Class II
3. Control wiring: NEC codes & ETL requirements
4. Air cleaning efficiency: ASHRAE 145.2

1.10 PROJECT CONDITIONS

- A. Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or Operator unless permitted to do so by facility Owner or Operator. Owner, Operator, contractor, or service personnel to follow power or electrical shut-down guidelines and procedures per the manufacturer to avoid potential equipment damage.

1.11 COMPLIANCE

- A. A summary of compliance requirements for the example list of design compounds (DCs) and design targets and mixture of compounds in the Table 1 below:

| COMPOUND OR PM <sub>2.5</sub>          | COGNIZANT AUTHORITY       | DESIGN TARGET           |
|--|---------------------------|-------------------------|
| Acetaldehyde                           | Cal EPA CREL (June 2016)  | 140 ug/m <sup>3</sup>   |
| Acetone                                | AgBB LCI                  | 1,200 ug/m <sup>3</sup> |
| Benzene                                | Cal EPA CREL (June 2016)  | 3 ug/m <sup>3</sup>     |
| Dichloromethane                        | Cal EPA CREL (June 2016)  | 400 ug/m <sup>3</sup>   |
| Formaldehyde                           | Cal EPA 8-hour (2004)     | 33 ug/m <sup>3</sup>    |
| Naphthalene                            | Cal EPA CREL (June 2016)  | 9 ug/m <sup>3</sup>     |
| Phenol                                 | AgBB LCI                  | 10 ug/m <sup>3</sup>    |
| Tetrachloroethylene                    | Cal EPA CREL (June 2016)  | 35 ug/m <sup>3</sup>    |
| Toluene                                | Cal EPA CREL (June 2016)  | 300 ug/m <sup>3</sup>   |
| 1,1,1-trichloroethane                  | Cal EPA CREL (June 2016)  | 1000 ug/m <sup>3</sup>  |
| Xylene, total                          | AgBB LCI                  | 500 ug/m <sup>3</sup>   |
| Carbon monoxide                        | USEPA NAAQS               | 9 ppm                   |
| PM <sub>2.5</sub>                      | USEPA NAAQS (annual mean) | 12 ug/m <sup>3</sup>    |
| Ozone                                  | USEPA NAAQS               | 70 ppb                  |
| Ammonia (only for spaces with animals) | Cal EPA CREL (June 2016)  | 200 ug/m <sup>3</sup>   |

1.12 COORDINATION

- A. If the original equipment solution is supplied by a manufacturer other than the one named, herein alternate equipment, coordinate with the General Contractor and affected subcontractors to ensure the specified performance is met.
- B. The Mechanical Contractor shall be responsible for costs incurred by the General Contractor, Subcontractors, and Consulting Engineers to accommodate equipment and controls furnished by a manufacturer other than manufacturer named as basis of design.
- C. Coordinate sizes and locations of concrete bases with actual equipment provided
- D. Coordinate sizes and locations of structural-steel support members, if any, with actual equipment provided.

### 1.13 WARRANTY

- A. Provide original equipment parts warranty for 12 months from date of shipment. Warranty shall cover manufacturer defects, and manufacturer agrees to replace components of units that fail in materials or workmanship within the specified warranty period. Warranty work shall be performed by manufacturer's factory-trained representatives or manufacturer-employed technicians.
- B. Annual Service and Service Agreements and details therein are NOT included or covered by Warranty (Standard only).
- C. Manufacturer or Manufacturer's Representative shall submit sample warranty for special warranty offerings to be purchased by and approved by the new equipment owner.

### 1.14 STARTUP

- A. Do not operate units for any purpose, temporary or permanent, until installation is completed in compliance with manufacturer's start-up requirements to ensure safe and correct operation and integrity of warranty.
- B. Factory-trained or factory-provided service technicians are required to start-up and commission units upon the complete installation of the equipment and supporting systems. Upon start-up completion, technician personnel to draft a commissioning document and provide it to equipment Owner or Operator to indicate satisfactory system installation and operation.
- C. Provide all manuals, instructions, Startup Checklist, and all quality assurance documents directly to Owner and/or Operator.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. *enVerid Systems, Inc.* HVAC Load Reduction (HLR®) Module(s).
- B. Original Equipment Manufacturer (OEM) rebranded equivalent.
- C. Approved equipment alternates (prior written approval or consent by Engineer of Record is required). Equipment Alternate must meet the below Performance criteria detailed herein.

### 2.2 PERFORMANCE

- A. Indoor air quality performance shall be in compliance with ASHRAE 62.1-2016 and relevant addenda via the Indoor Air Quality Procedure (IAQP).
- B. Air Cleaning Solution and Mechanism shall be fully compliant with ASHRAE Standard for Gas Phase Filtration: ASHRAE Standard 145.2 – 2011.
- C. Air Cleaning Solution shall be certified as zero-byproduct emitting by 3rd Party Certified Lab. Zero-byproduct certification letter required to be submitted to Engineer of Record and equipment Owner and/or Operator.

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- D. Mechanism for air cleaning shall be capture and release; air cleaning solution alternates shall not alter the chemistry or composition of airborne gaseous substances. Alternate air-manipulative or catalytic type cleaners shall not be approved (i.e. plasma cleaners, ionizers, etc.)
- E. Solution shall have PM<sub>2.5</sub> cleaning efficiency as verified by ASHRAE Standard 52.2 Lab Test by certified 3rd Party Lab. Original Equipment provider to furnish certified efficiency report to Engineer of Record and equipment Owner and/or Operator.
- F. Solution shall have Ozone (O<sub>3</sub>) removal efficiency as verified by ASHRAE Standard Lab Test by certified 3rd Party Lab.
- G. Solution shall not emit Ozone and/or Reactive Oxygen Species (ROS) of any kind; processes and mechanisms that emit ozone/ROS or have the potential to emit ozone or ROS are not acceptable.
- H. Solution shall have the capability to be automatically regenerated (self-cleaned) in-situ; replacement of cleaning mechanism or sorbent media shall not be required more than once per year.
- I. Gas-phase cleaning efficiencies must meet the following minimums for single-pass air cleaning of the following contaminants of concern:

| GASEOUS CONTAMINANTS | MEASURED STANDARD CHALLENGE CONCENTRATION | CARTRIDGE EFFICIENCY (%) |
|----------------------|---|--------------------------|
| Benzene              | 438 ppb                                   | 87%                      |
| Carbon Dioxide       | 1000 ppm                                  | 57%                      |
| Formaldehyde         | 121 ppb                                   | 55%                      |
| Hexane               | 453 ppb                                   | 74%                      |
| Isopropanol          | 449 ppb                                   | 77%                      |
| Ozone                | 71 ppb                                    | 70%                      |
| Toluene              | 386 ppb                                   | 52%                      |
| Xylene               | 419 ppb                                   | 60%                      |

**2.3 CONSTRUCTION AND COMPONENTS**

- A. Cartridge Bank: The cartridge bank shall house twelve (12) quantity cartridges that contain the sorbents used to capture molecular level contaminants (CO<sub>2</sub>, formaldehyde, VOCs, ozone, etc. as defined by ASHRAE Standard 62.1-2016) during the sorption (cleaning) process and then released during the regeneration (airflow purge or exhaust) process.
- B. Heater: An integrated heater shall raise the internal temperature of the unit to initiate the release of captured contaminants by molecular thermal excitation. The heater shall be controlled using a PID controller loop to maintain the internal temperature. Temperature control shall be an on-board software-based function. Controller shall contain 3-modes of safety protection with respect to heater control that are mechanical in nature to ensure safe operation:
  - 1. An airflow switch that ensures the heater is disabled when there is insufficient airflow inside the unit.
  - 2. A resettable thermal switch shall disconnect the heater when the temperature exceeds a preset limit and will only allow the heater to operate once a safe temperature has been reached.
  - 3. A one-time blow fuse shall permanently disconnect the heater in the event the two primary safety functions fail to work.

- C. Fans: Integrated DC brushless motor driven fans shall control airflow through the unit during the adsorption and regeneration cycles. The fans are controlled using pulse width modulation for variable speed and are safety listed. The fan motors shall contain on-board locked rotor protection to prevent damage to the unit in the event of motor failure or the fan becomes blocked or locked in position.
- D. Inlets & Outlets: The module shall include airflow damper inlets and airflow damper outlets controlled and modulated by mechanical actuator assemblies.
- E. Internal Damper: An internal shunt damper shall be used during the regeneration cycle to enable the system to reach and maintain optimal temperature using airflow recirculation and mixing. The internal damper shall be controlled by an actuator allowing for analog position control to actively modulate the amount of recirculation during the regeneration.
- F. Control Board: The electronic enclosure shall contain both the power supply and main controller board. The power supply converts the incoming AC power to all voltages required to operate all aspects of the unit including actuators, heater, fans, and sensors. The controller contains the systems software, all controls/relays/sensor interfaces, and all wireless and wired communication modules.
- G. Insulation: All internal surfaces of the unit shall be covered in heat-reflective insulation material for improved efficiency and soundproofing. All outdoor-rated and weatherized equipment modules shall contain between-the-wall pressed insulation to maintain thermal efficiency.
- H. Outdoor-rated equipment modules shall have galvanized steel double-walled construction with 1000-hr salt spray rated power-coated paint. Indoor-based equipment modules are excluded from this specification.
- I. Power Requirements: The unit shall be designed to work with single-phase AC power and should accommodate a range of line voltages and frequencies. Rated incoming line-voltage shall be 208-277V/ single phase at 60/50 Hz frequencies.
- J. Airflow: Module airflow performance shall be based on no more than 0.2" w.g. of external static pressure. Maximum airflow shall not exceed 1000 CFM of cleaning capacity with a design nominal airflow of 800 CFM per single unit. Regeneration Cycle design maximum airflow shall not exceed 500 CFM of exhaust capacity with a design nominal airflow of 300 CFM per single unit.

## 2.4 ACCESSORIES

- A. Original Equipment shall have all factory components installed and furnished as outlined in the previous Sections, unless otherwise indicated:
  - 1. TVOC Sensor: Manufacturer shall furnish optional total volatile organic compound sensor for system integration in the quantity specified by the registered engineer or building owner.
  - 2. External Sensors: Mechanical Contractor shall furnish optional field installed external air-psychrometric property sensors and coordinated with controls requirements. Electrical contractor shall be responsible for integration of external sensor connections and data logging to the BMS and used for the equipment module(s) per the manufacturer's recommendation.
  - 3. Mounting Legs: Manufacturer shall furnish elevated mounting legs for each corner of each equipment module. Mounting legs shall be furnished and provided with factory equipment

shipment and shall be field installed. Mounting legs shall be provided for indoor-based equipment modules only.

- B. All system installations require supplementary exhaust booster fan or power exhaust (outdoor-based units) to ensure adequate and flexible operation of scheduled or dynamically managed Regeneration Mode. Original equipment manufacturer shall NOT design, specify or provide supplementary exhauster. Supplementary exhaust booster fan specification shall be the responsibility of the Engineer of Record and furnished by the mechanical contractor.
  - 1. All integrating and supporting electrical and controls hardware and software of the supplementary exhaust booster fan shall be provided and specified by OTHERS.
  - 2. EXCEPTION: All outdoor-based equipment modules shall be factory-provided with a (1 qty) power exhauster mounted externally of each provided unit. Supplementary power exhaust fan design, specification, and details shall be the responsibility of the Original Equipment Manufacturer and furnished by the Original Equipment Manufacturer. Power exhaust specification shall be based on finalized building design parameters as provided by the Engineer of Record.
- C. Outdoor-based equipment modules shall be required to be installed on structural steel supports, mounting curbs, or weather-tight roof curbs, as specified by the Engineer of Record and supplied by the mechanical contractor or OTHERS. Downflow configurations with thru-the-roof duct penetrations shall be installed with insulated water-tight mounting curb, as specified by the Engineer of Record or mechanical contractor.
- D. Original Equipment manufacturer shall furnish all sorbent cartridge sets as separately shipped line-item. First-time loading of cartridge set shall occur AFTER construction and installation of original equipment. Twelve (12) quantity sorbent cartridges shall be included in first capital purchase of equipment price, lasting for 1 year. Additional replacement cartridge sets shall be executed per the signed service agreement.
- E. Spare parts are NOT included in manufacturer scope but shall be furnished by the contractor per the manufacturer's recommendations.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine all areas, surfaces, and sub-surfaces to receive Equipment Modules for compliance with requirements, installation tolerances, and other field conditions that may affect performance.
- B. Examine roughing-in for supporting mechanical and electrical systems to verify actual locations of connections before physical equipment installation.
- C. Proceed with installation only after unsatisfactory conditions have been approved and corrected.

#### 3.2 APPLICATIONS

#### 3.3 DELIVERY, STORAGE, AND HANDLING

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- A. Comply with original equipment manufacturer's instructions for storing, rigging, unloading, and transporting units. Protect units from physical damage. Leave factory-shipping covers in place until installation.
- B. Protect, pack, and secure loose-shipped items within the units. Include detailed packing list of loose-shipped items, including illustrations and instructions for application.
- C. Protect, pack and secure controls devices and other electronic equipment. Do not store electronic equipment in wet or damp areas even when they are sealed and secured.
- D. Enclose and protect control panels and electronic devices. Do not store equipment in wet or damp areas even when they are sealed and secured.
- E. Seal all openings to protect against damage during shipping, handling and storage.
- F. Wrap indoor-rated units with a tight sealing membrane. Wrapping membrane shall cover entire equipment module, including electrical components, for protection against rain, snow, wind, dirt, sun fading, road salt/chemicals, rust and corrosion during shipping and storage. Cover all equipment, regardless of size or shape and keep clean and dry. Alternatively, indoor-rated equipment modules must be tarped for shipment and storage.
- G. Store per manufacturer's written recommendations. Store equipment modules indoors in a warm, clean, dry place where units will be protected from weather, construction traffic, dirt, dust, water and moisture. If units will be stored for more than 6 months, follow manufacturer's instruction for long-term storage.
- H. Tarp outdoor units to protect against rain and road debris during shipping.
- I. Clearly mark with unit tag number. Securely affix safety-warning labels.
- J. Indoor-rated modules shall ship vertically in a sturdy box strapped to a pallet. Inside the box, there must be corner protectors and foam blocks on the top to protect the actuators. Shipping and handling warning labels must be affixed on the outside of the box, including a "tip-and-tell" indicator to confirm the unit was not tipped during shipping and handling.
- K. Immediately report to shipping handler, manufacturer's representative, or original equipment manufacturer, if damage is observed on the exterior of the packaging, including the "tip-and-tell" indicator to confirm unit and/or packaging was harmed during transport. Document all areas of concern using combination of photographs and handwritten comments to ensure record damage history.
- L. Rooftop or outdoor-rated based modules shall ship horizontally in their installed configuration. Execute all aforementioned recommendations with outdoor-rated product, where applicable for non-indoor attributes.

### 3.4 INSTALLATION

- A. Install equipment per industry standards, applicable codes, and manufacturer's instructions.
- B. Do not put the equipment modules into temporary use prior to complete inspection and startup performed per this specification.

- C. Rigging and material handling of units shall be conducted according to manufacturer's explicit instructions.
- D. Install equipment modules on a concrete pad, roof curb, structural steel base, or secured riser feet, depending on indoor or outdoor based installation, unit configuration, and chosen design. Refer to the IOM for detailed installation instructions published by the original equipment manufacturer.
- E. Install equipment modules with manufacturer's recommended clearances for access and servicing. Failure to abide clearance requirements will void proper equipment operation and ability for maintenance personnel to safely perform service to the unit(s). Please refer to the IOM or manufacturer's Design Guide for clearance requirements.

### 3.5 CONNECTIONS

- A. Mechanical and electrical installation connections shall be specified in other Divisions or Sections.

### 3.6 STARTUP SERVICE

- A. Manufacturer's factory-trained or factory-employed service technician shall startup equipment modules. Startup Checklist shall at minimum show the following procedures:
  - 1. After installation, energize the unit disconnect switch
  - 2. Verify correct voltage, phases, and cycles.
  - 3. Verify proper operation of equipment modules engaged in all required operating sequences. Verify proper air inlet and outlet airflows during Adsorption and Regeneration.
  - 4. Submit a startup report summarizing any problems found and remedies performed.

### 3.7 CLEANING

- A. Clean equipment module(s) unit interior prior to operation. Remove all tools, debris, dust, and dirt.
  - 1. Please note, molecular air-cleaning devices are highly sensitive to oversized particulate matter, such as dust, dirt, and other macro-molecules. Should the equipment module be exposed to the oversized particles aforementioned either during construction, installation, or operation, the equipment module will be rendered incapacitated due to system clogging.

### 3.8 FIELD QUALITY CONTROL

- A. Tests and Inspections
  - 1. All tests and inspections shall be performed by manufacturer's factory-trained or factory-employed service technician. Perform field tests and inspections according to commissioning document and start-up procedures.
  - 2. Test all mechanical components for each unit including damper-actuator assemblies, fan motor assemblies, door latches, mechanical switches, and field removable items and internal support structures.

3. Inspect all equipment-based controllers, wiring, components, connections, and installation supporting equipment.
4. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance and proper functionality.

### 3.9 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain Equipment Modules.
- B. Refer to manufacturer's published IOM furnish by the manufacturer to detailed maintenance and operating procedures.

**END OF SECTION 23 42 16**