SECTION 234300 - ELECTRONIC AIR CLEANERS

Revise this Section by deleting and inserting text to meet Project-specific requirements.

Verify that Section titles referenced in this Section are correct for this Project's Specifications; Section titles may have changed.

This Section may include provisions for LEED 2009, LEED v4, ASHRAE 189.1, IgCC, and Green Globes. Note that some sustainable design requirements are either mandatory or optional requirements that may be inserted in the Section Text using the hypertext links. Other requirements that are associated with sustainable design, and may be considered "best practice" or retained even if a sustainable design standard is not a project requirement, are discussed in the Evaluations.

1. GENERAL
   * + 1. RELATED DOCUMENTS

Retain or delete this article in all Sections of Project Manual.

* + - * 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
      1. SUMMARY
         1. Section Includes:

Electronic air cleaners.

Filters associated with electronic air cleaners.

Fan section and cabinet.

Filter gauges.

* + - 1. SUBMITTALS
         1. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.
         2. Manufacturer’s installation instructions shall be provided along with product data.
         3. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).
         4. Product Data: For each type of product. Include dimensions; operating characteristics; required clearances and access; rated flow capacity, including initial and final pressure drop at rated airflow; efficiency and test method; fire classification; furnished specialties; and accessories for each model indicated.
         5. Shop Drawings: For each electronic air cleaner.

Include plans, elevations, sections, details, and attachments to other work.

Show filter assembly, dimensions, materials, and methods of assembly of components.

Include setting drawings, templates, and requirements for installing anchor bolts and anchorages.

Retain subparagraph below if equipment includes wiring.

Include diagrams for power, signal, and control wiring.

Retain "Seismic Qualification Data" paragraph below if required by seismic criteria applicable to Project. Coordinate with Section 230548 "Vibration and Seismic Controls for HVAC." See ASCE/SEI 7 for certification requirements for equipment and components.

* + - * 1. Seismic Qualification Data: Certificates, for filters, accessories, and components, from manufacturer.

Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

* + - * 1. Product Test Reports: For each filter, for tests performed by [**manufacturer and witnessed by a qualified testing agency**] [**a qualified testing agency**].

Retain "Field quality-control reports" paragraph below if Contractor is responsible for field quality-control testing and inspecting.

* + - * 1. Field quality-control reports.
      1. CLOSEOUT SUBMITTALS
         1. Operation and Maintenance Data: For each type of filter and housing to include in emergency, operation, and maintenance manuals.
      2. MAINTENANCE MATERIAL SUBMITTALS
         1. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

Provide [**one**] <**Insert number**> complete set(s) of prefilters for each filter bank.

Provide detergent for [**one**] [**two**] <**Insert number**> refill(s).

Provide [**one**] <**Insert number**> container(s) of red oil for inclined manometer filter gauge.

* + - 1. QUALITY ASSURANCE

Retain "Testing Agency Qualifications" Paragraph below to require a UL, a CE, or an ETL marking. Qualification requirements are in addition to those specified in Section 014000 "Quality Requirements," which also defines "NRTL" (nationally recognized testing laboratory).

* + - * 1. Testing Agency Qualifications: An NRTL.

1. PRODUCTS

Manufacturers and products listed in SpecAgent and MasterWorks Paragraph Builder are neither recommended nor endorsed by the AIA or Deltek. Before inserting names, verify that manufacturers and products listed there comply with requirements retained or revised in descriptions and are both available and suitable for the intended applications. For definitions of terms and requirements for Contractor's product selection, see Section 016000 "Product Requirements."

* + - 1. PERFORMANCE REQUIREMENTS

Retain "Seismic Performance" Paragraph below with "Seismic Qualification Data" Paragraph in "Informational Submittals" Article for projects requiring seismic design. Delete paragraph if performance requirements are indicated on Drawings. Model building codes and ASCE/SEI 7 establish criteria for buildings subject to earthquake motions. Coordinate requirements with Structural Engineer.

* + - * 1. Seismic Performance: Filters shall withstand the effects of earthquake motions determined according to [**ASCE/SEI 7**] <**Insert requirement**>.

Retain first subparagraph below to define the term "withstand" as it applies to this Project. Definition varies with type of building and occupancy and is critical to valid certification. Option is used for essential facilities where equipment must operate immediately after an earthquake.

The term "withstand" means "the unit will remain in place without separation of any parts when subjected to the seismic forces specified[**and the unit will be fully operational after the seismic event**]."

For life-safety components required to function after an earthquake (such as fire-sprinkler systems, components that contain hazardous content, and storage racks in structures open to the public), the Component Importance Factor is 1.5. For other components, the Component Importance Factor is 1.0 unless the structure is in Seismic Use Group III and component is necessary for continued operation of facility or failure of component could impair continued operation of facility, in which case the Component Importance Factor is 1.5.

Component Importance Factor: [**1.5**] [**1.0**].

See ASCE/SEI 7, Coefficients for Architectural Component Table and Seismic Coefficients for Mechanical and Electrical Components Table for requirements to be inserted in subparagraph below.

<**Insert requirements for Component Amplification Factor and Component Response Modification Factor**>.

"ASHRAE Compliance" Paragraph below may be required to comply with Project requirements or authorities having jurisdiction. LEED 2009 IEQ Prerequisite 1 and LEED v4 "Minimum Indoor Air Quality Performance" require compliance with requirements in ASHRAE 62.1, including requirements for controls, surfaces in contact with the airstream, particulate and gaseous filtration, humidification and dehumidification, drain pan construction and connection, finned-tube coil selection and cleaning, and equipment access. Consult manufacturers to verify availability of units having components and features that comply with these requirements.

* + - * 1. ASHRAE Compliance:

Comply with applicable requirements in ASHRAE 62.1, Section 4 - "Outdoor Air Quality"; Section 5 - "Systems and Equipment"; and Section 7 - "Construction and Startup."

Comply with ASHRAE 52.2 for MERV for methods of testing and rating air-filter units.

* + - * 1. Comply with AHRI 850.
        2. Comply with [**NFPA 90A**] [**NFPA 90B**].
        3. Comply with UL 867.
        4. 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.
      1. CAPACITIES AND CHARACTERISTICS

If Project has more than one type or configuration of filter, delete this article and schedule filters on Drawings.

* + - * 1. Drawing Tag. No.: <**Insert number**>.
        2. Face Size: [**48 by 24 inches**] <**Insert dimensions**> nominal.
        3. Number of Cleaner Units: <**Insert number**>.
        4. Unit Depth: <**Insert dimensions**> nominal.
        5. Frame Access Location: [**Front**] [**back**] [**or**] [**side**].
        6. System Airflow: <**Insert number**> cfm.
        7. Maximum or Rated Face Velocity: [**500 fpm**] <**Insert number**>.
        8. Power Pack:

Volts: [**120**] [**208**] [**230**] [**460**] <**Insert number**> V.

Phase: [**Single**] [**Three**].

Hertz: 60 Hz.

Full-Load Amperes: <**Insert number**> A.

Minimum Circuit Ampacity: <**Insert number**> A.

* + - * 1. Maximum Overcurrent Protection Device: <**Insert number**> A.

Retain "Efficiency" Paragraph below.

* + - * 1. Efficiency: <**Insert number**> percent on particles <**Insert number**> microns and larger at 500 fpm.
        2. Initial Resistance: [**0.25-inch wg**] <**Insert number**>.

Retain "Prefilter Type" or "Final Filter Type" Paragraph below, or both, for units with particulate filters.

* + - * 1. Prefilter Type: Integral tracks to accommodate [**1-inch-**] [**2-inch-**] [**4-inch-**] thick, disposable[**or washable**] filters.

Prefilter Face Size: <**Insert width by height**>.

Number of Prefilters, Wide by High: <**Insert number wide by number high**>.

Retain "Minimum Efficiency Reporting Value (MERV) and Average Arrestance" Subparagraph below if inserting requirements for MERV 5 and higher. LEED 2009 IEQ Prerequisite 1 and LEED v4 EQ Prerequisite "Minimum Indoor Air Quality Performance" require compliance with ASHRAE 62.1 (2007 and 2010 versions, respectively), which require a MERV rating of 6 or higher for service to occupied spaces. LEED 2009 IEQ Credit 5 and LEED v4 IEQ Credit "Enhanced Indoor Air Quality Strategies" require MERV 13 or higher. Insert values appropriate to Project sustainability goals.

Minimum Efficiency Reporting Value (MERV) and Average Arrestance: MERV [**4**] <**Insert number**>, with "Composite Average Particle Size Efficiency and Arrestance, Percent in Size Range, Micrometers" according to ASHRAE 52.2.

Minimum Efficiency Reporting Value: MERV [**6**] <**Insert number**>, with "Composite Average Particle Size Efficiency, Percent in Size Range, Micrometers" according to ASHRAE 52.2.

* + - * 1. Final Filter Type: Integral tracks to accommodate [**12-inch**] [**18-inch**] [**24-inch**] <**Insert dimension**> disposable filters.

Final-Filter Face Size: <**Insert width by height**>.

Number of Final Filters, Wide by High: <**Insert number wide by number high**>.

Minimum Efficiency Reporting Value: MERV [**6**] <**Insert number**>, with "Composite Average Particle Size Efficiency, Percent in Size Range, Micrometers" according to ASHRAE 52.2.

Retain "Fan Motor Electrical Characteristics" Paragraph below for units with fan section.

* + - * 1. Fan Motor Electrical Characteristics:

Horsepower: <**Insert number**> hp.

Volts: [**120**] [**208**] [**230**] [**460**] <**Insert number**> V.

Phase: [**Single**] [**3**].

Hertz: 60 Hz.

Full-Load Amperes: <**Insert number**> A.

Minimum Circuit Ampacity: <**Insert number**> A.

Maximum Overcurrent Protection Device: <**Insert number**> A.

* + - * 1. Cleaning System: [**Manual**] [**or**] [**automatic**].
        2. Reservoir Tank: [**30 gal.**] [**50 gal.**].
        3. Connections:

Water Supply: <**Insert number**> NPS.

Drain: <**Insert number**> NPS.

* + - 1. ELECTRONIC AIR CLEANERS
         1. Description: Factory-fabricated, electronic air cleaner operating by electrostatic precipitation principles.

[Manufacturers:](http://www.specagent.com/Lookup?ulid=3544) Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[Air Quality Engineering, Inc](http://www.specagent.com/Lookup?uid=123457137803).

[CosaTron, a division of CRS Industries, Inc](http://www.specagent.com/Lookup?uid=123457137806).

[Trion, Inc](http://www.specagent.com/Lookup?uid=123457137805).

Approved equivalent.

Retain "Prefilter Media," "Prefilter,” or "Final Filter" Paragraph below for electronic air cleaners with filters. If Project has more than one type or configuration of prefilter, retain each type and schedule prefilters on Drawings. Delete both paragraphs if prefilters are specified in another Section or are not required as part of the electronic air cleaner system.

* + - * 1. Prefilter Media: [**Four**] [**Six**] alternate layers of [**galvanized-steel**] [**aluminum**] [**stainless-steel**], flat and herringbone-crimp screen.
        2. Prefilter: Comply with requirements in Section 234100 "Particulate Air Filtration" for [**flat**] [**pleated**] [**ring**] panel. Size and airflow capacity shall match those of electronic air cleaners.

Depth: [**1 inch**] [**2 inches**] [**4 inches**] <**Insert dimension**>.

UL 900 no longer has dual class, Class 1/Class 2, distinctions. See the Evaluations.

Comply with UL 900.

* + - * 1. Final Filter: Comply with requirements in Section 234100 "Particulate Air Filtration" for [**supported bag**] [**unsupported bag**] [**rigid-cell box**] [**V-bank cell**] [**self-supported pocket**]. Size and airflow capacity shall match those of electronic air cleaners.

Depth: [**12 inches**] [**18 inches**] [**24 inches**] <**Insert dimension**>.

UL 900 no longer has dual class, Class 1/Class 2, distinctions. See the Evaluations.

Comply with UL 900.

* + - * 1. Collection Cells: Aluminum, independently supported and nested.

Ionizing Section: Alternately spaced grounded struts and charged ionizing wires.

Collecting Section: Alternately grounded and charged plates, with insulators located out of airstream.

In "Power Pack" Paragraph below, coordinate electrical characteristics with those included in "Capacities and Characteristics" Article or in schedule on Drawings. One manufacturer uses a proprietary high-voltage and high-frequency-grid excitation technology method. Consult manufacturers.

* + - * 1. Power Pack: Self-contained, prewired rectifying unit to convert power, as [**scheduled on Drawings**] [**identified in "Capacities and Characteristics" Article**], to approximately 12,000 V dc for ionizer and 6000 V dc for collector; include overload protection, on-off switch, pilot light showing operating status, and access door interlock. Alternatively provide high-voltage and high-frequency-grid excitation technology power pack and system.
        2. Safety Accessories: Manual-reset safety switches and warning lights for filter plenum access doors, signal lights and safety switching upstream and downstream from unit within duct, and enameled high-voltage warning signs.

Manufacturer who uses excitation technology system does not require "Collection Section Cleaning System" Paragraph below. Consult manufacturers.

* + - * 1. Collection Section Cleaning System:

Detergent Reservoir Tank: [**30 gal.**] [**55 gal.**] <**Insert capacity**> with pump, motor, solenoid valve, level sensor, backflow preventer, wye-strainer, and ball valve.

Detergent.

Dispensing System: Motor-driven oscillating copper manifolds with brass spray nozzles on each side of the collector.

* + - * 1. Controls: Programmable logic controller in remotely mounted, NEMA 250, Type 12 enclosure; with integral time clock and manual override.

Contacts for enable-disable control by building automation system.

"Finish of Interior Surfaces" Paragraph below may be required to comply with Project requirements or authorities having jurisdiction. Retain for sustainable design systems, which require compliance with ASHRAE 62.1.

* + - * 1. Finish of Interior Surfaces: Surfaces in contact with the airstream shall comply with ASHRAE 62.1.
      1. FAN SECTION
         1. Fan: [**Forward curved, belt driven**] <**Insert fan and drive type**>.
         2. Motor:

Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

Type: [**Permanent-split capacitor with SCR for speed adjustment**] [**Electronically commutated motor**] <**Insert type**>.

Verify enclosure types available from manufacturer for specified equipment. Delete remaining subparagraphs if fan section characteristics are indicated on Drawings.

Fan-Motor Assembly Isolation: Rubber isolators.

Enclosure: Totally enclosed, fan cooled, and [**explosion proof**] [**dust-ignition proof**] <**Insert type**>.

Enclosure Materials: [**Cast iron**] [**Cast aluminum**] [**Rolled steel**] <**Insert type**>.

Motor Bearings: Sealed ball, <**Insert special requirements**>.

Unusual Service Conditions:

Ambient Temperature: <**Insert number**> deg F.

Altitude: <**Insert number**> feet above sea level.

Retain first subparagraph below if required to suit Project.

High humidity.

<**Insert conditions**>.

Efficiency: Premium efficient.

NEMA Design: <**Insert designation**>.

Service Factor: <**Insert value**>.

Motor Speed: [**Single speed**] [**Multispeed**] [**Infinitely adjustable with electronic controls**].

* + - 1. CABINET
         1. Description: Minimum <**Insert number**> gauge galvanized steel with <**Insert type**> finish for suspended, wall, frame, or duct mounting.
      2. FILTER GAUGES
         1. Diaphragm type, with dial and pointer in metal case, vent valves, black figures on white background, and front recalibration adjustment.

[Manufacturers:](http://www.specagent.com/Lookup?ulid=13306) Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[Dwyer Instruments, Inc](http://www.specagent.com/Lookup?uid=123457137801).

Approved equivalent.

Diameter: [**4-1/2 inches**] [**2 inches**].

Retain gauge ranges in three subparagraphs below to match expected pressure differences across media filters.

Scale Range for Filter Media Having a Recommended Final Resistance of 0.5-Inch wg or Less: 0- to 0.5-inch wg.

Scale Range for Filter Media Having a Recommended Final Resistance of 0.5- to 1.0-Inch wg or Less: 0- to 1.0-inch wg.

Scale Range for Filter Media Having a Recommended Final Resistance of 1.0- to 2.0-Inch wg or Less: 0- to 2.0-inch wg.

* + - * 1. Manometer-Type Filter Gauge: Molded plastic, with epoxy-coated aluminum scale, logarithmic-curve tube gauge, with integral leveling indicator, graduated to read from 0- to 3.0-inch wg, and accurate within 3 percent of full-scale range.
        2. Accessories: Static-pressure tips, tubing, gauge connections, and mounting bracket.

1. EXECUTION
   * + 1. EXAMINATION
          1. Examine electronic air cleaners and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
          2. Proceed with installation only after unsatisfactory conditions have been corrected.
       2. INSTALLATION
          1. Position each electronic air cleaner unit with clearance for normal service and maintenance. Anchor electronic air cleaners to substrate.

Air-handling units should not be used for temporary heating and ventilating unless expressly approved by Director’s Representative. If filters are used during construction, see SMACNA 008, "IAQ Guidelines for Occupied Buildings under Construction," for procedures to protect HVAC system.

* + - * 1. Do not operate fan system until electronic air cleaners and associated prefilters and final filters (temporary or permanent) are in place. Replace temporary filters used during construction and testing with new, clean filters.
        2. Operate electronic air cleaners for 24 hours as part of startup before units are put into operation.
        3. Install filter-gauge, static-pressure taps upstream and downstream from filters. Install filter gauges on filter banks with separate static-pressure taps upstream and downstream from filters. Mount filter gauges on outside of filter housing or filter plenum in an accessible position. Adjust and level inclined gauges.
        4. Install and connect water-supply and drainage piping.
        5. Coordinate electronic air cleaner and associated prefilter and final filter installations with duct and air-handling-unit installations.
      1. CONTROL CONNECTIONS
         1. Install control and electrical power wiring to field-mounted control devices.

Retain paragraphs below based on types of devices retained in Part 2.

* + - * 1. Connect control wiring between pressure sensors and [**DDC system**] <**Insert system description**>.
        2. Connect control wiring between controlled devices.
        3. Connect control wiring according to Section 260523 "Control-Voltage Electrical Power Cables."
      1. FIELD QUALITY CONTROL

Retain one of first four paragraphs below. Retain first "Testing Agency" Paragraph below if Director’s Representative will hire an independent testing agency.

Retain "Testing Agency" Paragraph below to require Contractor to hire an independent testing agency.

* + - * 1. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

Retain "Manufacturer's Field Service" Paragraph below to require a factory-authorized service representative to perform tests and inspections.

* + - * 1. Manufacturer's Field Service: Engage a company field advisor to test and inspect components, assemblies, and equipment installations, including connections.

Retain "Perform tests and inspections" Paragraph below to require Contractor to perform tests and inspections and retain option to require Contractor to arrange for the assistance of a factory-authorized service agent.

* + - * 1. Perform tests and inspections[**with the assistance of a company field advisor**].

Retain test requirements in "Tests and Inspections" Paragraph below with any combination of paragraphs above.

* + - * 1. Tests and Inspections: Test for leakage of unfiltered air while system is operating.

See Section 014000 "Quality Requirements" for retesting and reinspecting requirements and Section 017300 "Execution" for requirements for correcting the Work.

* + - * 1. Electronic air cleaner and associated filters will be considered defective if they do not pass tests and inspections.
        2. Prepare test and inspection reports.
      1. CLEANING
         1. After completing system installation and testing, adjusting, and balancing air-handling and air-distribution systems, clean electronic air filter housings and install new prefilter and final-filter media.
      2. PROTECTION
         1. Protect installed products and accessories from damage during construction.

END OF SECTION 234300